ETHICAL USE OF ANIMALS IN SCIENTIFIC STUDIES IN GHANA: PROPOSING A RESEARCH ETHICS GOVERNANCE FRAMEWORK

by

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DEDICATION

This work is dedicated to my wife, Mrs Dominica J.E.K. Anumu, and my children, Agnes J.E.Y. Anumu, Benita G.S.E. Anumu, Brian L.E.K. Anumu and Raphael M.S.K. Anumu.

DECLARATION

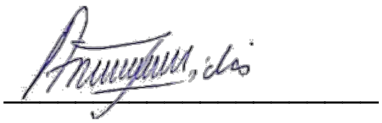
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I declare that the above thesis is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

I further declare that I submitted the thesis to originality checking software and that it falls within the accepted requirements for originality.

I further declare that I have not previously submitted the work, or part of it, for examination at UNISA or another qualification or at any other higher education institution.



SIGNATURE

12th December, 2025.

DATE

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ABSTRACT

While the use of animals in scientific studies has contributed to scientific and medical advancements, there is public apprehension about the inhumane treatment of animals used in scientific studies. This has resulted in an increased need for the ethical use of animals in research. Ghana currently lacks a comprehensive regulatory framework for animals' use in scientific studies, resulting in inconsistent application of ethical governance systems and practices in research-producing organisations, which is likely to undermine the credibility of studies using animals in the country. This study's purpose was to propose an animal research ethics governance framework for research-producing organisations by interpreting key stakeholders' (researchers, Animal Research Ethics Committee (AREC) members and AREC administrators) experiences of existing animal research ethics governance systems and practices in Ghana. To achieve this goal, the study was carried out over two sequential but interrelated phases: the empirical phase and the conceptual framework development phase. An exploratory, embedded single-case study that employed a qualitative research approach framed within an interpretive research paradigm was employed to achieve the objectives of the first phase of the project. Findings from this first phase showed that institutional ARECs were the main animal research ethics governance systems established in the country. Also, the lack of national guidelines in Ghana has resulted in a high dependence on international ethical guidelines for the governance of scientific studies using animals. Furthermore, the ethical approval practices (pre-review, review and post-review activities), as well as training and awareness creation by ARECs, were identified as existing animal research ethics governance practices for the ethical use of animals in scientific studies in research-producing organisations in Ghana. Findings from the first phase of the study informed the realisation of the second phase, where the practice-oriented theory of Dickoff et al. (1968) was employed to develop a culturally sensitive conceptual animal research ethics governance framework that incorporates virtue ethics and the indigenous Ghanaian perspectives on animals. The framework proposes the 6R principles (replacement, reduction, refinement, relationship, respect and righteousness) to promote the ethical use of animals in scientific studies in research-producing organisations in Ghana. The study recommends the validation and implementation of the proposed animal research

ethics governance framework to ensure the ethical and sustainable use of animals in scientific studies in Ghana.

SUMMARY

While the use of animals in scientific studies has contributed to scientific and medical advancements over the years, there is growing public apprehension about the inhumane treatment of animals when used for scientific studies. This has resulted in an increased need for the ethical use of research animals through the establishment of laws, guidelines and policies to govern their treatment. Ghana currently lacks a comprehensive regulatory framework for the use of animals in scientific studies, resulting in the inconsistent application of ethical governance systems and practices in various institutions, which is likely to undermine the credibility of scientific studies using animals conducted in the country. Little is known about the governance systems and practices established at national and institutional levels to ensure that animals are used ethically in the conduct of research in Ghana. Therefore, there is a need to understand the existing animal research ethics governance systems and practices in the country to propose a governance framework that will ensure animals are used ethically in scientific studies in Ghana. Consequently, this study's purpose was to propose an animal research ethics governance framework for research-producing organisations by interpreting key stakeholders' experiences of existing animal research ethics governance systems and practices to promote the ethical use of animals in scientific studies in Ghana.

To achieve the study's overarching purpose, this research was carried out over two sequential but interrelated phases. The empirical phase (phase one) and the conceptual framework development phase (phase two). An exploratory, embedded single-case study that employed a qualitative research approach framed within an interpretive research paradigm was employed to achieve the objectives of the first phase of the project. The study was conducted in three research-producing organisations with existing Animal Research Ethics Committees (ARECs) in Ghana. The study used semi-structured interviews and naïve sketches to collect data from 13 purposively sampled researchers, AREC members and AREC administrators, also referred to as key stakeholders throughout the thesis. An interview guide was used to guide the discussions, and interviews were audio recorded. Audio-recorded interviews were transcribed and thematically analysed using an inductive approach. To ensure

the trustworthiness of the findings, authenticity, confirmability, credibility, dependability, reflexivity and transferability measures were employed by the researcher. Findings from the first phase of the study informed the realisation of the second phase, where the researcher employed the practice-oriented theory of Dickoff et al. (1968) to develop a conceptual animal research ethics governance framework.

Key stakeholders understood the concept of 'animal research ethics governance' to mean the existence of rules, regulations and oversight bodies such as ARECs for the ethical use of animals in scientific studies. ARECs established at research-producing organisations were identified as the main animal research ethics governance system established in a deficient national governance system currently in Ghana. The lack of national standards and guidelines in the country has resulted in a high dependence on international ethical standards and guidelines for the governance of scientific studies using animals. The findings also showed that the animal research ethics governance practices for the ethical use of animals in scientific studies are primarily encapsulated in the ethical approval procedures and processes of ARECs, which include pre-application, application review and post-approval practices. Additionally, training and awareness creation on the ethics of using animals in scientific studies among researchers, staff and students of research-producing organisations, and the general public, were identified as animal research ethics governance practices. Findings from the empirical phase (phase one) of the study informed the realisation of the conceptual framework development phase (phase two), where the practice-oriented theory of Dickoff et al. (1968) was employed to develop a culturally sensitive conceptual animal research ethics governance framework that incorporates virtue ethics and the indigenous Ghanaian perspectives on animals. The study further proposes the 6R principles of replacement, reduction, refinement, relationship, respect and righteousness for the ethical use of animals in scientific studies in research-producing organisations in Ghana. These principles were central to the development of a conceptual animal research ethics governance framework for the ethical use of animals in scientific studies in Ghana.

The study recommends the validation and implementation of the proposed animal research ethics governance framework by developing national laws and guidelines for

the ethical use of animals in scientific studies and establishing a national oversight body to supervise all scientific studies using animals in the country. The study further recommends that research-producing organisations establish institutional policies and guidelines on the ethical use of animals in scientific studies, establish and adequately resource ARECs for their efficient functioning, and develop a capacity-building and awareness creation plan to enhance awareness, knowledge and skills in the use of animals in scientific studies. This will result in animals' ethical and sustainable use in research in Ghana.

KEY TERMS

Animal Ethics, Virtue Ethics, Governance Framework, Ethical Framework, Conceptual Framework, Ghana, Ethical use of Animals, Governance Systems, Governance Practices, Animal Research Ethics Governance, Research-producing Organisations, Animal Research Ethics Governance Framework.

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LIST OF ABBREVIATIONS AND ACRONYMS

5Fs	Five Freedoms
AAALAC	Association for Assessment and Accreditation of Laboratory Animal Care
AALAS	American Association for Laboratory Animal Science
ARECs	Animal Research Ethics Committees
ARRIVE	Animal Research: Reporting of In Vivo Experiments
CAES	College of Agriculture and Environmental Sciences
CAQDAS	Computer-Assisted Qualitative Data Analysis Software
CCAC	Canadian Council on Animal Care
CCSEA	Committee for Control and Supervision of Experiments on Animals
CIOMS	Council for International Organisations of Medical Sciences
CSIR	Council for Scientific and Industrial Research
GFDA	Ghana Food and Drugs Authority
GHAAREC	Ghana Association of Administrators of Research Ethics Committees
GLP	Good Laboratory Practice
GTEC	Ghana Tertiary Education Commission
HREC-CAES	Health Research Ethics Committee of the College of Agriculture and Environmental Sciences
IACUC	Institutional Animal Care and Use Committees
ICLAS	International Council for Laboratory Animal Science
IPRC	International Professional Recognition Council
MEST	Ministry of Environment, Science and Technology
MoE	Ministry of Education
NACLAR	National Advisory Committee for Laboratory Animal Research
NHREC	National Health Research Ethics Council
OECD	Organisation for Economic Co-operation and Development
OIE	Office International des Epizooties
PCF	Professional Competency Framework
PREPARE	Planning Research and Experimental Procedures on Animals: Recommendations for Excellence
SANS	South African National Standard

SAVC	South African Veterinary Council
SOP	Standard Operating Procedure
UFAW	Universities Federation for Animal Welfare
UHAS-REC	Research Ethics Committee of the University of Health and Allied Sciences
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNISA	University of South Africa
WHO	World Health Organization
WOAH	World Organization for Animal Health

CONTEXTUAL DEFINITION OF CONCEPTS USED

The concepts used in this thesis are defined within the study's context:

- ***Animal Research Ethics***

'Research ethics' is defined by Ajemba and Arene (2022) as the proper conduct and reporting of academic investigations in accordance with applicable disciplines and institutions' rules, without causing harm to anyone (researchers and researched) participating in the study. Protecting the rights and welfare of study participants who are predominantly humans and animals, preserving public trust in research endeavours, and preserving the integrity of the research process all depend on research ethics (Pasricha, 2023). In this study, 'animal research ethics' refers to basic principles and approved guidelines on the use of animals in scientific studies. It includes the ethical issues and obligations that researchers must consider when working with animals, ensuring that their welfare is given top priority and that the study is justified. In the context of this study, the aim of animal research ethics is to ensure a balance between scientific progress and the ethical use of animals, thereby fostering responsible and ethical practices within the research community.

- ***Ethical Use of Animals***

The ethical use of animals refers to researchers showing respect for animals' worth and animals' interests as living, sentient creatures by responsibly considering alternatives to experiments on animals, considering reductions in the number of animals used, alleviating the possibility of suffering and enhancing the welfare of animals, maintaining biological variety, acting in a habitat, exchanging data and material, and ensuring that only adequately competent persons handle live animals when using animals in research (Fernandes & Pedroso, 2017).

- ***3Rs, 3R Principles and 3R Framework***

The 3Rs represent the replacement, reduction and refinement principles espoused by Russel and Burch (1959) to promote the ethical use of animals in scientific studies. The 3Rs, 3R principles and 3R framework have been used interchangeably by various authors. The 3Rs, 3R principles or 3R framework, all of which stand for the principles

of replacement, reduction and refinement, will be referred to as the 3R principles for the purposes of this study.

- ***Animals, Research Animals, Laboratory Animals, Animals Used for Research or Animals Used in Scientific Studies***

An animal or laboratory animal is any vertebrate animal (including conventional laboratory animals, farm animals, wildlife, and aquatic organisms) that is created for or used in scientific studies (Albus, 2012; Hasenau, 2021). In this study, the terms 'animals', 'research animals', 'laboratory animals', 'animals used in research' and 'animals used in scientific studies' all refer to the same thing. The definition by Hasenau (2021) that an animal, research animal or laboratory animal or animals used in research or scientific studies is any animal that is used in any form of scientific study that involves the systematic collection and analysis of data was adopted for this study.

- ***Animal Welfare***

'Animal welfare' is defined by Bayne et al. (2019) and van der Staay et al. (2025) as the legal and regulatory protection of domestic and experimental animals to prevent cruelty and unnecessary suffering. According to Gazzano and Mariti (2020), animal welfare entails promoting the well-being of animals employed in scientific investigations by ensuring that fundamental requirements for animal housing, husbandry, and handling are met. However, in this study, 'animal welfare' refers to the use of regulated ethical standards and practices to protect animals used in scientific studies from cruelty and unnecessary suffering.

- ***Research and Scientific Studies***

The term 'scientific studies' in this thesis is synonymous with 'research'. According to Bahishti (2023), research is a systematic approach to data collection and analysis based on scientific principles in order to address specific questions or provide an in-depth understanding of a phenomenon of interest. It refers to the methodical pursuit of answers to specific issues, generally based on facts but often on logical reasoning and societal understandings (Niraula, 2019). Therefore, scientific studies in this study refer to the systematic search for answers to specific questions and increasing

knowledge of a given phenomenon including animals, through data collection and analysis using well-established methodologies based on scientific principles.

- ***Research Governance and Research Ethics Governance***

'Research governance' is defined as a system of administration and oversight that manages research, protects research participants and researchers, and ensures responsibility (New South Wales Health, 2011; Shaw et al., 2005). It encompasses the establishment of standards and norms to enhance the quality of research conducted and protect the public (Nabyonga-Orem et al., 2021).

Based on this understanding, 'research governance' is defined in this study as the process of establishing systems, policies, and guidelines to regulate the activities of all entities involved in research, encompassing researchers, research subjects (animals), and research-producing organisations. Therefore, within the context of this study, research ethics governance refers to the institutional, national, and international policies, procedures, or systems of administration, practices, and oversight that have been established to ensure the ethical conduct of research.

- ***Research Ethics Governance Framework***

A research governance framework is an oversight mechanism involving legislative guidance that establishes research norms and obligations to assist researchers in producing high-quality studies (Crammond et al., 2011; NHREC, 2024). In this study, a 'research ethics governance framework' refers to guidelines for improving the quality of research that will ensure public safety in improving ethical and scientific rigour, promoting best practices, minimising adverse events, and preventing unethical conduct of scientific studies using animals.

- ***Conceptual Animal Research Ethics Governance Framework***

According to Jabareen (2009) and Almadi (2020), a conceptual framework is a network of interconnected or methodically ordered structures that offer an organised method for understanding a certain occurrence. From the foregoing, an organised structure that describes the guidelines, standards and procedures for ensuring that research is conducted ethically is referred to as a conceptual research ethics governance

framework. Such a framework will be designed to guide researchers, research-producing organisations, as well as research ethics committees or committees specifically focused on animal research ethics, in navigating the ethical dilemmas that may emerge during the planning, implementation, and dissemination of research findings. For this study, a conceptual animal research ethics governance framework refers to an organised structure that describes the principles, guidelines, standards, procedures and practices for ensuring that animals are used ethically and responsibly in scientific studies. The aim of a conceptual animal research ethics governance framework will be to encourage scientific progress and simultaneously promote the ethical use of animals.

- ***Key Stakeholder***

A key stakeholder is an individual with a real or vested interest in an organisation's operations or a project. Managers, staff, shareholders, investors and direct beneficiaries of an organisation or project are the key stakeholders of that organisation (García-Sánchez et al., 2022). In a research project, key stakeholders include research participants and individuals with a direct or indirect interest in the findings of the research or beneficiaries of the research outcome (Habib et al., 2020). From the foregoing, key stakeholders in this study refer to researchers who conduct scientific studies using animals and submit their protocols to ARECs for review and approval, the AREC members who review protocols for scientific studies using animals submitted to the AREC for approval, and the AREC administrators who manage the administrative processes of the ARECs. In this study, key stakeholders represent the participant groups (researchers, AREC members and AREC administrators). Also, the terms 'participants' and 'key stakeholders' are used interchangeably.

- ***Research-Producing Organisation***

Research-producing organisation in the context of this study refers to all organisations that produce any form of research using animals. This term has been used in this study to encompass all organisations, including research institutions and non-research institutions that are not set out as research organisations but producing some form of research using animals. The term research-producing organisation, as used in this

thesis, is to ensure that all organisations or institutions producing any form of research using animals is covered.

STUDENT'S CONTRIBUTION TO THE STUDY

PhD research and its associated thesis writing is a complex process that calls for both an in-depth understanding of the topic and the ability of the student to offer novel insights that will advance knowledge in the field. A student's contribution is often the primary emphasis of their thesis in academic research, demonstrating their scholarly involvement and intellectual rigour. This section describes the student's specific contributions to this thesis. The student conducted the entire research with guidance from his supervisors, Dr Retha Visagie and Prof. Elizabeth Kempen.

The conceptualisation of the study, development of the proposal, data collection, data analysis and the thesis write-up were done by the student. The service of a co-coder was employed by the student to assist in co-coding and validating the codes generated by the student during data analysis. Assisted Artificial Intelligence tools were not used in this thesis to conceptualise, construct arguments, generate research findings, misrepresent originality or circumvent Unisa's research integrity processes. Furthermore, no AI "humaniser" tools or systems that aim to mask AI-generated authorship or evade institutional academic integrity processes were used in the generation of the thesis. The intellectual contribution of the researcher in this thesis is his own original work. SciSpace was used as a literature search platform to identify and access relevant scholarly publications. It was not used to 'humanise' or create thesis content. Furthermore, the student hired a language editor for the final editing and proofreading of the thesis. This was to ensure accuracy in language and typographical errors that the student and his supervisors might not have identified in the writing and review process, respectively.

DISSEMINATION ACTIVITIES CARRIED OUT

The student took steps to disseminate the findings beyond the confines of this thesis. The following presentations were made at international conferences:

1. **Anumu FEY**, Owusu SA & Baidoo H: Advancing Research Ethics Governance and Administration in Ghana. Poster presentation made at the 'Public Responsibility in Medicine and Research (PRIM&R) Conference' held at the Walter E. Washington Convention Center, Washington, DC, USA. December 3 – 6, 2023.
2. **Anumu FEY**, Visagie RG & Kempen E: Researchers' Application of the 3R Principles for the Humane Use of Animals in Scientific Studies in Ghana. Research Ethics Conference 2023. Oral presentation made at the 'Research Ethics Conference' organised by The Research Ethics Association and hosted by the University of Bath from July 6 – 7, 2023.
3. **Anumu FEY**, Visagie RG & Kempen E: Creating an Enabling Environment for Scientific Studies using Animals: The Role of Research Ethics Administrators. Poster presentation at the 'International Network of Research Management Societies (INORMS) Congress 2023' held in Durban, South Africa from May 30 – June, 2, 2023.
4. **Anumu FEY,** Visagie RG & Kempen E: Efficient Governance of Scientific Studies Using Animals: Role of The Research Administrator. Poster presentation at the '14th West African Research and Innovation Management Association (WARIMA) Annual Workshop & Conference' held in Banjul, The Gambia, from January 15 – 18, 2023.

By presenting the research at conferences and engaging with the scientific and professional community, the student ensured that the contributions reached a wider audience. Presenting at these conferences also helped the student to get responses, suggestions and critiques from the broader international audience that aided in strengthening the research and the student's understanding of the study.

Additionally, the student plans to publish articles on the following topics in either “Animals” or “Laboratory Animals Limited” peer-reviewed journals from this thesis:

- Animal Research Ethics Governance Systems and Practices in Ghana: Experiences of Key Stakeholders
- Promoting the Ethical Use of Animals in Scientific Studies in Ghana: A Proposed Governance Framework

Publishing in peer-reviewed journals will further afford the researcher the chance to effectively disseminate the findings of this study to a broader academic community to influence how scientific studies using animals will be governed and ensure that animals are used humanely in scientific studies, particularly in contexts similar to that of Ghana.

REFERENCING STYLE APPLIED IN THE THESIS

In academic writing, the significance of appropriate referencing cannot be overstated. The seventh edition of the American Psychological Association (APA) referencing style (American Psychological Association, 2025) was employed in writing this thesis. One of the distinguishing features of the APA referencing style is its emphasis on in-text citation, which uses the author-date method of citation. This method requires that the author's last name and the year of publication must be included in parentheses immediately following the relevant information. The APA referencing style also requires a reference list at the end of the research paper or document, which provides detailed bibliographic information that enables readers to identify the original sources of documents cited in-text.

Additionally, the seventh edition of the APA referencing style considers the wide variety of sources (social media, web, and other non-traditional materials) that researchers come across during the research process. The application of APA referencing style in this thesis was particularly critical, as the thesis represents a significant contribution to academic knowledge and will be subjected to rigorous evaluation by peers and experts in the field. Using the APA referencing style enabled the researcher to provide a well-referenced thesis, which highlights the study's originality and validity. Furthermore, it shows the level of engagement the researcher has had with existing literature. The APA referencing style was used in this thesis to ensure that the thesis followed academic standards, thereby enhancing the credibility of the study.

USE OF TURNITIN

The invention of digital technology has significantly impacted how students and academics approach the writing process, considering that the integrity of academic work is an essential component of scholarly pursuit. Turnitin functions as a protector of originality, offering a rigorous framework for identifying textual similarities through the analysis of submitted documents by contrasting them with an extensive database of scholarly publications, published literature, and online or digital resources (Meo & Talha, 2019). To achieve this goal, the student utilised the Turnitin software at all stages of the thesis-writing process to determine the written text's originality level. At the proposal stage, the final draft of the proposal was submitted to the Turnitin software. At the thesis-writing stage, the final versions of each chapter of the thesis were submitted for similarity assessment, after which the entire thesis was submitted to Turnitin for a final similarity check. As a student embarking on the complex journey of thesis writing, the role of Turnitin was prominent, not only as a tool for ensuring originality but also as an educational resource that fostered a deeper understanding of proper citation practices, paraphrasing and academic ethics.

CHAPTER ONE
INTRODUCTION

1.1 Introduction

The objective of Chapter One of this thesis is to delineate the context surrounding the ethical use of animals in scientific studies, to describe the main problem necessitating the conduct of this study, and the research question that this study aimed to address. The aim and objectives, rationale and significance of the study, a comprehensive overview of the methodology used in conducting the study, as well as the study's delimitations are presented in this chapter. Finally, the outline of this thesis is presented, in which the organisation of the thesis is shared. The chapter ends with a conclusion section and makes reference to the content that follows in Chapter Two.

1.2 Background

Throughout history, animals have held a pivotal role in the domain of biomedical research (Aske & Waugh, 2017) and constitute a fundamental component in several scientific and medical advancements (Andersen & Winter, 2019; Franco, 2013). Animals are critical in helping to solve many scientific and medical enigmas and contributing valuable insights for developing treatments for human diseases (Andersen & Winter, 2019; Franco, 2013; Jose et al., 2021). Using animals in research has, however, been an issue of contention in the literature for some time (Abd El-Aal, 2014; Beauchamp & DeGrazia, 2020). There is growing public and academic concern about the suffering of animals used in scientific studies (Guillén & Steckler, 2019). The contention of critics is that the anticipated benefits of scientific studies using animals are insignificant compared to the serious ethical issues arising from the practice (Earl, 2022; Fernandes & Pedroso, 2017; Hansen & Kosberg, 2019). Consequently, there is an increased apprehension among the general public regarding the ethical use of animals in scientific investigations.

Therefore, although the use of animals in scientific studies is increasing (Festing & Wilkinson, 2007; Kabene & Baadel, 2019), the conduct of such research continues to

be a contentious matter, primarily due to the ethical and moral considerations associated with using research subjects that are incapable of expressing their willingness to participate (Couto & Cates, 2019) or the use of potentially painful or unpleasant scientific procedures on the animals (Abd El-Aal., 2014). Zemanova (2020) therefore suggests that scientific studies using animals must be conducted in a compassionate and responsible manner to ensure that the quality of life of the animals before, during and after the study is maximised. This suggestion underscores the importance of animals being handled humanely before, during and after being used in scientific studies.

In this vein, Russell and Burch proposed the 3R principles, advocating for the ethical use of animals in scientific studies in the year 1959 (Hubrecht & Carter, 2019; Russel & Burch, 1959). They originated the concepts of replacement (using inanimate materials as substitutes for sentient, higher organisms), reduction (reducing the number of animals used in scientific studies to attain a specific level of accuracy and precision in data collection) and refinement (a reduction in the occurrence or severity of methodologies used on animals that must, however, be applied in empirical studies) (De Angelis et al., 2022; Russel & Burch, 1959). These principles are known as the 3Rs, which aim to improve both scientific integrity and the welfare of animals used in scientific studies (Hubrecht & Carter, 2019; Tannenbaum & Bennett, 2015). These principles have garnered extensive recognition globally as the ethical foundation for using animals in research (Hubrecht & Carter, 2019; Lauwereyns et al., 2024). The 3R principles is articulated in numerous institutional, national, and international regulations and guidelines pertaining to laboratory animals' ethical use (Grimm et al., 2023; Louis-Maerten et al., 2024; Verderio et al., 2023).

Moreover, there have been suggestions to expand the 3Rs to include other Rs such as relevance, responsibility, respect, and reproducibility (Akkermans et al., 2020; Brink & Lewis, 2023; Shamoo & Resnik, 2022; Simonato et al., 2020). In proposing the additional Rs, scholars argue that there has been an overdependence on the 3R principles, even though they have been criticised by some authors, including Ferdowsian and Beck (2011) and Blattner (2019). Critics claim that the 3R principles are insufficient in guaranteeing the ethical use of animals in scientific studies because

they do not address all aspects of research using animals (see Section 2.4 for a detailed presentation on the 3R principles). Despite these arguments, the 3R principles continue to serve as the basic framework used by many research institutions to guide the development of animal research ethics laws, guidelines and governance frameworks.

To ensure that animals are humanely used in scientific studies, it has become mandatory for research-producing organisations in several countries to adhere to laws and guidelines that promote animal welfare, thereby ensuring that these animals are adequately cared for and used in a humane manner (Brink & Lewis, 2023; Wallis, 2023). Animal research ethics governance frameworks are designed to provide guidance and standards for the ethically responsible use of animals in scientific studies (Brink & Lewis, 2023; McLeod & Hartley, 2018). They also intend to relieve animals from starvation, thirst, stress, suffering, injury, illness, nervousness, anguish, and the inclination for deviant conduct (Brønstad et al., 2016). In response to the increasing dialogue concerning societal apprehension and the independence of scientific research, governance frameworks for the ethical use of animals in scientific studies continue to evolve (Azilagbetor et al., 2024). These governance frameworks include implementing appropriate legislative guidance aimed at ensuring the ethical use of animals in scientific studies (Andersen & Winter, 2019; Guillén & Steckler, 2019).

Anderson et al. (2019) predict an increase in the number of animal ethics governance frameworks to be developed, considering growing concerns about the welfare of animals used in scientific studies. Frameworks, including the ‘two core values’ principle (DeGrazia & Beauchamp, 2019), the ‘3Vs framework’ (Würbel, 2017), the ‘five freedoms (5Fs)’ principle (Guillén & Steckler, 2019), the five domains (5Ds) framework (Mellor, 2017) and the ‘12Rs framework’ (Brink & Lewis, 2023; Wallis, 2023) have been proposed (see Section 2.4 for a detailed presentation on these frameworks). The main purpose of proposing these frameworks has been to ensure a balance between scientific progress and the ethical treatment of animals used in scientific studies. Consequently, the ethical issues pertaining to the use of animals in research are becoming more widely recognised as a subfield of research ethics known

as animal research ethics, which has emerged from growing conversations about the ethical use of animals in scientific studies (Arnason, 2020).

Animal Research Ethics Committees (ARECs) (NHREC, 2024), alternatively referred to as Animal Ethics Committees (Milford et al., 2025) or Institutional Animal Care and Use Committees (IACUC) (Everitt & Berridge, 2017; Pippin et al., 2025) to reflect different regulatory and ethical orientations, are established to review, approve, and oversee scientific studies that use animals (Hansen et al., 2012). In this study, the concept AREC (NHREC, 2024) was used to represent these committees. ARECs constitute a fundamental component of the animal research ethics governance framework and have been extensively leveraged to oversee and protect animals used in scientific studies, thereby fulfilling the goal of promoting animals' ethical use (Mohan & Huneke, 2019; Schuppli & Fraser, 2007). The primary objective of ARECs is to guarantee that researchers adhere to legislative frameworks and established guidelines and protocols pertaining to the care and ethical use of animals in scientific studies (Mohr et al., 2024; Silverman, 2015). This goal is achieved through the activities of several key stakeholders who are directly involved with the operations and processes of ARECs, particularly researchers, AREC members and AREC administrators who fulfil various roles in realising the committee's purpose.

Ghana, like many other African countries, is witnessing an increase in the use of animals in scientific studies (Arnason, 2020; Mohr et al., 2017). This phenomenon is ascribed to the presence of 16 public universities, three health research centres, a Council for Scientific and Industrial Research consisting of 13 research institutes, alongside several private universities and tertiary institutions, within which animals are either used for scientific studies or opportunities for their use exist. Currently, there are no national guidelines and governance frameworks that ensure animals are used ethically for scientific studies in Ghana. The country continues to draw on international research ethics guidelines and governance systems (Laar et al., 2020) to guide researchers, members of ethics committees, including AREC members and administrators, in using animals in scientific studies. Since these governance frameworks may not be suited to the context of animal research projects in Ghana, efforts must be made to develop a governance framework that would facilitate the

implementation of ethically sound practices that are contextually relevant for the conduct of research using animals (Carter & Williams, 2019). An attempt to propose an animal research ethics governance framework for research-producing organisations in Ghana, as intended in this study, seeks to avoid the imposition of governance frameworks that do not consider the Ghanaian context, while also addressing pertinent problems concerning the governance of using animals in scientific studies in Ghana.

Anderson et al.'s (2019) prediction of a rise in the development of animal ethics governance frameworks aligns with the identified need in Ghana for a governance framework that can ensure animals are used ethically in scientific studies. Currently, such studies in Ghana continue to increase, and the regulatory frameworks and ethical guidelines governing animal research are underdeveloped and inadequately enforced (Mohr et al., 2017, 2024; Nyika, 2009). The animal research ethics governance framework proposed in this study aspires to address this gap by advocating for the responsible and ethical use of animals in research within the Ghanaian context. This framework takes Ghana's unique cultural, social and economic circumstances into account while drawing on global best practices.

1.3 Research Problem

Ghana lacks an animal research ethics governance framework dedicated to the ethical use of animals in scientific studies, despite the significant prevalence of these studies in research-producing organisations in the country (Fakoya, 2012; Seth & Saguti, 2013; Tindana et al., 2019). Although there is general animal welfare legislation (Criminal Code, 1960 (ACT 29)) that stipulates that people should be prosecuted for putting animals through unnecessary suffering, its application to scientific studies remains vague, underutilised, and has not been enforced in the past (Mellor & Webster, 2014; Olsson et al., 2019). There is no established legal framework governing the ethical assessment of animals used for scientific studies in Ghana (Mohr et al., 2017). The absence of a national body, entity or ethical framework that provides guidance for the ethical conduct of animal research in Ghana persists (De Vries et al., 2017; Owusu et al., 2022; Tindana et al., 2019). This has resulted in an unregulated

and fragmented system where researchers are likely to conduct research in inhumane ways, compromising the quality of scientific studies using animals in Ghana, thereby affecting the credibility of such research conducted in the country. Animals will continue to suffer inhumane treatments during research if this unregulated system persists.

The current landscape of national governance structures and principles concerning research ethics in Ghana remains inadequately defined, particularly with regard to the systems and practices employed by the currently established ARECs. The efficacy of these systems and practices in promoting the ethical use of animals in scientific studies within the country remains ambiguous. Furthermore, the existing literature lacks comprehensive evidence detailing how research-producing organisations in Ghana oversee the ethical use of animals in scientific studies, despite the fact that countries such as Kenya, South Africa and Tanzania have documented robust governance frameworks through the enactment of comprehensive laws that regulate animals' use in research (NHREC, 2024; Seth & Saguti, 2013). This absence of a governance framework in Ghana significantly hampers the operations of the existing ARECs and their key stakeholders, which include researchers who rely on AREC services, members of the ARECs, and the AREC administrators. The lack of legislation and a national framework or guidelines dedicated to the ethical use of laboratory animals in Ghana leaves these key stakeholders without a clear mechanism to assess the ethical ramifications of using animals in proposed scientific studies. This inadequacy not only presents potential risks to the well-being of animals but also compromises the integrity and credibility of scientific studies conducted in Ghana that involve the use of animals (Fakoya, 2012; Mohr et al., 2017, 2024). As Ghana seeks to position itself as a hub for scientific innovation and research (Catlow & Pickett, 2024), the establishment of a robust governance framework for the ethical use of animals in scientific studies in the country is imperative.

An animal research ethics governance concept encompasses a variety of elements that include actors within the research value chain. They include funders, researchers, institutions, communities, research participants and countries where research is being conducted (Schoeman, 2019), as well as regulatory frameworks like regulations,

legislation, policies and guidelines (Kleiderman & Ogbogu, 2019; Canario et al., 2022). However, this concept has been mostly misrepresented and equated to the existence of ethics committees by many authors, including Rossouw (2020) and Canario et al. (2022). This lack of understanding of the fundamental principles of the concept of 'animal research ethics governance' significantly impacts how ethical practices in animals' use in research are regulated. Currently, there is a gap in academic discussions in Ghana on how key stakeholders understand and operationalise the animal research ethics governance concept. The absence of a unified understanding of the concept of 'animal research ethics governance' among key stakeholders can hinder the development of a governance framework for the ethical use of animals in research, which ultimately impacts the welfare of animals used for research and the integrity of scientific studies in Ghana. It is therefore imperative to explore the perceptions of key stakeholders regarding animal research ethics governance in order to clarify the diverse interpretations in Ghana. This will help in identifying current knowledge gaps and perspectives that will promote the development of an efficient animal research ethics governance framework that complies with both international standards and local contexts.

The lack of a national animal research ethics governance framework in Ghana and the diverse interpretations of animal research ethics governance have led to inconsistent implementation of research ethics governance systems and practices across different institutions (King & Zohny, 2021). This inconsistency can undermine the credibility of scientific studies and affect international collaborations (Fakoya, 2012; Mohr et al., 2017, 2024). Despite the critical role played by key stakeholders – particularly AREC members and AREC administrators – in shaping the animal research ethics governance systems and practices, their experiences and perspectives of existing animal research ethics governance systems and practices remain unexplored in the Ghanaian context. There exists a significant deficiency of empirical evidence that clarifies these key stakeholders' experiences within the context of research ethics governance systems and practices in Ghana. This absence of empirical evidence significantly impedes assessments of the efficacy of existing animal research ethics governance systems and practices, and the identification of potential areas for improvement.

Additionally, the absence of a cohesive understanding of these experiences may perpetuate ethical lapses and undermine the integrity of scientific studies using animals in Ghana (DuBois et al., 2018). It is therefore imperative to explore the nuanced experiences of these key stakeholders to identify the strengths and weaknesses in existing animal research ethics governance systems and practices. Exploring key stakeholders' experiences with the existing animal research ethics governance systems and practices will illuminate the challenges and opportunities within the existing governance systems and practices, ultimately fostering a more ethical approach to scientific studies using animals that aligns with both scientific integrity and social values. Understanding key stakeholders' experiences with the existing animal research ethics governance systems and practices in Ghana is crucial for developing an effective governance framework for the ethical use of animals that will comply with international ethics standards and resonate with the local context and cultural values of Ghana.

Despite the existence of globally accepted governance frameworks for animal research ethics, such as the 3R principles (Khan, 2024), there is no empirical evidence that the 3R principles have been adequately and consistently implemented in developing countries, including Ghana (Nyika, 2009; Lewis, 2019). Furthermore, the understanding and implementation of these guidelines and frameworks among key stakeholders in animal research ethics in Ghana remain inadequately explored. This brings up ethical questions about how animals are treated when used in scientific studies, which has the potential to erode public confidence and hinder scientific advancement. Additionally, there is a paucity of research that specifically addresses the Ghanaian context with respect to the understanding and implementation of these governance frameworks for the ethical use of animals in research. This gap in the literature underscores the necessity to identify local key stakeholder perspectives that can inform the development of an animal research ethics governance framework tailored to the cultural, social and economic realities of Ghana. It is therefore imperative to understand the suggestions from key stakeholders for creating a robust ethical framework that enhances compliance and promotes public confidence in scientific research. The ethical use of animals in scientific studies in Ghana is complex and requires collaboration and cooperation from all key stakeholders. Consequently,

it is vital to solicit recommendations and critical insights from key stakeholders to promote ethical practices that are culturally sensitive and scientifically sound.

While the necessity for a well-defined conceptual governance framework to facilitate the ethical use of animals in scientific studies is evident, the specific components required for such a framework to be effective in the Ghanaian context remain ambiguous. Consequently, it was imperative to engage the aforementioned key stakeholders (researchers, AREC members and administrators) in this study to gain insights into their experiences with existing animal research ethics governance systems and practices in the country. This engagement served as a foundation for generating a proposed conceptual governance framework for research-producing organisations aimed at promoting the ethical use of animals in scientific studies in Ghana.

1.4 Research Questions

Against the background provided in the preceding sections, this study sought to answer the following central research question:

Which existing animal research ethics governance systems and practices can inform a proposed conceptual governance framework for research-producing organisations to promote the ethical use of animals in scientific studies in Ghana?

The following sub-questions support the central question:

1. *How do key stakeholders understand the concept of 'animal research ethics governance' in Ghana?*
2. *What are the key stakeholders' experiences with the existing research ethics governance systems that promote the ethical use of animals in scientific studies in Ghana?*
3. *What are the key stakeholders' experiences with the existing research ethics governance practices that promote the ethical use of animals in scientific studies in Ghana?*

4. *What are the key stakeholders' suggestions for promoting the ethical use of animals in scientific studies in Ghana?*
5. *Which key components should be included in a proposed conceptual animal research ethics governance framework for research-producing organisations to promote the ethical use of animals in scientific studies in Ghana?*

1.5 Study Aim and Objectives

Overall, the study aimed to propose an animal research ethics governance framework for research-producing organisations by interpreting key stakeholders' experiences with existing animal research ethics governance systems and practices to promote the ethical use of animals in scientific studies in Ghana.

1.5.1 Objectives

This study was conducted through two successive yet interrelated phases, each with distinct objectives related to the phase, as shown in Figure 1.1. The initial phase, designated as the empirical phase (phase one), was followed by the subsequent phase that focused on the development of the conceptual framework (phase two). In Figure 1.1, it is proposed that the findings generated from the empirical phase (phase one) would feed into the conceptual framework development phase (phase two) of the study, thereby constituting the two core components of this study.

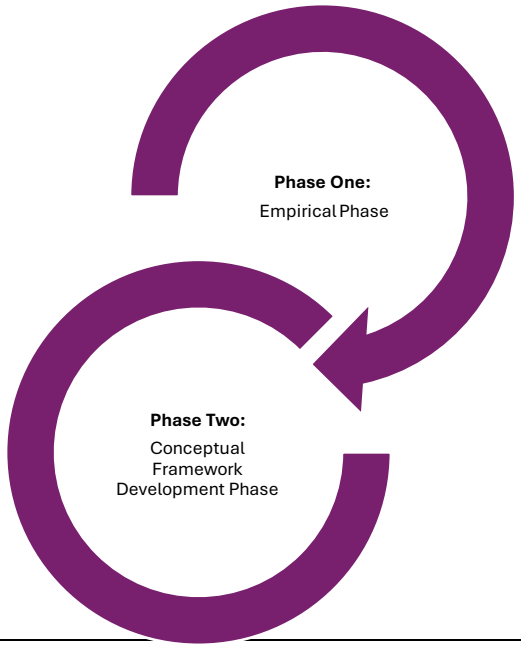


Figure 1.1: Interconnected phases of the study

Source: Author's construct, 2025

Each of the phases set out in Figure 1.1 encompasses distinct objectives for the fulfilment of the overarching aim of the study. The purpose of each of the phases, along with the specific objectives associated with the two phases, follows:

Phase one: Empirical phase – *To gain a deeper understanding of the experiences of key stakeholders with existing animal research ethics governance systems and practices that promote the ethical use of animals in scientific studies in Ghana.*

- Objective 1: To explore and describe key stakeholders' understanding of the concept of 'animal research ethics governance'.
- Objective 2: To explore and describe key stakeholders' experiences with the existing research ethics governance systems that promote the ethical use of animals in scientific studies in Ghana.
- Objective 3: To explore and describe key stakeholders' experiences with the existing research ethics governance practices that promote the ethical use of animals in scientific studies in Ghana.

- Objective 4: To explore and describe the key stakeholders' suggestions to promote the ethical use of animals in scientific studies in Ghana.

Phase two: Conceptual framework development phase – *To propose an animal research ethics governance framework for research-producing organisations by interpreting key stakeholders' experiences with existing animal research ethics governance systems and practices to promote the ethical use of animals in scientific studies in Ghana* (Objective 5).

1.6 Justification of the Study

The continued significance of using animals in scientific studies cannot be overemphasised. It is, therefore, imperative to constantly focus on improving the well-being of these animals (Herrmann & Jayne, 2019), particularly when there is a progressive increase in the use of animals in research (Arnason, 2020) and questions about their welfare persist (Hutchinson et al., 2022). As animal rights activist groups are becoming increasingly vocal about objections to research using animals (Gannon, 2007; Josse, 2021), there is a compelling need to ensure that scientific studies using animals are governed by a rigorous governance system or framework (Mohr et al., 2017). This is especially true in a developing country such as Ghana, where such governance frameworks do not exist. If such a governance framework is not developed urgently to regulate and govern scientific studies using animals, animal rights activists are likely to use cases of inhumane treatment of animals used in research in developing countries such as Ghana to advance their campaign for abolishing animals' use in scientific studies, despite the fact that their significance in research has been extensively validated (Aske & Waugh, 2017; Griffin et al., 2005). This will be particularly detrimental to scientific studies using animals in most developing countries, where the full potential of using animals in research has not been explored. Thus, the high potential for new scientific discoveries through the use of animals in research in the context of developing countries may be severely limited if ethical governance frameworks for such studies are not developed and implemented (Mohr et al., 2017).

The ethical considerations and regulatory frameworks governing animals' use in research necessitate a periodic re-evaluation to enhance these animals' welfare (Childers, 2022), particularly in developing countries where their use in scientific studies is on the rise (Festing & Wilkinson, 2007; Nyika, 2009; Robinson et al., 2019). Maintaining regulatory compliance must be the number one priority for researchers who employ animals as study subjects to continue to build a solid case for the use of animals in scientific studies. Due to the absence of an animal research ethics governance framework at the national level in Ghana (Mohr et al., 2017, 2024), the development of an animal research ethics governance framework without first exploring and understanding existing governance systems and practices, as well as the experiences of key stakeholders, could culminate in a framework that may fail to address the critical issues pertinent to Ghana. This outcome could render it unacceptable or unimplementable by the primary beneficiaries of the framework. Very few studies have explored the structure and functions of an AREC, as confirmed by Mohan and Huneke (2019) and Pietrzykowski (2021), and even fewer have explored the experiences of AREC members. Exploring the experiences of AREC members, researchers, and AREC administrators will therefore provide a better understanding of how ARECs in Ghana are functioning. This understanding will help provide relevant information, documentation and recommendations that could improve animal research ethics governance in the country. It will further enhance the understanding of the fundamental elements that should be included in an animal research ethics governance framework, particularly in the context of Ghana.

Africa's research ethics environment is largely undiscovered (Ali et al., 2021; Nabyonga-Orem et al., 2021), which offers an opportunity to develop a novel and appropriate governance framework (Schoeman, 2019) for the ethical use of animals in scientific studies. Currently, many institutions in Africa are either attempting to or developing their own ethical frameworks in less formal ways by creating guidelines and codes of conduct that govern them in using animals in research and teaching in their respective institutions (Hau et al., 2018). These available governance frameworks, however, reflect existing laws and regulations from other developed countries. Thus, the current state of developing governance frameworks for promoting the ethical use of animals in scientific studies presents limited standardisation in

AREC's operations in developing countries, including Ghana (Hau et al., 2018; Ndebele et al., 2014). Schoeman (2019) advises that governance frameworks developed in Africa must be culturally sensitive and grounded in the African context to improve their adoption and use. There is, therefore, a need to understand what currently exists and primary stakeholders' experiences (researchers, AREC members and AREC administrators) to ensure that the animal research ethics governance framework that will be developed will reflect the contextual situation in Ghana and provide guidance on the ethical use of animals in scientific studies. This study therefore seeks to provide some key empirical evidence through engagement with key stakeholders in developing a conceptual animal research ethics governance framework for scientific studies in Ghana.

1.7 Significance of the Study

The principal objective of this study was to develop a proposed conceptual animal research ethics governance framework for research-producing organisations aimed at enhancing the ethical use of animals in scientific studies in Ghana. This governance framework, which is the first of its kind in Ghana, serves as a guiding instrument for decision-makers in research-producing organisations, facilitating the promotion of the ethical use of animals in scientific studies. The proposed animal research ethics governance framework emphasises the need for transparency and accountability in research using animals. By instituting mechanisms for monitoring and reporting on scientific studies using animals, the animal research ethics governance framework aspires to enhance public confidence in the scientific community when research using animals is conducted in an African context.

This study aims to promote the ethical use of animals in scientific studies by providing research-producing organisations in Ghana with practical recommendations. It is anticipated that the recommendations may promote the integrity and acceptance of research conducted in Ghana within the larger scientific community. The insights gained from this study may also prove valuable to other developing nations with similar characteristics to Ghana and the African continent. Additionally, this study addresses the scarcity of empirical evidence and scholarly literature pertaining to national or

institutional policies or guidelines that govern the use of animals in scientific studies in Ghana and other African countries. The animal research ethics governance framework proposed in this study has the potential to function as a foundational model for other developing countries across the African continent, seeking to establish their own country-specific frameworks. The framework is tailored to address contextual issues rather than relying exclusively on frameworks developed in more economically advanced countries, which may be challenging to interpret and implement within the African context.

This study highlights important lessons and makes recommendations for formulating specific laws, policies and guidelines pertaining to the ethical use of animals in scientific studies in Ghana. It underscores the urgent need for legislative action and regulatory measures governing animals' use in research. As Ghana continues to enhance its scientific research capabilities, the significance of ethical governance in studies involving animals cannot be overstated. The establishment of a robust governance framework will not solely enhance the credibility of scientific studies using animals but will also serve to further the overarching aim of advancing ethical research methodologies on a global scale.

1.8 The Research Methodology

This section provides a brief overview of the methodology employed in this study. The research approach, paradigm, and research design employed to achieve the study's objectives are comprehensively presented and described in Chapter Four.

1.8.1 Research paradigm and study design

This study employed a qualitative research approach (Section 4.2) framed within an interpretive (also referred to as interpretivism or interpretivist) research paradigm (Burns et al., 2022; Burns & Peacock, 2019; Ryan, 2018) (Section 4.3). The selection of a qualitative research methodology was informed by the nature of the central research question and the overall aim of the study to explore key stakeholders' knowledge and experience of existing animal research ethics governance systems

and practices in research-producing organisations to inform the development of a proposed animal research ethics governance framework for Ghana. The interpretive research paradigm emphasises the importance of contextual factors and the collaborative generation of meaning between the researcher and participants, making it a suitable research paradigm for this study (Creswell & Creswell, 2018).

An exploratory, embedded single-case study design, as defined by Yin (2018), involving three institutional ARECs in Ghana as the embedded units, was adopted to realise the objectives of the empirical phase (phase one) of the study (Section 4.4). The choice of this design is justified by the need to acquire a more profound understanding of an under-researched area (Crawford, 2019), such as key stakeholders' experiences with the existing animal research ethics governance systems and practices in research-producing organisations in Ghana.

The exploratory nature of this study allowed for more profound insight to be gained into the understudied phenomenon (Hunter et al., 2019; Stebbins, 2001). The embedded nature of the case study design was essential, as it allowed the researcher to examine multiple units of analysis within a single case (Yin, 2018). This multi-faceted design enabled the exploration of different perspectives and dimensions of the existing governance systems and practices for the ethical use of animals in scientific studies in Ghana, providing a comprehensive view that a singular focus would likely overlook.

1.8.2 Study population and sampling strategy

The population for this study consisted of three purposefully selected key stakeholder groups in research-producing organisations in Ghana: (1) researchers, (2) AREC members, and (3) AREC administrators. This diverse group was intentionally selected (Campbell et al., 2020; Marshall, 1996) to provide a comprehensive perspective on existing animal research ethics governance systems and practices in research-producing organisations in Ghana.

These participants were recruited from three research-producing organisations in Ghana with institutional ARECs established (detailed description provided in Chapter 4, Section 4.5). Together, these three groups formed a balanced study population that enabled the exploration of varied experiences related to the research phenomenon. A purposive sampling strategy was employed as it facilitated the researcher's intentional inclusion of participants (Campbell et al., 2020; Etikan, 2016) possessing experiences with existing animal research ethics governance systems and practices in research-producing organisations in Ghana.

1.8.3 Data collection and analysis

The collection of empirical data for this study was done using semi-structured interviews, reflective diaries, and naïve sketches. The latter refers to a self-reporting exploratory approach wherein participants articulate their experiences and perceptions in response to specific inquiries (Chokwe & Wright, 2012). An interview guide was consistently used across the semi-structured interviews and the naïve sketches to ensure coherence in data collection (Roberts, 2020). All interviews were captured through audio recording and subsequently secured on a computer with password protection to maintain confidentiality.

Thematic analysis was employed to analyse the data in accordance with the six-step process proposed by Braun and Clarke (2006). This process suggests that the researcher first reviews each interview recording by listening to the recording multiple times to ensure that accurate verbatim transcription and familiarisation with the data occur. The resulting transcripts were subsequently imported into ATLAS.ti version 23, a computer-assisted software system designed for qualitative data analysis (Gupta, 2023). Using the software, codes were identified and systematically categorised to reflect the emergent themes. In addition to the coding carried out by the researcher, the expertise of an independent co-coder was employed to co-code and validate the codes generated by the researcher. The main themes and subthemes that emerged from the analysed data were carefully examined, defined, and named. The final phase of the data analysis process included the presentation and discussion of the findings,

using quotes from participants to support the themes and arguments being made (see Section 4.12.2 for a detailed description).

To enhance the credibility of participants' responses, data triangulation was employed (Fusch et al., 2018). This entailed integrating multiple sources of information, specifically interviews, naïve sketches, and reflective diaries. Quotes from the semi-structured interviews and naïve sketches were also used as evidence to substantiate the themes and subthemes identified. Finally, the researcher compared the findings of this study with those from similar research published in existing literature, thereby facilitating a literature confirmation to contextualise the findings within the broader academic discourse.

1.9 Procedures to Confirm Trustworthiness and Authenticity

Guba and Lincoln's (1989) measures for assessing trustworthiness were employed to ensure the study's scientific credibility. In order to affirm the accuracy and reliability of the findings of this study, the researcher employed various measures, including authenticity, confirmability, credibility, dependability, reflexivity and transferability. A detailed description of the measures of trustworthiness is provided in Section 4.14.

1.10 Ethical Considerations

This study was conducted in adherence to the research ethics policy established by the University of South Africa (UNISA) (2016). In adherence to this policy, ethical clearance was first requested from the Health Research Ethics Committee of the College of Agriculture and Environmental Sciences (HREC_CAES), which subsequently granted written approval with ethics clearance number 2022/CAES_HREC/038 to proceed with the study. Additionally, it is imperative to highlight that some of the data were collected during a period characterised by stringent COVID-19 protocols. All safety measures specified in the UNISA COVID-19 guidelines (UNISA, 2020) and those established by the individual research sites were followed.

Prior to the commencement of the data collection process, ethical approval was secured from the Research Ethics Committee of the University of Health and Allied Sciences (UHAS-REC) located in Ghana, with the ethics clearance reference, UHAS-REC A1 [153] 22-23. This was required to comply with the ethical requirements stipulated by one of the study sites, which necessitated approval from a research ethics committee in Ghana prior to authorising the collection of data within the institution. Consequently, before beginning the data collection process, permission for data collection was secured from all three institutions. The following ethical principles were rigorously adhered to during the course of the study:

- Respect for and protection of the rights and interests of participants (Ajemba & Arene, 2022; Seneviratne, 2023).
- Beneficence and non-maleficence (Ajemba & Arene, 2022; Seneviratne, 2023).
- Justice, fairness, and objectivity (Ajemba & Arene, 2022; Seneviratne, 2023).
- Integrity, transparency, and accountability (Ajemba & Arene, 2022; Seneviratne, 2023).

A comprehensive exposition regarding the ethical dimensions applicable to this study is provided in Section 4.15.

1.11 Delimitations of the Study

To fulfil the objectives of the study, the researcher established the following boundaries to explicitly articulate the confines of the study, while simultaneously guaranteeing the relevance and depth of the study:

1.11.1 Subject scope

The focus of this study was not on the philosophical discussions concerning animal rights or the ethical implications associated with the use of animals in scientific studies, although a narrative review of literature was conducted to understand these historical perspectives and discussions. The researcher adopted the approach of focusing on

existing governance systems and practices and how these could be improved to ensure that animals' use in scientific studies in Ghana is more ethical.

1.11.2 Study population

The study excluded other stakeholders of animal research ethics governance systems and practices, including heads of research-producing organisations, national policymakers, students, animal rights activists, and civil society organisations. These stakeholders were excluded from this study as they were not considered to possess the requisite depth of experience pertaining to the existing animal research ethics governance systems and practices for the ethical use of animals in scientific studies in research-producing organisations in Ghana to adequately address the research questions.

1.11.3 Scope

All research-producing organisations in Ghana without an established AREC were excluded from this study. Additionally, other government institutions and civil society organisations in Ghana were excluded from the study. This was because the study focused on exploring key stakeholders' experiences with existing animal research ethics governance systems and practices, which could only be found at research-producing organisations with ARECs. This decision was taken to make the findings and the proposed governance framework applicable to research-producing organisations in Ghana, where animals are used as research subjects.

1.12 Thesis Outline

The thesis is organised into 10 chapters for ease of flow and comprehension of the main issues. The chapters are as follows:

Chapter One – Introduction

This introductory chapter is dedicated to providing a comprehensive overview of the study. The background to the study, articulation of the research problem, research

questions, delineation of the study's objectives, justification, significance of the study, and a succinct description of the methodological approach employed in addressing the study's objectives are elucidated. The chapter ends with a discussion of the study's delimitations and an outline of how the thesis is structured.

Chapter Two – Literature Review (History, Philosophical Arguments and Principles for the Ethical Use of Animals in Scientific Studies)

Chapter Two presents a comprehensive review of available literature on the historical context and advantages associated with the use of animals in scientific studies, the philosophical arguments advocating for and contesting the use of animals in scientific studies as articulated by various scholars, and the existing ethical principles that govern the ethical use of animals in research. This chapter's objective is to use existing literature to provide an in-depth contextual understanding of the research topic.

Chapter Three – Literature Review (Animal Research Ethics Governance Systems and Practices)

Chapter Three also provides a detailed narrative review of animal research ethics governance. It provides a conceptual understanding of the term 'animal research ethics governance' and the existing animal research ethics governance systems and practices. The primary objective of this chapter is to identify gaps in the existing body of literature concerning the governance of scientific studies using animals on a global scale and within the context of Ghana, thereby providing a rationale for this study.

Chapter Four – Research Methodology

This chapter offers a comprehensive description of the methodology employed to address the empirical phase of the study. A description of the research paradigm, approach, and design used to achieve each objective of the study is presented. Furthermore, it provides a description of the study population, the sampling technique employed, the recruitment of participants, and the instruments and procedures used in the collection and analysis of the data for the study. The chapter concludes with a discussion of the measures undertaken to uphold the trustworthiness of the study and the ethical considerations adopted by the researcher throughout the course of this study.

Chapter Five – Findings on Key Stakeholders' Understanding of the Concept 'Animal Research Ethics Governance'

Chapter Five presents the findings and discussions of the first objective of this study, which was to explore and describe researchers, AREC members, and AREC administrators' understanding of the animal research ethics governance concept. The chapter commences with brief demographic information on participants, followed by a description of participants' understanding of the term 'animal research ethics governance'. This is methodically presented on a case-by-case basis, followed by a presentation of the findings derived from a cross-case analysis, re-contextualised with existing scholarly literature and discussed.

Chapter Six – Findings on Key Stakeholders' Experiences with Existing Research Ethics Governance Systems that Promote the Ethical use of Animals in Scientific Studies in Ghana

This chapter presents the findings and discussion pertaining to the second objective of the study, which aimed to explore the experiences of researchers, AREC members and AREC administrators with existing research ethics governance systems that promote the ethical use of animals in scientific studies in Ghana. The analysis of the empirical data collected through semi-structured interviews and naïve sketches is presented. The findings are first presented on a case-by-case basis, followed by a presentation of the findings derived from a cross-case analysis, integrating findings with existing literature, and discussion.

Chapter Seven – Findings on Key Stakeholders' Experiences with Existing Research Ethics Governance Practices That Promote the Ethical use of Animals in Scientific Studies in Ghana

This chapter presents the findings and discussion pertaining to the third objective of the study, which aimed to explore the experiences of researchers, AREC members and AREC administrators with existing research ethics governance practices that promote the ethical use of animals in scientific studies in Ghana. It offers a comprehensive analysis of the empirical data collected, which includes semi-structured interviews and naïve sketches. The findings are initially presented on a

case-by-case basis, followed by a cross-case analysis that incorporates a literature review and discussion.

Chapter Eight – Recommendations by Key Stakeholders for Promoting the Ethical use of Animals in Scientific Studies in Ghana

The findings and discussion of the fourth objective of the study are presented in this chapter. The fourth research objective was to explore researchers', AREC members' and AREC administrators' recommendations for promoting the ethical use of animals in scientific studies in Ghana. It offers a comprehensive analysis of the empirical data collected through semi-structured interviews and naïve sketches, initially addressing each case individually, followed by a cross-case analysis that incorporates a literature review and discussion.

Chapter Nine – Development of a Proposed Conceptual Animal Research Ethics Governance Framework for the Ethical use of Animals in Scientific Studies in Research-Producing Organisations in Ghana (Phase Two)

This chapter presents the procedure employed to develop a proposed animal research ethics governance framework for the ethical use of animals in scientific studies in research-producing organisations in Ghana. Additionally, the conceptual framework is presented, described and discussed.

Chapter Ten – Conclusions and Recommendations

This chapter serves as the conclusive segment of the thesis. It synthesises the findings derived from the study, articulating the overarching conclusions, and offers recommendations aimed at enhancing the ethical use of animals in scientific studies in research-producing organisations in Ghana. Furthermore, it provides the limitations encountered during the study and the study's contribution to the corpus of knowledge, systems, and practices pertaining to animal research ethics governance, both globally and within the Ghanaian context.

1.13 Chapter Conclusion

This chapter established the foundation for the study and highlighted the important role animals continue to play in biomedical research and several scientific and medical discoveries, despite ongoing controversies regarding their use in scientific studies due to ethical concerns. Frameworks like the 3R principles have been proposed to promote the ethical use of animals in research. It is evident in this chapter that Ghana lacks an adequate governance framework for the protection and ethical use of animals for research. To address this gap, the chapter emphasises the need to generate a deeper understanding of existing animal research ethics governance systems and practices in order to develop a proposed animal research ethics governance framework that promotes the ethical use of animals in scientific studies in Ghana. The delimitations of the study and a concise description of the methodology used to achieve the objectives of the study were presented.

Chapter Two is dedicated to a review of available literature on the research topic. It offers detailed insight into research that has already been conducted by other researchers on similar topics to this study.

CHAPTER TWO
LITERATURE REVIEW ON THE HISTORY, PHILOSOPHICAL ARGUMENTS AND PRINCIPLES FOR THE ETHICAL USE OF ANIMALS IN SCIENTIFIC STUDIES

2.1 Introduction

Chapter One outlines the study's background and rationale, underscoring the importance of undertaking this research. The literature review is divided into two chapters (Chapters 2 and 3) to facilitate a comprehensive exploration of the existing governance systems and practices concerning animal research ethics globally and specifically within Ghana. This approach aims to establish a contextual framework for the study. The current chapter focuses on a narrative review of the prevailing literature on the historical context and advantages of using animals in scientific studies. It also addresses the philosophical debates surrounding the ethical implications of animal use in scientific studies and the ethical principles articulated by various scholars regarding the humane treatment of animals in research settings. To thoroughly understand governance systems and practices pertaining to the ethical use of animals in scientific studies, it is essential to engage with the existing body of knowledge concerning the historical context, philosophical arguments, and ethical principles that govern scientific studies using animals. This chapter highlights gaps within the scholarly discourse on the ethics of using animals in scientific studies. Insights derived from the existing literature will provide a foundational background necessary for understanding the governance systems and practices that ensure the ethical use of animals in research contexts.

2.2 Historical Background and Benefits of Using Animals in Scientific Studies

The use of animals in scientific studies has been a subject of extensive debate and scrutiny throughout history. This section aims to synthesise the existing literature on the benefits of using animals in scientific studies, focusing on the ethical, scientific, and societal implications. The discussion highlights various perspectives, including the essential role of models in biomedical research, their contribution to understanding

complex biological systems, and the advancements they have facilitated in both human and veterinary medicine.

Historically, the use of animals in scientific studies has been part of human existence. However, the precise inception of this practice is ambiguous. For example, Rocklinsberg et al. (2017) suggest that using animals in scientific purposes can be traced back to the earliest recorded oral and written traditions of humans, approximately around 3,200 BCE. Similarly, Franco (2013) and Rajathy et al. (2018) assert that the practice originated concurrently with humanity's quest to prevent and treat diseases, dating back to 3000 BCE. In contrast, Rogozea et al. (2015) contend that the use of animals in scientific studies commenced around 500 BCE. Regardless of the uncertainty surrounding the timeline of this practice, it is widely accepted that the use of animals in scientific studies has roots in antiquity. The contemporary era of scientific studies using animals began in the 19th century, characterised by significant advancements such as the introduction of anaesthesia and aseptic techniques, which allowed for more humane and scientifically rigorous experimentation (Franco, 2013; Smith & Richmond, 2024). In Africa, the use of animals in research began in the late 19th and early 20th centuries, specifically in 1908 with the establishment of the Onderstepoort Veterinary Institute in South Africa (Brown, 2005; Junker & Penzhorn, 2015). Over the years, scientific studies using animals have played a pivotal role in numerous medical breakthroughs, including the development of vaccines, antibiotics, and surgical techniques (Builds, 2021; Cojocariu et al., 2025).

Animals have been considered an essential tool in advancing scientific knowledge, particularly within biomedical research (King & Zohny, 2021). Historically, their use has enhanced human understanding of various biological processes (Andersen & Winter, 2019; Parija & Mandal, 2013). Furthermore, animals continue to play an essential role in research to improve human and animal health (Rajathy, Louis & Leoney, 2018) and address complex biological and biomedical challenges (Andersen & Winter, 2019). Scientific studies using animals have also led to the creation of novel medications, vaccines, surgical procedures, and anaesthetic regimens (Andersen & Winter, 2019; Petetta & Ciccocioppo, 2021). Using animals in scientific studies and experiments has also led to medical progress (Rogozea et al., 2015). The significant

medical advancements attributed to animal research underscore its value, as evidenced by the fact that animals were involved in over 90% of Nobel Prize-winning research in physiology and medicine (Andersen & Winter, 2019).

Despite the aforementioned benefits of using animals in scientific studies for both human and animal welfare, ethical concerns regarding this practice have persistently emerged (Zwolińska, 2015; McLeod & Hartley, 2018). Shamoo and Resnik (2022) describe the ethical implications surrounding the use of animals in research as one of the most contentious issues in research ethics. Classical Greek philosophers, such as Plato (428/427–348/347 BC) and Aristotle (384–322 BC), postulated that animals possess souls, thereby rendering their use in scientific studies morally indefensible (Rocklinsberg et al., 2017; Sias, 2015). This philosophical argument spurred ongoing debates regarding animals' ethical use in scientific studies (Rogozea et al., 2015). Over time, various ethical perspectives have emerged, with some philosophers presenting conflicting views on the moral justification of using animals for research purposes (Zwolińska, 2015; Petetta & Ciccocioppo, 2021). Consequently, the use of animals in scientific settings has been a source of social and ethical contention since antiquity (Walker, 2020a).

Before the 18th century, animal experimentation occurred without moral or legal constraints, as it was perceived as the only practical and acceptable alternative to using humans (Petetta & Ciccocioppo, 2021). However, the 19th century witnessed a rise in public opposition to using animals for scientific purposes, coinciding with the increasing popularity of domestic pets (Rajathy, Louis & Leoney, 2018). The publication of Peter Singer's *"Animal Liberation"* in 1973 further intensified the debate surrounding the ethical use of animals in scientific studies (Rogozea et al., 2015; Singer, 2003). Singer (2003) and Vonk (2020) argue that, akin to humans, animals possess the capacity to suffer and, therefore, should not be subjected to inhumane treatment.

Despite the ethical dilemmas, proponents of scientific studies using animals maintain that it is indispensable for the advancement of medical science and the enhancement of human health, given that many biological processes are conserved across species

(Barré-Sinoussi & Montagutelli, 2015; Chang & Grieder, 2024). This assertion underscores the necessity for the establishment of robust systems and practices to regulate the use of animals in scientific studies.

The subsequent section provides a comprehensive review of the literature pertaining to the philosophical arguments of animal research ethics. Following this review, the ethical principles guiding animals' use are also examined.

2.3 Philosophical Arguments on the Ethical use of Animals in Scientific Studies

Ongoing debate has given rise to various theories that reflect differing philosophies on the ethical status of animals, categorising them as either "study objects" (entities for which ethical agents bear no direct responsibility) or "study subjects" (entities that possess inherent ethical significance) (Rocklinsberg et al., 2017). These philosophies encompass contractarianism, utilitarianism, animal rights theories, virtue ethics and the indigenous African philosophy on animals. A brief discussion of these ethical philosophies follows in the next section, providing insight into the predominant philosophical arguments employed by scholars either in defence of or in opposition to the use of animals in scientific studies.

2.3.1 Contractarian argument on the use of animals in scientific studies

The contractarian argument on the use of animals for research has evolved over centuries. The philosophical underpinnings of this argument in relation to animals' use in research can be traced back to social contract theories articulated by early modern philosophers such as Thomas Hobbes (1651), John Locke (1689), Jean-Jacques Rousseau (1762), and Immanuel Kant (1797). The contractarian argument explicitly addresses animals' moral status within the context of social contracts (Enman-Beech, 2023; Rawls, 1999; Rowlands, 1997). From the contractarian perspective, ethical and moral behaviour among individuals is primarily motivated by self-interest (Rocklinsberg et al., 2017; Palmer & Sandøe, 2011). This point of view posits that morality is conceptualised as a form of contract among autonomous, rational agents

who perceive mutual benefits in entering such contracts. Given that animals are deemed incapable of rational thought, they are excluded from participating in these moral contracts. Consequently, the contractarian framework posits that animals exist primarily for human use (Palmer & Sandøe, 2011). Within this paradigm, the stance on using animals in scientific studies is not inherently favourable; rather, it is contingent upon the specific circumstances and the perceived benefits that may accrue from using animals (Rocklinsberg et al., 2017). This perspective can be interpreted as providing justification for the exploitation of animals for scientific purposes, as it maintains that animals may be subjected to human interests due to their lack of rationality and inability to enter into moral agreements.

The contractarian viewpoint raises ethical concerns, particularly when juxtaposed with the treatment of children and individuals with diminished cognitive capacities. Like animals, these groups cannot engage in rational decision-making or form moral contracts with researchers (Singer, 2003). Exploiting such vulnerable populations for scientific inquiry is thus widely considered morally objectionable. A more nuanced understanding of animal sentience and the ethical implications surrounding animal rights is thus necessary. Ultimately, the contractarian rationale for using animals in scientific studies does not convincingly support a humane approach to animal use, as it prioritises human benefits over ethical considerations regarding the treatment of sentient beings.

2.3.2 Utilitarian argument on the use of animals in scientific studies

Utilitarianism has been a significant ethical framework since the 19th century, particularly in discourse surrounding the ethical use of animals in scientific studies (Häyry, 2021). Prominent philosophers such as Jeremy Bentham (1748–1832) have critically opposed the contractarian perspective, positing that the ethical evaluation of actions should be grounded in their consequences, specifically concerning the maximisation of happiness and the minimisation of suffering. Bentham argues that moral considerations regarding the treatment of animals should focus on their capacity to experience suffering, rather than their ability to reason (Bentham, 2000; Cardoso et al., 2020). Within the utilitarian framework, the welfare of animals may be

compromised if such actions enhance human welfare (Rocklinsberg et al., 2017). Consequently, the ethical justification for animal research is contingent upon the premise that such research yields benefits that outweigh the suffering inflicted on the animals involved. Utilitarian philosophers contend that if the advantages derived from research, such as advancements in medical science and a deeper understanding of diseases, significantly outweigh the suffering inflicted on animal subjects, then the research can be ethically justified (Anna et al., 2024). This perspective operates under the principle that the end justifies the means; thus, an action's consequences are prioritised over its motivations when making an ethical decision.

While utilitarianism advocates for the ethical use of animals in scientific studies, it simultaneously calls for the improved treatment of animals (Cardoso et al., 2020). Consequently, the utilitarian philosophy underpins contemporary international animal welfare laws and guidelines that regulate the use of animals in scientific studies (Killoren & Streiffer, 2020; Häyry, 2021; Offor, 2020). However, despite its advocacy for improved treatment of animals in scientific studies, utilitarianism is limited in its capacity to protect animals from maltreatment in research settings, as it does not categorically oppose the killing or harming of animals (Caviola et al., 2020). Furthermore, the inherent unpredictability of research outcomes raises significant ethical concerns that it is often impossible to ascertain the benefits of a study or the extent of suffering that will be inflicted on animal subjects before its initiation (Carvalho et al. 2019; Häyry, 2021) if appropriate animal research ethics governance systems, such as a well-composed AREC, are not in place.

Despite the existence of laws and guidelines informed by utilitarian principles, this philosophy does not provide comprehensive protection for animals, permitting their use in research contingent upon *a priori* expectations of human benefit. Thus, utilitarianism alone does not guarantee the humane treatment of animals or their protection within research contexts, although it represents an improvement over contractarian viewpoints. Moreover, utilitarianism has faced substantial criticism for its potential to justify harmful practices if perceived benefits are considered to outweigh the detriments (Ndukaku & Omobola, 2020). Critics, including Regan (1986) and Ndukaku and Omobola (2020), argue that this perspective may lead to a situation in

which the suffering of a minority (in this case, animals) is disregarded in favour of human interests, which will eventually perpetuate the inhumane use of animals in scientific studies, affecting animals and the entire environment.

2.3.3 Animal rights theory

The rights-based perspective on animal ethics, as articulated by Regan (1986) and subsequently elaborated by various philosophers, asserts that animals possess certain inalienable rights to exist free from exploitation and harm. This viewpoint fundamentally challenges the utilitarian rationale that justifies using animals in scientific studies, positing that the potential benefits to humans cannot supersede the inherent rights of animals. Consequently, Rocklinsberg et al. (2017) argue against using animals for research that serves human interests. Advocates of rights-based approaches argue for recognising the moral status of animals as equivalent to that of humans (Todorović, 2021), thereby underscoring the necessity for legal protection against cruelty and exploitation (Childers, 2022). This philosophical stance has led to calls for the total abolition of animal research, arguing that no scientific benefit can warrant violating an animal's rights (Wrenn, 2012). The rights-based approach has gained traction in legal contexts, resulting in animal welfare laws and international treaties protecting animals from inhumane treatment (Offor, 2020). Conversely, other scholars, including Häyry (2021) and Killoren and Streiffer (2020), argue that animal welfare laws and guidelines primarily derive from the utilitarian theory.

However, a counterargument to the animal rights theory exists. While proponents assert that it is contradictory to affirm human rights while denying rights to animals, Zwolińska (2015) counters this assertion by arguing that rights are derived from social contracts that bind members of a given community, which inherently include associated duties. Since animals cannot engage in such contractual obligations, they are not entitled to rights in the same manner as humans. According to this view, rights can only be conferred upon members of communities that adhere to commonly accepted ethical norms, thus excluding animals from possessing equivalent rights to humans (Zwolińska, 2015). This argument reflects a contractarian philosophy

regarding rights (discussed in Section 2.3.1) that conceptualises morality as a contract among autonomous, rational agents for their mutual benefit.

It is important to note that the rights under discussion in the context of the animal rights theory are not legal rights as defined by contractual agreements, but rather moral rights as elucidated by Regan (1986). While legal rights are established and maintained within a legal framework that entails obligations (as referenced by Zwolińska, 2015), moral rights arise from specific capacities such as sentience or self-awareness. Consequently, advocates for animal rights argue that animals possess moral rights due to capabilities that parallel those of humans, suggesting that the discourse surrounding animal rights pertains to moral rights inherent to sentient being rather than legal rights. The assertion is that it is untenable to uphold human rights while simultaneously denying rights to animals (Fischer, 2021). The literature on the animal rights theory presents a complex tapestry of philosophical inquiry, ethical considerations, and practical implications. As societal attitudes toward animals continue to evolve, the discourse surrounding animal rights is likely to expand and diversify.

2.3.4 Virtue ethics

Virtue ethics, which finds its foundations in the philosophical contributions of ancient philosophers such as Aristotle (384 BC), underscores the importance of character and moral virtues in the process of ethical decision-making. The application of virtue ethics to animal research is a relatively recent development; however, it has increasingly gained attention within contemporary ethical discussions (Adamson & Somma, 2024; Walker, 2020). Virtue ethics offers a distinctive lens through which to examine the ethical implications of scientific studies using animals. This ethical approach prioritises the character and intentions of the moral agent over the consequences of actions or strict adherence to prescriptive rules. Consequently, it encourages researchers to engage in self-reflection regarding their motives and the ethical ideals they strive to embody (Hursthouse, 2012). From the perspective of virtue ethicists, it is essential to strike a balance between promoting well-being and respecting rights (Rocklinsberg et al., 2017). This ethical framework seeks to harmonise the principles underlying animal

rights theories and utilitarian approaches, as previously discussed in Sections 2.3.2 and 2.3.3 of this chapter.

Virtue ethics advocates for a context-sensitive examination of the interactions between humans and animals, particularly in assessing the morality of animal research (Lockwood, 2020). This examination considers various contextual factors, including the identity of the moral agent, namely the researcher engaged in animal research, the specific environment in which the research occurs, the methodologies employed, and the researcher's emotional and cognitive responses during the research process (Walker, 2020). While rights-based theories emphasise the moral entitlements of animals and utilitarian theories focus on the experiences of sentient animals, virtue ethics underscores the significance of the researcher's character in determining the morality of their actions, as well as the role of habitual conduct in fostering ethical behaviour (Bobier & Allen, 2022; Walker, 2020). Consequently, in evaluating the ethical implications of employing animals in scientific studies, virtue ethicists prioritise the cultivation and maintenance of moral virtues and rational behaviour among researchers over the moral status of the animals themselves (Birch, 2017). This emphasis arises from the belief that the realisation of human potential and the adherence to moral principles necessitate the development of specific character traits (virtues) while simultaneously eschewing detrimental qualities (vices) (Lockwood, 2020). Within moral philosophy, virtues are regarded as commendable and admirable character traits, akin to qualities one might highlight in a character reference (Annas, 2009; Hursthouse, 2012). Conversely, vices are characterised as morally objectionable traits that are typically condemned and criticised (Annas, 2009; Hursthouse, 2012).

Virtue ethics occupies a mediating position between right-based and utilitarian perspectives regarding the use of animals in scientific studies. Due to the emphasis virtue ethics places on contextual considerations surrounding animals' use in research (Walker, 2020), the AREC's role becomes critical, since ARECs facilitate a thoughtful and contextually informed reflective process regarding the ethical use of animals in scientific studies (Kalkan & Kekeçoğlu, 2024). By integrating virtues such as compassion, respect, integrity, and responsibility, ARECs can promote ethical

standards in research practices. This aligns with the recommendations put forth by Killoren and Streiffer (2020) for a hybrid implementation of the utilitarian and rights-based theories, urging researchers to contemplate the broader implications of their work and to engage in practices that enhance animal welfare and minimise suffering. Ultimately, by fostering a culture of empathy and ethical reflection within the scientific community, virtue ethics can significantly contribute to the advancement of more humane research methodologies (Walker, 2025).

2.3.5 Indigenous African philosophies on the use of animals in scientific studies

African philosophies on the ethics of using animals in scientific studies have been underemphasised in the literature despite being around for many generations (Chemhuru, 2019; Coetser, 2022; Gyekye, 2010). The intersection of African philosophy and animal research ethics has garnered increasing attention in recent years (Horsthemke, 2023). This section provides a narrative review of themes and arguments identified within the current body of literature that underscores the contributions of indigenous African philosophical perspectives to the discourse on the ethical use of animals in scientific studies.

2.3.5.1 African philosophy and ethics

Indigenous African philosophies are deeply rooted in the continent's diverse cultural landscapes, embodying a holistic understanding of existence that often contrasts sharply with Western paradigms (Horsthemke, 2023). Cultural beliefs in Africa play a profound role in shaping attitudes toward animal research, influencing both ethical frameworks and practical behaviours related to the use of animals in scientific contexts. Africa is renowned for its broad spectrum of cultural heterogeneities, with each culture holding particular traditional animal customs and belief systems. These cultural norms can make addressing animal welfare and research ethics particularly challenging, as practices and attitudes vary widely across regions and communities (Qekwana et al., 2019).

In some societies, animals are considered integral to spiritual life, featuring prominently in myths, folklore, and rituals. For example, among the Yoruba of Nigeria, animals are categorised and valued based on their roles in cosmology and spirituality, with certain species considered sacred or taboo to hunt (Enemchukwu, 2024). Many African belief systems, including African traditional religions, thus attribute spiritual significance to animals (Olusola, 2005; Zubieta, 2016). Some animals are believed to possess supernatural powers or serve as vessels for spirits, while others are associated with witchcraft or omens (Enemchukwu, 2024; Ilimbetova, 2022). Beliefs can result in both protective attitudes (sparing animals considered sacred) and persecution (killing animals linked to witchcraft, such as cats and owls) (Enemchukwu, 2024).

Although there is no single, cohesive ‘African ethic’ or ‘African moral outlook’, there are several fundamental concepts shared by all African societies and cultures, particularly those in sub-Saharan Africa (Horsthemke, 2017; Joseph, 2018). Some of the most notable similarities and shared concerns among African communities allow for generalisation without causing misunderstanding or controversy. These include concepts like ubuntu (one’s humanity is derived from one’s relation to others), ukama (relatedness), the significance of community and relationships, and the roles played by God, spirits, ancestors, totems, and taboos (Horsthemke, 2017).

African philosophy is characterised by its communal approach, which often contrasts with Western individualistic frameworks. This communal perspective emphasises relationality, interconnectedness, and the moral significance of community, which extends beyond human beings to include animals and the environment (Wiredu, 1996; Ugwu et al., 2025; Gyekye, 1997). Such a view posits that ethical considerations in African thought are inherently linked to the well-being of the community, suggesting that the treatment of animals within research contexts cannot be divorced from their implications for human communities. Ubuntu is one of the most prominent concepts in African philosophy, which encapsulates the idea that “I am because we are”. This principle underscores the interconnectedness of all beings and emphasises mutual respect and care (Mkhize, 2008; Mukuni, 2021). The concept of ubuntu and similar

philosophies emphasise harmonious relationships, which can extend to animals, but typically do not equate animal interests with those of humans (Horsthemke, 2017).

African ethics are primarily concerned with community and harmonious relationships, extending this sense of interconnectedness to the environment and animals (Horsthemke, 2017). Communitarianism underscores the significance of perceiving oneself as an integral component of an expansive network of entities, thereby affording moral consideration to these entities that may, at times, supersede one's personal interests (Coetser, 2022). The application of ubuntu to animal ethics suggests that animals are not merely resources for human use but are integral members of the community deserving of moral consideration (Samuel, 2023). Scholars such as Wrage et al. (2023) argue that ubuntu necessitates a re-evaluation of the ethical frameworks governing animal research, advocating for practices that honour the dignity and intrinsic value of non-human life.

2.3.5.2 The Ghanaian traditional philosophy on animals

In Ghana, the traditional philosophy holds animals in high regard. Animals are integrated deeply into the cultural, spiritual and social life of Ghanaians. Ghanaians attribute cultural beliefs, conservation practices and spiritual significance to animals (Agyekum, 2023). Ethnic groups in Ghana, particularly the Akans, ascribe symbolic, spiritual and moral meanings to the existence of animals (Adu-Gyamfi, 2011; Agyekum, 2023; Francis, 2009). The Ghanaian philosophy on animals is therefore not different from other parts of Africa, where it emphasises the interconnectedness of humans and animals, which manifests in taboos, totems and myths that guide behaviour towards animals (Morgan, 2020).

Among the ethnic groups in Ghana, particularly the Akans, animals are believed to possess a special spirit called *sasa,* which implies that harming animals can cause serious misfortune for the person involved (Awuah-Nyamekye, 2012). Animals are embedded in Akan culture as symbols of proverbs, folktales, panegyrics, and clan totems, reflecting human behaviour and societal values. Certain animals are considered sacred or possess a potent life force (*sasa*), and harming such animals is

taboo, as it is believed to bring misfortune or spiritual consequences (Adu-Gyamfi, 2011; Agyekum, 2023; Francis, 2009). Animals are therefore protected and not killed indiscriminately (Awuah-Nyamekye, 2012). This belief ensures respect for animals.

Animals are also embedded in the Akan culture in the form of symbols and metaphors to represent human traits, behaviours and philosophies. Most proverbs, folktales and oral literature use animal behaviour and characteristics to teach moral lessons and social values within the Akan culture (Agyekum, 2023; Arhine et al., 2024; Francis, 2009; Morgan, 2020). The embedding of animals within the culture of the Akans fosters a worldview that sees animals as an integral part of human life and not merely objects to be used for the benefit of humans (Awuah-Nyamekye, 2012). The Ghanaian traditional knowledge thus respects animals as beings with spiritual and symbolic significance, which suggests a philosophical stance that cautions against the exploitative or unethical use of animals for research (Awuah-Nyamekye, 2012). The Akan worldview sees humans as part of a relational and interrelated universe where nature, including animals, is a living phenomenon. This fosters respect and sustainable interaction with the environment. Traditional taboos regulate the use of animals, forbidding hunting or consuming certain species during specific seasons or days and protecting totem animals (Adu-Gyamfi, 2011; Arhine et al., 2024; Morgan, 2020). The use of animal metaphors to express indigenous knowledge and worldviews indicates that animals are integral to Akan philosophy and education. This suggests that any scientific use of animals should consider and incorporate these indigenous perspectives to be culturally appropriate (Agyekum, 2023; Arhine et al., 2024).

2.3.5.3 Incorporating indigenous African philosophy on animals into contemporary animal research ethics

Discussions on the ethical use of animals in scientific studies have predominantly been influenced by utilitarian and rights-based arguments over the years. However, these frameworks often fall short of addressing the complexities of human-animal relationships as understood in African philosophy. The utilitarian perspective, which evaluates actions based on their consequences for overall happiness and tends to prioritise human benefit over animal welfare, may justify harmful practices in the name

of human benefit (Singer, 2003). This human-centred view contradicts indigenous African perspectives that promote a more equitable relationship between humans and animals. African philosophies emphasise the interconnectedness of humans, animals, and the environment, suggesting a duty of care rather than domination (Horsthemke, 2017). Although the use of animals is often justified if it serves the well-being of the community, unnecessary suffering and cruelty are generally discouraged (Horsthemke, 2017; Ikeke, 2018).

Conversely, rights-based approaches, such as those advocated by Regan (1986), emphasise the inherent rights of animals but may overlook the communal and relational aspects emphasised in African thought. Traditionally, animals are not considered moral equals to humans but are seen as part of the broader community of beings that require respect and care (Horsthemke, 2023). Many African philosophical viewpoints hold that humans have duties (direct or indirect to animals), emphasising care and respect rather than outright animal rights as understood in the rights-based approaches (Ikeke, 2018). The moral status of animals is considered in relation to their role within the community and the maintenance of harmony rather than through individual rights (Horsthemke, 2017). The relational approach, informed by African philosophical perspectives, advocates for an ethical framework that considers the interdependence of humans and animals. This perspective is supported by scholars like Tumanggor et al. (2023), who argue that ethical considerations should extend beyond the individual to encompass the broader community and ecosystem. By acknowledging the interdependence of all living things, the African philosophical approach advocates for a more compassionate use of animals in scientific studies that prioritise the welfare of animals.

Coetser (2022) contends that, should ARECs transition from a cost/benefit analysis of protocols governing the use of animals in research to a communitarian framework that reflects the African perspective, their decision-making processes would undergo a transformation where animals would be regarded as constituents of the community rather than mere instruments for human exploitation. Furthermore, Coetser (2022) maintains that in such scenarios, regardless of the potential advantages that employing animals in scientific studies may confer, animals will be perceived as

possessing intrinsic value and therefore cannot be relegated to the status of objects for human gain. If ARECs embrace a communitarian perspective that incorporates animals within their moral community, it would become untenable for them to rationalise inflicting harm upon animals. In such circumstances, the employment of animals in scientific studies would only be deemed justifiable when the experimental procedures are non-invasive and non-harmful to the animal (Coetser, 2022; Metz, 2012).

Additionally, within the context of the African communitarian philosophy, which posits a heightened moral obligation towards those in close proximity, the decision-making processes of ARECs can be interpreted through the lens of kinship, wherein animals are regarded as family members or close neighbours (Coetser, 2022). In such situations, members of ARECs would be less inclined to allow animals to undergo suffering and pain, even if the prospective benefits are substantial. Mugumbate et al. (2023) also articulate that the principle of ubuntu offers a compelling philosophical basis for fostering a familial environment. Conceptualising animals as kin and valuing interdependence and community over individual autonomy would necessitate an even more animal-centred deliberative process (Coetser, 2022).

While animal welfare is valued within the indigenous African philosophy, it is sometimes subordinated to pressing human development needs, reflecting the realities of limited resources and competing priorities (Ikeke, 2018; Kimwele et al., 2011). Consequently, Ikeke (2018) advocates for incorporating animal welfare and animal ethics considerations into human development processes, recognising that animal welfare contributes to human well-being, ecological balance, and sustainable development. A study by Awuah-Nyamekye and Oppong (2018) underscored the significance of incorporating indigenous cultural beliefs and values into wildlife conservation practices in Ghana, thus fostering the ethical use of animals in research. However, despite the promise of integrating African philosophy into animal research ethics, several challenges persist. For instance, Rapatsa (2016) and Friedman (2023) argue that the application of ubuntu to contemporary ethical dilemmas may be overly idealistic and difficult to operationalise in modern research contexts. There is also a risk of romanticising indigenous practices without critically engaging with the

socioeconomic realities that shape them (Chandler & Reid, 2020). Furthermore, indigenous communities are often at the periphery of decision-making processes pertaining to the use of animals, resulting in disputes over the rights and ownership of animals (Buergin, 2015; Corvin et al., 2023).

These critiques underscore the need for a nuanced understanding of how African philosophical principles can be effectively integrated into contemporary ethical frameworks. The integration of African philosophical principles can provide a culturally relevant framework that will encourage the humane use of animals in research, based on interconnectedness and relationality. Addressing these challenges necessitates a commitment to ethical research practices that honour indigenous perspectives by providing an alternative to the Eurocentric regulatory frameworks, such as the 3Rs, and prioritise the welfare of animals.

2.3.6 Conclusion – Philosophical arguments on the ethical use of animals in scientific studies

In summary, the ethical decision-making process regarding the use of animals in scientific studies is characterised by inherent complexities and tensions. The philosophical discourse on this subject predominantly centres on ethical considerations, utilitarianism, and the rights of animals. Advocates for animal research contend that the use of animals for research is warranted when they yield significant medical breakthroughs and enhancements to human health. This perspective is grounded in a utilitarian framework that posits the potential benefits to humanity outweigh the suffering endured by animals. Conversely, critics of this stance argue that animals possess intrinsic rights and should not be subjected to suffering for the benefit of humans. They advocate for the development and implementation of alternative research methodologies that do not involve animal subjects. This ongoing debate encapsulates a broader dialogue regarding the moral status of animals and the ethical obligations that humans bear towards them in the pursuit of knowledge and advancement.

While a considerable volume of literature has been dedicated to various dimensions of this issue, notable gaps persist. Much of the existing literature tends to be confined to specific academic disciplines, such as philosophy or biology. There is a pressing need for interdisciplinary research that synthesises perspectives from philosophy, ethics, animal behaviour, and veterinary science, thereby fostering a more nuanced understanding of animal welfare and ethical considerations. Additionally, there is a necessity for critical evaluations of the existing regulatory frameworks governing animal research, particularly in terms of their alignment with ethical theories and their efficacy in safeguarding animal welfare.

While the concept of consent is extensively addressed in the realm of human research ethics, it remains underexplored in the context of animal research. Philosophical inquiries into the notion of consent for animals, including the implications of autonomy and agency, represent a fertile area for further investigation. Furthermore, philosophical arguments concerning the ethical use of animals tend to be predominantly anchored in Western thought, with indigenous African philosophies not emphasised in literature on the ethics of using animals in scientific studies. These philosophies offer a valuable alternative to the use of animals in scientific studies within the African and Ghanaian context.

This study explored the understanding of animal research ethics governance among researchers, AREC members and AREC administrators, as well as their experiences with existing governance systems and practices on the ethical use of animals in scientific studies in Ghana. The study offers pertinent information that can address identified gaps, thereby contributing an interdisciplinary perspective to the discourse. By soliciting participants' experiences and viewpoints regarding the ethical use of animals in scientific studies in Ghana, this study has the potential to yield a more comprehensive understanding of animal research ethics in an African setting. Ultimately, the findings may contribute to the formulation of more humane and responsible practices and systems in the field of animal research. The next section focuses on a review of the literature on the ethical principles that are currently in place for the use of animals in scientific studies.

2.4 Ethical Principles for the Use of Animals in Scientific Studies

To ensure that animals are used humanely while advancing scientific discovery, several ethical principles embedded within various ethical frameworks have been espoused and are currently being used. This review focuses on evaluating the 3R principles, the 5Fs principle, the two core values principle, the 3Vs principle and the 12Rs framework for the ethical use of animals in scientific studies. This focus could help the reader understand the existing frameworks and determine whether there is a need to develop a governance framework for the ethical use of animals in scientific studies in Ghana.

2.4.1 The 3R principles

The 3R principles for the humane use of animals in scientific studies were initially proposed in a seminal publication titled *"The Principles of Humane Experimental Technique"* by Russel and Burch (1959), who were scholars at the Universities Federation for Animal Welfare (UFAW) in the United Kingdom (Hubrecht & Carter, 2019). In their publication, Russel and Burch (1959) defined the 3Rs as replacement (the substitution of animals if possible, with non-animal alternatives including cell cultures, mathematical or computer models and established cell lines); reduction (reducing the number of animals used for scientific studies to the minimum required to guarantee sufficient statistical power); and refinement (minimising the amount of harm and suffering inflicted on animals to the scientifically necessary minimum) (Hubrecht & Carter, 2019). The 3Rs emerged in response to growing awareness of animal welfare and the need for ethical standards in research (Camenzind & Eggel, 2022). It was proposed to address ethical concerns surrounding the use of animals in scientific studies while enhancing scientific validity. It is currently globally accepted and thought to be the most effective and morally righteous method for using animals in scientific studies (Petetta & Ciccocioppo, 2021).

This acceptance and implementation of the 3R principles have gained global momentum, mainly because the 3Rs have been included in the guidelines and regulations of international bodies such as the World Organisation for Animal Health,

the European Union, Council for International Organisations of Medical Sciences (CIOMS) and the International Council for Laboratory Animal Science (ICLAS), which has about 180 member states (Bayne et al., 2015). The ICLAS, for instance, requires all member states to include the 3R principles in their regulatory frameworks. All international legislation on the use of animals for research is thus based primarily on the ethical principles of the 3Rs, which have been explicitly mentioned in these international guidelines and regulations (Guillén & Steckler, 2019). Tannenbaum and Bennett (2015), as well as Camenzind and Eggel (2022), confirm the use of the 3R principles in international laws, regulations, policies, and ethical statements concerning the use of animals in scientific studies. Considering that this study aimed to develop a research ethics governance framework for the ethical use of animals in Ghana, it was imperative to review existing literature on the 3Rs to guide the development of the conceptual governance framework.

2.4.1.1 Challenges with the implementation of the 3R principles

Since the introduction of the 3Rs, scientific studies using animals have been guided by these principles and have been commonly acknowledged as the overarching ethical guidelines for animal-based research (CCAC, 2019; Hubrecht & Carter, 2019; Smith & Richmond, 2024). The 3R principles have been embedded in national and international legislations and guidelines that govern the use of animals in scientific studies throughout the world (Parija & Mandal, 2013; Díaz et al., 2020), thereby providing a clear directive for improving the well-being of laboratory animals (Hubrecht & Carter, 2019). For instance, South Africa has shown a commitment to the ethical treatment of animals in research and has made efforts to incorporate the 3R principles into its regulatory framework for animal experimentation. The implementation and adoption of the 3Rs in South Africa are primarily overseen by the National Health Research Ethics Council (NHREC) and the Animal Ethics Committee (NHREC, 2024). This has contributed to improved scientific outcomes using more humane practices in South Africa (DeGrazia & Beauchamp, 2019).

The 3R principles were presented as a hierarchy, so that replacement should be considered before reduction, with refinement being considered last (Curzer et al.,

2016; Franco et al., 2018; Blattner, 2019; Hubrecht & Carter, 2019). This is depicted in Figure 2.1, which shows the hierarchical nature of the 3R principles.

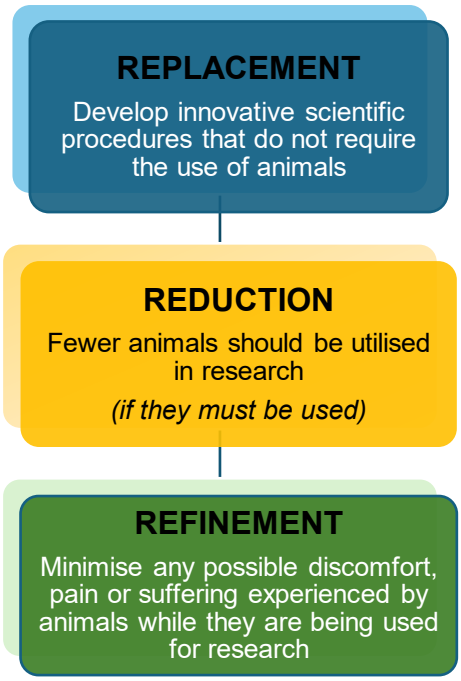


Figure 2.1: Graphical representation showing the hierarchical nature of the 3R principles

Source: Author's construct, 2025

Figure 2.1 shows that the first consideration by a researcher should be to replace the use of animals (replacement) in their studies with non-animal alternatives by exploring the use of tissues and cells, mathematics and computer models or established cell lines (Franco et al., 2018; Lauwereyns et al., 2024; Lewis, 2019). Where this is possible, animals will not be used in the first place, and issues on the humane use of animals will not arise. Where it is impossible to replace the use of animals with other non-animal models, the second option for a researcher is to use the minimum number of animals possible in their research by reducing the number of animals used for scientific studies (reduction) to the minimum required to ensure scientific validity and rigour. Using too many animals above the minimum required will not provide additional knowledge, and using too few animals below the minimum required will jeopardise the validity of the scientific study (Fröhlich & Loizou, 2023; Lauwereyns et al., 2024; Lewis, 2019). After this has been considered, the researcher is then required to ensure that

procedures used on the animals are refined in a way that reduces the amount of harm (both physical and psychosocial), which may be reversible or irreversible, and suffering caused to the animals during scientific studies. Refinement can be achieved through improved handling techniques, conducting studies using animals in ideal environments, optimising anaesthesia and analgesia protocols, and setting clear criteria for when to curtail testing to prevent unnecessary suffering (Fröhlich & Loizou, 2023).

Despite this understanding of how the 3Rs were meant to be implemented, Lauwereyns et al. (2024) and Louis-Maerten et al. (2024) argue that there is clarity that replacement must always be the first consideration among the 3Rs, but reduction and refinement were meant to be considered together. Thus, reduction was not meant to be considered before refinement, but both are to be considered together. Louis-Maerten et al. (2024) explain that Russel and Burch (1959) were not explicit on the hierarchy between reduction and refinement. Essentially, irrespective of the hierarchical structure, the 3R principles limit the use of animals in scientific studies to situations where the animals cannot be replaced by non-animal alternatives, the number of animals used has been as significantly reduced as is reasonable in light of the objectives of the study, and procedures and housing have been improved to minimise any negative effects on animal welfare (Franco et al., 2018).

Despite the global acceptance of the 3R principles by the majority of countries and international organisations, there have been challenges with their implementation in various countries and by various stakeholders. Researchers have implemented the 3Rs variably and have not followed the hierarchical structure described above, by first considering replacement before reduction and then refinement. In a study by Franco et al. (2018), on the attitudes of scientists towards the 3Rs, they found that scientists gave precedence to refinement over reduction and reduction was given precedence over replacement, thereby reversing the ‘hierarchy’ of the 3Rs as intended by Russel and Burch (1959). Similarly, Kousholt et al. (2023) also reported that researchers primarily focus on refinement followed by reduction before replacement when implementing the 3R principles. Lazado et al. (2024) also came up with a similar observation that researchers implement the 3Rs by focusing on reduction and then

refinement before replacement. The report from these studies indicates a lack of understanding of these principles, leading to an inappropriate and nonuniform implementation or application of the 3Rs by researchers.

By turning the hierarchy around, it implies that researchers have been trained to use animals in their studies and therefore do not consider alternatives, but rather consider reduction and refinement as their priority, which means that animals will continue to be used for scientific studies if this is not corrected. Vitale and Ricceri (2022) explain that in the implementation of the 3R principles, replacement faces more methodological inertia compared to refinement and reduction. This can be explained by the nature of researchers' training and experience, where their design of scientific studies from conception involves the use of animals. Consequently, their main concern is typically not to replace the use of animals with non-animal models, but rather to improve the procedures to minimise harm to the animals during the process before establishing how to use fewer animals overall. This is mainly because most scientists are not trained on alternatives to using animals in research, and they lack the necessary expertise and knowledge to consider using non-animal models as a first option. As a result, they have a bias towards using animals in scientific studies.

According to Blattner (2019) and Balls (2020), there has been a failure in implementing the 3R principles to achieve the goal for which they were introduced. Blattner (2019) observed that the number of animals used in scientific studies has not reduced even after the implementation of the 3Rs over the years. Blattner (2019) noted that the number of animals used as of 2019 was higher than the number used in the 1980s, which meant that the principles of replacement and reduction were either not being implemented or were ineffective. Additionally, Franco (2013) and Blattner (2019) observed that there were still widespread reports of rising numbers of scientific studies where animals are forced to endure the most severe experiments despite the adoption of the principle of refinement, which demands a reduction in the severity of animal experiments. In his assessment of the number of animals used in 2019 compared to the number used in the 1980s, Blattner (2019) failed to provide actual numbers to support his argument and also failed to acknowledge that there has been an increase

in the number of researchers and the number of scientific studies conducted between the two periods.

In disagreeing with the assertions of Blattner (2019) and Balls (2020), Müller (2023) argues that the historical intention and underlying philosophy of the 3R principles were not to reduce the number of scientific studies using animals but to focus on individual study designs that will reduce pain in animals used for scientific studies. Franco et al. (2018) argue that the number of animals used in research has increased because researchers prioritise refinement over replacement and reduction. Also, in a study by Carlsson et al. (2004), where they examined articles from 2,800 biomedical journals published between 1970 and 2000, they discovered that despite an increase in the number of articles published each year (implying an increase in research over the period), the percentage of studies using animals fell by 30%, with a 50% drop in the average number of animals used per published paper. Additionally, they showed a jump from 21% to 35% in the proportion of studies using tissue from untreated, euthanised animals rather than living ones. The study by Carlsson et al. (2004), confirmed by Fröhlich and Loizou (2023) as well as Mehmood et al. (2024), thus provides empirical evidence to support the fact that although scientific studies using animals have increased, the adoption of the 3R principles over the years has contributed to the replacement of animals with other non-animal models (replacement), a reduction in the number of animals used (reduction), and the use of more refined procedures (using tissues instead of live animals) (refinement). The proper application of the 3R principles, according to Carlsson et al. (2004) and Fröhlich and Loizou (2023), can reduce the number of animals used for scientific studies and use more humane scientific methods on the animals used.

There is also a lack of uniformity regarding the definition and understanding of the 3R principles, some of which are inaccurate and do not mean exactly what Russel and Burch (1959) espoused, resulting in differences in their implementation (Tannenbaum & Bennett, 2015). Curzer et al. (2016) argue that the 3Rs are poorly defined and, therefore, afford little guidance to ARECs in the governance of scientific studies using animals. According to Curzer et al. (2016), various ARECs interpret and apply the 3R principles differently, leading to a lack of uniformity in these committees' decisions.

Bayne et al. (2015) assert that despite their inclusion in national documents, the implementation of the 3Rs is difficult to judge because both researchers and ARECs cannot determine the extent to which proposed research will result in achieving the 3Rs. Müller (2023) also highlights that there is no uniformity in the definition of the 3R principles in national regulations and guidelines, resulting in a misapplication of the principles. For instance, in highlighting the lack of uniformity in defining the 3R principles, Rodriguez et al. (2023) compared the Swiss law on the use of animals in scientific studies and the 3R principles as stated by Russel and Burch; they observed differences in the definitions of the 3R principles resulted in the Swiss law's inability to achieve the humane use of animals in scientific studies as envisaged through the implementation of the 3Rs. In their nationwide study on reporting of 3R approaches in preclinical animal studies, Kousholt et al. (2023) also identified a lack of uniform application of the 3R principles by Danish authors, resulting in minimal reporting of the 3R approaches. The lack of standardised application of the 3R principles is occasioned by differences in definition and understanding of the 3Rs by their researchers.

From the foregoing, existing literature reveals that despite the global acceptance of the 3R principles for the humane use of animals in scientific studies, there is no uniformity in the definition of these principles, resulting in inconsistencies in their implementation across the scientific community. These inconsistencies in implementation are defeating the purpose for which Russel and Burch (1959) introduced the principles: first to ensure that animals are not used in studies where alternatives are available, and when the animals must be used, the minimum number required must be used, and the most humane treatment and procedures must be used. As a result of the inconsistencies, despite having the 3Rs in many international and national legislations and guidelines, the number of animals used in research has not declined (Marshall et al., 2022), and some researchers continue to conduct unethical research using animals.

2.4.1.2 Recommendations for expansions of the 3R principles

Some scholars have suggested that the 3R principles are inadequate in ensuring the ethical use of animals in scientific studies and have recommended additional Rs to make it complete and able to address additional concerns relating to laboratory animals. According to authors like Ferdowsian and Beck (2011), Aske and Waugh (2017), and Simonato et al. (2020), there has been an overdependence on the 3R principles. They argue that the 3Rs are inadequate in ensuring the humane use of animals in scientific studies because they do not address all aspects of scientific studies using animals, despite enhancing the progress of experimentation without compromising the quality of outcomes. After reviewing the European Directive on 3Rs, Ali (2023) also corroborated the assertion that the 3R principles alone are inadequate in ensuring optimal animal welfare. Following criticism of the 3Rs' adequacy to ensure the ethical use of animals in scientific studies, some scientists have proposed an expansion of these principles to address concerns raised to ensure optimal animal welfare in scientific studies, as initially proposed by Russel and Burch.

The Canadian Council on Animal Care (CCAC) (2019) and Lewis (2019) underscored the importance of the 3Rs and suggested its expansion to 4Rs by including 'reproducibility' as the fourth R. Its inclusion will maximise data obtained from scientific studies using animals, ensure efficient use of funds, and the reduction in the number of animals used globally for scientific studies. Parija and Mandal (2013) also include a fourth R (rehabilitation), which they define as post-experimentation animal aftercare. This concept of including rehabilitation has become a national policy in India, making experimental animals' rehabilitation a legal requirement (Pereira & Tettamanii, 2005; Prem, 2022).

Aske and Waugh (2017) also identified a lack of transparency and reporting of animal experiments in the 3R principles and proposed an expansion to 5Rs to include 'robustness' and 'reproducibility'. Expanding the 3Rs to five, they claim, will increase the quality, repeatability, and transparency of scientific publications and biological research. Robustness and reproducibility are not necessarily additions to the 3R principles, as they can be considered in assessing the refinement of the scientific

process and the scientific justification of the process. Kumah (2012) also proposed and encouraged researchers to consider expanding the 3Rs to five by including 'reuse' and 'rehabilitation' to create an opportunity for reusing the animals for other scientific studies and ensuring the rehabilitation of both the animals and their housing facilities. This, according to Kumah (2012), will improve the 3Rs but defeat the primary purpose of their introduction, which was to encourage the humane use of animals in scientific studies. Once the 3Rs are adhered to and achieved, the additional Rs (reuse and rehabilitation) proposed by Kumah (2012) will be achieved. The focus must, therefore, be on the achievement of the 3Rs and not on expanding the 3R principles.

Curzer et al. (2016) analysed the fundamental reasoning of the 3Rs and concluded that these principles provide animals with a moral status but not necessarily 'rights' in the philosophical sense. They argued that the 3Rs are written so that they anticipate that all planned animal-based scientific studies would be carried out. However, some may require tweaking of their proposed procedures for a more humane use of animals in the proposed study. They, therefore, proposed a fourth R, 'reject', which will allow ARECs to reject proposed scientific studies that are not sufficiently beneficial. This assertion is corroborated by Ferdowsian and Gluck (2015), who propose a fourth R, 'refusal', and contend that the framework of the 3Rs does not explicitly consider problems concerning the ethical justification of studies involving animals when replacement, reduction and refinement options are not available. They recommended that when the level of suffering is expected to be great and unrelenting, the fourth R, 'refusal', should be used. Both proposals by Curzer et al. (2016) and Ferdowsian and Gluck (2015) to add a fourth R ('reject' and 'refusal', respectively) focus on the AREC's role to 'reject' or 'refuse' proposals that will not be conducted humanely in the AREC's assessment. However, Russel and Burch's (1959) focus in proposing the 3Rs was on the researcher and not on the AREC. The function of the ARECs, as explained in Section 3.3, shows that these committees have the authority to reject or refuse proposed studies from being implemented. The addition of an "R" to represent refusal or rejection of proposed studies – to enable ARECs to reject or refuse implementation of proposed studies – will only state the obvious role and function of the ARECs and not the substantial issue of humane use of animals in scientific studies.

According to Shamoo and Resnik (2022), since not all scientific studies using animals are likely to yield results with scientific, medical or social value, a fourth R, 'relevance', should be added to the 3R principles. Shamoo and Resnik (2022) also recommended a fifth R, 'redundancy', which they describe as the situation where researchers use animals unnecessarily and waste research resources on studies that do not have any scientific value or justification. They explained that researchers must always endeavour to avoid redundancy when using animals in scientific studies. Related to this recommendation by Shamoo and Resnik (2022) is the proposal by Stojanović and Todorovska (2017) for the addition of 'responsibility' to the 3R principles. According to Stojanović and Todorovska (2017), adding 'responsibility' to the 3Rs will impose a responsibility on researchers and anyone who uses animals in scientific studies to comply with the 3R principles. Responsibility, according to Stojanović and Todorovska (2017), also implies that anyone who handles animals in scientific studies must have a certain level of training or certification to hold animals for research purposes. They assume that the level of training researchers have on the humane use of animals determines their level of 'responsibility' in humanely using animals; therefore, adding 'responsibility' to the 3Rs will ensure the humane use of animals. In South Africa, 'responsibility' has been accepted as a fourth R in the South African National Standard (SANS 10386:2021).

Similarly, Akkermans et al. (2020) suggest the inclusion of 'responsibility', 'respect' and 'reproducibility' to the 3Rs to make them 6Rs. Akkermans et al. (2020), like Stojanović and Todorovska (2017), perceive 'responsibility' as a management task within an experiment imposed on researchers who are responsible for the conduct of research that involves the use of animals. According to Akkermans et al. (2020), adding 'respect' to the 3Rs will ensure that researchers will design and perform experiments with the utmost respect for animals. Respecting the animals may result in a more ethical and humane use of these animals. They also recommended the inclusion of 'reproducibility' to the 3Rs to ensure that the outcomes of scientific studies using animals are reproducible by other researchers. Strech and Dirnagl (2019) contend that, despite the 3R principles aiming to safeguard animal welfare, that alone does not suffice to make animal research ethical. They argue for an additional 3Rs,

namely ‘robustness’, ‘registration’ and ‘reporting’ to ensure that the scientific value of research using animals is sufficiently robust.

Brink and Lewis (2023) also introduced the 12R principles by presenting extra concepts in addition to the globally accepted animal welfare 3R principles. The 12R principles seek to address the inadequacies of the 3Rs by incorporating a broader perspective that considers cultural, religious, political, and socioeconomic diversity across nations (Azilagbetor et al., 2024). The 12Rs are: replace, reduce, refine, respect, responsibility, regulation, reproducibility, relevance, transferability, righteousness, reliability, and reckoning. The 12R principles emphasise the importance of moral ethics in navigating ethical dilemmas in research and promote harmonisation rather than standardisation of ethical practices. Additionally, the 12Rs highlights the interconnectedness of animal welfare, research ethics, and the significance of relevance and reproducibility in scientific studies, thereby providing a holistic approach to animal research ethics that is adaptable to various contexts and stakeholders.

While the 12R principles have several strengths, there are also notable areas for critique. First, the 12R principles are a commendable attempt to provide a systematic approach to ethical considerations in animal research. By addressing principles such as respect, responsibility, and reproducibility, the authors aim to create a holistic view of animal welfare in scientific studies. However, this could benefit from a more detailed explanation of each of the 12Rs. The lack of specificity in the explanation provided by the proponents may lead to ambiguity in understanding how each principle can be practically applied in real-world scenarios. Moreover, Brink and Lewis (2023) mention the importance of a harm-benefit analysis as a key ethical safeguard but do not delve deeply into how this analysis can be conducted effectively. The discussion lacks concrete examples or case studies that illustrate the practical application of harm-benefit analyses in animal research. While Brink and Lewis’s (2023) reliance on the existing 3R principles and international guidelines, such as the PREPARE (Planning Research and Experimental Procedures on Animals: Recommendations for Excellence) and ARRIVE (Animal Research: Reporting of In Vivo Experiments), demonstrates their awareness of current standards, it also raises questions about the

novelty and originality of the 12R principle. The authors could have positioned their framework more distinctly within the existing literature, highlighting its unique contributions and how it builds upon or diverges from established guidelines. Table 2.1 shows a summary of authors and their recommendations for additions to the 3R principles to make it more comprehensive or relevant to specific parts of scientific studies using animals.

Table 2.1: Summary of recommended additions to the 3R principles by Russel and Burch (1959)

Recommended Additional 'R'	Proponents
Robustness	Aske and Wuagh (2017)
Rehabilitation	Parija and Mandal (2013); Blattner (2019); Kumah (2012)
Refuse or Reject	Ferdowsian and Gluck (2015); Curzer at al. (2016)
Reproducibility	CCAC (2019); Aske and Wuagh (2017); Akkermans et al. (2020)
Redundancy	Shamoo and Resnik (2022)
Relevance	Shamoo and Resnik (2022)
Reuse	Kumah (2012)
Responsibility	Stojanovic and Todorovska (2017); Akkermans et al. (2020); South African National Standard (SANS 10386:2021)
Respect	Akkermans et al. (2020)
Robustness, Registration and Reporting	Strech and Dirnagl (2019)
Respect, Responsibility, Regulation, Reproducibility, Relevance, tRansferability, Righteousness, Reliability, and Reckoning	Brink and Lewis (2023)

Source: Author's construct, 2025

The literature, as summarised in Table 2.1, shows that there is limited consistency in what has been identified by various authors as the gaps in the 3R principles and their suggestions for additional Rs' inclusion in the original 3Rs. For instance, the CCAC (2019), Aske and Waugh (2017) and Akkermans et al. (2020) proposed the addition of 'reproducibility', but while Aske and Waugh's justification for its inclusion to the 3R principles was to improve transparency and reporting of animal experiments, the CCAC (2019) justified its inclusion for the optimisation of data obtained and ensuring efficient use of funds. This example of justification for the inclusion of 'reproducibility' to the 3Rs makes it increasingly difficult for global acceptance and adoption of these suggested additions.

The literature also shows contextual motivation for proposing additions or modifications to the 3Rs, resulting in different suggestions from various scientists, making the adoption of these suggestions difficult. This gives credence to the assertion by Tannenbaum and Bennett (2015), confirmed by Vitale and Ricceri (2022) as well as Bailey (2024), that there is no uniform understanding of the 3R principles. So far as the suggested additions to the 3Rs meet local (national or institutional) needs, they may be adopted at national or institutional levels based on specific contextual needs while maintaining the original 3Rs in the context in which they were introduced. The 3R principles will then continue to be the fundamental or requisite condition for scientific studies using animals, while other additions to the 3Rs will be the sufficient condition to justify such studies. These sufficient conditions should be used within a context.

This explains why the 3R principles are being implemented differently in various countries and justifies the need to have a contextual governance framework for scientific studies using animals in Ghana. The 3R principles should be understood as the basic requirement for the ethical use of animals in scientific studies and not as an all-encompassing principle for the governance and ethical use of animals in research. Tannenbaum and Bennett (2015) succinctly explain that the 3R principles were offered not as the last word on the ethical use of animals in scientific studies but as a framework for future advancements. Once the 3Rs, as the foundation, have been accepted by everyone, suggestions for further developments and improvements can

help improve the ethical use of animals in scientific studies. The 3R principles should be perceived and understood as the core and primary focus of all scientific studies using animals, and the suggested Rs should be understood to be additional principles to complement and enhance the 3Rs (Ali, 2023).

2.4.2 The five freedoms (5Fs) framework

The Farm Animal Welfare Council of the United Kingdom formulated the 5Fs framework in 1960, which has become very well-known and used internationally (Mellor, 2016b). The 5Fs did not gain widespread acceptance until the Farm Animal Welfare Council's report on the welfare of farm animals in intensive systems was published in 1993 (Farm Animal Welfare Council, 1993, 2009). The Council concluded that farm animals in confinement should be given the following five freedoms:

1. Freedom from thirst, hunger and malnutrition – By providing ready access to a diet to maintain full health and vigour.
2. Freedom from thermal and physical discomfort – By providing a suitable environment, including shelter and a comfortable resting area.
3. Freedom from pain, injury and disease – By prevention or rapid diagnosis and treatment.
4. Freedom from fear and distress – By providing sufficient space, proper facilities and the company of the animal's own kind.
5. Freedom to express normal behaviour – By ensuring conditions that avoid mental suffering.

According to the Farm Animal Welfare Council, the 5Fs are essential to identify and assess the effectiveness of particular activities that promote the welfare of farm animals. Guillén and Steckler (2019) introduced the 5Fs framework into the discussion on the ethical use of animals for scientific purposes to complement the 3R principles. They argued that while these 5Fs were originally established for the farm animal environment, they are also mentioned in various research animal legislation and are therefore relevant for ensuring the humane use of animals in scientific studies. The

5Fs is used in harm-benefit analyses as part of the ethical assessment of research projects (Brønstad et al., 2016; Guillén & Steckler, 2019).

It is important to understand that the original focus of the 5Fs was on farm animals in confinement and not necessarily animals being used in scientific studies (Dawkins, 2023). The context and purpose for introducing these 5Fs and the expectations are critical in critiquing their introduction as a complement to the 3R principles. According to Webster (2016) and Mellor (2016), the 5Fs were initially intended to serve as a checklist for evaluating the advantages and disadvantages of husbandry systems rather than as goals that could be attained. As such, they should not be interpreted implicitly or explicitly as the ideal situation for animal husbandry. In effect, the 5Fs focused on ensuring good husbandry practices and not scientific studies using animals (Tobin et al., 2022). Agreeably, the 5Fs can be used as a guide for assessing the third R (refinement) concerning scientific studies using animals in confinement to ensure adequate and efficient husbandry practices are used (Tobin et al., 2022). Using the 5Fs will thus be beneficial as one of the tools and guidelines for ARECs to assess 'refinement' in proposed studies. The 5Fs is therefore not an addition to the 3R principles; instead, it provides a guide for determining refinement in the use of animals in scientific studies.

2.4.3 The Five Domains (5Ds) Model

The five domains (5D) model was proposed in 1994 by David Mellor and Cam Reid (Mellor & Reid, 1994) as a conceptual framework to simplify how the welfare of animals used in scientific studies is assessed (Hampton et al., 2023). The 5D model was built on the foundation of the five freedoms (5Fs) framework to replace the 5Fs due to perceived deficiencies identified with the 5Fs framework in ensuring the welfare of animals. Mellor and Reid (1994) argued that animal welfare can be better modelled through the animal's situation in terms of nutrition, environment, health, behaviour and mental state instead of analysing the presence or absence of hunger, fear, pain, discomfort and natural behaviours, as was proposed in the 5Fs framework. Unlike the 5Fs, which focused on reducing animals' negative experiences, the 5Ds focus on promoting animals' positive experiences. Mellor (2016) further argues that for animals

to have “lives worth living”, it is imperative to minimise the negative experience they are exposed to while at the same time providing them with opportunities for positive experiences.

The 5Ds of animal welfare are:

1. Nutrition (presence and quality of food and water for animals)
2. Environment in which they live (appropriate housing and safe surroundings for animals)
3. Physical health (animals free from disease, injury and impairment)
4. Behavioural (animals’ ability to express natural behaviours)
5. Mental state (emotional experience of animals)

According to Voogt et al. (2023), the first four domains (nutrition, environment, physical health, behaviour) are assessed to determine the fifth domain (mental state of the animal), which is then used to determine animals’ overall welfare. Through the attainment of the 5Ds, animals’ quality of experience or overall welfare is determined (Hampton et al., 2023). Like the 5Fs, the 5Ds are not an addition to the 3R principles but provides a model that ensures animal welfare is kept paramount not by reducing their negative experiences, but by putting the necessary facilities in place to enhance their positive experiences. This, in effect, contributes the third R in the 3R principles (refinement) by ensuring that animals are treated humanely and provided with basic necessities to make their “lives worth living” while being used in scientific studies.

2.4.4 The 3Vs principle

The 3Vs framework was developed to address the 3Rs’ limitations in evaluating the validity of scientific studies using animals, necessitating additional considerations (Eggel & Würbel, 2021; Würbel, 2017). Würbel (2017) proposed the 3Vs principle, arguing that while the implementation of the 3Rs is essential, it is insufficient for the rigorous conduct of animal-based research. The 3Vs underscore the importance of validation in scientific studies involving animals. This framework serves as a guideline for assessing the scientific appropriateness of proposed studies that utilise animal

models (Eggel & Würbel, 2021). The 3Vs facilitate the development of protocols that allow for a clearer evaluation of the validity of animal models through a harm-benefit analysis approach. This is achieved by posing critical questions: Is the animal model valid for the intended scientific objective (construct validity)? Are the model and protocol appropriately designed (internal validity)? To what extent can the findings be generalised to other animals or humans based on the study's objectives (external validity)? The components of the 3Vs are defined as follows:

- Construct validity (cV) – This measures the degree of alignment between the animal model and the specific characteristics it is intended to assess.
- Internal validity (iV) – This refers to the extent to which biases arising from inadequacies in a study's design, execution, or reporting can be minimised, thereby allowing the results to be attributed to variations in independent variables rather than confounding factors.
- External validity (eV) – This pertains to the extent to which findings from one study can inform the design, execution, or management of other studies or influence changes in animal populations.

Würbel (2017) posits that the 3Vs represent the most critical elements for ensuring scientific integrity in animal studies. Consequently, the advancement of scientific research involving animals will benefit from the integration of both the 3Vs and the 3Rs (Eggel & Würbel, 2021). While the 3Vs focus on the scientific validity of animal studies, the 3Rs emphasise the ethical considerations surrounding the use of animals in research. Therefore, the 3Vs can serve to complement the 3Rs in evaluating the appropriateness of scientific inquiries involving animal subjects.

It is noteworthy that Eggel and Würbel (2021) do not critique the merits of the 3Rs but rather introduce the 3Vs as an additional metric for ensuring the scientific validity of animal studies, which is secondary to the ethical imperative established by the 3Rs. They assert that the 3Vs constitute a 'sufficient condition' for conducting animal research. Given that the ethical treatment of animals is the primary focus of this discourse, the 3Rs' foundational role in safeguarding ethical standards in animal research remains unchallenged by proponents of the 3Vs framework. Thus, the 3Rs

continue to serve as a 'necessary condition' for the ethical use of animals in scientific studies.

2.4.5 The two core values principle

The two core values principle was proposed by DeGrazia and Beauchamp (2019). According to them, the principle addresses other areas of animal care that the 3Rs do not consider. DeGrazia and Beauchamp (2019) opined that the 3R principles only focus on using animals in scientific studies but leave out animal welfare standards, which should be applied to all ethically significant parts of scientific studies using animals. DeGrazia and Beauchamp (2019), supported by Landi (2020) and then Eggel and Würbel (2021), argued that the 3R principles were only a necessary condition for the ethical use of animals in scientific studies but not a sufficient condition, making it inadequate for animal ethics. DeGrazia and Beauchamp (2019) introduced the two-core values principle as a sufficient condition to complement the 3R principles (necessary condition). The two core values principle proposed by DeGrazia and Beauchamp (2019) are: Core value 1: the principles of social benefit, and Core value 2: the principles of animal welfare. Each of the two core values comprises three moral principles:

Core Value 1 – The principles of social benefit

- *Principle 1: The principle of no alternative method* – Animals should only be used for scientific studies if it is the only ethically acceptable way to address a problem whose solution offers the prospect of social benefit. Animals should not be used in scientific studies that will harm them.
- *Principle 2: The principle of higher net benefit for human society* – This refers to the cost-benefit analysis, where the net prospective benefit for using animals in scientific studies must always outweigh the cost. Animals should not be used for scientific studies if the cost of using them outweighs the social benefit of their use.
- *Principle 3: The principle of sufficient value to justify harm* – This principle implies that the prospect of the net benefit to humans for using animals in scientific studies must be sufficiently valuable to justify expected harm to animal subjects.

Core Value 2 – The principles of animal welfare

- *Principle 4: The principle of no unnecessary harm* – This principle states that animals used for scientific studies must not be harmed unless a particular harm is necessary and morally justified for scientific purposes.
- *Principle 5: The principle of basic needs* – According to this principle, the basic needs of animals used in research must be met in the conduct of scientific studies unless the failure to meet the specific basic needs of the animals is both necessary for and morally justified by scientific purposes.
- *Principle 6: The principle of upper limits to harm* – Animals used for scientific studies must not be made to endure severe suffering for a lengthy period.

According to DeGrazia and Beauchamp (2019), a prospective study using animals is only morally justified if it satisfies both the principles of social benefit and the principles of animal welfare. A critical review of the two values principle by DeGrazia and Beauchamp (2019), in comparison to the 3R principles, shows that the two values principle is an expansion of the 3Rs and essentially does not offer any new principle not already contained in the 3Rs. The two core values principle focuses on the 3rd R, 'refinement'. As acknowledged by DeGrazia and Beauchamp (2019), their proposed principles are only to complement the 3Rs and not to replace them, but then it may not be a complement but an expanded explanation and contextual application of the 3R principles. Additionally, each of the six principles is so closely related that it is difficult to distinctly distinguish between one principle from another. Also, some of the principles have been vaguely defined and explained, which will make their implementation difficult. For instance, DeGrazia and Beauchamp (2019) indicate that what counts as 'sufficiently valuable' should be left for ARECs to debate and a decision to be taken. However, a framework that seeks to provide guidance on the use of animals cannot be left open for debate and decision by individual ARECs. Consequently, these principles will only be seen as guidelines to assist ARECs in deciding on the merits of proposed studies that intend to use animals.

The proposed principles by DeGrazia and Beauchamp (2019) therefore overlap with the 3Rs. The only difference is that they try to broaden it to other animals not being used for scientific studies, which was not the primary aim of Russel and Burch (1959)

when they espoused the 3Rs, with their focus on the humane use of animals in scientific studies.

2.4.6 The 6P principles

In their proposal of the 6P principles, DeGrazia and Beauchamp (2019) underscore the necessity for a robust ethical framework that simultaneously addresses human interests and animal welfare, positing that existing governmental guidelines and institutional practices require substantial enhancement. They contend that a novel ethical framework for animal research is imperative, given the heightened public concern regarding animal welfare, advancements in scientific methodologies, and the limitations inherent in the traditional 3R principles established by Russell and Burch in 1959. They proposed a set of six principles – three focused on social benefit and three on animal welfare – as a more effective ethical guideline for animal research. The six principles, collectively termed the 6Ps, are delineated as follows:

2.4.6.1 Principles of social benefit

1. Principle 1: No-alternative method asserts that the use of animals in scientific studies is only ethically acceptable if it is the only means of addressing the research problem and the resolution of the research problem would provide social benefits. This principle aligns with the replacement aspect of the 3Rs.
2. Principle 2: Expected net benefit posits that the anticipated societal benefits arising from a research study must outweigh the expected costs and potential risks to human beings. This principle introduces a consideration of the benefits derived from animal research, thereby informing the harm-benefit analysis.
3. Principle 3: Sufficient value to justify harm maintains that the prospective net benefits to human society arising from a research study must be sufficiently substantial to warrant the anticipated harm to animal subjects. This principle expands the harm-benefit analysis by weighing the benefits of the research against the expected harm to the animals involved.

2.4.6.2 Principles of animal welfare

4. Principle 4: No unnecessary harm stipulates that the infliction of suffering or harm on animal subjects must only occur when it is necessary for achieving scientific objectives and ethically justified. This principle integrates animal welfare considerations into the harm-benefit analysis and resonates with the refinement aspect of the 3Rs, implicitly addressing reduction using appropriate animal numbers.
5. Principle 5: Basic needs asserts that unless there is a scientifically necessary and ethically justified reason, the basic needs of animals must be met when they are used in scientific studies. DeGrazia and Beauchamp (2019) provide a plausible catalogue of basic needs, which includes access to nutritious food and clean water, safe shelter, adequate stimulation, exercise, opportunities for species-typical behaviours, sufficient rest to maintain physical and, where applicable, mental health, access to veterinary care, companionship for social species, and freedom of movement within adequate space.
6. Principle 6: Upper limits to harm states that animals used in research must not experience severe and prolonged suffering. In extraordinary situations, exceptions may be permitted if the research is deemed necessary and ethically justified by substantially significant social and scientific objectives. This principle aids in defining humane endpoints for animals involved in research, whether anticipated or implemented in response to unforeseen adverse effects.

The 6P principles is rooted in shared values and moral tenets, aiming to reconcile the dichotomy between scientific inquiry and ethical considerations. A notable strength of the 6Ps lies in its comprehensive and inclusive approach, which seeks to integrate diverse perspectives from ethics, science, and public discourse (Penha et al., 2023; Landi, 2020). Furthermore, the 6Ps serve as a significant extension that balances the dual societal values of social benefit and animal welfare, each subdivided into three guiding principles (DeGrazia & Beauchamp, 2019). However, a limitation of this principle is its potential inadequacy in fully addressing the complexities of animal sentience and the varying moral statuses assigned to different species, which may complicate the practical application of these principles (Browning & Birch, 2022).

Strech and Dirnagl (2019) further contend that the 6Ps may still fall short if the scientific value of the research is not sufficiently considered. Thus, the proposed 6Ps should be regarded as complementary to the 3R principles rather than as a wholly new set of guidelines for the ethical treatment of animals in scientific research.

2.4.7 Conclusion – Ethical principles for the use of animals in scientific studies

The 3Rs of replacement, reduction, and refinement articulated by Russell and Burch have garnered widespread acceptance and are currently incorporated into the legal frameworks, guidelines, and policies of numerous countries as the ethical foundation for conducting scientific research involving animals. Nonetheless, a review of the existing literature indicates that implementing these principles exhibits significant variability across different regions of the world (Hubrecht & Carter, 2019). Critiques have emerged regarding the sufficiency of the 3Rs to guarantee the ethical treatment of animals in scientific research, prompting proposals for additional principles and modifications to the original framework. Scholarly discourse reveals a lack of consensus on the adequacy of the 3Rs in ensuring the ethical use of animals in research (Ferdowsian & Beck, 2011).

While there is a general agreement among researchers regarding the necessity of the 3Rs as a prerequisite for the use of animals in scientific studies, contention surrounding the proposed supplementary principles remains. As the body of knowledge concerning the use of animals in scientific research continues to evolve, novel concepts aimed at enhancing animal protection and promoting humane treatment have emerged alongside the 3Rs. These include frameworks such as the 6Ps, 3Vs, 5Fs, and the two core values principle. Importantly, the literature reviewed by the researcher does not oppose the 3Rs as a foundational framework for ethical animal use; rather, these additional principles are posited as enhancements that complement the original 3Rs, promoting the humane treatment of animals in research.

This perspective aligns with the observations of Petkov et al. (2022), who assert that these supplementary principles serve as refinements to the foundational 3Rs

framework. Recognising that the 3Rs were initially proposed to facilitate the humane use of animals in research and were not intended to represent a definitive stance on the ethical treatment of animals, scientists and policymakers must approach the 3Rs as a foundational basis that invites contextual adaptations. This underscores the necessity for a governance framework tailored to the ethical use of animals in Ghana, with the 3Rs serving as its cornerstone. Consequently, it can be concluded that, given the global acceptance of the 3Rs as a necessary condition for scientific studies involving animals, it is essential for researchers and institutions to develop expanded interpretations that render the 3Rs more applicable within their specific contexts. A similar methodology will be employed in the development of a conceptual framework for the use of animals in scientific studies in Ghana, leveraging the 3Rs as the foundational basis, since the majority of national and international regulations and guidelines reference these principles.

2.5 Chapter Conclusion

The purpose of this chapter was to review prevailing literature on the historical context and advantages of using animals in scientific studies, the philosophical debates surrounding the ethical use of animals in scientific studies, and the ethical principles articulated by various scholars regarding the humane treatment of animals in research settings. The chapter helped to engage with the existing body of knowledge concerning the historical context, philosophical arguments, and ethical principles that govern scientific studies using animals to help understand the governance systems and practices pertaining to the ethical use of laboratory animals. It provided the needed background for the development of an animal research ethics governance framework for Ghana. Reviewing the historical development of animal research ethics sheds light on how ethical principles were developed.

This chapter reveals that the significance of using animals in scientific studies is well-documented, with numerous scholars articulating the necessity of such practices. Nonetheless, the existing literature reveals ongoing debates regarding the ethical implications of using animals for research purposes. Philosophical discourse surrounding this issue encompasses four predominant schools of thought:

contractarianism, utilitarianism, animal rights theory, and virtue ethics. The divergence of perspectives among these frameworks, along with the emergence of additional philosophical approaches, underscores the complexity of the ethical landscape in which animal research is situated. Given the continued use of animals in scientific studies, it is imperative to ensure that such research is conducted humanely. The establishment of ethical principles governing the use of animals in research is crucial at this juncture, as these principles may mitigate ethical disputes by ensuring that all animal research adheres to principles of ethicality and sustainability comparable to those applied in studies involving human subjects.

To facilitate the ethical use of animals in scientific studies, the 3R principles of refinement, reduction, and replacement proposed by Russell and Burch have been internationally recognised and adopted by various countries, albeit with some variations in implementation. Despite its widespread acceptance, criticisms regarding the sufficiency of the 3R principles to ensure the ethical use of animals persist, and a consensus among scientists on this matter has yet to be reached. Furthermore, there is a notable gap in the scientific literature concerning the extent to which the 3R principles have been integrated into national legislation, policies, and guidelines across different jurisdictions.

While other ethical principles and frameworks have been developed to complement the 3Rs, none can replace the 3R principles. In the context of Ghana, the development of a conceptual framework to ensure the ethical use of animals in scientific research will benefit from the incorporation of the 3R principles, alongside additional modifications tailored to the specific cultural and regulatory landscape of the country.

The next chapter is another literature review chapter dedicated to reviewing available literature on animal research ethics governance systems and practices. It provides deeper and more detailed insight for understanding the concept of ‘animal research ethics governance’ and the available animal research ethics governance systems and practices.

CHAPTER THREE
LITERATURE REVIEW ON ANIMAL RESEARCH ETHICS GOVERNANCE SYSTEMS AND PRACTICES

3.1 Introduction

Chapter Two presented a review of literature on the history, philosophical arguments and principles for the ethical use of animals in research. This chapter is a continuation of the review of literature on existing governance systems and practices for the ethical use of research animals. The chapter aims to gain a better understanding of the existing animal research ethics governance systems and practices globally and in Ghana to provide a frame of reference for the study.

The chapter is composed of five main sections. It commences with this introduction, followed by a section that helps to provide a clear definition of the 'animal research ethics governance' concept. The third main section of the chapter focuses on reviewing literature on animal research ethics governance systems. This review was based on three key contexts – macro (global), meso (national) and micro (institutional) – of animal research ethics governance systems. The fourth section of the chapter synthesises literature on existing animal research ethics governance practices. The last section focuses on synthesising and summarising all the sections of the chapter.

3.2 Defining the Animal Research Ethics Governance Concept

To define the concept of 'animal research ethics governance', it is imperative to first establish a precise understanding of the term 'governance'. This understanding can subsequently be applied to the domain of research governance, and further to the specific context of animal research. The term 'governance' is etymologically derived from the Greek verb *kubernáein,* which translates to "to steer a ship" (Acharya, 2024). This Greek root evolved into the Latin verb *gubernare,* leading to various forms of the word in multiple languages, such as *gouverner* in French, and government and governance in English (Acharya, 2024; Fukuyama, 2016; Gilis, 2019; Hamedinger, 2023; Plattner, 2013). This means that the word 'governance', as we have it today in

English, originated from Greek; therefore, to understand governance, there is a need to get the original meaning of the word in Greek, which is to steer a ship. This understanding of the original meaning indicates governance to mean authority, responsibility, decision-making or leadership.

The concept of governance gained prominence in the 1990s (Ansell & Torfing, 2017; Mirea, 2023) and has since been used across diverse fields, including public administration, economics, health, education, research, and political science (Acharya, 2024; Plattner, 2013). The term ‘governance’ has been interpreted in various ways by different scholars, resulting in the absence of a single definition (Acharya, 2024; Hamedinger, 2023; Lee & Kamradt-Scott, 2014). The World Bank characterises governance as “the manner in which power is exercised in the management of a country’s economic and social resources for development” (World Bank, 1992, cited in Plattner, 2013). Similarly, Rhodes (1996) and Howlett and Ramesh (2014) conceptualise governance as a form of self-organising, interorganisational networking that encompasses establishing, promoting, and maintaining connections between governments and their citizens. Weckert and Lucas (2013) view governance as an integral component of an ‘integrity system’, which they define as non-legal institutional mechanisms aimed at mitigating inappropriate behaviour and fostering an ethical climate.

Furthermore, Fukuyama (2016) describes governance as the regulation of social behaviour through networks and other non-hierarchical structures. While Howlett and Ramesh (2014) emphasise governance as a process involving the cultivation of specific relationships between governments and their citizens, Gilis (2019) expands the definition to encompass a range of operations conducted at various levels within both public and private institutions. Governance is also characterised as a dynamic process that acknowledges the roles of both formal and informal participants (Schoeman, 2019). Acharya (2024) identifies that governance has been defined in the literature as a structure, process, mechanism and strategy. This implies that ‘governance’ could be defined either as a formal structure within institutions, as a process of steering activities to a desired goal, institutional processes and procedures of decision-making and control, and the strategies designed by key stakeholders to

achieve organisational goals. Siyal and Hobbs (2022) also define 'governance' as a decision-making process through the formation of policies, regulations and mechanisms for continuous monitoring and control by a governing body. Consequently, the literature reveals a lack of consensus regarding the definition of 'governance', attributable to its extensive applicability across different contexts (Fukuyama, 2016; Gilis, 2019). A summary of the definitions can be found in Table 3.1.

Table 3.1: Summary of definitions of governance

Author	Definition of Governance
The World Bank (1992)	The manner in which power is exercised in the management of a country's economic and social resources for development.
Rhodes (1996)	Self-organising, interorganisational networks.
Weckert & Lucas (2013)	A formal part of an integrity system – non-legal institutional mechanisms that are designed to reduce inappropriate behaviour and to promote and support an ethical climate.
Howlett & Ramesh (2014)	A process including building, promoting and maintaining a particular kind of connection between governments and their citizens.
Fukuyama (2016)	The control of social behaviour through networks and other non-hierarchical systems.
Schoeman (2019)	A dynamic process involving both formal and informal actors.
Gilis (2019)	A variety of operations carried out at various levels in both public and commercial institutions.
Siyal & Hobbs (2022)	A decision-making process through the formation of policies, regulations and mechanisms for continuous monitoring and control by a governing body.
Acharya (2024)	A structure, process, mechanism and strategy put in place by key actors to achieve specific goals.

Source: Author's construct, 2025

The definitions delineated in Table 3.1 illustrate a significant evolution in the conceptualisation of governance. Initially perceived primarily as a mechanism for

exercising power at the national level in the 1990s, the contemporary understanding of governance has expanded to encompass a multifaceted process that operates across various strata, from national to personal levels, as suggested by the World Bank (cited in Plattner, 2013). Despite the diversity in definitions, a prevailing theme emerges: governance is fundamentally characterised as a process (Acharya, 2024; Howlett & Ramesh, 2014; Schoeman, 2019), a network of connections (Howlett & Ramesh, 2014; Rhodes, 1996), or a system (Acharya, 2024; Weckert & Lucas, 2013) that exerts hierarchical control or regulation (Acharya, 2024; Fukuyama, 2016) over behaviour by a governing body or group of people who wield power (Plattner, 2013). Thus, governance can be conceptually framed as the establishment of systems designed to regulate the actions of individuals or entities within a particular domain, ultimately aimed at achieving specific objectives.

While all definitions resonate with the notion of ‘steering or regulating’ (derived from the term’s etymology), they have been applied in various specialised contexts. This indicates that, despite the term’s broad applicability across disciplines, it is necessary to delineate a conceptual boundary or context that governs its usage (Acharya, 2024). The parameters of this conceptual boundary of the term ‘governance’ significantly influence the components included within its definition. In this study, which focuses on research governance and research ethics governance in scientific studies using animals, the aforementioned understanding of governance is further explored in the subsequent section by first clarifying the term ‘research governance’.

3.2.1 Research governance

This section is dedicated to elucidating the concept of research governance, which serves as the conceptual boundary for governance within the scope of this study. Similar to the term ‘governance’, the term ‘research governance’ lacks a universally accepted definition in the existing literature, primarily due to its encompassing nature that covers a diverse array of topics. Jonsson and Bouvy (2018) assert that most definitions of ‘research governance’ have their origins in the medical profession, although they do not substantiate the claim. The terms ‘research’ and ‘governance’ acquire distinct meanings in varying contexts, leading to the emergence of alternative

definitions of ‘research governance’ (Shaw et al., 2005). Consequently, a singular definition remains elusive.

Various organisations and institutions delineate research governance differently, contingent upon their specific contexts, resulting in the absence of a universally applicable document or definition (Lowthian, 2019). For instance, Shaw et al. (2005) state that research governance encompasses the management and oversight structures that ensure accountability, protect research participants and staff, ensure quality, and regulate research activities. Similarly, Sieber and Tolich (2012) conceptualise research governance as an administrative process that establishes research standards, defines mechanisms for their implementation, and supervises compliance to safeguard both research subjects and the institution from potential harm. Lowthian (2019) also defines ‘research governance’ as the processes employed by institutions to ensure accountability for research conducted under their auspices, incorporating a wide array of regulations, principles, and standards intended to enhance and sustain research quality. Nabyonga-Orem et al. (2021) contextualise research governance within health research, describing it as encompassing various factors that foster a conducive environment for planning and implementing health research.

Collectively, the definitions provided by these scholars characterise research governance as a system of policies or guidelines designed to ensure adherence to research standards. Variations in these definitions arise from differing applications of the systems, policies, or guidelines in question. In light of these considerations, this study proposes to define ‘research governance’ as the process of establishing systems, policies, and guidelines to regulate the activities of all stakeholders involved in research, including researchers, research subjects (both human and animal), and research-producing organisations. From the foregoing, the aim of research governance encompasses the establishment of ethical and scientific standards, the specification of enforcement mechanisms for the standards, the monitoring and evaluation of existing systems, the enhancement of research integrity, and the protection of public interests by promoting ethical conduct of research and mitigating unethical practices (Alderson & Morrow, 2006; Bloom & Frew, 2008; Moan et al.,

2023). Therefore, contrary to the assertion made by Juma et al. (2021) that research governance is solely the responsibility of the government, it is evident that research governance cannot rest exclusively with governmental authorities. While the government plays a crucial role in instituting appropriate national laws, legislation, guidelines, and policies, all stakeholders within the research ecosystem bear responsibilities for effective research governance. In addition to the central government, research institutions and individual researchers also have specific roles to play in the governance of research activities.

3.2.2 Animal research ethics governance

Despite being mentioned in several scholarly documents, the term ‘animal research ethics governance’ has not been defined by scholars. Its meaning has been limited to the existence of research ethics committees. Many authors, including Porter (2008), Dyck and Allen (2013), Schopper et al. (2015), Vadeboncoeur et al. (2016), Schopper et al. (2017), Schoeman (2019), Rossouw (2020) and, Canario et al. (2022) equate research ethics governance to the existence of ethical review structures, policies and guidelines either within a country or an institution. Their discussion of research ethics governance is restricted to research ethics committees, although research ethics governance must also involve identifying and recognising stakeholders within the research value chain, including funders, researchers, institutions, communities, research participants and the country where research is being conducted (Schoeman, 2019). Research ethics governance involves the establishment of a regulatory framework that is aimed at advancing society as a whole (Jonsson & Bouvy, 2018; Schoeman, 2019). It requires the development of regulations, legislation, policies, guidelines, and ethical standards for the conduct of research (Kleiderman & Ogbogu, 2019; Canario et al., 2022).

With animal research ethics governance being an application of research ethics governance to scientific studies using animals, McLeod and Hartley (2018) further explain that animal research ethics governance refers to the provision of guidance and regulatory frameworks for overseeing the use and welfare of research animals. In line with this definition by McLeod and Hartley (2018), and the definition of ‘research

governance' from the previous section (Section 3.2.1), within the context of this study the concept animal research ethics governance can be understood as the process of establishing systems, policies, and guidelines to regulate the activities of all stakeholders involved in research using animals that will ensure their humane use. These systems, policies and guidelines governing the ethical use of animals in research are established in accordance with widely recognised ethical principles. The subsequent section presents a critical analysis of the existing literature pertaining to animal research ethics governance systems that have been proposed or are currently implemented in the governance of scientific studies using animals.

3.3 Animal Research Ethics Governance Systems for the Ethical Use of Animals in Scientific Studies

In Section 3.2, 'animal research ethics governance' was conceptualised as the process of establishing systems, policies, and guidelines to regulate the activities of all stakeholders involved in research using animals that will ensure their humane use. It is also evident from the preceding chapter (Section 2.4.1) that the 3R principles are the core principles used to govern the use of animals in scientific studies. This section focuses on reviewing existing literature on animal research ethics governance systems that promote the ethical use of research animals.

Research ethics governance systems have been described by Kim et al. (2024) as structured frameworks that encompass guidelines, principles, and oversight mechanisms designed to protect research participants, promote integrity, and facilitate responsible research practices. These systems are established to ensure the ethical conduct of research, particularly in response to historical instances of unethical practices, with the primary objective of safeguarding research participants and upholding the integrity of research activities (Schoeman, 2019). Such governance systems are integral to ensuring accountability, protecting the welfare of research participants, and facilitating ethical decision-making processes. They address reasonable disagreements regarding the appropriateness of research while taking societal implications into account (Sheehan et al., 2018). A comprehensive research ethics governance system includes regulatory and oversight mechanisms that are

specifically designed to protect research participants, ensure the credibility of data, and maintain scientific validity. This encompasses various structures, including governmental bodies, regulations, and guidelines, as well as oversight mechanisms (Silverman, 2017). Ultimately, research ethics governance systems serve as essential frameworks that uphold ethical standards in research practices, involving guidelines and committees that oversee research activities to ensure compliance with ethical principles, particularly in sensitive domains such as agriculture, nutrition, and health (Matandika et al., 2023).

Animal research ethics governance systems encompass the regulatory and oversight frameworks designed to safeguard the rights and welfare of animal subjects involved in research endeavours. These systems are instrumental in ensuring adherence to ethical standards and fostering responsible practices within scientific studies that use animals (Silverman, 2017). As articulated by Mohr et al. (2017), animal research ethics governance systems facilitate the ethical care and use of animals in research, incorporating processes for ethical review, oversight of animal welfare, and compliance with established guidelines that aim to enhance both scientific integrity and animal well-being. Additional components integral to animal research ethics governance systems include ARECs (Mohr et al., 2024), ethical principles such as the 3Rs (replacement, reduction, refinement) (McLeod & Hartley, 2018), and the animal data governance regulatory framework articulated by Eke et al. (2023). Consequently, animal research ethics governance systems represent essential formal structures and frameworks instituted by research institutions to oversee and ensure ethical compliance in studies involving animal subjects. These frameworks comprise policies, procedures, and institutional bodies, such as ARECs, all designed to uphold the rights and welfare of animals, thereby promoting ethical research practices and ensuring accountability within the research community (Silverman, 2017).

Animal research ethics governance systems are structured to provide ethical oversight concerning animals' use in research, emphasising the principles of care, welfare, and animal rights while also considering the cultural and socioeconomic contexts in which research occurs (Mohr et al., 2024). Thus, animal research ethics governance systems can be conceptualised across various contexts, ranging from international to

institutional levels. The international context of animal research ethics governance includes global laws and guidelines pertaining to the use of animals in research. In contrast, national and institutional contexts may also encompass specific laws, guidelines, and policies that govern the ethical treatment of animals in scientific studies, thereby ensuring research integrity and ethical conduct that benefits society while minimising harm to animals. In summary, it is proposed that frameworks of animal research ethics governance systems can be delineated into three distinct contexts:

i. **Macro context** – encompassing international laws, regulations, and legislation governing animal research ethics.
ii. **Meso context** – comprising national laws, regulations, and legislation pertaining to animal research ethics.
iii. **Micro context** – involving institutional policies, guidelines, and structures established to govern animal research ethics.

The conceptual framework for the proposed animal research ethics governance system is illustrated in Figure 3.1. This figure delineates a macro-context governance system, wherein international legislation and guidelines regulate the use of animals in scientific studies. These overarching international laws subsequently inform meso-level governance, wherein individual nations formulate their own laws, policies, and guidelines to oversee the ethical treatment of animals in scientific studies within their jurisdictions. The governance framework culminates in the micro-context, which is responsible for ensuring ethical practices in animal research at the institutional level through the implementation of institutional policies and the establishment of ARECs.

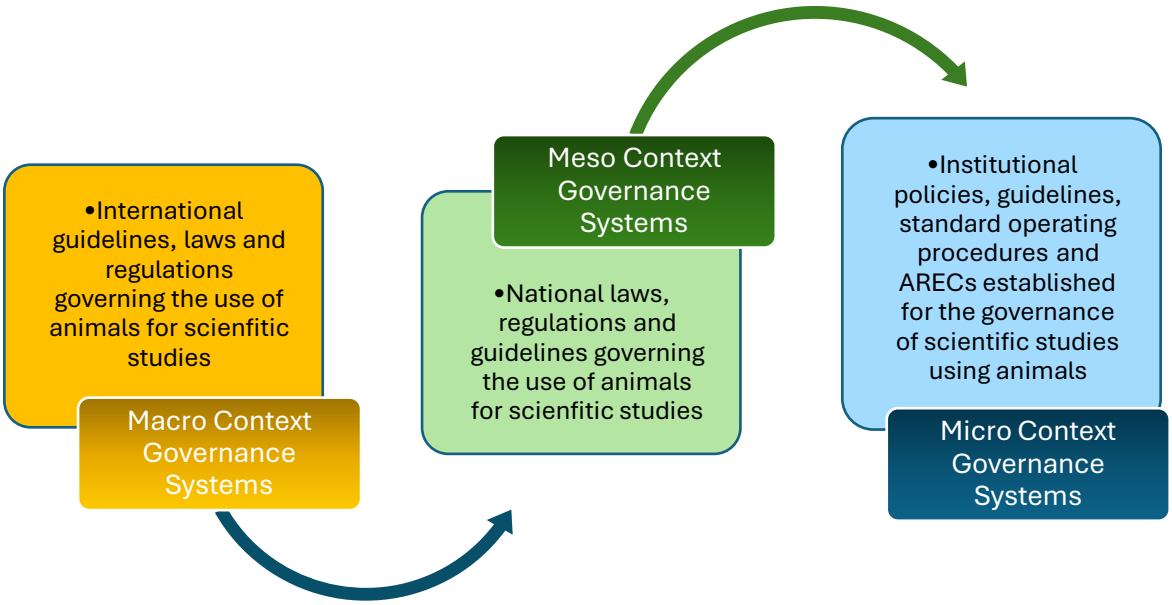


Figure 3.1: Animal research ethics governance structure

Source: Author's conceptualisation, 2025

The subsequent sections provide a comprehensive review of the literature concerning existing animal research ethics governance systems within the three specified contexts illustrated in Figure 3.1. The purpose of the subsequent sections is to show the existence of animal research ethics governance systems within macro, meso and micro contexts. A detailed review and interrogation of the systems is beyond the scope of these sections.

3.3.1 Macro context of animal research ethics governance systems for the promotion of ethical use of animals in scientific studies

This section presents existing literature on globally accepted animal research ethics governance systems comprising international standards, guidelines and declarations accepted by multiple countries to promote the ethical use of animals in scientific studies. These include the World Organization for Animal Health (WOAH) terrestrial code, CIOMS-ICLAS (Council for International Organizations of Medical Sciences (CIOMS) - International Council for Laboratory Animal Science (ICLAS)) International Guiding Principles for Biomedical Research Involving Animals, and the Basel Declaration.

3.3.1.1 The World Organization for Animal Health (WOAH) Terrestrial Animal Health Code (Terrestrial Code)

The WOAH, previously known as the Office International des Epizooties (OIE), plays a pivotal role in the establishment of international standards pertaining to animal health and welfare (Cáceres et al., 2023) as delineated in its Terrestrial Animal Health Code (2019). This Code serves as a fundamental framework for member countries in the governance of animal health and welfare on a global scale (Cáceres et al., 2023; Wannous, 2020). It was developed to facilitate the safe trade of animals and animal products, offering guidelines and standards that member countries are encouraged to adopt.

The WOAH, established in 1924, has evolved to address the complexities of animal health in an increasingly interconnected world (Cáceres et al., 2023). Initially focused on the control of contagious diseases, the organisation has expanded its scope to include animal welfare, food safety, and the management of zoonotic diseases. The Terrestrial Animal Health Code, first adopted in 1968, embodies this evolution by providing a comprehensive framework for addressing terrestrial animal health issues (Cáceres et al., 2023; Schipp & Sheridan, 2013). The Code is systematically organised into several chapters, each addressing distinct aspects of animal health and welfare. Key provisions include guidelines for disease prevention and control, animal welfare standards, and protocols for biosecurity measures (Schipp & Sheridan, 2013; Torres et al., 2022). Additionally, the Code underscores the significance of veterinary services, delineating standards for their quality and effectiveness.

The OIE Terrestrial Animal Health Code is instrumental in promoting animal health and welfare on a global scale. Its provisions related to animal welfare, which encompass considerations such as housing, transport, and slaughter practices, reflect an increasing acknowledgement of the ethical dimensions surrounding animal treatment (Schipp & Sheridan, 2013; Torres et al., 2022). Overall, the OIE Terrestrial Animal Health Code represents a comprehensive framework for the management of animal health and welfare globally. Its historical development, key provisions, and implications for international trade underscore its significance in contemporary animal

health governance, which must be considered in current and future guidelines on animal health. However, there exists a notable gap in research regarding the implementation and assessment of the Code's effectiveness in contributing to the ethical governance of scientific studies involving animals across diverse contexts, particularly within developing countries.

3.3.1.2 The CIOMS-ICLAS International Guiding Principles for Biomedical Research Involving Animals

The CIOMS was founded in 1949 through a collaborative initiative between the World Health Organization (WHO) and the United Nations Educational, Scientific and Cultural Organization (UNESCO) (Younus et al., 2020). It operates as an international, non-governmental, and nonprofit entity. Currently, CIOMS comprises 45 member organisations, which include a diverse array of international, national, and associate entities, thereby encompassing a wide spectrum of biomedical disciplines, national academies of sciences, and medical research councils (Van Delden & Van Der Graaf, 2017). The ICLAS is a prominent scientific organisation committed to the enhancement of both human and animal health and well-being through the promotion of ethical practices in the care and utilisation of animals in research on a global scale (Erichsen & Hopla, 2021).

The membership of ICLAS encompasses various categories, including national members, scientific/union members, institutional members, associate members, and affiliate members. National members are typically represented by governmental agencies or ministries that oversee research activities at the national level (Erichsen & Hopla, 2021). Scientific members predominantly consist of national or regional associations focused on laboratory animal science. Collectively, ICLAS members form a comprehensive network of both national and international organisations aimed at fostering a basic harmonisation of standards within the field of laboratory animal science, with a particular emphasis on advancing the quality of animal-based research in developing countries (Hasenau, 2023).

The CIOMS-ICLAS International Guiding Principles for Biomedical Research Involving Animals (CIOMS & ICLAS, 2012) constitute a pivotal advancement in the ethical discourse surrounding animal research, offering a framework that seeks to reconcile the pursuit of scientific knowledge with the imperative of animal welfare. Originally published in 2002, with the current version published in 2012, the CIOMS-ICLAS guidelines have been revised to reflect the evolving landscape of biomedical research (CIOMS & ICLAS, 2012). These guidelines underscore the necessity of ethical standards and welfare considerations in the context of animal research, aspiring to achieve a global harmonisation of practices that ensures responsible and ethical treatment of animals. Central to these guidelines are the 3R principles (replacement, reduction, and refinement), which advocate for minimising both the use of animals and their suffering while simultaneously maximising the scientific validity of research outcomes (Kalkan & Kekeçoğlu, 2024; Petkov et al., 2022).

Furthermore, the guidelines highlight the essential role of ARECs in enforcing compliance with the 3Rs, thereby safeguarding animal welfare throughout the research continuum (Kocaman Kalkan & Kekeçoğlu, 2024). The CIOMS-ICLAS guidelines articulate fundamental ethical principles that emphasise respect for animal welfare, scientific integrity, and social responsibility. The guidelines encourage researchers to ensure that the use of animals is scientifically justified, with a careful assessment of whether the potential benefits of the research outweigh any harm inflicted upon the animals (CIOMS & ICLAS, 2012). Additionally, the guidelines advocate for the application of the 3Rs at every stage of the research process. The effective implementation of these principles is vital for promoting responsible research practices and addressing public concerns regarding animal welfare. By integrating ethical considerations into the design and execution of research studies, the CIOMS-ICLAS guidelines foster a more humane approach to animal experimentation. Moreover, the guidelines stress the significance of transparency and accountability in animal research. Researchers are encouraged to disseminate their findings, including negative results, thereby enriching the collective knowledge of the scientific community and mitigating unnecessary duplication of studies (Neves et al., 2024). This commitment to openness is essential for fostering trust between the scientific

community and the public, particularly in light of increasing concerns regarding animal welfare.

Despite the robust ethical framework provided by these principles, challenges persist in their implementation, particularly in achieving a balance between scientific progress and animal welfare. While the CIOMS-ICLAS guidelines are comprehensive, ongoing debates and challenges concerning the ethical ramifications of animal research remain prevalent. Critics argue that the application of the 3Rs is often inconsistent, with some researchers inadequately justifying their use of animals or failing to implement effective strategies for reduction and refinement (Neves et al., 2024). Additionally, cultural and regional disparities in attitudes toward animal research complicate the universal application of the CIOMS-ICLAS guidelines. In certain regions, traditional practices may conflict with contemporary ethical standards, resulting in tensions between scientific advancement and cultural beliefs (Petkov et al., 2022).

Addressing these disparities necessitates a nuanced appreciation of local contexts and the formulation of tailored approaches that honour both ethical principles and cultural values. The evolving landscape of ethical standards ultimately calls for continuous dialogue and adaptation within the research community going forward.

3.3.1.3 The Basel Declaration

The Basel Declaration emerged from the “Research at a Crossroads” conference, which advocated for ethical practices in animal research (Gruber, 2011; Mcgrath et al., 2015). Adopted in 2010, the Declaration underscores the ethical responsibilities of researchers engaged in scientific studies involving animals. It highlights the necessity of trust, transparency, and communication in the context of animal research while addressing the ethical implications associated with the use of animals in scientific studies (Petkov et al., 2022). The Declaration posits that biomedical challenges cannot be effectively addressed without the involvement of animal experimentation, framing research as a continuum that spans from basic to applied science (Gruber, 2011; Petkov et al., 2022). It advocates for a balanced approach to animal research, weighing potential benefits against ethical considerations (Gruber, 2011).

The Basel Declaration is grounded in the 3R principles (replacement, reduction, and refinement) (Kiani et al., 2022; Petkov et al., 2022), calling for a commitment to humane research practices and the acknowledgement of the moral responsibilities that researchers have towards the animals used in their scientific studies. It articulates several core ethical principles that should guide researchers in their use of animals for scientific purposes. Primarily, the Declaration asserts the necessity of justifying the use of animals in research, stipulating that such use should only be pursued in the absence of viable alternatives (Treue et al., 2010). These principles are fundamental to ensuring that animal research is conducted with a sense of responsibility and respect for animal welfare. The principal ethical guidelines delineated in the Basel Declaration include three specific aspects:

i. The Declaration promotes the 3R principles by encouraging researchers to seek alternatives to animal use wherever feasible, employing in vitro or computational methods. The number of animals used in research should be minimised while still ensuring valid results, and procedures should be modified to alleviate pain and distress, thereby enhancing animal welfare during research (Kiani et al., 2022; Petkov et al., 2022).
ii. The Declaration emphasises the importance of responsibility and animal-centred ethics. Researchers are required to ensure adherence to ethical standards and to maintain accountability for the welfare of the animals involved (Kiani et al., 2022). The animal-centred ethics perspective advocates for the recognition of animals as autonomous subjects, stressing their welfare, interests, and potential for consent within the research process (Mancini & Nannoni, 2022).
iii. Furthermore, the Declaration underscores the importance of scientific rigour, necessitating researchers to design studies capable of yielding valid and reproducible results (Franco & Olsson, 2014). This aspect highlights the dual responsibility of researchers: to advance scientific knowledge while simultaneously ensuring the ethical treatment of animals.

The Basel Declaration has stimulated discourse regarding the necessity of training and education for researchers engaged in scientific studies using animals, which was

accentuated by Hubrecht and Carter (2019). By equipping researchers with the requisite knowledge and skills to conduct ethical research using animals in future, institutions can facilitate the effective integration of the principles outlined in the Basel Declaration into scientific practices. The Basel Declaration thus has the potential to guide future advancements in the ethics of animal research.

However, despite its commendable intentions, the Declaration encounters challenges in practical implementation, particularly regarding compliance and ethical oversight across diverse research environments. Thus, ongoing dialogue and policy refinement is critical in effectively addressing these challenges (Gruber, 2011). While the Basel Declaration aspires to enhance ethical standards in animal research, it also raises pertinent questions about the sufficiency of existing frameworks and the need for continuous improvement in ethical practices. This ongoing discourse is vital for fostering responsible research methodologies. The Basel Declaration represents a significant milestone in the evolution of animal research ethics, emphasising researchers' moral obligations and the necessity for humane practices in scientific inquiry. Although it has positively influenced research practices and institutional policies, persistent challenges and critiques underscore the need for continual dialogue and enhancement in the field.

As the landscape of biomedical research evolves, the principles of the Basel Declaration will remain essential in guiding ethical considerations and ensuring the responsible use of animals in research going forward. The Declaration is particularly relevant in the ongoing discourse on the ethical use of animals in research, as it aligns with efforts to balance scientific progress with ethical obligations in the conduct of research using animals.

3.3.1.4 Internationally accepted guidelines governing the planning and reporting of scientific studies using animals

Guidelines have been developed by various institutions and accepted by the international scientific community and journals to govern the conduct of researchers using animals for their studies and how they report on scientific studies using animals.

Many of these guidelines are premised on the perception that reproducibility is the main measure of integrity in research (Franco et al., 2018; Franco & Olsson, 2014). For some researchers, transparent reporting underpins reproducible science (Percie Du Sert et al., 2020). Between 51% and 89% of scientific studies using animals are not reproducible, mainly because researchers have failed to provide detailed, systematic and transparent reports on their research using animals (Mullard, 2011; Enserink, 2017; Ritskes-Hoitinga & Wever, 2018). The focus of the scientific community has therefore generally been on ensuring transparent reporting of scientific studies using animals. Smith (2020), however, argues that achieving better reporting does not necessarily improve the quality of research that has already been conducted by the researcher. The author contends that the focus should be on ensuring the quality of research and not the reporting, since a good report of a badly conducted experiment does not make the experiment any better. Smith (2020) therefore recommends that scientists who use animals in scientific studies must be given comprehensive guidelines for planning their research studies involving the use of animals. However, both arguments can hold true as some researchers will be compelled to conduct research more ethically if they know that a detailed description of their processes will be required using a guideline for reporting, as confirmed by Percie Du Sert et al. (2018) and Percie Du Sert et al. (2020), while researchers in general should be required to follow a particular guideline in conducting research using animals.

The aforementioned arguments have led to the formulation of guidelines that are widely recognised and endorsed by the scientific community and academic journals for the conduct and reporting of research involving animal subjects. These guidelines are known as the ARRIVE and PREPARE guidelines, respectively, which are discussed below.

a) The Animal Research Reporting of In Vivo Experiments (ARRIVE) guidelines

The ARRIVE guidelines were developed and introduced in the year 2010 by a group of scientists to improve the completeness of information in articles that will

consequently improve the quality of scientific research in a very broad range of areas (Kilkenny et al., 2010). The ARRIVE guidelines provide a 20-item checklist of details to include in articles describing *in vivo* studies so that others can review the work thoroughly, assess its scientific rigour, and replicate the procedures and findings (Percie Du Sert et al., 2020). The guidelines have been endorsed by over 1000 scientific journals and several funding agencies since they were first published in 2010 (Enserink, 2017; Kilkenny et al., 2010; McGrath et al., 2010). Over the years, there have been reports that the ARRIVE guidelines have not yielded the expected results of improving reporting standards (Baker et al., 2014; Gulin et al., 2015; Percie Du Sert et al., 2020; Ting et al., 2015) mainly because researchers are either not aware of the guidelines, they do not know what is expected of them, or the guidelines are being ignored by researchers (Enserink, 2017; Ritskes-Hoitinga & Wever, 2018).

Concerns about the ARRIVE guidelines' inability to achieve the desired results of detailed and transparent reporting of scientific studies using animals, and advances in the scientific environment, resulted in an international working group being convened to revise the guidelines. In reviewing the guidelines, the working group considered prioritising the items of the ARRIVE guidelines and developing an explanation and elaboration document on the various items in the checklist for easy understanding by researchers (Percie du Sert et al., 2018). Following the working group's outcomes, Percie Du Sert et al. (2020) revised the ARRIVE guidelines to become the ARRIVE 2.0 guidelines. ARRIVE 2.0 provides updated information and a reorganisation of the checklist to facilitate its use by journal editors, reviewers and researchers for improved rigour and transparency in scientific studies using animals, thereby improving reproducibility of scientific studies using animals (Percie Du Sert et al., 2020).

The revised ARRIVE guidelines 2.0 are grouped into two: 10 essential and 11 recommended items, making a total of 21 checklist items to consider in reporting on scientific studies using animals, particularly for *in vivo* studies. The list of items in the guidelines is very comprehensive for reporting; however, the current reorganisation of the checklist places emphasis on the essential 10 items, which focus on detailed reporting on the methodology used in the study. Although this gives an indication of the humane use of animals in the procedures used, particularly in reference to the

3Rs, there is no explicit statement in any of the 'essential' 10 items that clearly requests researchers to provide such information. Ethical issues are captured in the 'recommended set' of 11 items, where ethical statements, housing and husbandry and animal care and monitoring are listed as part of the checklist. Considering that these have not been listed as part of the essential 10 but rather as part of the recommended set, it gives an indication that these recommended sets are not a requirement but 'nice to have' in a report. Researchers will therefore not be compelled to include such details in their reports. In its current state, the ARRIVE 2.0 guidelines consequently do not focus on the ethical use of animals by researchers but on reporting the methodology, with the focus on studies' reproducibility. It is also critical to assess the level of adoption of these guidelines by researchers for reporting on their animal-based research.

b) Planning Research and Experimental Procedures on Animals: Recommendations for Excellence (PREPARE) guidelines

In proposing the PREPARE guidelines in 2017, Smith et al. (2018) argued that there was very little guidance on how researchers should plan scientific studies using animals, despite the existence of many guidelines for reporting on these scientific studies. Smith et al. (2018) also argued that guidelines for planning scientific studies using animals had greater potential in ensuring the ethical use of animals than reporting guidelines. Therefore, they proposed the PREPARE guidelines, which, when followed by researchers, will ensure the quality of preparations for scientific studies using animals, interaction between researchers and the animal facility, and ensure quality during the conduct of scientific studies (Smith, 2020; Smith et al., 2018). The PREPARE guidelines have three main sections: formulation of the study, dialogue between scientists and the animal facility, and quality control of the components in the study (Smith, 2023). These three sections provide a detailed outline for researchers in preparing to conduct scientific studies using animals, and when the study is ongoing. The PREPARE guidelines aim to enhance animal welfare by promoting best practices in study preparation (Herrmann, 2019). These guidelines put more of an emphasis on harm-benefit analysis, the use of humane procedures, and what happens to animals employed in scientific studies (Smith, 2020).

The difference between the ARRIVE and PREPARE guidelines is that the ARRIVE guidelines focus primarily on reporting on scientific studies using animals, while the PREPARE guidelines primarily ensure adequate preparation and conduct of scientific studies using animals (Abbas et al., 2021). Unlike the ARRIVE guidelines, the PREPARE guidelines provide a detailed consideration of the ethical issues that will ensure the ethical use of research animals. It is suggested that these two guidelines (ARRIVE and PREPARE) must be used together for planning and conducting scientific studies using animals and subsequently for reporting on these studies, since the PREPARE guidelines complement the ARRIVE guidelines (Herrmann, 2019). If the PREPARE guidelines are followed by researchers, it will be easy for the researchers to adhere to the ARRIVE guidelines for reporting on animal-based studies.

3.3.1.5 Conclusion – Macro context of animal research ethics governance systems for the ethical use of animals in scientific studies

In conclusion, internationally recognised global frameworks such as the Basel Declaration, the CIOMS-ICLAS International Guiding Principles, and the WOAH Terrestrial Animal Code represent significant milestones in the evolution of animal research ethics governance. These frameworks offer a comprehensive structure that directs researchers in fulfilling their ethical responsibilities towards animal subjects while simultaneously facilitating advancements in scientific inquiry. Nonetheless, the persistent challenges and critiques associated with these guidelines underscore the necessity for continuous assessment, adaptation, and refinement, particularly within the context of developing countries. Additionally, the current fragmented nature of the various guidelines for the ethical use of animals in scientific studies makes it difficult for researchers to fully implement all guidelines. This suggests the need for harmonisation of all guidelines to make it easy for researchers to refer to and adopt in the conduct of their research.

The introduction of the PREPARE and ARRIVE guidelines signifies a notable progression in the governance of scientific studies using animals. By emphasising ethical planning and transparency in reporting, these guidelines aim to address the critical issues related to studies' reproducibility and the welfare of research animals.

By fostering a culture of ethical research practices and promoting adherence to these guidelines, the integrity of scientific studies using animals can be enhanced to ensure that they continue to contribute positively to scientific knowledge and public trust.

The future of animal research depends not only on the guidelines themselves but also on the commitment of researchers to uphold the highest standards of ethical conduct and transparency in their work. Moreover, there is a paucity of empirical literature examining researchers' experiences with the implementation of these guidelines. Given that all governance systems are designed to ensure the humane treatment of research animals, understanding the perspectives and experiences of researchers, AREC members, and AREC administrators is crucial. Such insights are vital for the development of a governance framework that is readily adoptable and applicable by all stakeholders, including researchers.

3.3.2 Meso context of animal research ethics governance systems for the promotion of ethical use of animals in scientific studies

The meso context of animal research ethics governance systems in this study refers to the governance systems established at national levels to ensure the ethical use of research animals. Adopting explicit national ethical standards and legislation for this purpose is a recent development in many countries (Bayne et al., 2024; Cheluvappa et al., 2017). Various laws, rules, and guidelines have been enacted to regulate the general use of animals by humans and, more specifically, in scientific studies in multiple countries across the globe (Alagarsamy et al., 2022), albeit with variations due to individual countries' cultural settings. Individual countries have formed and executed these rules in multiple ways, and the governing authority differs by country despite having similar underlying ethical principles (Bayne et al., 2024; Cheluvappa et al., 2017). This section provides a bird's eye view of the national context of animal research ethics governance systems; thus, legislation, policies and guidelines across the globe are considered from various geographical regions, including Oceania, Asia, Europe, North America, Latin America and Africa.

3.3.2.1 Existing national animal research ethics governance systems (legislation, policies and guidelines) in the Oceania Region

Australia is the only country among the 14 identified countries in the Oceania region with a well-established and comprehensive national governance system for the ethical use of animals in scientific studies (Timoshanko et al., 2017; Wallis, 2023). Laws for the protection of research animals in Australia are passed by both State and territory governments (Englefield et al., 2019; Morton & Whittaker, 2022; Vasbinder & Locke, 2016), with different groups of animals recognised under the various state and territory regulations. As a result, there are different laws governing animal research in Australia that are not uniform (Morton & Whittaker, 2022; Timoshanko et al., 2017) within a governance system described by Englefield et al. (2019) as fragmented, complex, inconsistent and contradictory. The "Australian Code of Practice for the Care and Use of Animals for Scientific Purposes" (Code), established in 1969, with its latest edition published in 2013 and updated in 2021 (National Health and Medical Council, 2021), serves as the foundation document for all national policies and practices pertaining to the protection of animals used for research. It is the main document that governs the use of research animals in Australia (Cheluvappa et al., 2017; Morton & Whittaker, 2022).

The Code's main objective is to guarantee the moral treatment and usage of animals employed in research. The guidelines provided by the Code are intended to serve as a guide for researchers, educators, institutions, ARECs, and everyone else involved in the care and use of animals for scientific reasons (Vasbinder & Locke, 2016). In addition to this code of practice, Morton and Whittaker (2022) identified 201 subordinate legislations in force in Australia between 28 March 2022 and 5 April 2022. This confirms the complexity and possible contradictions of animal research ethics laws in Australia, as asserted by Englefield et al. (2019). The need for a more harmonised animal research ethics governance system and legislation in Australia is evident. It also serves as an indication to other countries that have not yet developed their animal research legislation to ensure a harmonised governance system and legislation to ensure that there are standards met by all researchers who use animals for research. Overall, the animal research ethics governance systems in Australia

have been well established and will be a useful guide in the development of an animal research ethics governance framework for Ghana.

New Zealand has an Animal Welfare Act (1999) updated in April 2025 (Animal Welfare Act 1999, 2025), which replaced its Animal Protection Act of 1960. The current Act governs the use of animals in scientific studies. It places emphasis on the obligations of those responsible for the care of animals. It establishes the legal requirements for ethical reviews of scientific studies using animals in New Zealand but does not focus much on the care and use of animals for research purposes (Animal Welfare Act 1999, 2025). Additionally, New Zealand has developed an animal welfare strategy (Ministry for Primary Industries, 2013) to reaffirm the country's commitment to ensuring that animals are treated humanely and to provide a clear guide on protecting animals in various sectors, including research, industry and domestic. Woodhouse et al. (2021) advocate for the incorporation of indigenous Māori ethical concepts and beliefs, which emphasise spiritual and environmental connections between humans and animals into existing legislation and policies on the humane use of animals, which are not accounted for in current legal frameworks that are mainly taken from Western legal frameworks on animals. This suggests the importance of incorporating indigenous national animal beliefs and practices into animal laws, making it easier to adhere to such laws.

3.3.2.2 Existing national animal research ethics governance systems (legislation, policies and guidelines) in Asia

Many Asian countries, including Malaysia, Singapore, South Korea, the People's Republic of China, Japan and India, have created national laws that govern the use of animals in scientific research (Cvek et al., 2017; Wallis, 2023). While some of these countries only recently developed their national laws, others, like China, Japan, and Korea, have been working on developing and amending their rules and regulations regarding animal experimentation since 1983 (Ogden et al., 2017). This suggests that the use of research animals and related legislation in Asia has been in existence for a few decades now.

Singapore has adopted the National Advisory Committee for Laboratory Animal Research (NACLAR) guidelines to promote the humane and responsible treatment and use of animals in research. These guidelines, which were adapted from Australia, Canada, New Zealand, and the United States of America, define the obligations of all parties engaged in the care and use of animals for scientific purposes (researchers, ARECs, students, employees, etc.). It emphasises the need for all proposals on the use of animals for scientific purposes to be evaluated by an AREC (Retnam et al., 2016; Vasbinder & Locke, 2016; Wallis, 2023).

In **China**, the 'Regulations for the Administration of Laboratory Animals' that came into effect in 1988 and was amended in 2021 is one of the early legislations, which established the basic rules for using animals for scientific purposes (Cao, 2022; Ogden et al., 2017). This is the first document to describe the requirement for each research institution to establish an IACUC. Its purpose is similar to the IACUC in the United States: to evaluate and oversee the animal care and use programme at the research institution (Cao, 2022; Vasbinder & Locke, 2016). China's Ministry of Health later published detailed implementation rules for the administration of laboratory animals used in medical experiments and the standards for medical experiments using animals in 1992 (Cao, 2022; Wallis, 2023). China issued its first national standards governing the treatment of animals in research in 2016 to improve animals' condition during research (Bayne et al., 2018; Cao, 2022; Vasbinder & Locke, 2016). This was followed in 2018 by a release of guidelines for the ethical review of laboratory animal welfare (National Standard GB/T 35892-2018), which provides guidelines for ARECs and researchers who use animals in their research on the ethics review processes (MacArthur Clark & Sun, 2020). China thus has several national laws and guidelines regulating the use of animals in scientific studies.

In **Japan**, scientific studies using animals at the national level are governed by the "Law for the Human Treatment and Management of Animals", which was promulgated in 1973 with its latest amended version approved in 2005 (Katayama et al., 2022; Ogden et al., 2017). Japan has two key documents, the Law and the Standard, which are used to govern scientific studies using animals (Katayama et al., 2022; Ogden et al., 2017). Various ministries and agencies have developed guidelines from these two

documents, which are used at the lower governance levels (Katayama et al., 2022). Although research institutions in Japan are responsible for self-regulation with respect to the use of research animals, the majority depend on the guidelines established by the Science Council (Cvek et al., 2017; Katayama et al., 2022).

India established a committee at the national level named the "Committee for Control and Supervision of Experiments on Animals (CCSEA)" under their 1960 "Cruelty to Animals" Act (Cvek et al., 2017; Khan, 2024; Retnam et al., 2016). The CCSEA has a general oversight function and is mandated to promote the humane care of animals and develop appropriate guidelines (Cvek et al., 2017; Khan, 2024). India currently has guidelines and ethical principles for regulating the use of animals in scientific studies, particularly in biomedical research (Khan, 2024; Retnam et al., 2016).

From the foregoing examples, many Asian countries have developed basic legislation and guidelines to govern the ethical use of research animals. In developing a national legislation or guidelines for the ethical use of animals in Ghana, these countries' governance systems and documents could serve as a valuable resource.

3.3.2.3 Existing national animal research ethics governance systems (legislation, policies and guidelines) in Europe

Animal protection legislation in Europe has a long history. In 1876, the United Kingdom enacted the world's first national rule regulating the use of animals in research (Kirk & Myelnikov, 2022; Orlans, 2002). The European Directive 86/609/EEC, developed in 1986, and the current version, Directive 2010/63/EU, developed and promulgated in 2010, were among the first pieces of shared animal protection law in Europe (Guillén & Borkowski, 2020). Being a directive of the European Union, most member states have transposed Directive 2010/63/EU into their national legislation (Marinou & Dontas, 2023; Olsson et al., 2017; Vasbinder & Locke, 2016). The details provided in this directive have helped in harmonising legislation, laws, and guidelines for the protection of animals being used in scientific studies in European Union member states (Cvek et al., 2017; Marinou & Dontas, 2023; Olsson et al., 2017; Vasbinder & Locke, 2016).

All member states of the European Union, as well as the United Kingdom, have national legislation, laws and guidelines drawn from Directive 2010/63/EU of the European Union. This continent-wide Directive by the European Union serves as a good example for other continents to ensure harmonisation in the establishment and implementation of laws on the use of animals for research.

3.3.2.4 Existing national animal research ethics governance systems (legislation, policies and guidelines) in North America (United States and Canada)

The governance of scientific studies using animals in the **United States of America** is multifaceted (Kalkan & Kekeçoğlu, 2024; Vasbinder & Locke, 2016). The principal legislation document guiding animals' use in America is the Animal Welfare Act (1976) (USDA, 2020), which was further developed into the Animal Welfare Regulations (CFR, 1985) (USDA, 2020). Moreover, the Public Health Service Policy on Humane Care and Use of Laboratory Animals is the principal policy guiding all institutions where scientific studies using animals are conducted (Cvek et al., 2017). The "Guide for the Care and Use of Laboratory Animals (the Guide)" was also released in the United States in 1963 with the intention of advising institutions on the use of animals in research. Since its first release, the "Guide" has undergone several revisions, with the current version being the 8th edition; it provides a clear description of the national level governance of the use of animals in scientific studies (Cheluvappa et al., 2017; National Research Council, 2011). Scientific studies using animals in the United States are thus governed by different but interrelated systems of regulations, policies, guidelines, and procedures (Cvek et al., 2017; National Research Council, 2011; Vasbinder & Locke, 2016).

In **Canada**, the federal government does not have the jurisdiction to regulate the care and use of animals in research. Therefore, there is no national legislation governing their use in the country (Black et al., 2022; Lavelle et al., 2024; Vasbinder & Locke, 2016). Canada's laws governing the use of research animals fall under provincial jurisdiction. Apart from the Criminal Code of 1985, on the protection against cruelty to animals, there is no national legislation regulating the use of animals in scientific

studies (Vardigans et al., 2019). The CCAC was therefore created in 1968 as an independent not-for-profit organisation to regulate animals' ethical use in research contexts (Black et al., 2022; Cheluvappa et al., 2017; Cvek et al., 2017; Vardigans et al., 2019; Vasbinder & Locke, 2016).

Griffin and Locke (2017) compared the laws, rules, policies, and oversight systems in place in Canada and the United States for animals used in scientific studies and observed that the approaches to animal research oversight in these countries are both founded on the 3R principles, even though each country's strategy differs. Unlike the United States, which has a more centralised legal system with respect to animals, in Canada, regulations governing how animals are used for scientific studies are mostly decentralised, with each state having their own laws and guidelines. While no direct national laws exist in Canada, the United States has two federal laws that are used for regulating research using animals: the Animal Welfare Act and the Public Health Services Act. The Canadian approach emphasises direction and policy while relying less on legislation (Griffin & Locke, 2017). The fact that ARECs play an important role in enforcing regulations and procedures in scientific research institutions using animals is one commonality between the governance systems in the United States and Canada (Kalkan & Kekeçoğlu, 2024). Griffin and Locke (2017), however, fail to specify the advantages and disadvantages of each of the systems and recommend any one of these systems for other nations that are yet to develop their laws and guidelines for using animals in research.

From the foregoing, the United States and Canada have established two separate governance systems: centralised and decentralised legislation. The governance systems in the United States and Canada provide countries such as Ghana, which are yet to establish national legislation and guidelines on the ethical use of animals in research, with the experiences of a centralised and decentralised governance structure and legislation. Lessons can thus be drawn for the development of a national governance system for the ethical use of animals in scientific studies.

3.3.2.5 Existing national animal research ethics governance systems (legislation, policies and guidelines) in Latin America

In Latin America, legal regulations specific to the care for animals used in scientific studies are a recent phenomenon (Andersen & Winter, 2019; Rivera et al., 2018; Rivera et al., 2017). Brazil, one of the countries with very well-developed national regulations, only established its national laws in the year 2008 (Ramos et al., 2024). Except for Brazil, Mexico and Uruguay, which have detailed regulatory and enforcement frameworks in place for the use of animals in research, many countries in the region do not have specific laws regulating scientific studies using animals (Cvek et al., 2017; Rivera et al., 2017). Most of the other countries in the region have little or no governance systems for the oversight of such studies (Gallo et al., 2022; Vasbinder & Locke, 2016). Countries like Chile, Colombia and Peru have emerging frameworks at the national level for the ethical use of animals in research (Gallo et al., 2022).

3.3.2.6 Existing national animal research ethics governance systems (legislation, policies and guidelines) in Africa

In Africa, most countries have inadequate national legislation, policies or guidelines for research using animals (Hau et al., 2014, 2018; Kebede, 2023; Mohr et al., 2017, 2023; Nyika, 2009). In general, Africa has less developed rules, legal frameworks, and regulations regarding the use of animals in research than other regions of the world (Hau et al., 2014, 2018; Kebede, 2023). Scientific studies using animals are not specifically regulated by law in North and West Africa (Hau et al., 2018; Mohr et al., 2017). However, a few countries in East and Southern Africa, particularly Kenya, South Africa and Tanzania, have been reported to have enacted comprehensive laws that govern the use of animals for scientific purposes (NHREC, 2024; Seth & Saguti, 2013). This claim is confirmed by Hau et al. (2014), who sought to review legislation and guidelines governing the use of animals in scientific studies in all African countries, but ended up focusing only on the legislation in Kenya, Tanzania and South Africa, as such legislation was non-existent in other African countries. According to Hau et al. (2014), these three countries have produced the most comprehensive legislation in Africa on the use of animals in scientific studies.

Tanzania has the "Animal Welfare Act of Tanzania", **Kenya** has the "Prevention of Cruelty to Animals Act", and has also developed guidelines for the care and use of animals in research and education called the "National Guidelines for the Care and Use of Animals in Research and Education in Kenya". These guidelines provide standards and guidance to all stakeholders of scientific studies using animals, particularly researchers, students and ARECs (Hau et al., 2014, 2018; Kimwele et al., 2011). **South Africa** has the "Animal Protection Act 71 of 1962", the "Performing Animals Protection Act 24 of 1935", the "South African Medical Research Council Act, 58 of 1991" (Hau et al., 2018; Mohr, 2013) and the "South African Ethics in Health Research Guidelines: Principles, Processes and Structures" (National Health Research Ethics Council, 2024). In addition to the above legislation, South Africa has another standard document, "The South African National Standard" (SANS 10386:2021), which explicitly covers the use of animals in scientific studies. The South African National Standard (SANS 10386:2021) aims to establish national standards for the use of animals in research and emphasises the roles and responsibilities of researchers, teachers and institutions that use animals in scientific studies. With all these national legislation and guidelines in place in South Africa, Mohr (2013) and Mohr et al. (2023) describe the country's animal research ethics governance system as the most comprehensive in Africa. In comparison to the European Union, Africa ultimately lacks a continent-wide directive, with South Africa having the most comprehensive national system.

In Ghana, there are currently two legal documents: Chapter 9 of the Criminal Code, 1960 (ACT 29) (Parliament of Ghana, 1961), which addresses offences relating to animals, and the Wild Animals Preservation Act, 1961 (ACT 43), which makes provision for the handling of wild animals with a focus on hunting, and animal export and import. These laws and regulations do not address or provide for the ethical treatment and use of animals in scientific studies (Mohr et al., 2017). Since Mohr and his colleagues' study in 2016 (Mohr et al., 2017), there is no evidence of any empirical study conducted on the governance systems in place for the ethical use of research animals in Ghana. There is also no evidence of any legislation on animals' ethical use in scientific studies in Ghana. This study is therefore critical in bridging the knowledge

gap and providing baseline information for the development of an animal research ethics governance framework for Ghana.

3.3.2.7 Conclusion – Meso (national) context animal research ethics governance systems for the promotion of ethical use of animals in scientific studies

This section reviewed scholarly literature on the existence of legislation and guidelines that govern the use of animals in scientific studies at the meso (national) level across the globe. The review revealed that empirical studies or reviews of national legislation and guidelines on the use of animals in scientific studies are sparse. Globally, governance systems are diverse and fragmented, with only the European Union having a continent-wide directive that governs the use of animals in research in all member countries. African countries, apart from South Africa, have the least developed national legislation, policies and guidelines. Thus, there is a gap in Africa, including Ghana, with respect to national laws, regulations, and guidelines governing scientific studies using animals. The lack of legislation, guidelines and policies in Africa has created a situation where institutions adapt or adopt their guidelines and policies from developed countries, and there is a need to have an overarching animal research ethics governance framework in Ghana that will guide the use of animals in scientific studies in the country.

3.3.3 Micro context of animal research ethics governance systems for the promotion of ethical use of animals in scientific studies

As indicated earlier in this chapter (Section 3.3), the micro context of animal research ethics governance systems is conceptualised as research governance at the institutional level. This includes institutional policies, standard operating procedures and the establishment of ARECs at the institutional level to ensure the ethical use of animals in scientific studies. The main governance system used at the micro level has been the establishment of ARECs, which are either given authority by the national or meso level governance system (legislation, policies and guidelines), or institutional policies where there are no national level governance systems in place. This section

focuses on institutional policies, guidelines and research ethics committees as the main institutional governance system established in many institutions. The section further focuses on ARECs since this study is interested in the ethical use of research animals.

3.3.3.1 Research ethics committees as a governance system for ensuring ethical conduct in research

Research ethics committees have been established in various countries across the world as part of research governance systems. Despite having comparable structures, compositions and procedures, research ethics committees differ from country to country mainly due to the customs, norms and legal frameworks that exist in the specific country (Olver et al., 2021). There are mainly two types of research ethics committees for the governance of human and animal-based studies, respectively: Human Research Ethics Committees (usually called Institutional Review Boards, Research Ethics Committee, Ethics Review Committee or Ethics Review Board) and Animal Research Ethics Committees (usually called Institutional Animal Care and Use Committee, Animal Ethics Committee or Animal Research Ethics Committee). The focus of this study is on the ARECs as a governance structure at institutional (micro) levels to ensure the ethical use of animals in scientific studies. Most national (meso) and international (macro) regulations and guidelines have made the establishment of ARECs or ethical review and approval of studies using animals mandatory, leading to the establishment of ARECs in many jurisdictions (Cvek et al., 2017).

3.3.3.2 The role of animal research ethics committees (ARECs) in governance of scientific studies using animals

ARECs have been established to ensure accountability and responsibility in the use of animals in scientific studies (Díaz et al., 2020; Pietrzykowski, 2021; Rose, 2012). It is unclear from the literature when the first AREC was established. While Corrêa Neto et al. (2017) report that the first animal rights committee was established by Harvard University in 1907, Rose (2012) and Pietrzykowski (2021) suggest that Canada and Australia were the first countries to establish ARECs in 1970. Additionally, Schnaider

and De Souza (2003) assert that the first formal AREC was established in Sweden in 1979, after which ARECs were established in the United States and Brazil in 1984 and the 1990s, respectively. The establishment of ARECs has become ubiquitous in recent years, and it has become a widely acknowledged legal standard around the world (Pietrzykowski, 2021). ARECs serve as the oversight body responsible for ensuring the ethical use of animals in scientific studies (King & Zohny, 2021).

According to Vasbinder and Locke (2016) and Pietrzykowski (2021), ARECs operate in nearly every country that oversees animal research, exhibiting numerous similarities in their conceptualisation, regulation, and management across different countries. In jurisdictions where they are established, ARECs are primarily tasked with the critical evaluation of research protocols involving scientific studies using animals, aiming to reassure the public regarding the minimisation of animal suffering and the promotion of animal welfare in these cases (Díaz et al., 2020; Russell, 2012). Consequently, ARECs serve as essential regulatory entities responsible for the review and approval of scientifically justified studies involving animals. They function as internal institutional oversight bodies, entrusted with ensuring that research protocols adhere to ethical standards in accordance with both national and international legislation, as well as institutional guidelines (Everitt & Berridge, 2017; Gomez, 2023; Russell, 2012).

ARECs play a vital role in ensuring the ethical conduct of research in most countries (Díaz et al., 2020). It is an institutional body responsible for examining and approving planned animal activities at any university or institution that conducts animal research to ensure humane treatment, regulatory compliance, and responsibility in the use of animals (Mohan et al., 2018). According to Silverman (2015), the AREC has two primary responsibilities: to (1) ensure that its home institution complies with national regulations and policies on the use of animals in scientific studies; and (2) assist with the welfare of animals involved in scientific studies. ARECs are vital in providing stringent safeguards and protecting animals from unnecessary harm during research since they are unable to consent to participate in such studies (Childers, 2022; Kalkan & Kekeçoğlu, 2024; Silverman, 2015).

As part of the ethical protocol review process, the AREC provides significant guidance on the experimental design of proposed research, including statistical concerns (Everitt & Berridge, 2017). The role of the AREC is also to keep pain, discomfort, and distress to the animal to a minimum (Silverman, 2015). According to Cheluvappa et al. (2017), ARECs set guidelines that help to determine whether animals must be used for a study or not, and oversee the humane use of these animals. Díaz et al. (2020) also note that ARECs are required to review the experimental design and justification for the adequate and restricted use of animals. They have the authority to revoke approval for a protocol if, in the AREC's view, the study does not provide enough benefit to compensate for the pain and discomfort caused to research animals. In addition to ARECs' primary responsibility to ensure the ethical treatment of animals used in scientific studies, they also enhance the advancement of science towards the common good by ensuring the humane treatment of animals and their justified use in research (Gibson, 2021).

Wherever they are established, ARECs are in charge of maintaining a balance between good science and good animal welfare (Mohan & Huneke, 2019; Prem, 2022). In their examination of the oversight responsibilities of ARECs, Pritt and Hammer (2017) emphasise the importance of the ARECs' role in facilitating the replicability of animal studies. They contend that, despite the absence of a formal mandate requiring ARECs and other animal research oversight bodies to evaluate proposed studies for replicability, the committees' obligations to ensure humane treatment, appropriate handling, and the relevance of control measures can significantly contribute to enhancing the replicability of animal research findings. This perspective is corroborated by Everitt and Berridge (2017) and Silverman et al. (2017), who assert that considerations of replicability and clinical translatability align with the objectives of the ARECs, as the scientific integrity of animal research is central to ethical considerations in this domain.

A study conducted by Mohan et al. (2018) further elucidates the contributions of various AREC members and their respective roles in improving research rigour and mitigating issues of irreproducibility in animal studies. The authors propose the following specific functions for different AREC members:

- Veterinarian: The veterinarian serves a critical advisory role regarding husbandry practices and other factors that may influence experimental outcomes (Cavalieri et al., 2023). Their expertise extends to the selection of appropriate animal models, assessment of physiological characteristics pertinent to the study, and the development of behavioural indicators. Additionally, veterinarians can evaluate the competencies of investigators and provide essential training in surgical techniques, aseptic practices, and pain management.

- Scientific members: The scientific members of the AREC are tasked with offering insights on experimental variables and husbandry issues that could impact research outcomes. They are also responsible for refining methodologies and determining whether these refinements are likely to affect the scientific validity of experiments. Furthermore, scientific members can assist in the standardisation of critical biological and chemical resources.

- Non-affiliated and non-scientist members: These members play a vital role in integrating community and public perspectives regarding animal care and research. By contributing to discussions about reproducibility and enhancing experimental rigour, non-affiliated and non-scientist members serve as important advocates for community interests in the oversight process. The authors posit that the reproducibility of scientific studies involving animals will be significantly improved if AREC members effectively fulfil their designated roles as outlined above. However, it is noteworthy that, while reproducibility constitutes a crucial element of scientific rigour, the existing laws, policies, and guidelines governing ARECs do not explicitly mandate these committees to assume the role of ensuring reproducibility. Although such objectives can be integrated into the performance of their statutory duties, it is unlikely that ARECs will prioritise the assurance of studies' reproducibility until the legislative frameworks that establish these committees are revised to encompass this responsibility.

3.3.3.3 Composition of ARECs

The composition of ARECs represents a critical area of inquiry within the academic discourse, as it significantly influences their capacity to ensure the ethical use of animals in scientific research (Gibson, 2021). The composition of ARECs is governed by various legal frameworks, policies, and guidelines that establish their operational parameters, leading to notable differences across various national and institutional contexts. For example, in South Korea, the membership of ARECs is mandated to consist of between three and 15 members. China's provincial legislation stipulates that ARECs must include management personnel, scientific and technical staff, professional veterinarians, and lay members, although it does not specify a precise membership number (Cvek et al., 2017). In New Zealand, the regulations require a minimum of four members on ARECs, which must include an institutional code-of-ethics holder (or a senior member appointed by the chief executive), a veterinarian, an external member with no affiliation to the institution or involvement in animal use, and a representative from the regional competent authority (Cvek et al., 2017). In the United States, the composition of ARECs is primarily dictated by the requirements set forth in the Public Health Service Policy and the Animal Welfare Act (Orlans, 1986; Silverman et al., 2006). These regulations mandate a minimum of five members, categorised into four distinct roles: one veterinarian with training or experience in laboratory animal science and medicine; one practising scientist with experience in conducting animal research; one member whose professional expertise lies outside the domain of animal research, such as an ethicist or legal expert; and one individual with no affiliation to the institution (Mohan & Huneke, 2019).

This framework bears similarities to the membership criteria outlined in the Animal Research Act of 1985 in Australia, as well as the Australian Code for the Care and Use of Animals for Scientific Purposes. While these guidelines delineate four categories of members, they do not prescribe a specific committee size. The designated categories in the Australian context include: category A – a veterinarian; category B – an animal researcher; category C – an individual with a demonstrated commitment to animal welfare who is not involved in the establishment, animal research, or the supply of animals for research; and category D – an independent

individual who does not fit the criteria of the other categories, is not associated with the establishment, and has no prior involvement in animal research (Everitt & Berridge, 2017). It is important to note that each category may encompass multiple members; however, should the total membership exceed four, it is mandated that categories C and D collectively represent at least one-third of the committee's composition.

In South Africa, the membership composition of ARECs, as outlined by the South African National Standard for the Care and Use of Animals for Scientific Studies (SABS Standards Division, 2021), mirrors that of the Australian Code. This alignment is attributable to the fact that the South African National Standard was developed based on the Australian guidelines. In addition to the minimum membership requirements specified by the South African National Standard, the National Health Research Ethics Council of South Africa (2024) mandates that ARECs should consist of at least nine members, including at least one member with veterinary qualifications (category A), a minimum of two members with substantial and recent experience in the use of animals for scientific purposes (category B), at least one member with expertise in quantitative research methodologies, at least one member with experience in translating relevant basic sciences to applied sciences or practice, at least one member with active membership in, and endorsement by, an independent animal welfare organisation knowledgeable about the welfare and husbandry of the species used (category C), and at least one layperson who has no prior involvement with the care or use of animals for scientific purposes and is independent of the life sciences, biological sciences, and health sciences (category D). Furthermore, the inclusion of members with daily hands-on contact with animals, expertise in biostatistics, knowledge of animal research ethics, and legal qualifications is also recommended.

The variations in the requisite membership composition of ARECs across different countries are delineated in Table 3.2. In countries lacking national legislation or guidelines, such as several African countries, including Ghana, institutions often refer to the guidelines established by other countries to inform the formation of ARECs and their membership criteria. For example, in Ghana, the three institutions that have established ARECs each exhibit distinct membership configurations, with each

committee comprising at least one veterinarian, one layperson, and one legal practitioner.

Table 3.2: Summary showing the differences in the composition of ARECs in some countries, including Ghana

Country	Membership (Minimum and Maximum)	Categories of AREC Membership by Legislation
United States of America (USDA Animal Care: Animal Welfare Act and Animal Welfare Regulations, 2020)	Minimum – 5 Maximum – Not stated	Four categories of members: 1. Trained veterinarian 2. Scientist experienced in using animals for research 3. Layperson whose primary focus is not research (lawyer, ethicist) 4. Someone not affiliated with the institution
Australia (Everitt & Berridge, 2017)	Minimum - 4 Maximum – Not stated	Four categories of members: 1. Category A – A veterinarian 2. Category B – An animal researcher 3. Category C – A person with a demonstrated commitment to animal welfare who is not involved with the establishment, animal research or the supply of animals for research 4. Category D – an independent person who does not fit the requirements of the other categories, is not associated with the establishment and who has never been involved in the use of animals for research *NB: Each category can have more than one person appointed to it, but if the total membership is more than four, categories*

Country	Membership (Minimum and Maximum)	Categories of AREC Membership by Legislation
		C and D must represent at least one-third of the members.
South Africa (NHREC, 2024)	Minimum – 9 Maximum – Not stated	1. At least one member with veterinary qualifications (Category A) 2. A minimum of two members with substantial and recent experience in the use of animals for scientific purposes (Category B) 3. At least one member with expertise in quantitative research methodologies 4. At least one member with experience in translating relevant basic sciences to applied sciences or practice 5. At least one member with active membership in, and endorsement by, an independent animal welfare organisation knowledgeable about the welfare and husbandry of the species used (Category C) 6. At least one layperson who has no prior involvement with the care or use of animals for scientific purposes and is independent of the life sciences, biological sciences, and health sciences (Category D) 7. A member with daily hands-on contact with animals, expertise in biostatistics, and knowledge of animal research ethics 8. A member with legal qualifications

Country	Membership (Minimum and Maximum)	Categories of AREC Membership by Legislation
South Korea (Cvek et al., 2017)	Minimum – 3 Maximum – 15	Not specified/stated
China (Cvek et al., 2017)	Minimum – 4 Maximum – Not stated	Must have at least one person from each of these categories: 1. Management 2. Scientific and technical staff 3. Veterinarian 4. Lay members
New Zealand (Cvek et al., 2017)	Minimum – 4 Maximum – Not stated	1. Institutional Code of Ethics holder (or a senior member appointed by the chief executive) 2. A veterinarian 3. An outsider who is not affiliated with the institution and is not involved with animal use 4. A representative from the regional competent authority

Source: Author's construct, 2025

Despite the variability in the composition and number of ARECs, regulatory frameworks consistently mandate the inclusion of at least three essential categories of individuals: scientists, veterinarians, and laypersons.

A substantial body of research indicates that the composition of ARECs significantly influences the deliberative processes and decision-making outcomes of these committees (Cvek et al., 2017; Hansen, 2013; Schuppli, 2011; Silverman et al., 2015; Tjärnström, 2013). Hansen et al. (2012) conducted an analysis of the membership structures of 21 leading research institutions in the United States and observed a predominant representation of scientists within ARECs. They posited that this preponderance of scientific members may overshadow the perspectives of those

representing animal welfare and the general public, thereby contributing to bias favouring animal research. Such a dynamic, they argue, undermines the overall objectivity and efficacy of the oversight mechanisms in place. This perspective is corroborated by the findings of Russell (2012) and Silverman et al. (2017), who assert that the decision-making processes of ARECs are disproportionately influenced by the numerical superiority of scientists relative to other member categories.

Furthermore, Silverman et al. (2017) explored the dynamics of protocol discussions within AREC meetings and found evidence suggesting that the member presenting a protocol significantly sways subsequent discussions. Their findings indicate that scientists within ARECs exert considerable influence over both discussions and decisions. In contrast to a limited number of earlier studies that employed direct interviews with AREC members (Borkowski et al., 1997; Houde et al., 2009), the study conducted by Silverman et al. (2017), and recent research by Budda and Pritt (2020), did not engage in direct interviews with members from diverse categories to capture their experiences regarding the decision-making processes and governance roles of ARECs in ensuring the ethical utilisation of animals in scientific research. The outcomes of these studies suggest that future research aimed at elucidating the perspectives and experiences of AREC members should intentionally include representatives from each category, particularly ensuring the presence of both a scientist and a non-scientist. Such an approach would facilitate a more comprehensive understanding of the experiences and viewpoints of non-scientist members within ARECs.

Gibson (2021) posits the necessity of integrating holistic species experts into ARECs, arguing that these individuals, who are community members possessing extensive first-hand experience with animals' optimal living and dying conditions, can significantly enrich the deliberative processes and decision-making frameworks of the ARECs. According to Gibson (2021), the inclusion of holistic species experts, akin to the contributions made by non-scientists and non-affiliates, will mitigate harm and promote the ethical treatment of animals in scientific research. However, Gibson acknowledges the limited availability of such experts, which raises questions about the feasibility of their widespread inclusion in ARECs. While he emphasises the value of

their experiential insights in harm-benefit analyses, he does not provide substantial justification beyond this point for their proposed inclusion. Gibson's (2021) comparison of holistic species experts to non-scientists and non-affiliates suggests that where these experts are accessible, they may function similarly to the existing non-scientist members of the AREC, rather than establishing a distinct category of membership.

The role of non-scientists is to contribute unique knowledge derived from their training and experiences, a function that aligns with the proposed contributions of holistic species experts (Silverman, 2015). Furthermore, Silverman (2015) advocates for the inclusion of additional professionals, such as librarians, biologists, biostatisticians, geneticists, and anaesthesiologists – as members or consultants to the AREC – and he also proposes that students be incorporated into academic institution-based ARECs to represent student perspectives and foster a learning environment. However, the rationale for including students is less compelling, given that AREC members are tasked with reviewing complex protocols and conducting harm-benefit analyses. The inclusion of students primarily for representational purposes and educational opportunities may undermine the committee's functionality. It could also lead to discrepancies in membership composition between academic and non-academic ARECs, especially since there are calls for harmonisation across these committees. It may be more appropriate for students to participate as observers or non-voting members, enabling them to learn and contribute perspectives without affecting the decision-making process.

In discussing the composition of ARECs, Silverman (2015) highlights the critical role of AREC administrators, who, although not formally recognised as committee members, facilitate the operational functions of the AREC. He asserts that the contributions of AREC administrators are essential to the committee's effectiveness, suggesting that their role is as significant as that of voting members. This assertion is supported by findings from a previous study conducted by Silverman et al. (2012), which revealed that AREC administrators' perspectives regarding the structure and functions of the committees diverged from those of the voting members and chairpersons. This discrepancy can be attributed to the differing responsibilities associated with their respective roles. Consequently, in research endeavours aimed

at capturing the experiences and insights of ARECs, it is crucial to include the perspectives of AREC administrators, as their unique responsibilities may yield distinct opinions that are valuable for a comprehensive understanding of the committee's dynamics.

3.3.3.4 Conclusion – Micro context governance system for the ethical use of animals in scientific studies

In the micro or institutional context, the governance of scientific studies using animals is predominantly managed by ARECs. Institutions establish ARECs to oversee the ethical use of animals in scientific investigations conducted within their premises. The existing literature substantiates the critical role and function of ARECs in ensuring the ethical treatment of animals in research, a fact that is widely recognised within the academic community. However, despite the consensus regarding the significance of ARECs, there is a lack of uniformity across countries concerning the regulatory requirements and composition of these committees, particularly with respect to the number of AREC members. The review indicates that, universally, the membership of ARECs minimally includes researchers engaged in animal research, veterinarians, and laypersons.

In the case of Ghana, as is the situation in many African nations, there is an absence of national regulations or guidelines that delineate the membership criteria and operational protocols for ARECs. Consequently, there is no standardised composition among the three existing ARECs in Ghana. Furthermore, the literature reveals a dearth of national regulations or guidelines regarding the composition of ARECs, as well as a lack of research exploring the experiences of AREC members within the country. The reviewed literature highlights a significant gap in research that engages AREC members and AREC administrators to investigate their experiences related to the governance of scientific studies involving animals.

Given the pivotal role that ARECs play in overseeing the ethical use of animals in research at the institutional or micro context, it is essential to examine the perspectives of AREC members and administrators regarding the governance systems and

practices implemented for the ethical use of animals in scientific studies, both within their institutions (micro context) and at the national level (meso context).

3.4 Animal Research Ethics Governance Practices for the Ethical Use of Animals in Scientific Studies

This section focuses on the review of literature on research ethics governance practices, a closely linked concept to research ethics governance systems, although they perform different functions within the framework of ethical research conduct. Research ethics governance practices refer to the specific actions and methodologies employed by researchers and institutions to implement the ethical principles outlined in research ethics governance systems (González-Esteban, 2023). These governance practices involve the day-to-day activities that ensure compliance with ethical standards. Examples of governance practices include conducting ethical reviews, training for researchers on ethical standards and best practices in research conduct, stakeholder engagement and monitoring, and mechanisms for reporting unethical behaviour or breaches of conduct. The focus of research ethics governance practices is on the practical implementation of ethical guidelines and fostering a culture of integrity among researchers. In summary, animal research ethics practices are the operational activities that ensure animal research ethics governance systems function effectively in research settings (González-Esteban, 2023).

3.4.1 Animal research ethics application and review process

The ethics review process in scientific studies involving animal subjects constitutes a fundamental aspect that safeguards the humane treatment of these animals while simultaneously facilitating scientific progress. Numerous studies have highlighted the variability inherent in the ethics review processes and systems, which are contingent upon factors such as the nature of the research, geographical context, and institutional mandates (Bowes et al., 2023; Guillén & Borkowski, 2020; Lopez-Baron et al., 2024; Olsson et al., 2022). This variability has resulted in a lack of standardisation within the review processes employed by ARECs. Furthermore, Jörgensen et al. (2021) have documented inconsistencies in the application requirements set forth by different

ARECs, which they contend contribute to suboptimal ethical applications and insufficient harm-benefit analyses. They assert that these discrepancies in application requirements pose significant obstacles to the effective submission of research protocols for review, as well as to the thorough evaluation of the associated harm-benefit ratios by ARECs. In their examination of the ethics review process in Sweden, Jörgensen et al. (2021) identified persistent issues within the ethics review process. These issues include misalignments between legislative requirements and the structure of the ethics application forms, which often result in the submission of incomplete information. Such inadequacies hinder ARECs' ability to conduct comprehensive harm-benefit analyses of research protocols. Consequently, the authors advocate for a re-evaluation and restructuring of the ethics review process, alongside a revision of the ethics application forms, to enhance their efficacy and compliance with ethical standards.

Based on the preceding discussion, it is plausible that a comparable scenario exists in Ghana, characterised by inconsistencies in the ethics application and review processes. Such variability may adversely impact the thoroughness of protocol evaluations, thereby influencing the ethical use of animals in scientific studies within the country. Presently, there is a notable deficiency in the documentation of these processes in Ghana. This study aims to rectify this gap by exploring the current governance practices related to animal research ethics in institutions where ARECs are established. Furthermore, it explores the experiences of AREC members, administrators, and researchers concerning the ethics application and review procedures.

3.4.2 Training and certification for researchers who use animals in conducting scientific studies

The competency of researchers engaged in the care and use of animals in scientific studies considerably influences both the quality of the research and the well-being of the animals involved. Various national legislations and guidelines govern the use of animals in scientific studies; however, there is considerable variation in the training and certification requirements for researchers across different countries (Bert, 2007;

Franco & Olsson, 2014). Regardless of the extent of regulatory oversight at either the national or institutional level, it remains researchers' responsibility to ensure that scientific studies using animals are conducted in a humane manner (Franco & Olsson, 2014). Consequently, the training of researchers is paramount to guarantee that they understand their ethical obligations and conduct themselves accordingly.

In certain jurisdictions, regulations mandate that researchers undergo training as a prerequisite for the use of animals in scientific research, although such requirements have not necessarily influenced the attitudes and practices of researchers (Fischer & Rodrigues, 2018). For example, in South Africa, the South African Veterinary Council (SAVC) is legally tasked with authorising and licensing individual researchers intending to use animals in scientific studies. A veterinarian must verify the competence of the researcher in all animal procedures prior to certification (South African Veterinary and Para-veterinary Professions Act, 2015). Furthermore, all members of ARECs, as well as AREC administrators and researchers, are obligated to complete training in research ethics. Additionally, researchers, including students, must undertake a physical animal handling course and ethics training before engaging in research involving animals in South Africa (NHREC, 2024).

Fischer and Rodrigues (2018) contend that the persistence of issues related to research misconduct and inadequate reporting in studies involving animals suggests that existing training programmes have not instigated necessary attitudinal changes among researchers. However, this assertion is not substantiated by empirical evidence demonstrating a direct correlation between training and researchers' attitudes towards animal use in research. It is also plausible that the frequency and severity of reported research misconduct may have been significantly higher had researchers not undergone such training. Therefore, ongoing training for researchers is essential to uphold high scientific standards and ensure the humane treatment of animals in research contexts (Franco & Olsson, 2014).

Despite the importance of this issue, there is a lack of literature exploring the perspectives and experiences of researchers who have participated in these training programmes, as well as the impact of such training on their understanding and

attitudes towards self-governance in the conduct of scientific studies involving animals. Similarly, there is limited knowledge regarding the training and certification practices implemented by institutions with ARECs in Ghana to ensure that researchers are adequately prepared to use animals in a humane manner.

Overall, the chapter intended to offer a better understanding of the existing animal research ethics governance systems and practices globally and in Ghana to provide a frame of reference for the study. The chapter was composed of five main sections. It commenced with an introduction, followed by a section that provided a clear definition of the concept 'animal research ethics governance'. The third main section of the chapter focused on reviewing literature on animal research ethics governance systems based on three key contexts – macro (global), meso (national) and micro (institutional) – of animal research ethics governance systems. The fourth section of the chapter synthesised literature on existing animal research ethics governance practices. The last section of the chapter focused on synthesising and summarising all the sections of the chapter.

3.5 Chapter Conclusion

The purpose of this chapter was to gain a better understanding of the existing animal research ethics governance systems and practices globally and in Ghana to provide a frame of reference for the study. The chapter helped to understand the concept of 'animal research ethics governance' and existing governance systems and practices for the ethical use of animals in scientific studies globally and in Ghana. This chapter offered a clear definition of the concept 'animal research ethics governance', as well as animal research ethics governance systems and practices. Governance of research using animals was conceptualised into macro (global), meso (national) and micro (institutional) contexts. At the macro level, there is substantial evidence of the existence of international declarations and guidelines that govern the ethical use of animals in scientific studies. At the meso level, various national laws, regulations, and guidelines have been established in numerous countries, particularly in more developed countries. Notably, certain African nations, such as South Africa and Kenya, have implemented comprehensive legislation that promotes the humane

treatment of animals in scientific studies. However, the literature indicates a significant deficiency in such legislative frameworks in many other African countries, including Ghana. At the micro level, institutions have developed policies and guidelines primarily aimed at establishing ARECs. Although empirical studies exist, they are limited in scope regarding the composition and functions of ARECs in ensuring the ethical use of animals in scientific studies.

Key animal research ethics governance practices identified in the literature include ethics application and review processes, and training and certification of researchers. The review further reveals that existing governance practices are often characterised by inconsistencies in the ethics application and review processes, as well as variability in training and certification requirements. There is a notable absence of empirical research exploring the experiences of AREC members, researchers, and AREC administrators regarding the governance systems and practices for the ethical use of animals in scientific studies. Much of the current literature on animal research ethics tends to focus predominantly on the efficiency of ARECs. Consequently, research aimed at developing a conceptual framework for the ethical use of animals in scientific studies must explore the experiences of researchers, AREC members, and AREC administrators within the context of existing governance systems and practices. Such an exploration will ensure that any proposed governance framework is both acceptable and practical for all stakeholders involved, including researchers, AREC members, and AREC administrators. The next chapter of this thesis provides a comprehensive discussion of the methodology employed in exploring the understanding and experiences of key stakeholders with animal research ethics governance systems and practices in Ghana.

CHAPTER FOUR
RESEARCH METHODOLOGY

4.1 Introduction

The objective of Chapter Three was to provide a review and discussion of available literature on animal research ethics governance systems and practices. The chapter provided insight into the concept of 'animal research ethics governance' and the current state and gaps in existing animal research ethics governance systems and practices globally (macro context), nationally (meso context) and in institutions (micro context). This chapter discusses the research approach, research paradigm, as well as the study design applied to achieve the objectives of this study. As a reminder, this study comprised two phases: the empirical phase (phase one) aimed to gain deeper insight into key stakeholders' experiences with the existing animal research ethics governance systems and practices that promote the ethical use of animals in scientific studies in Ghana; and the conceptual framework development phase (phase two) aimed to generate a proposed animal research ethics governance framework for research-producing organisations by interpreting key stakeholders' experiences of existing animal research ethics governance systems and practices to promote the ethical use of animals in scientific studies in Ghana.

This chapter begins with a description of the research approach adopted for the study, followed by the research paradigm and design. This is followed by a description of the research setting, study population, the sampling strategy employed and how the sample size was determined. Additionally, a description of the processes employed in recruiting the study participants, data collection processes, the role of the researcher in the entire data collection process, and the data analysis procedure is presented. To conclude the chapter, the operationalisation of the study, the measures employed to confirm trustworthiness and authenticity of the study, and the ethical considerations adhered to by the researcher in conducting the study are presented.

4.2 Qualitative Research Approach

A qualitative research approach, which is appropriate for exploring in-depth and complex phenomena (Creswell & Creswell, 2018; Marshall & Rossman, 2016), such as key stakeholders' experiences with existing animal research ethics governance systems and practices that promote the ethical use of animals in scientific studies in Ghana, was adopted for this study. The qualitative approach was identified as ideal for this study because the study's goal was to explore key stakeholders' experiences (Creswell & Creswell, 2018) with respect to animal research ethics governance in research-producing organisations in Ghana. The qualitative research approach is underpinned by the assumption that reality is subjective and constructed through social interactions (Crawford, 2019; Denzin & Lincoln, 2018). This implies that individuals' context and background influence the interpretation of their experiences. This understanding of the qualitative research approach aligns with the objectives of this study, which sought a comprehensive understanding of the contexts, meanings and viewpoints of key stakeholders on the existing governance systems and practices for the ethical use of animals in scientific studies in Ghana. Also, qualitative research posits that human behaviour cannot be fully understood through numerical data alone; instead, it requires an in-depth exploration of participants' perspectives and lived experiences (Creswell & Creswell, 2018), emphasising the richness of data obtained through in-depth interviews.

Based on the aim and objectives of this study, the qualitative research approach directed the researcher to choose appropriate data collection procedures, as well as data analysis and discussion processes, for a rich and in-depth understanding of the research phenomenon. Overall, through a holistic and contextual lens, the qualitative research approach is recognised for its commitment to understanding the complexities of human experiences. Through this lens, this study significantly contributed to a better understanding of key stakeholders' experiences with the existing governance systems and practices for the ethical use of animals in scientific studies in Ghana.

4.3 Research Paradigm

This study was conducted within an interpretive research paradigm. The choice of a research paradigm demonstrates the researcher's convictions and cognitive constructs employed to understand or interpret reality (Guba & Lincoln, 1994). The foundation of the interpretive research paradigm is based on the idea that people's experiences and understanding of their social context shape their social reality (Pervin & Mokhtar, 2022). This frame of reference guided the researcher to believe that truth and knowledge are subjective (Ryan, 2018) and that the key stakeholders' experiences with the existing governance systems and practices for the ethical use of animals in scientific studies in Ghana had multiple realities due to the differences in their life experiences and social backgrounds. Consequently, the choice of interpretive research paradigm for this study was guided by the researcher's goal of understanding the subjective context of the experiences of participants (Guba & Lincoln, 1994).

The researcher interacted with participants through semi-structured interviews and naïve sketches that elicited subjective meanings from participants on the existing governance systems and practices on the ethical use of animals in scientific studies in Ghana. The interpretive research paradigm further asserts that reality is socially constructed and that knowledge is derived from the interpretations and interactions of people (Creswell & Creswell, 2018). Therefore, using an interpretative research paradigm, the researcher acknowledges that there is no single truth (Pervin & Mokhtar, 2022) and complete researcher objectivity is not possible (Sikorski et al., 2024; van Dongen & Sikorski, 2021). Knowledge is co-constructed in an interactive process involving the researcher's thoughts and cognitive processing of the data, informed by interactions with the participants. By applying thematic analysis, the researcher reported on the different perspectives or views of participants. Thus, using the interpretive research paradigm, the researcher was able to generate meaning from the experiences that key stakeholders had with respect to the existing governance systems and practices for the ethical use of animals in scientific studies in Ghana.

4.4 Study Design

An exploratory, embedded single-case study design was employed to answer the research questions for this study. An exploratory study design is used to gain insights and a deeper understanding into a phenomenon or situation of which little is known and has not previously attracted research (Saunders et al., 2023; Stebbins, 2001; Thomas & Lawal, 2020). The choice of this design aligns with the qualitative research approach employed in this study, which was used to explore broad research questions and not a predetermined research hypothesis (Crawford, 2019). Given the paucity of prior research and literature on key stakeholders' experiences with governance systems and practices for the ethical use of animals in scientific studies in Ghana, an exploratory research design was considered ideal and was employed for this study. The decision to use an exploratory design was also made due to its adaptability and flexibility (Hunter et al., 2019), which allowed the researcher to delve deeper into this new field and find new information that will further the body of knowledge on governance systems and practices for the ethical use of animals in scientific studies. Choosing an exploratory study design enabled the researcher to investigate the key stakeholders' experiences without any predetermined factors and be open to the discovery of ideas and insights.

Case study research designs help with an in-depth empirical analysis of a phenomenon in its natural context that can be used to explain, describe, or explore occurrences or phenomena (Baxter & Jack, 2015; Hancock & Algozzine, 2006; Yin, 2018). Case study research designs assume the need to examine the context and other complex conditions related to the phenomenon (Yin, 2018). Considering that this study was aimed at providing an in-depth understanding of key stakeholders' experiences with governance systems and practices for the ethical use of animals in scientific studies, the case study research design was selected to allow for in-depth, rich and culturally specific data collection (Baxter & Jack, 2015).

For this study, the researcher adopted Yin's (2018) and Miles et al.'s (2014) definition of a 'case' as *"a phenomenon of some kind occurring in a bounded context".* Yin (2018) differentiates between a single case study and a multiple case study. The author

explains that a single case study enables the researcher to explore a phenomenon within a particular bounded context (case), and in a multiple case study, researchers explore differences within and between more than one bounded context (cases). This study employed an embedded single case study design, which is a single case study with many units of analysis integrated into the design (Yin, 2018). With the embedded case study, the same phenomenon was explored in different subunits embedded within the same bounded context to identify similarities and differences within the broader bounded context's embedded subunits (case). An embedded single case study design was used to gain a rich and in-depth comprehension of the phenomenon being explored (Baxter & Jack, 2015; Yin, 2018).

From the foregoing discussion and the adoption of Yin's (2018) and Miles et al.'s (2014) definition of a 'case', the case for this study refers to the phenomenon '*animal research ethics governance'* in the bounded context of *'Ghana'.* The embedded units of analysis were the three existing ARECs established by three research-producing organisations in Ghana. These ARECs were treated as sub-units situated within the case (see Figure 4.1 for a pictorial view of the case and embedded cases).

In keeping with the interpretive research paradigm, the embedded single case study design assisted the researcher in understanding the experiences of key stakeholders based on their unique contexts (Pervin & Mokhtar, 2022). It also allowed the researcher to understand the similarities and differences between the embedded cases with respect to key stakeholders' experiences with animal research ethics governance systems and practices that promote the ethical use of animals in scientific studies in Ghana. Combining an exploratory and embedded single case study design was most suited for this study considering that the researcher was interested in delving into the depths of an unexplored phenomenon (the experiences of key stakeholders of the existing research ethics governance systems and practices that promote the ethical use of animals in scientific studies in Ghana) by understanding a real-world case with contextual conditions and providing an extensive in-depth description.

4.5 Study Setting

The study was conducted in three research-producing organisations with ARECs in Ghana. Ghana is a country in West Africa that stretches from the Gulf of Guinea to the Atlantic Ocean on its southern border. The country is bordered on the north by Burkina Faso, east by Togo and west by the Ivory Coast. The country's total land area covers approximately 238,533 km^2 (Ghana Statistical Service, n.d.). The 2021 census data put Ghana's population at 30,792,608 (Ghana Statistical Service, 2021). There are currently over 302 accredited higher education institutions, also known as tertiary institutions in Ghana, out of which 16 are public universities (GTEC, 2025) and a national scientific council where several scientific studies, including studies involving the use of animals, are conducted. However, as indicated in Chapters One and Two (Sections 1.2 and 2.5, respectively), there is no national body, legislation, guidelines, or frameworks that govern the ethical use of animals in scientific studies in Ghana (De Vries et al., 2017; Mohr et al., 2017; Tindana et al., 2019).

The embedded units for this study were the three existing institutional ARECs in Ghana. For privacy reasons, to protect the institutions' identity as far as possible, and to protect the confidentiality and anonymity of the participants, the names of the institutional ARECs have been withheld, and they are instead referred to as AREC 1, AREC 2 and AREC 3. The embedded units are described as follows:

- **Embedded Unit 1 (AREC 1)** – This AREC is located in Accra (see Figure 4.1), the capital city of Ghana. The institution where this AREC is situated engages in ongoing research involving the use of animals. The AREC was established in 2012 with the mandate to review all live vertebrate animal scientific studies conducted at or in collaboration with the institution and its employees. AREC 1 is guided by an animal care and use standard operating procedure (SOP). The members of the AREC include a veterinary virologist, a pharmacologist/ toxicologist, a clinical pathologist, a veterinary epidemiologist, immunologists, a microbiologist, a laboratory animal scientist, a geneticist, an animal nutritionist, a wildlife specialist, and a legal practitioner. These members review ethics applications submitted to the AREC.

- **Embedded Unit 2 (AREC 2) –** This AREC is also located in Accra (see Figure 4.1) and was established in 2012. The institution where this AREC is situated was established as a public research institution with research centres located across the country, where scientific studies using animals are conducted. Considering that this institution has research centres in all parts of the country, it was thought that participants from embedded unit 2 (AREC 2) would be able to contribute towards a better understanding of the animal research ethics governance systems and practices for the ethical use of animals in scientific studies in Ghana. Membership of the AREC includes experts in the use of animals in research, such as a veterinarian, animal breeder, a lawyer, sociologist, parasitologist and a bioethicist.

- **Embedded Unit 3 (AREC 3)** – This AREC is in the middle to the northern part of Ghana (see Figure 4.1). The institution where AREC 3 is situated has several ongoing scientific studies using animals. AREC 3 was established to oversee the care and management of animals used in scientific studies and other activities at the institution. AREC 3's major goal is to uphold all national and international regulations for safeguarding the lives and welfare of animals used during teaching and research (AREC 3, 2018). Membership of AREC 3 is multidisciplinary and multi-sectoral, including animal scientists, a social scientist, a veterinarian, a biomedical scientist, an animal rights advocacy group representative, and a public representative (AREC 3, 2018) who review proposals for the use of animals in scientific studies.

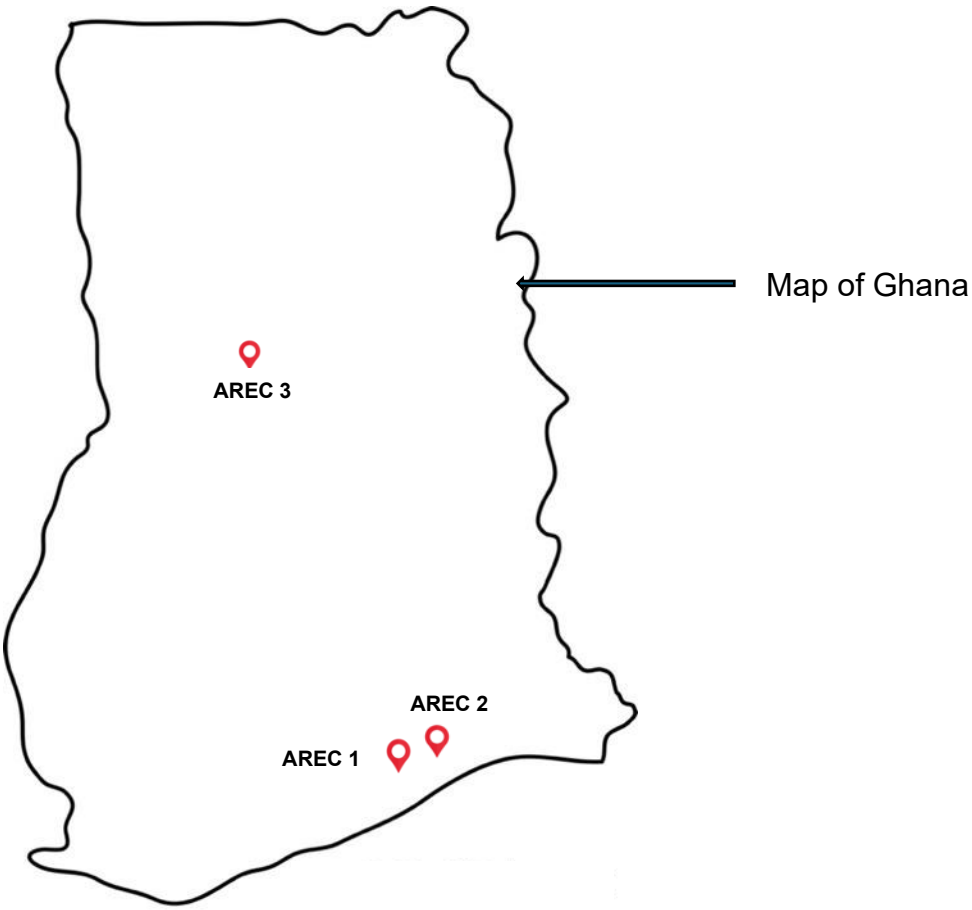


Figure 4.1: Outline map of Ghana showing the case and embedded sub-units (ARECs 1, 2 and 3)

Source: Author's adaptation from Yin (2014). Outline map accessed from https://www.worldatlas.com/maps/ghana on 13th March 2023.

Figure 4.1 shows a graphical and geographic representation of the case and embedded cases used in this research. The outline map of Ghana shows the geographic area (bounded area) of the case (animal research ethics governance in Ghana). The location of the embedded units (AREC 1, AREC 2 and AREC 3) is shown within the bounded area (outline map of Ghana).

4.6 Study Population

The population studied was researchers, AREC members and AREC administrators in the three ARECs in Ghana described in Section 4.5. These are key stakeholders obliged to promote the ethical conduct of scientific studies using animals in Ghana.

4.7 Sampling Strategy

Purposive sampling was employed in recruiting participants for this study from the population of researchers, AREC members and AREC administrators from the three ARECs in Ghana. Luborsky and Rubinstein (1995) define 'purposive sampling' as a practice where researchers recruit participants based on some explicit predefined traits or conditions, which, in the view of the researcher, will help explore or describe the phenomenon being investigated. Purposive sampling was therefore employed to recruit the most suitable participants to respond to the research questions (Marshall, 1996; Nyimbili & Nyimbili, 2024). By employing a purposive sampling strategy, the researcher successfully recruited participants whose experience matched the study's objectives (Campbell et al., 2020). Purposive sampling enabled the researcher to deliberately include participants with distinct characteristics and understanding (Etikan, 2016; Nyimbili & Nyimbili, 2024) of the existing governance systems and practices for the ethical use of animals in scientific studies in Ghana. They would consequently be able to provide the researcher with rich information about the phenomenon being explored.

In addition to their experience, the participants who were purposively recruited into the study were those who were willing and available to participate (Etikan, 2016; Nyimbili & Nyimbili, 2024; Palinkas et al., 2015). To this end, key stakeholders from the study sites were purposively sampled to participate in the study to share their knowledge and experience of the animal research ethics governance systems and practices for the ethical use of animals in scientific studies in Ghana. Participants were recruited based on the following inclusion criteria:

4.7.1 Inclusion criteria for participant recruitment

In qualitative research, it is important to ensure that participants are carefully selected to provide relevant and meaningful data that will address the study's objectives. To this end, the researcher established inclusion criteria to guide participant recruitment for this study to ensure that everyone recruited to participate was the most appropriate. The criteria were developed based on the research questions and the specific context

of this study. To participate in the study, participants were required to meet the following criteria:

- *Researchers*
  - Employed at the institution where the AREC is located. This was to ensure that participants had considerable knowledge and understanding of the governance systems and practices existing in their respective institutions and in Ghana. In other words, information-rich individuals were targeted.
  - Engaged in scientific studies using animals for at least three years. Since researchers' experiences regarding the ethical use of animals are part of this study, participants were expected to have prior experience conducting scientific studies involving animals as a principal investigator. Principal investigators have direct responsibilities for conducting methodologically and ethically sound research; consequently, they would be able to provide more insight regarding their experiences. A minimum of three years conducting scientific studies using animals was deemed adequate for the researchers to have the necessary knowledge and experience that was useful for this study.
  - Must have submitted their protocols to the institutional AREC for review at least once. This was to ensure that all participants had experience submitting protocols to the AREC for review and approval and had experienced the existing animal research ethics governance systems and practices in their respective institutions, which were being explored in the study.

- *AREC members*
  - Must have served on the AREC for at least two years. This was to ensure that AREC members who participated in the study had participated in AREC meetings and had first-hand experience of the animal research ethics governance systems and practices in the institution as members of the AREC. AREC members with such a level of experience were deemed to be adequately experienced and knowledgeable in animal research ethics and its governance and would be able to share their rich and valuable experiences to help explore the objectives of the study.

- *AREC Administrators*
    - Must have served as an AREC administrator for at least one year. This was to ensure that AREC administrators who participated in the study had at least one year of experience working as AREC administrators and had gained some experience and knowledge regarding the governance systems and practices of the AREC.
    - Currently or previously serving as an AREC administrator at the study site for at least one year. This was to ensure that AREC administrators who participated in the study had knowledge and experience of existing governance systems and practices, which were being explored, and not historical facts. AREC administrators who had left the services of the AREC for more than one year were deemed not to have the necessary knowledge and experience of existing animal research ethics governance systems and practices in the institution, as these might have changed.

The researcher was assisted by institutional gatekeepers to ensure that all participants selected for the study met the inclusion criteria (see Section 4.9 for a detailed description of how participants were recruited).

4.7.2 Exclusion criteria for participant recruitment

The exclusion criteria were characteristics of prospective participants that disqualified them from participating in the study. These criteria helped the researcher maintain focus on the specific objectives of the study and ensure that recruited participants aligned with the study's objectives. The key exclusion criteria were:

- ***Age Restrictions***

Participants younger than 18 were excluded from the study. This criterion was established to ensure that all participants were legally recognised as adults and capable of providing informed consent. This criterion was easy for the researcher to apply since participants were employees of the research-producing organisations who are not permitted by law to employ persons younger than 18. Additionally, the

researcher confirmed the ages with prospective participants during informal rapport-building conversations prior to recruitment.

- ***Language Proficiency***

Participants who were not proficient in English were excluded from the study. Effective communication is essential in qualitative research, particularly in interviews and discussions where a nuanced understanding is necessary. Participants lacking proficiency in the primary language of the study were likely to struggle to articulate their thoughts and experiences, leading to incomplete or inaccurate data. This criterion aimed to ensure that all participants could effectively engage in discussions and provide rich, detailed responses. This criterion was applied by the researcher through testing both the written and oral English proficiency of prospective participants. Written English proficiency was tested through the initial introductory emails sent to prospective participants and their responses to these emails. Moreover, oral English proficiency was confirmed during the initial introductory telephone call by the researcher to prospective participants. The language of communication was English, and prospective participants were expected to communicate with the researcher in English.

- ***Limited Availability***

Participants who were unable to commit to the time required for participation in the study were excluded. This criterion was essential for ensuring that participants could engage fully in the research process, including semi-structured interviews and the submission of naïve sketches (described in Section 4.10). The researcher considered that participants who were unable to dedicate the necessary time to providing naïve sketches and participating in semi-structured interviews might provide incomplete data or withdraw from the study, which could disrupt the research process and compromise the findings. Thus, this exclusion criterion was crucial for maintaining the integrity of the study.

The exclusion criteria outlined above were critical in shaping the participant pool for this qualitative study. By implementing these criteria, the researcher aimed to ensure that the collected data were relevant, rich, and reflective of the diverse experiences

within the target population. Purposive sampling, guided by these exclusion criteria, allowed for a focused exploration of the existing animal research ethics governance systems and practices in Ghana while maintaining ethical standards and participant well-being.

4.8 Sample Size Determination

Qualitative research experts contend that there is no simple answer to the number of participants to use for a qualitative study. Since the sample size is determined by the nature of the study, there is no specific formula or method for estimating sample size (Creswell, 2016; Creswell & Creswell, 2018). In spite of this, a few researchers have recommended different sample sizes to be used in qualitative studies. For instance, while Francis et al. (2010) recommend a minimum sample size of 17, Hagaman and Wutich (2017) recommend between 20 and 40 participants for qualitative studies, and Luborsky and Rubinstein (1995) report that most authors recommend a sample size between 12 and 26 for qualitative studies. Yet, other methodologists, including Bernard (2017) and Morse (2015), recommend a sample size between 30 and 60 for ethnographic studies, and Charmaz (2006) and Creswell (2007) recommend 20 to 30 participants for grounded theory research and six for phenomenology studies. Guest et al. (2020) also recommend a minimum sample size of 15 for all qualitative studies. For exploratory qualitative studies, Vasileiou et al. (2018) deem a sample size of eight participants to be appropriate, and Creswell and Creswell (2018) also recommend that case studies include approximately three to five participants.

From the foregoing, it is obvious that there is no agreement or consistency among qualitative research methodologists regarding the best sample size for qualitative studies. The differences in the recommendations confirm that the sample size for qualitative studies depends on several factors, including methodological, epistemological, theoretical, ideological and practical factors (Baker & Edwards, 2012). According to Sandelowski (2000) and Denzin and Lincoln (2018), the sample size in a qualitative study must be large enough to allow for a rich understanding of the phenomenon being studied and, at the same time, small enough so that there is no redundancy in collected data. The sample size selected for qualitative studies must

enable the researcher to gain the quality of information that they hope to achieve, which is able to explain the phenomenon being explored (Sandelowski, 2010). Consequently, the appropriate sample size for any qualitative study is dictated by the nature and aim of the study.

To this end, a sample size of 15 participants, comprising two researchers from each of the three embedded cases (total of 6 researchers), two AREC members from each of the three embedded cases (total of 6 AREC members), and the AREC administrators from each of the three embedded cases (total of 3 AREC administrators), was predetermined by the researcher. As an exploratory, embedded single-case study employing a qualitative methodology, the researcher deemed this number as adequate to gain the quality of information required to achieve the study's objectives. This number also falls within Vasileiou et al.'s (2018) and Creswell and Creswell's (2018) recommendations of a total of at least eight and three participants for exploratory and case study research, respectively.

Other pragmatic considerations by the researcher, including the availability of participants, resource constraints, the scope of the study and the nature of the phenomenon being explored, contributed to the decision on the sample size (Baker & Edwards, 2012; Luborsky & Rubinstein, 1995; Marshall, 1996; Vasileiou et al., 2018). Even though a total sample size of 15 was predetermined by the researcher, 13 participants comprising five researchers, five AREC members and three AREC administrators were ultimately recruited and participated in the study. This was due to the researcher's inability to recruit the expected number of AREC members and researchers from AREC 3, where only one researcher and AREC member were recruited instead of the two planned for each. A relatively low number of researchers and AREC members from AREC 3 met the inclusion criteria, and the unavailability of those who met the inclusion criteria played a role in participant recruitment. Still, the relatively small sample size used for this study is justifiable since the richness of the data was complemented by using multiple data collection methods (Creswell, 2016; Creswell & Creswell, 2018), as described in Section 4.10 of this chapter.

4.9 Recruitment of Participants

Participant recruitment started after obtaining ethics approval (Appendix 4.1) and institutional permission (Appendix 4.3) from the three research-producing institutions. Using the inclusion criteria described in Section 4.7.1, the gatekeepers, including the head of administration and AREC administrators at the three institutions, assisted the researcher in identifying suitable prospective participants for the study. After obtaining the prospective participants' consent to share their contact information with the researcher, the gatekeepers in each institution provided the researcher with the email addresses and telephone numbers of five prospective participants.

Following the purposive sampling method, the researcher first established rapport with the prospective participants to make them feel comfortable and valued, and to increase their willingness to participate in the study (Stake, 2010). To this end, the researcher first sent introductory emails to all prospective participants to introduce himself and the study to them. In this email, the purpose of the study, why they were being asked to participate, and how the researcher obtained their contact details were explained. They were also presented with the participant information sheet and consent form and requested to read, sign, and return the signed consent form to the researcher if they agreed to participate in the study or contact the researcher if they had any questions about participating. Second, the researcher followed up the email with a phone call, displaying a friendly and respectful attitude, to establish personal contact with the prospective participants and to build rapport before the face-to-face semi-structured interviews (Creswell, 2016). This recruitment approach was adopted considering that the prospective participants were well-educated and knowledgeable in research and consenting procedures. During the phone calls, the researcher addressed any concerns and questions raised by prospective participants. Throughout this process, four prospective participants who were contacted could not participate in the study; two declined, and the other two could not avail themselves for the interview. The two who declined were replaced, but the other two could not be replaced due to time constraints.

4.10 Data Collection

The researcher collected data through various methods as Creswell and Creswell (2018) recommend, including semi-structured interviews, naïve sketches and reflective diaries to give the researcher a deep understanding of the participants' experiences with the research phenomenon. Using the three data-gathering methods improved the study's credibility and allowed the researcher to generate a comprehensive view of the phenomenon under investigation (Crowe et al., 2011; Fusch et al., 2018).

As an embedded case study, data were collected from three categories of participants across three research-producing institutions. The data were collected sequentially, moving from one institution to the next. Thus, data were collected from 29 December 2022 to 26 August 2023, first from participants in AREC 1, then from AREC 2, and finally from AREC 3. This long duration (approximately eight months) of data collection was attributed to the unavailability of participants due to their busy schedules and the difficulty encountered by the researcher in identifying participants who fit the inclusion criteria in AREC 3. The following methods were used to collect data.

4.10.1 Semi-structured interviews

Semi-structured interviews are part of qualitative data collection methods, where predetermined questions are complemented with open-ended, ad-hoc follow-up questions that are initiated by the interviewer during the interview process (Ahlin, 2019). This method was ideal for this study as it provided a platform for the researcher to understand participants' viewpoints, experiences, and meaning (Ahlin, 2019; Braun & Clarke, 2006, 2022; Evans & Lewis, 2017). Semi-structured interviews brought out dense and detailed insight and understanding of the existing governance systems and practices for the ethical use of animals in scientific studies in Ghana from the participants' point of view (Ahlin, 2019). The semi-structured interview guide (see Appendix 4.5) was designed using open-ended questions that solicited detailed information regarding participants' experiences. As suggested by Ahlin (2019), this only served as a guide and follow-up questions (probes) were asked to solicit

additional and detailed information from participants. Asking follow-up questions allowed the participants to provide detailed information by expanding and explaining the information they shared to clarify the points they raised.

The semi-structured interviews were conducted in person, in a face-to-face setting, and at a location convenient for the participants. For most participants, the semi-structured interviews were conducted in their offices. Due to their busy schedules, the researcher met others at various places (hotel conference rooms, private homes) preferred by the participant and convenient for the semi-structured interview, where privacy could be assured to ensure confidentiality and to encourage the participants to speak freely and openly about their experiences.

When conducting the semi-structured interviews, the researcher sat opposite the participant, facing the participant directly in a relaxed way, with an open body posture to ensure participants were comfortable. For the interviews conducted from December 2022 to March 2023, the researcher followed the required COVID-19 prevention protocols, including the wearing of a face mask by the researcher and participants, keeping a physical distance of at least two metres between the researcher and participants, and the use of 70% alcohol-based sanitiser by the researcher and participants before commencing the interviews. The researcher did not observe this protocol during interviews conducted after March 2023, when most Ghanaians had been vaccinated against COVID-19 and the COVID-19 protocols had been lifted by the Ghanaian government.

Each interview lasted for approximately 30 minutes on average. The researcher used digital audio recorders to record and capture all information gathered during the interviews. The recordings were stored on a password-protected computer for transcription and analysis purposes.

4.10.2 Naïve sketches

Naïve sketches are a written self-reporting exploratory approach of data collection where participants relate their experiences and perceptions by writing their responses

to specific questions (Chokwe & Wright, 2012; Freeks, 2020; Naicker et al., 2014; Giorgi, 1985). Naïve sketches were used to collect descriptions of individuals' experiences related to the existing governance systems and practices for the ethical use of animals in scientific studies in Ghana. The naïve sketches (see Appendix 4.6 for a sample naïve sketch) offered an additional data source to validate the data received during the interviews. This strengthened the data's authenticity and trustworthiness (Section 4.11) by adding narrative depth to the study (Amin et al., 2020; Lincoln & Guba, 1986; Moagi, 2014). Using the naïve sketches allowed participants to reflect on their experiences with animal research ethics governance systems and practices in Ghana and aimed to achieve in-depth answers.

To obtain the naïve sketch, a copy of the interview guide was sent electronically to all participants via email at least two weeks before the semi-structured interview. The researcher requested the participants to write down their answers and return them electronically through email before the face-to-face interviews were conducted. Using a naïve sketch allowed participants to see the interview questions and gave them adequate time to reflect on the questions to draw meaning from their experiences. The use of naïve sketches also made the participants feel at ease during the interview (Crawford, 2019) since they already knew the scope of the interview. Twelve out of the 13 naïve sketches expected were received by the researcher; they amounted to 21 pages (Times New Roman font type, font size 12 with single spacing) in total. Most participants, however, provided very short answers to the questions. Participants had difficulty responding to the question on research ethics governance systems and research ethics governance practices. Most could not distinguish between the two, so some did not respond to the question on research ethics practices. In contrast, others simply copied and pasted the same answers they provided to the research ethics governance systems question to answer the question on research ethics governance practices. This allowed the researcher to clarify these questions during the semi-structured interviews to solicit detailed responses.

4.10.3 Reflective diary

As part of this study, the researcher (author of the thesis) kept a reflective diary (see Appendix 4.7 for a sample of a reflective diary) from the start of data collection until its end, in accordance with the suggestion by Travers et al. (2020) that reflective diaries need to be kept for a period long enough to capture every phenomenon of interest. The reflective diary was an additional data source to provide multiple perspectives and a more comprehensive view of the governance of ethical animal use for scientific studies in Ghana. The reflective diary enabled the researcher to provide in-depth insight into participants' perspectives by capturing subjective experiences, thoughts and feelings about the interviews and experiences shared by participants.

An A5 size (5.83 × 8.27 in) notebook was used for this purpose to make it easy for the researcher to carry around for timely and convenient entry of reflections (Parekh et al., 2021; Travers et al., 2020; Ukrop et al., 2019). Prompts for practising reflection and keeping a diary, as described by Travers et al. (2020), were adapted for this study. The prompts were stated as the following questions:

1. *What happened?* The researcher documented a general description of the interview process. In answering this question, the researcher described the interview that was conducted, who was interviewed, where and when the interview was conducted, and any other issues prior to the start of the interview worth stating, such as the ease or difficulty with which the interview date and time were scheduled.
2. *What was the researcher thinking or feeling at the time?* This prompt helped the researcher to document his feelings during the interview. What was running through the researcher's mind and how he felt while conducting the interview was documented. These included his views regarding whether the participants felt comfortable responding to some of the questions, whether participants were sharing their experiences or what they felt was a good story to tell, and the kinds of probing questions to ask the participants to make them share more of their experiences.

3. *What was good and bad about the experience?* The researcher reflected on the entire interviewing experience with each participant and documented his thoughts about the event, evaluating his experience by looking at both positive and negative experiences. Items documented included the suitability of the interview location, how cordial and open the interview was, how openly the participant responded to the questions, and examples of their personal experiences.
4. *What else can you make of the situation?* This prompt enabled the researcher to reflect more deeply on the interview experience and analyse the situation in deeper detail to identify and document other observations during the interview process. This served as a way for the researcher to self-assess whether the objective of the interview was achieved.
5. *What else could you have done, or what would you have done differently?* At this point, the researcher reflected on and documented his thoughts on what could have been done while conducting the interview to improve the outcome. The researcher identified some aspects of the interview, such as probing, guiding the conversation, or certain information that should have been provided, which were omitted. This helped the researcher to reflect and plan for the next interview, learning lessons from the interview to improve upon the ensuing interviews to get the best out of the interviews.

The diary entries were mostly written immediately after each interview, accompanied by a date. In a few instances where more than one interview was conducted on the same day, the entries were written later in the evening or the following day. The researcher ensured that the diary entries for each interview were written within 24 hours after the interview to minimise potential memory errors and recall bias (Parekh et al., 2021; Travers et al., 2020).

4.11 Role of the Researcher in Data Collection

The researcher plays a critical role in all qualitative research and acts as the primary data-gathering instrument because of their active engagement in all aspects of the research, from planning to data collection to dissemination (Creswell & Creswell, 2018; Marshall & Rossman, 2016; Stake, 2010). As a researcher who sought to generate a

deeper understanding of existing animal research ethics governance systems and practices in Ghana, the researcher acknowledged his position as a data collection instrument and was conscious of the possible biases this poses and did everything in his power to prevent bias (Creswell & Creswell, 2018; Johnson et al., 2020). Qualitative researchers are advised by Creswell and Creswell (2018) to formally disclose their biases before beginning their research. Leedy and Ormrod (2021) also emphasised the necessity for qualitative researchers to recognise and openly admit their biases.

Having served as an administrator of a research ethics committee in one of the institutions for four years and in his role as the president of the Ghana Association of Administrators of Research Ethics Committees (GHAAREC) at the time of conducting the study, the researcher already had a good rapport with administrators of research ethics committees in Ghana, including ARECs. Two of the AREC administrators interviewed were known professionally to the researcher before the conduct of this study. This placed the participants in a situation where they could potentially provide responses that they perceived to be socially acceptable but not wholly reflective of their experience (Bergen & Labonté, 2020). To prevent this outcome, the researcher established a good rapport with the participants as part of the recruitment and informed consent process that created an atmosphere conducive for honest reflection on their experiences. The researcher also phrased questions in a manner that allowed the participants to feel accepted and comfortable to provide honest responses no matter what their answer was. The researcher assured the participants of their anonymity in reporting and that the study was being conducted to learn more from their experiences.

The researcher also knew some AREC members and researchers in two institutions used for the study. This background may have exposed the researcher to bias in the purposive sampling of AREC members and researchers as participants. To deal with this potential bias, gatekeepers of the embedded units (research-producing organisations) assisted the researcher in identifying prospective participants who were most suitable for the study using the inclusion criteria. Thus, the choice of participants was not only limited to the researcher's discretion but also guided by the assistance of institutional gatekeepers (see detailed description of this process in Section 4.15.1).

Also, the researcher's personal experience as an administrator of a research ethics committee in Ghana that reviewed protocols with aspects of animal use in scientific studies, and his participation in the AREC meetings of the UNISA College of Agriculture and Environmental Sciences (CAES) as an observer for two years, meant he had some beliefs or perceptions about the existing governance systems and practices for the ethical use of animals in scientific studies, which he was looking forward to confirming through the study. This is referred to as confirmation bias (Leedy & Ormrod, 2021). To address this bias resulting from the researcher's personal experience with the governance of ethical use of animals in scientific studies, the researcher made use of method triangulation procedures in data collection, where data were collected using interviews, naïve sketches and a reflective diary. Additionally, to avoid all possible biases, the researcher had a close self-examination to reflect on and describe any ideas, expectations, or cultural values that would make him more likely to interpret the evidence in a biased way (Fouché et al., 2021; Leedy & Ormrod, 2021, 2016). These ideas and expectations included the belief that researchers in Ghana were not using animals ethically for their scientific studies, and there were weak governance systems in place to ensure the ethical use of animals in scientific studies in Ghana. These ideas had the potential of influencing the researcher's expectations from the interviews but were modified prior to the interviews after careful reflection on the objectives of the study and the research paradigm employed. It was important that the researcher's biases were put aside and not allowed to interfere with the interpretation of data or the questioning of participants.

To create a conducive environment for research participants to speak freely about their personal experiences, the researcher was facilitative, systematic, and thorough in interviewing the participants (Fox, 2009; Leedy & Ormrod, 2021). The researcher first initiated an informal discussion on a general topic to establish rapport with the participants to make them feel at ease and comfortable to have a conversation with the researcher on the research topic. Since rapport creation was initiated earlier through email exchanges and telephone conversations between the researcher and the participants at the stage of administering the informed consent and naïve sketches prior to the face-to-face interviews, creating this conducive environment was easy with all the participants. However, the researcher encountered some difficulties conducting

a systematic interview with a few participants who became carried away with the topic, and the researcher had to draw them back to the issues being discussed in order to address the study's objectives. Throughout the interview process, the researcher also endeavoured to maintain neutrality by avoiding offering an opinion on any issues (Creswell & Creswell, 2018; Fox, 2009). This situated the researcher in a non-expert role and allowed the participants to freely discuss their experiences with ease.

4.12 Data Analysis

This section explains the processes followed in analysing the data obtained from the semi-structured interviews and naïve sketches.

4.12.1 Transcription of interviews

The transcription procedure commenced immediately following the completion of each audio-recorded interview. This approach was adopted to maintain the data's contextual relevance and enhance the researcher's familiarity with the content. The researcher transcribed the audio-recorded interviews verbatim in Microsoft Word for data analysis. The researcher listened to each interview recording several times and did a verbatim transcription of each interview to produce transcripts that were not only accurate but also reflective of the participants' voices and experiences. After producing the transcripts of each interview (see Appendix 4.8 for a sample transcript), the researcher edited the transcripts by listening to the audio recordings again while simultaneously reviewing the transcripts. The editing process involved correcting any inaccuracies in transcription, such as incorrect punctuation, to ensure that the transcripts were accurate and corresponded verbatim with the audio recordings. The transcription process was relatively straightforward, as the audio was primarily composed of a one-on-one dialogue, which typically ranged from 21 to 42 minutes.

To protect participants' privacy and confidentiality, all audio files and transcriptions were assigned unique identification codes, and any identifying information was redacted from the transcripts. Data management protocols were strictly adhered to by

the researcher by ensuring that all materials were securely stored on a password-protected computer, which is only accessible to him.

4.12.2 Thematic analysis

Data analysis in case study research focuses on understanding, describing, and explaining the phenomenon being investigated in the context of the selected case (Miles et al., 2014; Yin, 2018). The data acquired in this study were methodically shortened, restructured, categorised, and analysed to allow the researcher to present the findings for this embedded single case study (Budiyanto et al., 2019; Staa & Evers, 2010). The case was treated as a single entity for the inferences of data contained in it. Data were analysed within the embedded units (AREC 1, AREC 2 and AREC 3) separately (within case analysis) (Hudon et al., 2022; Yin, 2018) to provide in-depth contextual knowledge and descriptions of key stakeholders' experiences with the governance systems and practices for the ethical use of animals in scientific studies in Ghana. The data were also analysed across the three embedded units (cross-case analysis) (Stake, 2010; Yin, 2018) to gain an in-depth description and understanding of participants' experiences. This helped provide insights into the differences and similarities in the experiences of participants in each embedded case (Saunders et al., 2023) and gave a holistic picture of the research phenomenon, while it allowed for an in-depth understanding of both individual ARECs and collective dynamics of ARECs in Ghana.

The data were analysed by employing a thematic analysis method. The thematic data analysis method for qualitative studies helps researchers identify and make sense of the similarities in how a topic is discussed or written about (Braun & Clarke, 2012). The thematic data analysis method is flexible and allows researchers to focus on analysing meaning across the entire dataset or closely examining a single component of a phenomenon being explored (Braun & Clarke, 2012). The thematic data analysis method was found to be the most appropriate for this study, given that the researcher adopted an exploratory embedded single case study design to explore the experiences of key stakeholders with the existing governance systems and practices for the ethical use of animals in scientific studies in Ghana. The approach allowed the

researcher to identify and make sense of similarities among participants' experiences within each AREC and across the three ARECs under study. The choice of thematic analysis method also helped provide a deep contextual insight (Braun & Clarke, 2006, 2022) that helped the researcher understand key stakeholders' experiences with the existing governance systems and practices for the ethical use of animals in research in each of the ARECs. Since the current study lacked prior research to draw from, the use of thematic analysis was very beneficial, as it allowed the researcher to extract important information that helped in the development of a proposed governance framework for the ethical use of animals in scientific studies (Saunders et al., 2023).

The six-step process developed by Braun and Clarke (2006) was followed to analyse the data of each embedded case separately. Although this is usually an iterative process in most qualitative data analyses, it is presented sequentially as shown in Figure 4.2 and described as follows:

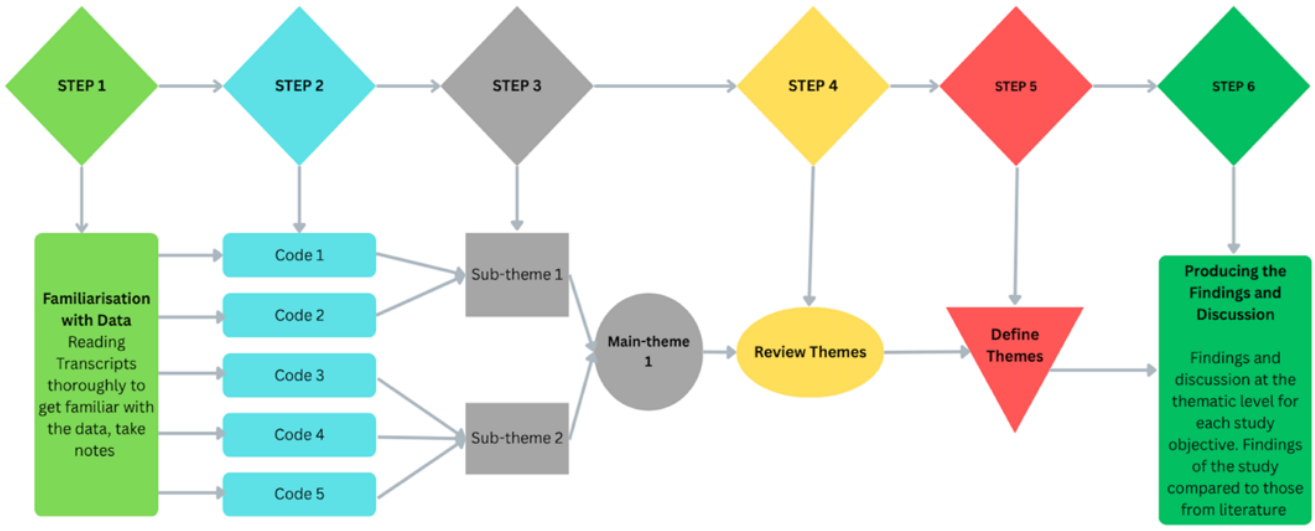


Figure 4.2: Thematic data analysis process followed

Source: Author's adaptation from Naeem et al. (2025) following the 6-step data analysis process of Braun and Clarke (2006)

- ***Step 1: Familiarisation with data***

In this step, the researcher immersed himself in the data by reading and rereading the interview transcripts and naïve sketches, as well as listening to the audio recordings until he reached a state of intimate familiarity with the data (Braun & Clarke, 2012;

Saunders et al., 2023). While reading the transcripts and listening to the audio recordings, the researcher highlighted potential areas of interest by making notes. The note-taking enabled the researcher to analyse the transcripts more critically, analytically and with reflection on the meaning of the data. The notes functioned as triggers for the process of coding and the development of themes (Braun & Clarke, 2012).

- ***Step 2: Coding***

The researcher adopted an inductive approach to coding the data. With this approach to coding, instead of using an existing theory or principle to generate codes, the codes were directly derived from the content of the data (Braun & Clarke, 2012). The coding process was facilitated through the use of Atlas.ti version 23, computer-assisted qualitative data analysis software (CAQDAS). The CAQDAS was used because it is a fast and efficient way of storing and locating qualitative data (Creswell, 2014; Creswell & Creswell, 2018). It also helped improve the rigour, validity, transparency, and reproducibility of the study (Ronzani et al., 2020).

The transcripts were imported into the ATLAS.ti version 23 software to code the data for analysis. The researcher thoroughly read each transcript again and provided labels for any feature of the data identified to have potential relevance to answering the research questions. During the coding process, the researcher paid attention to the meanings in the text and inferences from the data that reflected the participants' meanings and experiences. Following Braun and Clarke's (2012) advice, the researcher thoroughly read the data again after creating the initial round of codes in order to either find new codes or recode previously coded data. This was an attempt to guarantee that all the data had been fully coded.

To ensure the quality of the coding process and the codes generated from the transcriptions, an independent co-coder supported the researcher in co-coding and validating the generated codes. After signing a confidentiality agreement, the researcher transferred all transcripts, interview guide and a summary of the study, including the background, aim, objectives, and methodology, to the co-coder via email. The co-coder inductively generated codes using ATLAS.ti version 23. In addition to

the inductive personal coding approach, the co-coder also generated codes using the artificial intelligence coding feature of the ATLAS.ti version 23 software package. The artificial intelligence coding was used solely to benchmark the researcher and co-coder's coding, but was not used as the main coding framework for the data. Following the coding process, the researcher and the independent co-coder undertook, they had a consensus discussion where the findings from the co-coder and those of the researcher were compared to check for any differences in the outcomes. These differences were discussed, and the final list of codes to be used for the study was agreed upon. Summary tables displaying the codes derived from the data are provided in Appendices 5.1 to 8.4.

- ***Step 3: Generation of themes***

In this step, the codes identified by the researcher in the previous step were grouped into subthemes (categories) and further grouped into main themes. The subthemes were generated by reviewing the codes to identify areas of similarity and overlap between the codes. Through this process, the researcher identified broad topics around which the codes cluster and these codes were put together to form categories that reflect and describe a coherent, meaningful pattern in the data. The researcher explored different ways of combining the categories generated to form themes.

Braun and Clarke (2012) recommend that two to six themes be developed for each distinct research question to prevent having too thin or overly cohesive themes. The researcher therefore categorised the themes into two: main themes and subthemes. The research questions informed the main themes, and for every research question, a minimum of two and a maximum of four subthemes were generated to guarantee that the themes were given enough depth and detail to preserve the richness and complexity of the data. The researcher then looked at the relationships between the developed themes to determine how effectively they were combined to present the overall story in the data that addressed the research questions. A thematic table was then developed to outline the main themes and subthemes developed (see Appendices 5.1, 5.2, 5.3, 6.1, 6.2, 6.3, 7.1, 7.2, 7.3, 8.1, 8.2, 8.3).

- ***Step 4: Review of themes***

Step 4 of the thematic analysis process was a quality-checking step, which entailed an iterative process where the themes developed in step 3 were reviewed by the researcher to ensure that they offered appropriate descriptions of the data and addressed the study's objectives. During this step, the researcher worked both inductively and deductively (Creswell & Creswell, 2018) by moving back and forth between the data, categories and themes to ensure that a distinctive and coherent set of themes was established. Throughout this process, some of the initial themes generated were either discarded, collapsed or split, and some new themes were generated (Braun & Clarke, 2012). The researcher then conducted a final reading of the transcripts to determine whether the themes meaningfully capture the important elements of the entire dataset in relation to the research questions.

- ***Step 5: Defining and naming themes***

A successful thematic analysis, according to Braun and Clarke (2012), should have themes that directly answer the research questions, have a single focus, and are connected but distinct from each other. This step was therefore aimed at ensuring that the developed themes were well defined. The researcher carried out another review of the developed themes and a distinctive definition of each theme to ensure each of the themes is unique, focused and directly addresses a research question. Summary tables showing the defined themes generated from categories and codes derived from the data are provided in Appendices 5.1, 5.2, 5.3, 6.1, 6.2, 6.3, 7.1, 7.2, 7.3, 8.1, 8.2, and 8.3.

- ***Step 6: Producing the findings and discussion***

This step was aimed at providing a compelling story about the data based on the analysis conducted and making an argument to answer the research questions. Data triangulation was used as a way of validating participants' responses by using different sources of data (researchers, AREC members and AREC administrators) from each of the embedded cases studied (a detailed description of triangulation is presented in Section 4.11). This step also involved selecting quotes to support the themes and produce a compelling argument to answer the research questions. The researcher drew on quotes from across all categories of participants in each embedded case to

show the coverage of the theme rather than using quotes from only one category of participants (Braun & Clarke, 2012).

To avoid repetition in reporting on the findings, the researcher integrated literature re-contextualisation and discussion into the presentation of findings to create a "findings and discussion" chapter rather than having separate chapters for findings and discussions. The findings of the study were compared to those from similar studies that were published in the literature (re-contextualisation of literature). This made it easier to highlight this study's distinct findings. This approach, according to Moule and Goodman (2016), is appropriate for inductive qualitative research in which the literature merely serves to corroborate the study's findings rather than guide the study itself. Findings and discussions at the thematic level for each of the study's four objectives for this phase are presented in separate chapters (Chapters 5 to 8).

To report the findings of this study, qualitative, descriptive and narrative writing styles were followed by the researcher. Information contained in the report was de-identified, where neither the names of the ARECs nor the names of the participants were stated in the report to identify participants' specific statements. Instead, codes were used to represent participants and ARECs.

4.13 Operationalisation of the Study

The study's operationalisation outlines the methods by which each of its five objectives were investigated by the researcher. Operationalisation of the study, presented in Table 4.1, is viewed in terms of the methods used for gathering data relevant to addressing each objective and the analysis method that was followed to analyse the data. The study's objectives were operationalised through specific questions that were posed to all participants to explore their experiences of the ethical use of animals in scientific studies in Ghana.

Table 4.1: Operationalisation of the study

Questions Asked to Address a Specific Research Objective	Method of Data Gathering	Method of Data Analysis
Objective 1: To explore and describe key stakeholders' understanding of the concept of 'animal research ethics governance'		
1.1 Please provide me with a brief overview of your involvement in animal research.	Semi-structured interviews Naïve sketches Reflective diary	Thematic analysis of transcribed data
1.2 Could you please tell me how familiar you are with animal research ethics?		
1.3 How do you understand the term 'animal research ethics governance'?		
1.4 (a) How do you think the ethical use of animals in scientific studies is currently governed in Ghana? (b) In your institution?		
Objective 2: To explore and describe key stakeholders' experiences with the existing research ethics governance systems that promote the ethical use of animals in scientific studies in Ghana		
2.1 According to you, which governance systems promote the ethical use of animals in scientific studies?	Semi-structured interviews Naïve sketches Reflective diary	Thematic analysis of transcribed data
2.2 What has been your experience with the existing animal research ethics governance systems to promote the ethical use of animals in scientific studies?		
Objective 3: To explore and describe key stakeholders' experiences with the existing research ethics practices that promote the ethical use of animals in scientific studies in Ghana		
3.1 According to you, which research ethics governance practices promote the ethical use of animals in scientific studies?	Semi-structured interviews Naïve sketches Reflective diary	Thematic analysis of transcribed data
3.2 What has been your experience with the existing research ethics governance practices in place in your institution to promote the ethical use of animals in scientific studies?		

Questions Asked to Address a Specific Research Objective	Method of Data Gathering	Method of Data Analysis
Objective 4: To explore and describe the key stakeholders' suggestions to promote the ethical use of animals in scientific studies in Ghana		
4.1 (a) How do you think the ethical use of animals in scientific studies can be promoted in Ghana? (b) In your institution?	Semi-structured interviews Naïve sketches Reflective Diary	Thematic analysis of transcribed data
4.2 What do you think an animal research ethics governance framework to promote the ethical use of animals should include or address?		

Source: Author's construct, 2025

4.14 Procedures to Confirm Trustworthiness and Authenticity

The way researchers persuade themselves and their readers that qualitative studies' findings are worth paying attention to is referred to as research trustworthiness (Guba & Lincoln, 1989). According to Korstjens and Moser (2018), as well as Creswell and Creswell (2018), credibility, transferability, dependability, and confirmability are the quality criteria to be observed in all qualitative studies to confirm trustworthiness in qualitative studies. They add that reflexivity should be an integral part of the study to ensure the transparency and quality of qualitative studies.

Authenticity in qualitative research is achieved when the researcher accurately, thoroughly and faithfully reports the experiences of participants (Amin et al., 2020; Hoque et al., 2017; Polit & Beck, 2017). Lincoln and Guba (1986) contend that in order to achieve authenticity, the conditions of fairness, ontological authenticity, educative authenticity, catalytic authenticity and tactical authenticity must be achieved. To prove the credibility and the accuracy of the findings of this study, the following measures were taken by the researcher:

4.14.1 Credibility

Credibility refers to the researcher's activities that raise the possibility of the study's findings being trustworthy (Guba & Lincoln, 1989). When readers recognise the experience described in the literature when presented with the same event, and when participants recognise the research findings published as their experiences, credibility is established (Guba & Lincoln, 1989; Johnson et al., 2020; Lincoln & Guba, 1986).

From the very beginning of the study, during data collection to the writing of the thesis, the researcher employed strategies to ensure the credibility of the study. The researcher used prolonged engagement, reflexivity, peer examination, triangulation, and member checking (Hoque et al., 2017) to assure the study's credibility, as described below:

- *Prolonged engagement* – For a rich, in-depth contextual understanding of the key stakeholders' experiences with the governance systems and practices for the ethical use of animals in scientific studies in Ghana, the researcher spent sufficient time engaging participants in interviews during the empirical phase of this study (Creswell & Creswell, 2018; Guba & Lincoln, 1989). An average of 45 minutes was spent with each study participant; about 15 minutes on average was spent to engage the participants in conversations to build trust and rapport (Guba & Lincoln, 1989) and to make the whole interview process informal and enable them to express themselves more freely. The remaining 30 minutes on average were used to conduct the semi-structured interviews. During this process of prolonged engagement, the researcher encouraged participants to provide examples for their statements. In addition, the researcher did a lot of probing and asked follow-up questions (Korstjens & Moser, 2018), which was also meant to get a very accurate account from the participants (Creswell, 2016; Yin, 2016). The researcher spent the rest of the 15 minutes taking notes before and after each interview.

- *Reflexivity* – Reflexivity relates to the researcher's participation in a qualitative study in terms of biases and the importance of critical reflection during data collection, analysis and interpretation (Korstjens & Moser, 2018). Reflexivity enables

researchers to deal with the inherent influence that they bring to a qualitative study (Amin et al., 2020). To address this inherent influence, the researcher kept a reflective diary throughout the research process, as described in Section 4.7 (also see Appendix 4.7 for a sample of the reflective diary).

- *Peer Examination* – Peer examination was a critical component of the trustworthiness strategy employed in this study. Peer examination is a procedure of identifying a peer who is autonomous of the research and has the goal of reviewing the study's findings and asking questions about the study (Creswell & Creswell, 2018). The purpose of employing peer examination in this study was to provide an external perspective on the research process, identify potential biases, and ensure that the interpretations made during data analysis were grounded in the data. Throughout the research process, the academic supervisors of the researcher and a post-doctoral research fellow at a university in Ghana, who is independent of the study and well-versed in qualitative research, reviewed the analysis and reports on an ongoing basis. The researcher provided them with the research proposal, interview transcripts, and preliminary findings of the study. The researcher particularly requested the peer reviewers to help identify any evidence of researcher bias, confirm whether the data adequately portray the phenomenon being investigated, and identify errors of interpretation (Polit & Beck, 2017). The peer reviewers provided both verbal and written feedback to the researcher. The feedback received was then incorporated into the final analysis and write-up. Using peer examination enhanced the quality of the research and promoted the sense of accountability and transparency in the research process. Additionally, the researcher made oral and poster presentations at scholarly conferences as part of the peer examination process, where questions and suggestions were considered in the study. By employing peer examination, the researcher contributed to reducing the risk of researcher bias.

- *Triangulation* – Triangulation is the process of putting data from different sources together to validate the core themes identified in the research (Merriam & Tisdell, 2016). Triangulation is achieved when the researcher uses different strategies to collect data for the same study (Creswell & Creswell, 2018; Streubert & Carpenter,

2011). Triangulation improves a study's reliability and validity by using various approaches in a single study, since the benefits of one approach compensate for the weaknesses of another (Streubert & Carpenter, 2011).

Creswell (2016) asserts that triangulation happens spontaneously during coding, when a researcher searches through several sources of data to discover validations for themes. The four types of triangulation are data triangulation, investigator triangulation, theory triangulation, and methods triangulation (Denzin & Lincoln, 2018; Fusch et al., 2018; Yin, 2016). Investigator triangulation, method triangulation and data triangulation were employed in this study. To ensure investigator triangulation, the researcher engaged the services of a co-coder (Korstjens & Moser, 2018), who is experienced in qualitative research, to assist in ensuring that codes and themes generated from the interview transcripts were consistent with the data. The codes and themes generated by the researcher and those generated by the co-coder were triangulated to check for any differences in the outcomes. These differences were discussed, and a final list of codes and themes was agreed upon. The researcher also employed method triangulation (Korstjens & Moser, 2018), where semi-structured interviews, naïve sketches and a reflective diary were used as data collection methods, to collect information about the experiences of key stakeholders with the governance systems and practices for the ethical use of animals in scientific studies in Ghana, enabling the researcher to construct a dense description of the phenomenon that reflects the reality. Data triangulation was also used by relying on the data from researchers, AREC members and AREC administrators from the three ARECs. To provide a cogent argument for the generated themes, the researcher triangulated the data from various sources during the data analysis process (Creswell & Creswell, 2018) by looking at the evidence from each source.

- *Member Checking* – Member checking is used to measure the level of accuracy of the findings of a qualitative study (Creswell & Creswell, 2018). It involves taking the descriptions or themes generated from interviews back to participants for participants to ascertain their accuracy. Member checking was employed to solicit feedback from participants regarding the accuracy and interpretation of the data.

After the initial analysis, the summary of the findings was thus shared with participants to review. Participants were to read and verify the accuracy of the findings in relation to their shared experiences. To enable the researcher to stay within the timelines for completing the study, participants had two weeks to provide their feedback. The researcher followed up the email with phone calls to remind them to read and provide their feedback on the report. Despite following up on the emails with phone calls, only one participant provided feedback via email. To ensure that participants provided feedback on the study's findings, the researcher called the remaining participants to discuss the findings and solicit their feedback telephonically. The researcher was able to receive feedback from eight out of the 13 participants by employing this strategy due to the unavailability of other participants. This process ensured that participants' voices were accurately represented in the study. Consequently, the feedback received from participants aided the researcher in refining the analysis, thereby improving the credibility of the findings.

4.14.2 Transferability

The likelihood that the findings of a qualitative study will be useful to others in similar conditions (Streubert & Carpenter, 2011) and easily applied to other situations (Korstjens & Moser, 2018) is referred to as transferability. The researcher ensured transferability by providing a rich, dense and detailed contextual description (Korstjens & Moser, 2018; Creswell & Creswell, 2018) of the study's methodology and participants' experiences with the governance systems and practices for the ethical use of animals in scientific studies in Ghana. This helped to make the study more meaningful to readers to enable them to make an informed decision about the transferability of these findings to their unique settings.

4.14.3 Dependability

Dependability refers to the degree of consistency that the findings of a study exhibit across time and researchers (Hays et al., 2016). When the procedures used in conducting a particular study are fully and thoroughly explained, the researcher is

increasing the dependability of the study (Korstjens & Moser, 2018). Streubert and Carpenter (2011) also posit that once the researcher is able to demonstrate how trustworthy a study's findings are, its dependability will have been proven.

To achieve dependability in this study, the researcher provided a detailed description of the study's methodology and kept an audit trail of the research process (Carcary, 2009, 2020). Keeping an audit trail entailed that the researcher kept a detailed account of all actions undertaken in the study and stored information on all the research processes and data generated. Audio recordings, verbatim transcripts, field notes, reflective diaries, naïve sketches, and consent forms were all kept in their original states to be made available for any checks to confirm dependability. The researcher also had regular debriefing sessions with his supervisors (Carcary, 2009, 2020) to update them on his progress, provide a detailed description of the research process, and share samples of the data (audio recordings, transcripts, reflective diaries) with them for their review. The frequent debriefing sessions made it easier for the supervisors to ascertain how the researcher was going about the study, and identified shortfalls were then quickly corrected.

4.14.4 Confirmability

Korstjens and Moser (2018) define 'confirmability' as the ability of non-study team members to confirm research findings. The aim of confirmability is to establish neutrality in data interpretations and ensure findings are not based on the researcher's preferences and perspectives. Confirmability demonstrates that the researcher's interpretations and conclusions are clearly deduced from the collected data (Korstjens & Moser, 2018; Nowell et al., 2017). Confirmability was established for this study through data triangulation (presented in Section 4.11.1) and using a reflective diary. Using the reflective diary assisted the researcher in providing detailed notes on decisions made during the research process.

4.14.5 Authenticity

The procedures used by the researcher in achieving authenticity are described below:

- *Fairness:* Fairness is regarded as the most crucial factor in determining authenticity (Amin et al., 2020; Lincoln & Guba, 1986). To ensure fairness in conducting this study, the researcher ensured that all ideas, concerns and opinions of participants were captured in the study's findings (Denzin & Lincoln, 2018). No aspect of participants' experiences was removed from the findings. The researcher took all reasonable precautions to prevent a scenario where some values are downplayed while others are emphasised. The researcher therefore took different approaches to dealing with the fairness requirement.

  First and foremost, the researcher took cognisance of his role as a data collection instrument in this qualitative study, was conscious of any biases he may have, and did everything in his power to prevent them (Creswell & Creswell, 2018; Johnson et al., 2020). Considering that an interpretive research paradigm was being used, the researcher also reflected on his position as a researcher and the necessity of being transparent about his past viewpoints and convictions (Denzin & Lincoln, 2018). So, over the course of the research, the researcher kept a reflective diary in which all critical self-reflections were recorded (Denzin & Lincoln, 2018) as described in Section 4.7. Also, to ensure fairness, a fair selection procedure was used in selecting participants (described in detail in Section 4.6). The researcher took all selected participants through the informed consent process so they could voluntarily decide to participate in the study (described in Section 4.12). The same interview guide served as the basis for all interviews, though it was modified based on evolving meanings and whether the interview was conducted for researchers, AREC members, or AREC administrators. This interview guide provided everyone who participated in the study the opportunity to voice their thoughts on various facets of the phenomenon.

  To get authentic responses to the interview questions, the researcher asked participants for concrete examples of their experiences and also allowed participants the freedom to use their native languages if they felt better able to express themselves in their native language, as participants tend to produce more authentic outcomes using their native language than using a second language

(Hoque et al., 2017). During the data collection process, the researcher remained respectful of the contexts/settings of participants by avoiding being judgemental but open to learning about their experiences within their individual contexts. Since authenticity also hinges on proper recording of data (Hoque et al., 2017), in addition to audio recording and verbatim transcription of the recorded interviews, a field notebook was kept where detailed notes of all the researcher's thoughts were recorded throughout the data collection process (described in Section 4.7). During the analysis of interviews, the researcher used the same interpretivist theoretical approach for all interviews and made all attempts at clarifying and honouring constructions in a balanced, impartial way, as attested by different participants (Lincoln & Guba, 1986). A thick description of the analysis process was provided to enable all readers to see how the researcher proceeded in analysing the data, to enable them to evaluate the authenticity of the study (Amin et al., 2020). The researcher included direct quotes from the interviews and naïve sketches in the final report to enable readers to easily determine the authenticity of the study. The researcher also made the final report available to participants to confirm whether they had been fairly represented in the report.

- *Ontological authenticity:* To ensure ontological authenticity (Peck & Mummery, 2023), the researcher first built a trusting relationship with all participants and encouraged them to share their rich experiences and perspectives on the governance systems and practices for the ethical use of animals in scientific studies in Ghana, as there was no *a priori* expectation. This created a relaxed environment where participants felt comfortable to freely share their experiences. The researcher also kept an open mind and a sense of curiosity to learn from the experiences and knowledge of the participants throughout the interview process through probing and prolonged engagement.

- *Educative authenticity:* The researcher employed member checking and peer examination throughout the research process (Peck & Mummery, 2023; Shannon & Hambacher, 2014), as described in Section 4.9.1.

- *Catalytic authenticity:* Considering the nature and purpose of this study, apart from the questions requesting participants to provide their thoughts on what could be done to improve the governance of scientific studies using animals in Ghana and their suggestions of what a governance framework aimed at ensuring the ethical use of animals in scientific studies in Ghana should contain, measures for catalytic authenticity (Peck & Mummery, 2023) were not directly employed. The questions asked during the interviews made participants think about possible actions to take to improve the ethical use of animals in their respective institutions, although there was no action plan requested or a follow-up on how their thoughts translated into action.

- *Tactical authenticity:* To ensure tactical authenticity (Clarke & Wright, 2020; Johnson & Rasulova, 2016; Shannon & Hambacher, 2014), as part of the consenting process, the researcher explained the purpose of the study, the kind of data that would be collected and what was expected of the participants. The researcher assured participants of measures put in place to ensure confidentiality (Section 4.10.1) and also employed member checking (Section 4.9.1).

4.15 Ethical Considerations

UNISA's policy on research ethics (2016, revised in 2024) was adhered to in this study. In adherence to this policy, ethical clearance was first sought from the CAES research ethics committee before a written confirmation of authority to conduct the research was given by the CAES for data collection. All COVID-19 safety guidelines, as stipulated in the UNISA COVID-19 guidelines (UNISA, 2020) and those of the study sites, were adhered to. The UNISA research ethics policy (UNISA, 2016) contains principles that are aligned with international principles for ethical conduct of research. These principles are based on the internationally known Belmont Report (1979), which protects the rights of all human participants (Miracle, 2016; Tariq, 2025). The measures taken to adhere to these principles are discussed next.

4.15.1 Respect for and protection of the rights and interests of participants

The researcher ensured that participants' autonomy (freedom to decide whether to participate or not) was upheld to promote informed and non-coerced consent (UNISA, 2016; Arellano et al., 2023). The researcher wrote a letter to each of the selected institutions requesting permission to conduct the study (see Appendix 4.2 for a sample permission letter). After adhering to institutional requirements for obtaining permission to conduct research, institutional permission was obtained from all three institutions to conduct the study (see Appendix 4.3 for a sample institutional permission letter). At one of the institutions, the gatekeepers considered the inclusion and exclusion criteria of the study and purposively selected individuals to be interviewed and included their names and contact details (email address and telephone numbers) in the permission letter. This helped the researcher to contact them directly via telephone and email to request their voluntary participation. At the other two institutions, the researcher contacted the AREC administrators, who assisted in identifying prospective participants based on the study's inclusion criteria and provided the researcher with their email addresses and telephone numbers from the AREC's database. Before providing the email addresses and telephone numbers, the AREC administrators called the prospective participants to seek their permission to provide the researcher with this information in line with accepted privacy legislation (Data Protection Act, 2012, 2012; Protection of Personal Information Act No. 4 of 2013, 2013).

The prospective participants were then contacted via telephone. The researcher introduced himself and informed them about the nature of the study and their role in the study. They were taken through the various sections of the information sheet, and their permission was obtained to send them an email containing the consent form and naïve sketch questions (see Appendix 4.4 for a sample email). Emails introducing the researcher and the study were sent to prospective participants who could not be reached by telephone, and they were provided with the consent form, interview questions for the naïve sketch, and the contact details of the researcher. Participants were allowed an average of two weeks to reflect and decide whether they would participate in the study or not.

For those who did not respond to the emails within the two weeks, a follow-up email was either sent or a telephone call was placed to remind them and to assure them of the voluntariness of their decision to participate in the study, and the fact that there would be no penalties or negative implications if they decided not to participate in the study. The prospective participants were also encouraged to ask the researcher any questions regarding their participation in the study. The researcher took all reasonable steps consistent with established research ethics guidelines to minimise the possibility of undue influence on participants' decision to participate in the study. Consequently, the prospective participants decided to participate in this study voluntarily (Yin, 2018), free from any form of inducement or coercion.

The prospective participants were requested to sign an informed consent form after they had voluntarily decided to participate in the study. Those who could not sign electronically went ahead to complete the naïve sketch and submitted it via email (see Appendix 4.6 for an example of the naïve sketch). Their consent forms were signed when they met the researcher in person before the semi-structured interviews were conducted. After signing the consent form, participants were made aware that they were at liberty to withdraw from the study at any time without the necessity of giving any reason for their decision. No participant took that option.

The participants and their respective institutions were treated with dignity and respect, and their privacy and confidentiality were maintained. The researcher adhered to all research guidelines of the institutions where data were collected. Because the permission granted by the institutions did not explicitly state that the names of the institutions could be included in the research report, these institutions were referred to as AREC 1, AREC 2 and AREC 3. Unique codes were used to identify each participant. This was done to ensure that the information that was gathered and published was not directly linked to the institutions as juristic persons or to the participants (natural persons). By password-protecting his computer and external hard drive, the researcher ensured that personal information of participants utilised for research purposes was kept safe from loss, damage, and/or unauthorised access.

Information obtained from participants was kept strictly confidential and used for the intended purposes only. The information was accessible only to the researcher and his supervisors, and the answers provided by participants were anonymised. When transcribing the audio-recordings, pseudonyms and codes were used to replace all personal references and references to any institutions. The audio recordings from interviews were labelled using the identification numbers (codes) assigned. The audio recordings were stored on a computer that is password-protected and only accessible to the researcher. In disseminating the findings of this study, no details or descriptions of participants or information that could be linked to participants were included in any part of the reports or manuscripts for publication. Personal identifiers were de-linked from study identifiers and datasets. Linked files and informed consent forms were maintained in a locked cabinet accessible only to the researcher for a period of five years. Electronic copies of the data were stored in the UNISA repository, which will be kept for a minimum period of 15 years for future research or academic purposes in accordance with the UNISA research data management policy (UNISA, 2021). Only anonymised datasets were shared. Additionally, to protect the confidentiality of the study sites, all institutional and personal identifiers on formal documents, including permission letters and ethical clearance certificates, were redacted.

4.15.2 Beneficence and non-maleficence

Beneficence, as a principle of ethics in research, is an obligation (on the part of the researcher) to make sure that the research contributes positively to the good or welfare of people (UNISA, 2016). The goal of beneficence is for the study to benefit both study participants and the scientific community (Fouché et al., 2021). Considering that beneficence aims to improve participants' well-being, it is implied that participants are aware of the potential advantages of the study's findings for them (Fouché et al., 2021).

As part of the consenting process, the possible benefits of the study were explained to participants and their respective institutions. The researcher clearly explained to participants that they may not have any direct benefit from participating in this study and that the findings of the study will result in the development of a conceptual animal

research ethics governance framework aiming to promote the ethical use of animals in scientific studies in Ghana. It was further explained to prospective participants that once the conceptual framework that will be developed from this study is adopted and implemented, it will provide guidance on what must be done in research-producing institutions to ensure the responsible conduct of scientific studies involving animals in Ghana. Participants were informed that the guidance that will be provided by the conceptual framework is needed to promote the integrity and acceptance of research conducted in Ghana by the scientific community. The framework will also serve as a guide for researchers who use animals, AREC members and AREC administrators to promote the ethical conduct of scientific studies using animals.

Furthermore, non-maleficence, as a principle of ethics in research, entails the researcher ensuring that the research does not cause harm to the participants or any person in general, whether intentionally or unintentionally (Fouché et al., 2021; UNISA, 2016). As part of the consenting process, it was explained to participants that the study did not pose any possible or foreseeable negative consequences or risk of harm to them. The researcher was, however, mindful of any potential injury or discomfort individuals could experience while participating in the study (Fouché et al., 2021) and was therefore empathetic to the feelings of participants when probing with questions that could create emotional discomfort.

Given that this study explored the experiences of participants, the researcher was aware that some interview questions would evoke emotions that needed to be managed appropriately, such as by providing support, proposing a pause, or providing refreshments. To prevent this from happening, participants were provided with the interview guide as part of the informed consent process to inform their decision whether to participate in the study. Additionally, during the interviews, the researcher was highly attuned to the feelings of the participants and constantly assessed the situation; participants were advised not to answer questions that they considered sensitive. They were also reminded of their right to withdraw from the study and were further assured that their information would not be used against them in any way. Also, interviews were conducted at a time and venue that was convenient for the participants.

4.15.3 Justice, fairness, and objectivity

The ethical principle of justice, fairness and objectivity places a responsibility on the researcher to use both fair and scientific means of selecting participants and ensuring that the study benefits society (UNISA, 2016). Consequently, the researcher ensured that participant selection was fair, transparent and scientifically justified. The strategies and procedures for selecting participants, including the reasons for selecting specific individuals to participate in this study, were clearly described as part of this study (Section 4.7.3) and executed accordingly. The researcher adopted a fair procedure for recruiting the study participants and ensured that everyone who met the inclusion criteria had equal opportunities to participate in the study. In all three study sites (ARECs affiliated to a specific research-producing institution), the participants were selected with the help of either the chairpersons of the AREC or the AREC administrator after the inclusion and exclusion criteria were discussed with them. This helped to reduce researcher bias as much as possible.

When the researcher received the names and contact information of the prospective participants from the institution, he explained how their contact details were accessed, the reason for the study, why they qualified to participate in the study, and what was expected of them as participants to ensure justice and fairness. This enabled prospective participants to make an informed decision regarding their participation in the study as the process provided them with adequate information about the study and what was expected of them. Recruitment was therefore done without coercion. Recruitment was only done after voluntary informed consent was obtained from the prospective participant.

For fairness in reportage, member checking was used (as described in Section 4.9.1) to ensure that participants confirmed that the interpretation given to their account was correct. As a qualitative researcher, the researcher understood his role as a data collection tool and displayed neutrality and reflexivity as far as possible to reduce all forms of bias during the research process, as described in Section 4.5.

4.15.4 Integrity, transparency, and accountability

The focus of research integrity, transparency and accountability is on the researcher, where the values and virtues of researchers are emphasised (Nicholls, 2021). In conducting this study, the researcher adhered to the Singapore statement on research integrity's essential principles of honesty, accountability, professional civility, and fairness when dealing with others (Kleinert, 2010). Accordingly, the researcher took up the following research integrity responsibilities as stated in the Singapore statement and described by Kleinert (2010) and Dorch (2015): the researcher ensured and maintained the trustworthiness of this study as described in Section 4.9 of this document, adhered to all research-related regulations in Ghana and UNISA that apply to this study, kept all records of this study for verification and replication purposes, and adhered to UNISA's policy on data management (University of South Africa, 2021) for sharing data generated from this study. The researcher further took responsibility for any contributions made to publications, applications for funding, or reports produced from the conduct of this study. Additionally, where there are publications resulting from this study, the researcher will appropriately acknowledge the names and roles played by various individuals in the research. The researcher hereby discloses no financial or any other conflict of interest in the conduct of this study that is likely to negatively influence the quality of this research and any publications that may result from the conduct of this research.

4.16 Phase Two: Conceptual Governance Framework Construction

In this phase of the study, the researcher developed a proposed animal research ethics governance framework, aiming to promote the ethical use of animals in scientific studies in research-producing organisations in Ghana. Dikobe et al. (2023) define a 'conceptual framework' as a network of related concepts that improves understanding of specific occurrences. Such frameworks provide a structured approach to organising and interpreting essential concepts, complex ideas, interrelationships, and processes within a field of study or research problem (Ibričević, 2024). Within the context of this study, a conceptual framework will help provide a structured approach to organising and understanding the complex nature of animal research ethics governance in

research-producing organisations in Ghana that will promote the ethical use of animals in scientific studies. Developing a conceptual framework aided the researcher in using concepts from the empirical phase to explore the relationships between the concepts and better organise and implement effective strategies for promoting the ethical use of animals in scientific studies in research-producing organisations in Ghana. Also, through the development of a conceptual framework, the researcher was able to bring together results from the empirical phase of the study (phase one) to enhance understanding of animal research ethics governance systems and practices in Ghana.

To achieve the objective of phase two of this study, which aimed to develop a proposed conceptual animal research ethics governance framework for the ethical use of animals in scientific studies in research-producing organisations in Ghana, the practice-oriented theory proposed by Dickoff et al. (1968) was employed. This theory provides a structured approach to developing theories that are directly applicable to real-world situations. Although Dickoff et al. (1968) developed the practice-oriented theory to provide a framework for developing nursing theories to guide nursing practice, the theory has been applied in diverse disciplines; among others, public health, psychology, education and business management (Visagie, 2002, 2009; Amukugo et al., 2015; van Rooyen et al., 2017; Uys, 2021; Gause et al., 2025) to develop conceptual frameworks in various fields. The practice-oriented theory has been applied to various fields due to its ease of application in diverse contexts and the practice-oriented nature, which ensures easy understanding and implementation of the conceptual frameworks developed.

4.16.1 Assumptions of the practice-oriented theory

The assumptions underpinning the practice-oriented theory by Dickoff et al. (1968) make it ideal for developing practice-oriented frameworks, such as an animal research ethics governance framework that will ensure the ethical use of animals in scientific studies in Ghana. Understanding these assumptions was crucial for the researcher to apply this theory, as they informed how the framework was developed. It was also important for the researcher to critically examine these assumptions to ensure that the

resulting animal research ethics governance framework is appropriate and effective. These assumptions are:

- Theory-practice relationship: The theory assumes a strong, reciprocal relationship between theory and practice (Dickoff et al., 1968; Enuma Onyiapat et al., 2025; McFarlane, 1977). It assumes that knowledge gained from studies is hinged on understanding existing theories and can be translated into practice (Moyo et al., 2023). For this study, this assumption provides that ethical theories on the use of animals for research can be used to influence or improve animal research ethics governance systems and practices and vice versa.

- Prescriptive nature: The practice-oriented theory assumes that theories should be prescriptive, guiding actions rather than just describing phenomena (Beckstrand, 1980; Dickoff et al., 1968; Nangombe & Amukugo, 2016). Based on this assumption, the practice-oriented theory prescribes specific actions to be taken in achieving the study's objectives, not focused on describing a given phenomenon (Dickoff et al., 1968; Hanisch, 2024). The aim of developing an animal research ethics governance framework is to provide a framework that will guide specific actions that ensure the ethical use of animals for research in Ghana.

- Distinct purpose or goal: The practice-oriented theory underscores the need for a distinct goal for every practice-oriented theory (Dickoff et al., 1968; Hanisch, 2024). This distinct goal guides the researcher in developing and applying the theory in a real-world setting. Research ethics governance is goal-oriented, and the goal for developing a governance framework is to promote the ethical use of animals in scientific studies in Ghana. This purpose guided the researcher in applying the principles of the theory to develop a framework that will ensure the ethical use of animals in scientific studies in Ghana.

- Flexibility and adaptability: The practice-oriented theory is sufficiently adaptable to accommodate new available data or evolving circumstances (Ravitch & Riggan, 2017). It can be modified to fit different real-world situations or empirical data. This

makes it suitable to be adapted for the development of a governance framework for the ethical use of animals in scientific studies in Ghana.

- Cultural and contextual sensitivity: The practice-oriented theory considers relevant contextual and cultural factors (Dickoff et al., 1968; Hanisch, 2024; Nangombe & Amukugo, 2016). By applying the six components of the theory to specific studies, the contextual and cultural aspects are considered in the development of the framework. This makes the adaptation of this theory for this study ideal, as contextual data from the empirical study were used and the resultant framework applied to the Ghanaian context and culture.

The assumptions described above underpin the development of conceptual frameworks across various disciplines. The practice-oriented theory with its assumptions was identified as suitable and guided the development of the governance framework for the ethical use of animals in scientific studies in Ghana.

4.16.2 Description of the development of a conceptual framework

In developing the animal research ethics governance framework for the ethical use of animals in scientific studies in research-producing organisations in Ghana, the following six survey questions or components of the practice-oriented, organising principles of Dickoff et al. (1968) were addressed:

1. ***Agency – "Who or what conducts the activity?"***

Agency refers to the individuals, institutions or bodies responsible for conducting activities that realise the overall goal of the framework. In the context of this study, agency refers to the individuals or institutions responsible for ensuring and promoting the ethical use of animals in scientific studies in research-producing organisations in Ghana. These are individuals who are responsible for conducting various activities and establishing the right governance systems and practices that will ensure that animals are used ethically in scientific studies in Ghana.

2. ***Patiency or recipiency – "Who or what is the beneficiary or recipient of the activity?"***

Patiency is described by Dickoff et al. (1968) as all persons or things who receive or benefit from the activities of agents (described in point 1 above). The recipient (patiency) in this study refers to the receiver or beneficiary of the proposed governance framework developed to ensure that animals are used ethically in scientific studies in Ghana. The recipient refers to the individuals and research-producing organisations that will benefit directly from the development of an animal research ethics governance framework for the ethical use of animals in scientific studies. Recipients are the main reason for developing the animal research ethics governance framework to help address issues of the unethical use of animals in research, which affects them directly and therefore will benefit directly from the development and implementation of the governance framework.

3. ***Framework (Context) – "In what context is the activity performed?"***

The context refers to the environment within which an activity takes place in the context of a study (Dickoff et al., 1968). The environment is described by Dickoff et al. (1968) as contextual factors that are both physical and nonphysical. The framework (context) in this study refers to the setting in which an animal research ethics governance framework for the ethical use of animals in scientific studies in Ghana will be performed or implemented. An animal research ethics governance framework must be implemented within a context that is able to promote the ethical use of animals in scientific studies. This question provides a description of the Ghanaian context within which scientific studies using animals will be performed. This ensures that the unique situation of the context is brought to bear in developing the animal research ethics governance framework to ensure that the developed framework is contextual and addresses the specific needs within the context for which it is developed.

4. ***Terminus (Outcome) – "What is the activity's final goal?"***

The terminus refers to the endpoint, accomplishment or final goal of the activity (Dickoff et al., 1968). The terminus of this study refers to the envisioned outcome or goal of the proposed animal research ethics governance framework for research-producing organisations in Ghana. The terminus provides the endpoint for developing

an animal research ethics governance framework. It answers the question: Why is this animal research ethics governance framework being developed? The terminus helped the researcher to clearly define the endpoint or the goal for developing the animal research ethics governance framework.

5. ***Procedure – "What is the activity's guiding process, technique, or protocol?"***

The procedure refers to the processes, principles, rules or protocols that govern an activity (Dickoff et al., 1968). It describes the steps to be taken to achieve the overall goal of the activity (Dickoff et al., 1968). The procedure in this study refers to the steps or tangible actions necessary to achieve the ethical use of animals in scientific studies in research-producing organisations in Ghana. For the development of an animal research ethics governance framework that will ensure animals are used ethically in scientific studies, the procedure provides and describes practical actions to be taken by the 'agents' to ensure that the overall goal of the governance framework is achieved.

6. ***Dynamics – "What is the source of energy for the activity?"***

Dickoff et al. (1968) describe dynamics as the power source for any person or thing functioning as an agent, recipient or context to ensure the realisation of the goals of the activity. In the context of this study, dynamics refers to the source of energy to support the ethical use of animals in scientific studies in research-producing organisations in Ghana. Dynamics provides a description of the motivation and the factors necessitating the push for an animal research ethics governance framework that will ensure animals are used ethically in scientific studies in research-producing organisations in Ghana.

According to Dickoff et al. (1968), the survey questions described above give six perspectives on a subject in an effort to uncover distinct aspects of the subject. The decision to adopt the practice-oriented theory of Dickoff et al. (1968) is rooted in its comprehensive, practical and interdisciplinary nature. The practice-oriented theory provides a systematic approach that emphasises how various components or factors within a specific context are interrelated. This interrelatedness of factors is particularly

relevant to the context of the ethical use of animals in scientific studies, which has various factors, including ethical, regulatory and scientific requirements and objectives that must be integrated to ensure ethical practices.

The theory was considered ideal for this study because of its practice-oriented nature, which makes it easy to translate the framework into practice. Also, the six interconnected components of the theory (agent, recipient, framework, terminus, procedure, dynamics) are sufficient to capture all essential aspects of an animal research ethics governance framework that will promote the ethical use of animals in scientific studies in Ghana. Developing a framework using this theory will make the framework easy to understand and easily implementable in Ghana and other countries with similar contexts. Dickoff et al.'s theory was also applied in this study because it supports a purely qualitative and inductive research approach, which was employed in this study (Dickoff et al., 1968).

4.17 Chapter Conclusion

The focus of this chapter was on describing the research methodology used to address the study's objectives. This study employed a rigorous qualitative research methodology, framed within an interpretive paradigm and utilising an exploratory embedded single case study design to explore key stakeholders' experiences with the existing governance systems and practices for the ethical use of animals in scientific studies in Ghana. Through purposive sampling, a combination of semi-structured interviews, naïve sketches and a reflective diary was used to collect data to facilitate a rich and nuanced understanding of the existing governance systems and practices for the ethical use of animals in scientific studies in Ghana. Thematic analysis was employed by the researcher to provide a systematic approach for the interpretation of data. Measures to ensure trustworthiness, including member checking, reflexivity, triangulation, and peer examination, were employed to ensure the credibility and reliability of the findings. To ensure the integrity of the research process, ethical considerations were addressed.

In general, this chapter provides a good foundation for the presentation of findings and discussions in the subsequent chapters of this thesis. The next five chapters present the findings, interpretations, and discussions based on the study's objectives. Each of the ensuing five chapters is dedicated to the presentation and discussion of the findings of one specific objective of this study. Chapter Five provides the demographic characteristics of participants and findings, interpretations, and discussions with respect to key stakeholders' understanding of the concept 'animal research ethics governance'.

CHAPTER FIVE
FINDINGS ON KEY STAKEHOLDERS' UNDERSTANDING OF THE CONCEPT 'ANIMAL RESEARCH ETHICS GOVERNANCE'

5.1 Introduction

In Chapter Four, a detailed description of the methodology employed by the researcher to address the objectives of this study was provided. The current chapter presents the demographic information of the study participants, along with a thorough analysis, discussion, and interpretation of the findings related to the first objective of this research, which sought to ***explore and describe key stakeholders' understanding of the concept of 'animal research ethics governance'***. The ensuing discussion and interpretations of the findings are primarily grounded in the interviews conducted and the naïve sketches submitted by participants. The literature reviewed in Chapters Two and Three was also employed to re-contextualise and validate the findings presented in this chapter.

5.2 Demographic Information of Participants

The study's sample comprised 13 participants who were purposively selected using specific inclusion criteria established by the researcher. This selection process aimed to ensure that individuals possessing pertinent experience, particularly those involved in the use of animals in scientific studies and those serving on ARECs in Ghana, were included to fulfil the primary objective of phase one of the study (to gain a deeper understanding of key stakeholders' experiences with existing animal research ethics governance systems and practices that promote the ethical use of animals in scientific studies in Ghana). A detailed explanation of the inclusion and exclusion criteria used for participant selection is provided in Chapter Four, Section 4.7. The researcher invited all individuals who met the inclusion criteria to participate in the study voluntarily.

5.2.1 Case category, participants' labels, and codes

In order to protect the identity of participants and maintain their confidentiality, a unique code was assigned to each participant upon receipt of their naïve sketches and the transcription of their audio-recorded interviews. All identifiable personal information, including names and addresses, was systematically redacted from the data. Furthermore, the specific institutions from which participants were drawn were not disclosed to enhance confidentiality.

This research was designed as an embedded case study, with participants selected from three distinct embedded cases, referred to as ARECs. These embedded cases were designated as AREC 1 (embedded case 1), AREC 2 (embedded case 2), and AREC 3 (embedded case 3). The participant pool included researchers, AREC members, and AREC administrators who were key stakeholders in the ethical use of animals in scientific studies in Ghana. Each embedded case consisted of two researchers, two AREC members, and one AREC administrator from AREC 1 and AREC 2. In contrast, AREC 3 included one researcher, one AREC member, and one AREC administrator, as a significant portion of the study's population in this institution did not meet the inclusion criteria or declined to participate. Consequently, the total number of participants comprised five researchers, five AREC members, and three AREC administrators, making a total of 13 participants.

The coding system employed for the AREC administrators utilised the letter 'A' to denote 'administrator', followed by a numerical designation from 1 to 3 for each administrator, resulting in codes A1, A2, and A3. Similarly, for AREC members, the letter 'M' was employed to represent 'member', with the addition of numbers 1 through 5 to differentiate members across the ARECs. Thus, members from AREC 1 were assigned codes M1 and M2, members from AREC 2 were assigned M3 and M4, whereas the member from AREC 3 was assigned the code M5. A congruent coding methodology was applied to the researcher participants, employing the letter 'R' supplemented by numerical identifiers from 1 to 5 for each AREC. Similarly, researchers from AREC 1 were coded R1 and R2, researchers from AREC 2 were

designated codes R3 and R4, and the researcher from AREC 3 was assigned the code R5.

5.2.2 Description of participants

This section delineates the description of the participants affiliated with each AREC. A comprehensive summary of this description is presented in Table 5.1, followed by an individual description of each participant. The section culminates with an overarching summary description of the participants.

Table 5.1: Summary of demographic characteristics of participants

Case Category	Participants' Labels	Participants' Codes	Participants' Highest Educational Level	Experience
AREC 1	AREC Administrator	A1	PhD Candidate	5 years as AREC administrator
	AREC Member	M1	PhD	4 years as an AREC member (Chair)
	AREC Member	M2	PhD	8 years as an AREC member
	Researcher	R1	PhD	17 years using animals for research
	Researcher	R2	PhD	8 years using animals for research
AREC 2	AREC Administrator	A2	PhD Candidate	10 years as an AREC administrator
	AREC Member	M3	PhD	10 years as an AREC member (Chair)
	AREC Member	M4	Vet. Doc/PhD	6 years as an AREC member
	Researcher	R3	PhD	20 years as a researcher

Case Category	Participants' Labels	Participants' Codes	Participants' Highest Educational Level	Experience
	Researcher	R4	PhD Candidate	10 years as a researcher
AREC 3	AREC Administrator	A3	Masters	2 years as an AREC administrator
	AREC Member	M5	PhD	2 years as an AREC member
	Researcher	R5	PhD	8 years as a researcher

Source: Author's construct, 2025

5.2.2.1 Description of participants from AREC 1

Five participants, including one AREC administrator, two AREC members and two researchers affiliated with AREC 1, participated in the study. The primary demographic characteristics of these participants are described as follows:

- ***Participant 1 – AREC Administrator 1 (A1)***

Participant A1 was an AREC administrator at AREC 1. A1 held a master's degree and, at the time of the interview, was enrolled in a PhD programme with a focus on development studies. A1 had five years' experience as an AREC administrator. Prior to becoming an AREC administrator through appointment by his superior, he had never been involved in animal research, so his involvement with animal research began when he became an AREC administrator. As an AREC administrator, he reviewed protocols and ensured that the SOPs of the AREC were applied.

- ***Participant 2: AREC Member 1 (M1)***

Participant M1 held a PhD in chemical pathology and had four years' experience as the chair of the AREC. He had been involved with research using animals since 1999 as a graduate student. He had experience conducting research using four different rat species in China, Bangladesh, South Africa and Ghana.

- ***Participant 3: AREC Member 2 (M2)***

This participant held a PhD in applied molecular bioscience (animal genetics) and had been an AREC member for eight years. He had been involved in using animals in research and teaching at a higher education institution for over 16 years and was the head of the animal production unit of the institution at the time of the interview.

- ***Participant 4: Researcher 1 (R1)***

Participant R1 held a PhD in anatomy and cell biology and had been using animals for research for the past 17 years. He used rats and mice to induce conditions such as diabetes mellitus, and also did some behaviour tests on animals, such as rats. He had submitted protocols to ARECs for review several times over the years, both in Ghana and in the United States of America.

- ***Participant 5: Researcher 2 (R2)***

R2 held a PhD in immunology and, for the past eight years, had been conducting research using animals. He had submitted some protocols to the AREC for review over the past eight years, albeit not consistently. He had more experience working in the clinical field with humans than with animals.

5.2.2.2 Description of participants from AREC 2

One AREC administrator, two AREC members and two researchers associated with AREC 2 participated in the study. Their basic demographic characteristics are as follows:

- ***Participant 6: AREC Administrator 2 (A2)***

Participant A2 was an administrator by profession and was the first AREC administrator of the institution. She had been in this position since the inception of the AREC 10 years ago. She led the development of the SOPs of the AREC. She held a master's degree and was pursuing a PhD programme in public health, focusing on bioethics at the time of the interview.

- ***Participant 7: AREC Member 3 (M3)***

Participant M3 held a PhD in veterinary studies and had 10 years' experience as an AREC member and 30 years' experience as an animal scientist. He had worked in the animal production discipline for over 30 years.

- ***Participant 8: AREC Member 4 (M4)***

This AREC member (M4) was a veterinarian who had been a member of the AREC for about six years. He was also a researcher who, for the past eight years, had been using animals for his research. He was an experienced zoo and wildlife manager and specialised in wildlife veterinary medicine. This participant was a member of both AREC 1 and AREC 2 due to his qualification as a veterinarian and his experience working with animals. He participated in this study as a member of AREC 2.

- ***Participant 9: Researcher 3 (R3)***

This participant (R3) held a PhD in animal science nutrition/reproduction interaction and had been conducting research using animals for the past 20 years. She used livestock and mice for her research and had submitted protocols to the AREC over the past 10 years.

- ***Participant 10: Researcher 4 (R4)***

This participant (R4) had been conducting studies using animals for the past 10 years. She held a master's degree and was pursuing a PhD programme in animal nutrition at the time of the interview. She started her research on pigs with her focus on animal nutrition.

5.2.2.3 Description of participants from AREC 3

One administrator, one AREC member and one researcher associated with AREC 3 participated in the study. Their basic demographic characteristics are as follows:

- ***Participant 11: AREC Administrator 3 (A3)***

Participant A3 was a university administrator who was appointed two years ago to serve as the administrator of the newly established AREC in his institution. He held a master's degree in business administration.

- ***Participant 12: AREC Member 5 (M5)***

This participant (M5) was a researcher with 19 years' experience using animals, such as mice, for research purposes. He held a PhD in pharmacology and had been a member of the AREC for the past two years, where he served as the pharmacologist and toxicologist expert on the committee.

- ***Participant 13: Researcher 5 (R5)***

This researcher (R5) held a PhD in pharmacognosy and herbal medicine and had been conducting research using animals for the past eight years. His research mainly focused on validating the traditional use of plants and other natural products in medicine. For some time, his focus was on diabetes and then neuropharmacology, where he used mice. He had experience submitting protocols for review at two Ghanaian ARECs and one in the United Kingdom over the past eight years.

5.2.2.4 Summary of participants' description

The educational qualifications of the participants in this study ranged from master's degrees to PhD degrees. Specifically, all three AREC administrators (A1, A2, and A3) held master's degrees, with A1 and A2 enrolled in PhD programmes at the time of the interviews. In contrast, all participants who were AREC members (M1, M2, M3, M4, and M5) had obtained PhD degrees as their highest academic qualification. Notably, one member from AREC 2 (M4) also held a Doctor of Veterinary Medicine degree in addition to their PhD. Among the researchers, all but one (R4 from AREC 2) had attained PhD qualifications. R4 held a master's degree and was a PhD candidate at the time of the interview.

In compliance with the inclusion criteria for participant selection, participants' experience working with animals, either as researchers, AREC members or AREC administrators, ranged from two to 20 years. This experience encompassed the duration of their involvement in animal research, animal research ethics administration, or membership in the AREC. AREC 3 comprised the least experienced participants, with both the AREC administrator and member having two years of experience, a situation attributable to the committee's establishment two years prior to the interviews.

Conversely, AREC 2 included the most experienced participants, with their administrator (A2) having 10 years of experience, researchers possessing up to 20 years of experience in animal research, and AREC members accumulating up to 10 years of service. Given the extensive experience of participants in various capacities, whether in conducting animal research or serving as administrators or members of the AREC, they were well-positioned to provide valuable insights that would enhance the researcher's understanding of the existing governance systems and practices pertaining to the ethical use of animals in scientific studies in Ghana. It can be observed from the participants' description that lay persons serving on ARECs were not represented in this study because AREC 1 did not have lay representatives, and the lay representatives of the other two ARECs did not meet the inclusion criteria.

5.3 Data Analysis Presentations

This section delineates the findings pertinent to the first research objective, which aimed to explore and describe key stakeholders' understanding of the concept of 'animal research ethics governance'. As specified in Chapter Four, Section 4.12.2, the findings derived from the cross-case thematic analysis are presented herein as an integrated whole, rather than detailing the findings of each embedded case in isolation, followed by a separate discussion of the cross-case analysis. This approach was adopted to reduce the repetition of quotations and to enhance the clarity and coherence of the narrative, thus facilitating a more concise analysis for the reader (Gustafsson, 2017).

Consistent with the exploratory embedded single case design employed in this study, which encompasses one overarching case with three embedded cases, the findings from the cross-case analysis provide a comprehensive perspective that integrates data from the three embedded units of analysis (ARECs). This methodology allows for the mapping of subthemes and main themes across the three embedded cases, thereby elucidating both the distinctions and commonalities among them. The findings are systematically presented and discussed alongside a literature review at the conclusion of each main theme. This structure is intended to prioritise the perspectives of the participants before integrating the perspectives of scholars. Detailed findings, including significant verbatim quotations and key codes derived from the participants' narratives for each embedded case, are documented in Appendices 5.1 to 5.4. Additionally, summarised versions of these comprehensive findings are provided in Appendix 5.5.

5.4 Key Stakeholders' Understanding of the Concept of 'Animal Research Ethics Governance'

The study's first objective was to explore and describe how key stakeholders make sense of the concept 'animal research ethics governance' in Ghana. Consequently, the findings presented in this chapter provide answers to the first research question, ***'How do key stakeholders understand the concept of 'animal research ethics governance' in Ghana?'*** To answer this question, the participants from each of the three ARECs answered three main questions:

- *How do you understand the term 'animal research ethics governance'?*
- *How do you think the ethical use of animals in scientific studies is currently governed in Ghana?*
- *How do you think the ethical use of animals in scientific studies is currently governed in your institution?*

A comprehensive thematic analysis of 16 pages of transcriptions (Times New Roman, font size 12, single spacing) derived from participant interviews and six pages of naïve sketches (Times New Roman, font size 12, single spacing) from participants on the

questions above was conducted to triangulate the findings. The detailed thematic analysis was conducted on a case-by-case basis for each AREC (see Appendices 5.1, 5.2 and 5.3 for a case-by-case analysis for AREC 1, AREC 2 and AREC 3, respectively), followed by a cross-case analysis encompassing the three ARECs, which served as embedded units in this research. Furthermore, comprehensive findings, including key quotations and coding from the interviews and naïve sketches, are detailed in Appendices 5.4 and 5.5, respectively.

This chapter delineates the findings from the cross-case analysis, augmented by verbatim quotations from the interviews and naïve sketches provided by participants across all three ARECs (embedded cases). The analysis elucidates both commonalities and differences among the three ARECs through a thematic analysis. The interpretations aim to enhance the understanding of the concept of 'animal research ethics governance' as perceived by the key stakeholders in Ghana and their respective institutions.

The presentation of findings is organised thematically, highlighting main themes and subthemes corresponding to each principal question posed to participants. The main themes emerged from subthemes identified from the analysis of participant interviews and naïve sketches. Table 5.2 shows a summary of the cross-case (cases are AREC 1, AREC 2 and AREC 3) thematic analysis, illustrating the main themes, subthemes and the total occurrence of each subtheme across the three embedded cases. In Table 5.2, subthemes that emerged across all three ARECs indicate a common perception or experience among all participants from the three ARECs in the country. Subsequent sections present the findings associated with each research question, detailing their main themes and subthemes as depicted in Table 5.2. These sections also engage in a discussion supported by verbatim quotations from participants to substantiate the researcher's assertions.

Table 5.2: Summary of cross-case analysis of findings on key stakeholders' understanding of animal research ethics governance

Questions	Main Themes	Subthemes	Occurrence of Subtheme per AREC			
			AREC 1	AREC 2	AREC 3	Total Occurrence
How do you understand the term 'animal research ethics governance'?	5.4.1.1 A governing body providing *"oversight"* for the ethical conduct of research using animals	a) Governance structure for the ethical conduct of research using animals	x	x	x	3
		b) Governing body providing oversight for the ethical conduct of research using animals	x		x	2
	5.4.1.2 Legal and regulatory framework ensuring compliance in the ethical use of animals for research	a) Establishment and enforcement of rules and regulations for the ethical conduct of research using animals	x	x	x	3
		b) Existence of standards, practices, and procedures for the ethical conduct of research using animals	x	x	x	3
	5.4.1.3 Insufficient knowledge and awareness of animal research ethics governance		x	x	x	3
How do you think the ethical use of animals in	5.4.2.1 Lack of a national legal and regulatory framework for	a) Lack of specific regulation for the ethical use of animals for research in Ghana	x	x	x	3

Questions	Main Themes	Subthemes	Occurrence of Subtheme per AREC			
			AREC 1	AREC 2	AREC 3	Total Occurrence
scientific studies is currently governed in Ghana?	the ethical use of animals for research in Ghana	b) Lack of national policies and guidelines for the ethical use of animals for research in Ghana	x	x		2
		c) Lack of a national governance structure or oversight body for the ethical use of animals for research in Ghana	x	x		2
	5.4.2.2 Lack of awareness on how the ethical use of animals in scientific studies is being governed in Ghana		x	x	x	3
How do you think the ethical use of animals in scientific studies is currently governed in your institution?	5.4.3.1 Use of institutional structures, policies and procedures for the ethical use of animals for research	a) Adherence to institutional policies, guidelines and the 3R principles to ensure the ethical use of animals for research	x	x	x	3
		b) Availability or establishment of institutional ARECs	x	x	x	3
	5.4.3.2 Failure to ensure compliance with	a) Non-compliance with established procedures for the ethical use of	x	x	x	3

Questions	Main Themes	Subthemes	Occurrence of Subtheme per AREC			
			AREC 1	AREC 2	AREC 3	Total Occurrence
	institutional systems established to ensure the ethical use of animals in research	animals for research within institutions				
		b) Adherence to ethical research conduct is primarily driven by the necessity for publishing research findings and securing funding		x		1

Source: Author's construct, 2025

5.4.1 How key stakeholders understand the concept 'animal research ethics governance'

From the analysis of interviews and the naïve sketches across the three ARECs, three main themes emerged, as highlighted in yellow in Table 5.2. These themes elucidate participants' understanding of the concept of 'animal research ethics governance'. Participants from all three ARECs articulated their understanding of animal research ethics governance as a **governance structure composed of one or more governing bodies that oversee the ethical conduct of research using animals,** guided by **a legal and regulatory framework ensuring compliance in animal research**. **Several participants expressed insufficient knowledge and awareness of the meaning of the concept of 'animal research ethics governance'**. Table 5.3 presents the aggregated dimension, which is the main question participants responded to, the main themes that emerged, and the corresponding subthemes from which these main themes were derived.

Table 5.3: Main themes and subthemes from interviews and naïve sketches describing participants' understanding of the concept of 'animal research ethics governance'

Question	Main Themes	Subthemes
How do you understand the term 'animal research ethics governance'?	5.4.1.1 A governing body providing *"oversight"* for the ethical conduct of research using animals	a) Governance structure for the ethical conduct of research using animals
		b) Governing body providing oversight for the ethical conduct of research using animals
	5.4.1.2 Legal and regulatory framework ensuring compliance in the ethical use of animals for research	a) Establishment and enforcement of rules and regulations for the ethical conduct of research using animals
		b) Existence of standards, practices, and procedures for the ethical conduct of research using animals
	5.4.1.3 Insufficient knowledge and awareness of animal research ethics governance	

The following sections provide a thematic presentation of the findings. The sections systematically present and discuss each main theme and its associated subthemes. Direct quotes from participants were used to validate the discussion and arguments.

5.4.1.1 Main theme 1: Animal research ethics governance refers to a governing body providing "oversight" for the ethical conduct of research using animals

Participants understood that the concept of **'animal research ethics governance'** encompasses a formalised structure characterised by a governing entity, which may operate at the national level or within research institutions. This entity is endowed with the authority to formulate policies and guidelines that regulate the conduct of research involving animals, either within the country or the institution. Within this overarching theme, responses were categorised into two distinct subthemes:

- Subtheme 1: Animal research ethics governance as a governance structure for the ethical conduct of research using animals
- Subtheme 2: Animal research ethics governance as a governing body providing oversight for the ethical conduct of research using animals

The subsequent presentation of these subthemes, along with supporting quotations, is intended to elucidate the findings. However, it is important to recognise that these quotations may not be exclusively associated with a single theme and may overlap with other themes.

a) Subtheme 1: Animal research ethics governance as a governance structure for ethical conduct of research using animals

Participants from all three ARECs recognised animal research ethics governance as a formalised structure instituted by governmental authorities at the national level, as well as established structures, such as ARECs, created by individual institutions to ensure the ethical conduct of research using animals. Researcher 2 from AREC 1 explained:

> *"So, I will explain that as a formal structure that should be in place to spell out the rules and guidelines for working with animals. This will determine whether what one wants to do with animals is necessary or not. To define some scope of, for example, what you want to do, how many animals do you need so that you are not told you are overusing animals for the fact that they are available."* **[R2]**

In a similar vein, AREC Administrator 1 (AREC 1) described animal research ethics governance as systems put in place by heads of institutions to ensure the ethical use of animals for research. He said:

> *"These are systems put in place basically, not necessarily by the researchers, but in our parts, by the administrative offices that manage how research on animals is conducted. And some of these systems, some of these structures,*

> *can be in the form of the SOPs [standard operating procedures] on how animal research is conducted. Or an overall ethics policy that also stipulates how animal research will be conducted."* **[A1]**

Similarly, AREC Member 1 (AREC 1) perceived animal research ethics governance as a system that oversees and regulates activities:

> *"Well, when we talk of governance, we are looking at a system that overlooks an activity. That monitors an activity, that evaluates an activity, that regulates an activity. That is governance."* **[M1]**

Considering 'governance' as the keyword in the concept, AREC Member 3 (AREC 2) understood governance as a structure put in place to ensure the ethical use of animals. He said:

> *"Well, of course, the layman's understanding of governance will be how structured it is, who oversees what in terms of animal use, and who is making sure that whatever is agreed upon is in place. Erm, that is what I will say my understanding will be like."* **[M3]**

AREC Member 5 (AREC 3) understood animal research ethics governance as powers vested in individuals holding administrative positions to regulate the use of animals for research in organisations:

> *"And then, I was also thinking about governance in terms of certain powers enshrined in certain individuals or organisations involved in animal research ethics. So, I wasn't looking at it as just general standards or general procedures for the animal procedures themselves, but in terms of administration, in terms of position holders, in terms of legislation or laws that will ensure that that is done."* **[M5]**

In his naïve sketch, Administrator 3 (AREC 3) described animal research ethics governance as:

> *"A system through which animal research ethics are directed and controlled in an institution."* **[A3_N]**

Additionally, Researcher 3 (AREC 2) explained governance as:

> "*Governance is about ruling and having control over something. So it is about the systems that are put in place to control the use of animals in research, or, yeah, by industries, etc."* **[R3]**

In addition, participants from ARECs 1 and 3 described animal research ethics governance as the establishment of ethics policies and guidelines on how animals should be used for research purposes. Participants mostly understood animal research ethics governance to mean providing or ensuring that there are policies and guidelines in place for the ethical conduct of research using animals in the country or institution. AREC Member 2 (AREC 1) stated:

> *"Yeah, I think it has to do with the provision of some guidelines and a regulatory framework within which people who work with animals can operate. Yeah, I think in terms of us, it has to do with the provision of some guidelines and a regulatory framework within which people can operate."* **[M2]**

Researcher 2 (AREC 1) also shared:

> *"So, these are basically rules and guidelines for regulating how animal experimentation is done so that there is no abuse or misuse of animals."* **[R2]**

In his naïve sketch, Researcher 5 (AREC 3) wrote:

> *"I understand it as a set of guidelines or regulations that provide guidance to the care, welfare and use of animals in research, experimental or laboratory animals."* **[R5_N]**

AREC Member 5 from AREC 3 mentioned:

> *"I look at governance more as directing and controlling. So, I was thinking about procedures, processes, and even people who are involved in directing and controlling animal research, how animal research ethics are done."* **[M5]**

The quotations presented indicate that participants perceived animal research ethics governance as an institutional or organisational structure established to oversee and monitor the ethical use of animals in scientific studies. Participants articulated that this formal organisational structure is designed to formulate rules, guidelines, and policies governing the ethical use of animals in research. From the participants' viewpoint, the presence of an authoritative oversight mechanism dedicated to the ethical use of animals in research constitutes the defining characteristic of animal research ethics governance.

b) Subtheme 2: Animal research ethics governance as a governing body providing oversight for the ethical conduct of research using animals

Animal research ethics governance was conceptualised by certain participants, notably AREC members, as a group or institutional entity tasked with establishing and defining the roles and responsibilities associated with the use of animals in scientific studies. This interpretation of animal research ethics governance was derived exclusively from interviews conducted with participants from AREC 1 and AREC 3. According to these participants, this governing body is perceived as a reputable ethics committee that operates under the accountability of a higher authority. For instance, AREC Member 2 from AREC 1 articulated:

> *"So, there must be a group that will be responsible for the use of, responsible for, and oversee the use of animals, and that comes with the provision of necessary documents. I think it should even extend to giving licenses to people who operate an animal facility. It involves a body that will come up with some policies and guidelines as to the use of animals. So, it involves a body that will*

> *come up with the various guidelines and a framework within which people who work with animals will operate. I think basically that is what it is."* **[M2]**

AREC Member 1 (AREC 1) specifically emphasises that the establishment of ARECs is the prerequisite for animal research ethics governance:

> *"So, if we are talking about governance concerning the ethics of the use of animals, then we are saying that we must have proper ethics committees that should be accountable to some authority. So, first of all, the ethics committee itself should have guidelines as to how they will accept work for animal research."* **[M1]**

Administrator 2 (REC 2) also described animal research ethics governance as:

> *"… a board or an independent body that is set aside to actually look at the ethical use of animals. That means you look at the integrity of the animals being used in research. More or less, the animal becomes the research participant that we are using for research purposes to collect data of any form. So, we need to look at the main use of such animals; we need to look at the dignity of such animals; and we also need to look at the scientific validity of the whole work that you want to do. And lastly, consider the relevance of the work that you want to do as well. You look at that. And other research integrity-related issues."* **[A2]**

Some participants understood that the establishment and existence of an independent entity, such as the ARECs in the institution, which is tasked with overseeing the use of animals for research, signifies animal research ethics governance. For these individuals, the establishment of such a body at either the national or institutional level is indicative of the existence of animal research ethics governance. Their expectation is that this entity will uphold ethical standards in the use of animals in scientific studies.

The findings by Canario et al. (2022) validate participants' conceptualisation of animal research ethics governance as a regulatory entity with animal research ethics oversight responsibilities. These findings similarly associate research ethics

governance with the establishment of institutional structures. Moan et al. (2023) articulate that governance encompasses both individuals and institutions that guide and regulate processes through the implementation of institutional rules and guidelines designed to achieve specific outcomes. This conceptualisation of governance aligns with that of participants who underscored the importance of having established policies, guidelines, and an oversight body to ensure the ethical use of animals in scientific studies.

Several scholars, including Porter (2008), Dyck and Allen (2013), Schopper et al. (2015), and Canario et al. (2022), corroborate the participants' views by equating research ethics governance with the existence of animal research ethics committees. These scholars focus their discussions and arguments on the existence of ethics committees as institutional structures that are established to oversee research activities. From the findings of this study, participants specifically indicated that ethics committees derive their authority from existing institutional policies and guidelines. Beyond perceiving animal research ethics governance as a regulatory entity providing oversight, the findings suggest that participants also recognised it as a legal and regulatory framework, a topic that is further elaborated upon in the subsequent section.

5.4.1.2 Main theme 2: Animal research ethics governance as a legal and regulatory framework ensuring compliance in the ethical use of animals for research

The second main theme that emerged from the analysis of interview and naïve sketch data regarding participants' understanding of the concept of 'animal research ethics governance' is that most participants across all three ARECs associated this concept with the presence of a legal and regulatory framework that is essential for ensuring the ethical conduct of research involving animals. This theme is further delineated into two subthemes, each supported by relevant quotations:

- Subtheme 1: Animal research ethics governance pertains to the establishment and enforcement of rules and regulations for the ethical conduct of research using animals

- Subtheme 2: Existence of standards, practices, and procedures for the ethical conduct of research using animals

The following section elaborates on these subthemes, accompanied by supporting quotations, to provide a clearer understanding of the findings.

a) Subtheme 1: Animal research ethics governance pertains to the establishment and enforcement of rules and regulations for the ethical conduct of research using animals

The majority of participants regarded the establishment of rules and regulations governing animal research as a crucial element of animal research ethics governance. Researcher 1 (AREC 1) articulated this perspective, stating:

> *"I think that would have to do with the general regulations. At least in the US, for example, I know they have laws, so there are actual laws that govern the use of animals. That governance structure, at least in my lay understanding, will have to encompass rules and regulations. Just as we have various laws governing the use of animals for human consumption, in research there should also be general laws."* **[R1]**

Researcher 5 (AREC 3) also explained:

> *"Okay, so, governance, I mean, if you say governance, what comes to mind is a set of rules, regulations, and laws that people must abide by or live with. So, if you talk about animal research ethics and governance, I believe it will be a set of regulations and laws you must adhere to if you are going to involve animals in your study…"* **[R5]**

AREC Administrator 3 (AREC 3) emphasised that animal research ethics governance requires the existence of rules and regulations, and adherence to these rules and regulations by researchers:

> *"Governance is an activity that ensures conformance of rules and other regulations to ensure that the system perfectly works for the good of the human community or something, and therefore, if you say you are a researcher, then you must adhere to the rules, and adherence to the rules is being monitored by somebody, some institution, or some agents. And therefore, at any point in time, you must be guided by the rules."* **[A3]**

Additionally, AREC Member 4 (AREC 2) summarised animal research ethics governance as:

> "*… a term. It is used to describe the processes involved in animal research, regulations, and management. Yeah, that's what I think."* **[M4]**

Participants articulated their understanding of 'animal research ethics governance' within this subtheme by emphasising the significance of existing laws, guidelines and regulations. The necessity for a robust legal and regulatory framework to oversee ethical considerations in animal research was underscored. Furthermore, the implementation of systems designed to monitor compliance and ensure that researchers, as well as individuals using animals for research purposes, adhere to established laws and guidelines was highlighted as essential for the benefit of the human community.

b) Subtheme 2: Existence of standards, practices, and procedures for the ethical conduct of research using animals

Other participants also thought that animal research ethics governance includes standards, practices, procedures, and processes that anyone using animals for research must adhere to. In his naïve sketch, AREC Member 5 (AREC 3) wrote:

> *"I understand the term 'Animal Research Ethics Governance' as the procedures or processes or persons directing or controlling how animal research ethics are done."* **[M5_N]**

Additionally, Researcher 3 (AREC 2) held the same opinion that:

> *"Governance generally focuses on setting certain standards, procedures, and processes that will oversee, have a general oversight of, and control over the use of animals for scientific studies. Animal research ethics governance is controlled by setting standards, etc. to control the use of animals in research."* **[R3]**

In the same vein, AREC Member 4 (AREC 2) defined 'animal research ethics governance' as a term that describes processes for ethically using animals for research:

> *"Yeah, it's a term. It is used to describe the processes involved in animal research, regulations, and management. Yeah, that's what I think."* **[M4]**

Furthermore, AREC Administrator 1 (AREC 1) also explained animal research ethics governance as:

> *"So, basically, procedures, standard practices, and systems are put in place to govern or control how animals are used in research. So that animals are not abused, animals are not handled anyhow, and animals are not taken for granted during the process of research. So basically, something that will guide the users of these animals in their research."* **[A1]**

According to several participants from all three ARECs, animal research ethics governance includes the standards, procedures, practices and processes established for the ethical use of animals in research. In other words, in some participants' view, animal research ethics governance is the existence of established processes, standards and practices to control the use of animals for research. This perception by some participants is corroborated by Porter (2008), who also described research ethics governance as a variety of processes and systems designed to guarantee that research is conducted ethically. Jonsson and Bouvy (2018) and Schoeman (2019) also state that research ethics governance involves the development of a regulatory

framework to ensure the ethical conduct of research. In support, Kleiderman and Ogbogu (2019) and Canario et al. (2022) underscore the existence of regulations, legislation, policies and guidelines to ensure the ethical conduct of research. Although these authors did not refer directly to animal research ethics governance, it is suggested that their definition can be applied to animal research as encompassing a regulatory framework with regulations, legislation, policies and guidelines for the ethical use of animals for research. This is a critical aspect of governance, providing a framework for all stakeholders. Therefore, it is suggested that legislation and policies providing an overall framework within which to conduct animal research are critical in the governance of animal research.

5.4.1.3 Main theme 3: Insufficient knowledge and awareness of animal research ethics governance

A few participants exhibited a limited understanding and awareness of animal research ethics governance. In certain instances, participants offered only generalised information and were unable to articulate a clear definition of what 'animal research ethical governance' entailed for them. Some expressed uncertainty or indicated a lack of knowledge regarding the concept. For example, one participant acknowledged a lack of familiarity with the concept, stating:

> *"Animal research ethics governance... Well, I'm not sure I have... I can say I'm an expert on that, or I can say I'm exposed to that."* **[R1]**

In support, AREC Member 3 (AREC 2) expressed uncertainty regarding the scope and implications of animal research ethics governance. He articulated:

> *"Yeah, until you brought it up, it was new to me. … governance in this case is a new concept to me, and I am not too sure what it entails or how my work fits into it."* **[M3]**

Participants from AREC 1 and AREC 2 explicitly mentioned their uncertainty regarding the concept of 'animal research ethics governance'. In contrast, participants from

AREC 3 did not convey a comparable lack of comprehension concerning this concept. However, during the interview with Administrator 3 from AREC 3, the researcher observed that, although the administrator did not overtly express any ambiguity or lack of awareness regarding the concept, his responses were generic. He stated:

> *"So, in a way, governance is to ensure that there is sanity in the system. At least we are to protect creation. Whatever we have on this earth, especially where life matters, no matter whether we are animals or other things, there are rules to ensure that the rules are not breached or infringed upon, and that is, I mean, for the sustenance of our society and to ensure that the right things are done."* **[A3]**

This expression suggests that, despite possessing a rudimentary understanding of governance, some participants encountered difficulties in articulating the specifics of animal research ethics governance. Across the three ARECs, some participants either explicitly acknowledged their unfamiliarity with the concept or endeavoured to provide personal interpretations of its mention. This underscores a notable dichotomy; although a majority of participants were able to elucidate their understanding of animal research ethics governance, a few openly admitted their lack of understanding or awareness of the concept.

These findings are consistent with the insights provided by Kolstoe and Pugh (2023), who observe that researchers often use the terms 'research integrity', 'research ethics', and 'research governance' interchangeably, which results in ambiguity. Tzermpinou (2023) also identified inconsistencies in the way researchers interpret research ethics governance and emphasised the need to have a clear definition of the concept 'animal research ethics governance'. Given that some participants were unable to articulate their understanding of animal research ethics governance, despite their experiences with the AREC and conducting animal-based research, a critical need for enhanced awareness and educational initiatives regarding animal research ethics governance in Ghana persists.

5.4.2 How the key stakeholders think the ethical use of animals in scientific studies is currently governed in Ghana

This section delves deeper into the participants' comprehension of the concept of 'animal research ethics governance', specifically by soliciting their opinions and experiences of animal research ethics governance in Ghana. An analysis of the interview data and naïve sketches revealed two main themes:

- Lack of a national legal and regulatory framework for the ethical use of animals for research in Ghana
- Lack of awareness on how the ethical use of animals in scientific studies is being governed in Ghana

These findings were summarised in Table 5.2, highlighted in blue, and are further detailed in Table 5.4, which outlines the subthemes associated with each main theme. The subsequent subsections elaborate on these main themes, incorporating relevant subthemes and verbatim quotations to substantiate the arguments presented in the reviewed literature.

Table 5.4: Main themes and subthemes from interviews and naïve sketches exploring participants' perception of how ethical use of animals in research is currently governed in Ghana

Question	Main Themes	Subthemes
How do you think the ethical use of animals in scientific studies is currently governed in Ghana?	5.4.2.1 Lack of a national legal and regulatory framework for the ethical use of animals for research in Ghana	a) Lack of specific regulation for the ethical use of animals for research in Ghana
		b) Lack of national policies and guidelines for the ethical use of animals for research in Ghana
		c) Lack of a national governance structure or oversight body for the ethical use of animals for research in Ghana

Question	Main Themes	Subthemes
	5.4.2.2 Lack of awareness on how the ethical use of animals in scientific studies is being governed in Ghana	

5.4.2.1 Main theme 1: Lack of national legal and regulatory framework for the ethical use of animals for research in Ghana

The analysis of the interview data collected from all three ARECs revealed a prominent theme concerning the absence of a national legal and regulatory framework governing the ethical use of animals in Ghana. This main theme emerged from the following subthemes:

- Subtheme 1: Lack of specific regulation for the ethical use of animals for research in Ghana
- Subtheme 2: Lack of national policies and guidelines for the ethical use of animals for research in Ghana
- Subtheme 3: Lack of a national governance structure or oversight body for the ethical use of animals for research in Ghana

The subthemes are presented and discussed below.

a) Subtheme 1: Lack of specific regulation for the ethical use of animals for research in Ghana

This study's findings reveal that Ghana currently does not have a comprehensive national law on the ethical use of animals in scientific studies. The absence of specific laws regulating animals' use in research was identified by some participants. Additionally, a few participants mentioned that the sole national law relevant to the general welfare of animals, which does not specifically pertain to their use in research, is encapsulated in Ghana's Criminal Code of 1960, Act 29. AREC Member 5 (AREC 3) articulated:

> *"Yeah, I think, in Ghana, it is not an act of legislation by the government. I tried searching to see if there is any law in Ghana that prescribes how animal research ethics should be governed or done; there was none. The only thing I could find was the criminal code, which was talking about offenses against animals, and it was just listing; some of them are even very funny. I saw one of them that says, you cannot use a cattle without informing the owner, so but generally there is nothing like that, so institutions in Ghana where research is being done have taken it upon themselves to put some structures and some measures in place to be able to operationalise this."* **[M5]**

AREC Member 2 (AREC 1) also stated:

> *"Yeah, I think that this is the Ghana Criminal Code 1960 Act 29. Yes, if you go to Section 303, it talks about all those. I don't know of any other documents. It captures important issues. Yes, the research component is not there, but in a way, it talks about if you are using animals for anything."* **[M2]**

Likewise, Researcher 1 (AREC 1) stated:

> *"… I don't know, for example, in the legal framework in Ghana, if there is any law governing the use of animals for research. I don't know if there is."* [**R1]**

Administrator 2 (AREC 2) corroborated this assertion, noting that ARECs are dependent on international regulations, which they subsequently modify to suit their specific contexts:

> *"In Ghana, for what I know, we don't have a governance system in place. What we did when we were setting up our board [AREC] was to fall on other international regulations to be able to guide the development of the SOPs. And I'm sure that is what most of the institutions that have it [ARECs] in place are doing. Mostly, we fall on international bodies. Yes, in Ghana."* **[A2]**

Apart from the Criminal Code (ACT 29), which was enacted in 1960 and subsequently amended in 2012, with Section 303 addressing the general treatment of animals, there is a notable absence of national legislation or regulations governing the use of animals in research within Ghana. Consequently, the lack of specific laws regulating their use in scientific studies compels research-producing organisations and individual researchers to take on the responsibility for ensuring that animals are used ethically in scientific studies. As a result, the establishment of systems and protocols to ensure the ethical use of animals in research is largely dependent on the discretion and initiative of these entities.

b) Subtheme 2: Lack of national policies and guidelines for the ethical use of animals for research in Ghana

Several participants also pointed out that the absence of national policies and guidelines for the ethical use of animals for research typifies the governance of this research in Ghana. AREC Member 2 (AREC 1) confirmed this view by stating:

> *"As far as, to the best of my knowledge, we don't have any such guidelines [national guidelines] in place nationally."* **[M2]**

Administrator 2 (AREC 2) stated in her naïve sketch that:

> *"Currently in Ghana, there are no known guidelines for animal research. Most researchers comply with international regulations."* **[A2_N]**

AREC Administrator 1 (AREC 1) further elucidated that while fragmented laws and regulations exist within the country that are employed by various institutions, a cohesive national regulatory framework is notably absent. She explained:

> *"So, in most cases, any document that for instance, the Ghana Wildlife Association used to govern their operation is referred to by most animal researchers. So, like I said, we don't have any [referring to national policies and*

guidelines] but you could find pockets of laws, pockets of regulations and guidelines, and any other documents that people refer to." **[A1]**

In support of the aforementioned assertion, AREC Member 1 (AREC 1) elaborated on the challenges associated with establishing a national governing policy. He explained:

"You know, it's difficult to try and get a governing policy that will oversee various institutional activities. It's always difficult because of political things." **[M1]**

The absence of a national policy or established guidelines regarding the use of animals in research within Ghana has led certain institutions and individual researchers to rely on policies and guidelines from other countries and international organisations. As a result of this reliance, there are inconsistencies in the policies and guidelines employed by various ARECs across the country. An analysis of the data indicates a notable lack of uniformity among the three existing ARECs, as these committees appear to be governed by disparate regulations in their decision-making processes. Therefore, it is recommended that the formulation of a national policy on the use of animals in research would provide a foundational framework from which individual institutions could develop tailored guidelines and policies that address their specific contexts, while still adhering to the overarching principles established by the national policy.

c) Subtheme 3: Lack of a national governance structure or oversight body for the ethical use of animals for research in Ghana

Participants who defined 'animal research ethics governance' as the presence of a national or institutional structure or national authority to regulate the ethical use of animals for research pointed out that Ghana lacked such a structure. They shared that they were unaware of the existence of any national structure in place for the ethical use of animals in research. In the participants' view, this implies the lack of a governance structure or any form of structured governance system nationally overseeing the ethical use of animals in research. AREC Administrator 1 (AREC 1) stated:

> *"We don't have a national animal research ethics board. But we have semi-unit, semi-animal bodies that look at animal welfare in general. But not necessarily animal research ethics or the ethics of animal research."* **[A1]**

AREC Member 1 (AREC 1) also confirmed:

> *"So nationally, I don't know of anybody or any organised body that oversees some of these things. In some institutions, even now, it is coming up strongly, so most universities now have ethics committees."* **[M2]**

Researcher 2 (AREC 1) made a comparison with human research ethics governance in Ghana. They stated that there is no national structure for the governance of animal research ethics because there is no such structure for human ethics either:

> *"No, nationally, I would doubt if there was anything happening because even for human ethics review committees, there is even a struggle there. There are so many of them now, but there is no governing structure nationally even for that one."* **[R2]**

AREC Member 3 (AREC 2) shared his experience:

> *"Nationally, I don't see anything in existence. I don't see that there is policing of animal use, as I know elsewhere. I have had the opportunity to work in the US with animals, even in New Zealand with animals, and over there, there is strict adherence to rules such that if you are using animals unethically, they can come and stop your work. Here, nobody is policing anything, and so, just this morning, I was telling one of my colleagues that we did some work on grasscutters, and later on, we saw that we were really punishing the animals ignorantly. Nobody told us anything, right, and so, looking at the different jurisdictions I've worked in, I will say there is nothing at all*." **[M3]**

This was further confirmed in the interview with Researcher 3 (AREC 2), who stated:

> *"So, we are talking about Ghana; I haven't seen any documents. All I know is that we have ethics committees that you submit your application to."* **[R3]**

Researcher 1 (AREC 1) also noted that:

> *"So, in Ghana, if we have a law and a national body, then it can even cover all research using animals or the general use of animals, even for consumption. The body will ensure that people who use animals for any purpose adhere to certain regulations and standards that will be appropriate."* **[R1]**

He elaborated:

> *"The body will ensure that people who use animals for any purpose adhere to certain regulations and standards that will be appropriate. I think what the IACUCs are doing, let's say the one at the University of Ghana, for example, should meet international standards, but then there should be at least a very minimum standard for everyone in the country, so we can say that something is happening. I think having that national framework or policy would help."* **[R1]**

Ghana currently lacks a national oversight authority tasked with the responsibility of ensuring that scientific studies using animals are conducted in a humane and ethical manner. Establishing such an oversight body would help facilitate the standardisation of guidelines that govern the operations of ARECs in the country. While researchers may adhere to their respective institutional policies and guidelines, there is an obvious absence of uniformity in the policies and guidelines developed by these institutions. This discrepancy arises from the fact that institutions are adopting policies and guidelines from various international contexts, leading to inconsistencies in ethical standards and practices across the country.

The quotes above confirm that participants from all three ARECs indicated a perceived lack of a national legal and regulatory framework for the ethical use of animals for

research in Ghana. The findings of this study confirm the assertions by Fakoya (2012), Seth and Saguti (2013), Hau et al. (2014, 2018) and Mohr et al. (2023) about a dearth of legal governance frameworks in most African countries, which results in inadequate legal backing for ARECs. Additionally, Mohr et al.'s (2017) assertion that Ghana has no known legislation governing animals' use for scientific studies is corroborated in this study. The findings also confirm the claim by De Vries et al. (2017), Tindana et al. (2019) and Owusu et al. (2022) that Ghana lacks a national body or framework that guides ethical research in the country. Despite these authors referring to research ethics in general, the findings from this study support the notion that a lack of a national legal and regulatory framework also applies to animal research in Ghana.

5.4.2.2 Main theme 2: Lack of awareness on how the ethical use of animals in scientific studies is being governed in Ghana

Most participants indicated a deficit in awareness regarding the governance of the ethical use of animals in scientific studies in Ghana (Table 5.4). This lack of awareness can be attributed to either a lack of information or the absence of any notable national initiatives or governmental actions aimed at ensuring the ethical treatment of animals used in research. Researcher 5 articulated that the absence of national policies, guidelines, or legislation has resulted in a lack of clarity regarding the governance of ethical practices in animal research in Ghana. She remarked:

> *"I don't really know how they are governed in Ghana. I have not come across any policies. Genuinely, I haven't seen any policies on the net. I don't know if our constitution captures animal welfare, yeah. Even as a start, animal welfare not to talk about their uses in scientific studies; I don't know about it. So, but I have had protocols reviewed and accepted by KNUST, so perhaps they have their own policies that have not been made public to us, the researchers."* **[R5]**

Researcher 3 also stated in her naïve sketch that:

> *"I am not aware of governance at the national level or any national legislation or regulations that supports the work of the various animal ethics committees.* **[R3_N]**

This was further confirmed in her interview when she stated:

> *"So, we are talking about Ghana; I haven't seen any documents. All I know is that we have ethics committees that you submit your application to."* **[R3]**

She also shared her experience from other countries:

> *"So, I think, as I said, maybe the committees have documents that they use. For example, in Australia, you go through training, so they mention some of the regulations and all that, but for our system, you get approval, then there are recommendations. They think your protocol is not good and all that, but as to whether they have particular standards they follow and whether there are documents, I haven't seen anything like that. I have not seen any documents. I don't know. Maybe the various committees have one national body that they belong to, but I don't have an idea about that."* **[R3]**

Researcher 1 affirmed Researcher 3's assertion by claiming:

> *"So well, I haven't checked, and I don't know, for example, in the legal framework in Ghana, if there is any law governing the use of animals for research. I don't know if there is. There could be, but I am not aware of any. But in a place like the US, they already have an established law, so in Ghana, if we have a law and a national body, then it can even cover all research using animals or the general use of animals, even for consumption."* **[R1]**

Additionally, Researcher 2 also expressed his doubts about any existing national initiative to govern the use of animals for research. He stated:

> *"So, when it comes to animals, I doubt if there is really anything happening at the national level."* **[R2]**

Researcher 4 stated plainly:

> *"Like I said, I don't know about it, this is my first time answering this question. I don't think I can give a genuine response"* **[R4]**

The aforementioned quotations, sourced from researchers participating in the study, indicate a notable lack of awareness regarding the governance of ethical use of animals in research at the national level in Ghana. The participants were not sure of the existence of laws, policies, guidelines or oversight bodies with respect to the ethical use of animals in scientific studies, particularly compared to other countries like the United States of America and Australia. The prevailing uncertainty and scepticism among participants concerning the availability of relevant documents, policies, and legislation governing animal research in Ghana is substantiated by a review of the literature, which did not yield any evidence supporting the existence of such regulatory frameworks. Subsequently, this suggests that there may also be a very low awareness among researchers and the general population on the ethical use of animals for research.

Participants were unanimous with respect to their experiences related to governance in the ethical use of animals in scientific studies in Ghana. Participants clearly showed that they had experienced an unregulated governance regime when it comes to the ethical use of animals for research in Ghana. The only document that mentions the humane use of animals is Ghana's Criminal Code 1960, Act 29 (Parliament of Ghana, 1961), although this Act does not address the use of animals for research (Mohr et al., 2017). The findings of this study confirm the observation by Cheluvappa et al. (2017) and Petkov et al. (2022) that the adoption of explicit national ethical standards and legislation for the use of animals in scientific studies is a recent development in many countries. Similar to some African countries, Ghana is one of the countries that is yet to adopt such explicit national ethical standards and legislation (Hau et al., 2014, 2018; Mohr et al., 2017, 2023; Nyika, 2009).

5.4.3 The key stakeholders' experience with animal research ethics governance in their institutions

In order to further explore participants' perspectives and experiences related to the concept of 'animal research ethics governance', participants were also asked about their institutional experiences with the governance of scientific studies using animals. Two main themes emerged:

- Use of institutional structures, policies and procedures for the ethical use of animals for research
- Failure to ensure compliance with institutional systems established to ensure the ethical use of animals in research

These findings are summarised in Table 5.2, highlighted in pink, and further detailed in Table 5.5, which outlines the subthemes associated with each main theme.

Table 5.5: Main themes and subthemes from interviews and naïve sketches exploring participants' experiences with animal research ethics governance in their institutions

Question	Main Theme	Subthemes
How do you think the ethical use of animals in scientific studies is currently governed in your institution?	5.4.3.1 Use of institutional structures, policies and procedures for the ethical use of animals for research	a) Adherence to institutional policies, guidelines and the 3R principles to ensure the ethical use of animals for research
		b) Availability or establishment of institutional ARECs
	5.4.3.2 Failure to ensure compliance with institutional systems established to ensure the ethical use of animals in research	a) Non-compliance with established procedures for the ethical use of animals for research within institutions
		b) Adherence to ethical research conduct is primarily driven by the necessity for publishing research findings and securing funding

The subsequent subsections elaborate on these main themes, incorporating relevant subthemes and verbatim quotations to substantiate the arguments presented in the reviewed literature.

5.4.3.1 Main theme 1: Use of institutional structures, policies and procedures for the ethical use of animals for research

The experiences shared by most participants from all three ARECs showed that animal research ethics at their respective institutions were governed by institution-specific policies and procedures. Two subthemes support this main theme:

- Subtheme 1: Adherence to institutional policies, guidelines and the 3R principles to ensure the ethical use of animals for research
- Subtheme 2: Availability or establishment of institutional ARECs

The subthemes are presented below with verbatim quotes from participants.

a) Subtheme 1: Adherence to institutional policies, guidelines and the 3R principles to ensure the ethical use of animals for research

Most participants emphasised that their institution had developed policies and procedures that govern the use of animals for research. These policies, developed by institutions, apply only to researchers within the institution and those who collaborate with researchers in the institution. AREC Administrator 1 (AREC 1) explained:

> *"So, in my institution, it is mainly through the ethics policy that we have. The ethics policy covers both human research and animal research. And then we also have a specific document, which is the standard operating procedure for the use and care of animal ethics, which also governs our daily operations as far as animal research is concerned*." **[A1]**

AREC Member 1 (AREC 1) also stated:

> *"We do have extensive guidelines that will let us take into consideration, first and foremost, the welfare of animals. So, it's not just the ethics committee, you know, that is granting the ethics, but we also look at the use and care of the animals. So, there are two things here: how do you use them, and how do you care for them?"* **[M1]**

AREC Member 5 (AREC 3) wrote in his naïve sketch:

> *"The KNUST has a research ethics policy. In the policy, however, governance is not explicitly spelt out, though there are descriptions alluding to it."* **[M5_N]**

Researcher 5 (AREC 3) also indicated their awareness of the existence of policies for the use of animals in research, despite not being familiar with the content of the policy:

> *"So, I know there are some policies relating to the animal house community. Yes, I know there are some policies relating to the use of animals in research, but the details of them I am not quite familiar with because, er, I am not quite familiar with them. But I believe that a section of the review committee is in charge of dealing with the experiments or protocols that involve animal work. I am aware there are some guidelines they are using because they wouldn't approve a protocol without following such guidelines."* **[R5]**

The establishment of institutional policies and guidelines is recognised as a critical governance mechanism for ensuring the ethical use of animals in research. Key stakeholders rely on the policies formulated by their respective institutions to regulate the use of animals in research activities. In the absence of a national policy or pertinent legislation, certain institutions in Ghana, specifically the three institutions that have instituted ARECs, have taken the initiative to develop their own policies to oversee ethical procedures and processes. The proactive development of these policies and guidelines by the institutions represents a commendable effort toward the governance of the ethical use of animals for research.

Adherence to the 3R principles by institutions was also mentioned by a few participants from AREC 1. AREC Member 1 (AREC 1) stated:

> *"So, at the end of the day, we have the 3R formula that we use. We want to look for refinement in any research to be sure that, you know, maybe somebody puts in research that uses 100 rats. Can we refine it in such a way that you may not even need rats at all? Maybe you need mice, or somebody puts in that I need mice, but we refine it to say, no, even that. Considering the volume of blood that you may need and the kind of work you are proposing to do, let's refine your work so that you don't go and use the mice and later come back and say it didn't work. Then we also look at the reduction. You know, refinement, reduction... We have to reduce the numbers that you intend to use for animal work as much as possible. This is quite relevant. I think I forgot the 3rd R. The 3Rs govern animal use. So, the committee looks at this and works with it."* **[M1]**

AREC Member 2 (AREC 1) also mentioned the 3Rs and recommended a fourth R, namely respect:

> *"… we use the 3Rs and I add a fourth one which is respect. You must respect the animals."* **[M2]**

These participants from AREC 1 suggested that animal research ethics governance in their institution incorporates the 3R principles, which are used by their institutional AREC in the evaluation and approval of research proposals and protocols. Furthermore, one participant contributed to the discourse regarding the sufficiency of the 3Rs in ensuring the ethical use of animals for research by introducing a fourth R, which he delineated as 'respect' for the animals involved.

b) Subtheme 2: Availability or establishment of institutional ARECs

Participants from all three ARECs associated animal research ethics governance within their institutions with the establishment of an AREC. When queried regarding their experiences with animal research ethics governance in their institutions, they

referenced the presence of ARECs as a significant component of their institution's ethical oversight mechanism. Researcher 1 (AREC 1) stated:

> *"At the University of Ghana, there is the Institutional Animal Care and Use Committee (IACUC). Maybe all other institutions, for example, the University of Cape Coast, don't have such a committee. It's now that they are trying to adopt it. The University of Ghana has a body, the IACUC, that governs the use of animals for research."* **[R1]**

AREC Member 5 (AREC 3) wrote in his naïve sketch:

> *"In the KNUST, there is a structured governance system for animal research ethics with the establishment of the AREC."* **[M5_N]**

AREC Member 1 (AREC 1) also stated that:

> *"Ethics governance is under the Office of Research, Innovation, and Development (ORID). Yeah, and the composition of the committee is such that it should meet its goals. So, you have specialties from various places, genetics people, pharmacology, clinical pathology, toxicology… so, without that, it means that the governance structure is weak. And then it means that it is not properly related to the overall ruling structure."* **[M1]**

Administrator 2 (AREC 2) mentioned:

> *"Okay, for now, what we have is that, because we have the IACUC in place, we expect that everybody who is doing research related to animals will first and foremost bring it to the ethics board for the ethics board to look at it and approve the ethical aspect of the scientific soundness of the work before the person goes ahead or proceeds with data collection and all that. And ideally, from time to time, we do monitor to find out if they are complying with the guidelines set aside or if they are doing something different from what we have approved. I mean, the IACUC."* **[A2]**

AREC Member 3 (AREC 2) confirmed that the institution did not have any animal research ethics governance in place apart from the establishment of the AREC:

> *"No, no, I co-incidentally served as the director before I left, and so if there is anything I would have known, but there was nothing. All we did was, because the IACUC was there, you tried to bring your work to the IACUC"* **[M3]**

He further described the institution's animal research ethics governance as rudimentary:

> *"Within the institution, not until this committee was setup, nobody required us to do anything, so a lot of my work that was done using animals here was done without any ethical clearance. I just did things the way I knew how, and even now, it is still voluntary. Nobody is requiring that; no, you can't do this with animals by using them. You choose to submit yourself to it. And the IACUC (Institutional Animal Care and Use Committee) will now come in and direct you. The governance here is very rudimentary."* **[M3]**

Researcher 3 (AREC 2) also stated during the interview:

> *"In my institution, we have an ethics committee that reviews and approves protocols. I think we had one workshop to introduce why we need to apply for ethics and all that. I want to believe they have subscribed to some international standards or codes, but I don't know about the details."* **[R3]**

Researcher 4 (AREC 2) posited that the governance of animal research ethics within the institution is primarily the responsibility of the institution's head office. This office houses an established AREC that is tasked with the review and approval of protocols pertaining to research involving animals. She articulated this perspective as follows:

> *"The CSIR head office is handling it. So, at each institute, if you are a researcher, you apply to the ethics committee at the head office. So, they will review your proposal, your materials, and methods, and how you are going to*

> *use them. So, they bring, I think, other researchers on board in your area. When they read it, they will review it and give you a response."* **[R4]**

AREC Member 5 (AREC 3) wrote in his naïve sketch that:

> *"In the KNUST, there is a structured governance system for animal research ethics with the establishment of the AREC. The KNUST has a research ethics policy. In the policy, however, governance is not explicitly spelt out, though there are descriptions alluding to it."* **[M5_N]**

AREC Member 5 (AREC 3) also confirmed the existence of an AREC as a way of governing research using animals during the interview:

> *"My institution has an animal ethics committee. So, in my opinion, the University of Ghana is one of the institutions that has tried to do it in a more organised manner. So, there is a research policy, a research ethics policy, and then there are research ethics committees that have been approved by the university…"* **[M5]**

In this study, the key stakeholders from all three ARECs associated the existence of an AREC with the presence of animal research ethics governance in their institutions. This observation indicates that ARECs are perceived as a critical component of animal research ethics governance that facilitates the ethical use of animals in scientific studies.

For this main theme, participants' experiences with animal research ethics governance in their respective institutions were identified as relating to the use of institutional policies, procedures and the existence of ARECs for the ethical use of animals for research. It was observed that most participants across all three ARECs predominantly associated animal research ethics governance with the mere presence of ARECs, with only a minority acknowledging the role of institutional policies and the application of the 3R principles.

These findings corroborate existing literature, which suggests that research ethics governance is often confined to the establishment of research ethics committees along with the formulation of policies and guidelines at both national and institutional levels (Schopper et al., 2017; Schoeman, 2019; Rossouw, 2020; Canario et al., 2022). Although the establishment of an AREC is an important component of animal research ethics governance, their establishment alone must not be construed to mean the presence of a comprehensive research ethics governance system. ARECs are ultimately established to function within specific contexts, which are guided by laws, policies and guidelines at institutional, national and international levels (Silverman, 2017). It is therefore important to develop laws, policies and guidelines in addition to the establishment of ARECs to ensure the effective governance of scientific studies using animals.

5.4.3.2 Main theme 2: Failure to ensure compliance with institutional systems established to ensure the ethical use of animals in research

The second main theme that emerged from the subthemes identified from interviews and naïve sketches regarding participants' experiences with the governance of animal research ethics within their respective institutions was the failure of these institutions to enforce compliance with established ethical frameworks for the use of animals in research. This main theme emerged from the following two subthemes:

- Subtheme 1: Non-compliance with established procedures for the ethical use of animals for research within institutions
- Subtheme 2: Adherence to ethical research conduct is primarily driven by the necessity for publishing research findings and securing funding

a) Subtheme 1: Non-compliance with established procedures for the ethical use of animals for research within institutions

Some participants acknowledged that despite their institution making some efforts at ensuring the ethical use of animals for research, the institution has failed to ensure that researchers comply with its animal research ethics governance systems. They

indicated a lack of supervision of the work of the AREC and researchers who use animals, as well as inadequate resources to enable efficient functioning of the ARECs. Quotations from some participants are presented below to confirm these points. AREC Member 2 (AREC 1) explained:

> *"The major challenge we have here is that somebody wants to do some work in Cape Coast or something and brings a document for review. In governance, it is not only the document the person brings, but you also have to follow up. You visit the site. You have to be sure of where the person is going to conduct the study. And then periodically, in the course of the work, you also have to go and check whether they are adhering to the recommended protocol. But that has been lacking because of limited resources. I'm sure you understand."* **[M2]**

In the course of the interview with AREC Administrator 2 (AREC 2), it was noted that the AREC at her institution was not being patronised by all researchers. Furthermore, she indicated that the institution faced challenges in implementing measures to mandate that all researchers submit their protocols for review and approval by the AREC. She articulated:

> *"Mmmm, I will say it is not for everybody. I'm very confident there are other research projects going on that do not come to our board (IACUC)."* **[A2]**

This assertion was corroborated by AREC Member 3 (AREC 2), who indicated that researchers submit their protocols for review on a voluntary basis. Furthermore, it was noted that no systematic mechanism exists to ensure adherence to the established procedures and policies.

> *"So, apart from the IACUC, there is no other governance system within the institution; even that is voluntary. It's much more of a voluntary thing for people to submit to the IACUC."* **[M3]**

AREC Administrator 3 (AREC 3) shared during the interview that, although the institution has been in operation for some years, it commenced a more rigorous

approach to the ethical use of animals in research in the year 2020. He suggested that this shift in focus is likely attributable to international regulatory requirements.

> *"I think over the years, as I said, the university established this thing [AREC] in 2020, and the whole process was completed in 2021, where we were appointed in January. It appears that over the years, many things were overlooked, and therefore, in the course of that, as we are part of the international community, maybe somewhere in the international arena some of these things were raised, and therefore maybe the attention of Ghanaian researchers was drawn to these international requirements. So, I'll say it's a new thing. We are still learning in the learning process."* **[A3]**

According to AREC Member 5 (AREC 3), despite the lack of national legislation on the use of animals, scientists are being compelled to obtain ethical clearance for their research. This phenomenon is pushing scientists to seek ethical clearance for their proposed studies from ARECs, which were not properly established:

> *"…so all these in a way push scientists in Ghana even though there is no legislation by the country; this will drive any scientist to be looking for that, so a lot of the institutions are having it [AREC] now, but in very quasi, like in very little sometimes just in the department saying they have ethics committees which do not even exist, and probably it will just be one person who is receiving and authorising that the research has been approved, the ethics application has been approved."* **[M5]**

AREC Member 1 (AREC 1) also stated:

> *"Yes, at the institutional level, there still hasn't been an understanding of the need for an animal ethics committee. If we all understand that, why would a human ethics committee take it upon itself to review documents for animal research? I mean, it tells you that there is something wrong. I mean, if you don't really appreciate the university's structure, So, these are breaches that we really need to address. Because the committee is... it's like human rights. The*

> *purpose is to protect animals, animal welfare, and the proper use of them for research, teaching, etc., but not only research; some use it for teaching and demonstration as well. Even as an ethics committee, we are still going around; there are still people or faculty members in the university who do not even know of a committee like that in the university, and therefore they do what they feel is right."* **[M1]**

He elaborated:

> *"You must put yourself in the shoes of an animal if somebody has to determine your fate and the person is not a competent person. It's like you have a clinical or medical problem; a heart specialist must look at you; and you have a skin specialist who is sitting there and taking decisions for you. I mean, it's not right, it's not fair, it's immoral, and it's unethical for a human research ethics committee to review protocols for the conduct of research using animals."* **[M1]**

From the quotes above, the experiences of some participants regarding the ethical use of animals in research within their institutions are characterised by an inefficient and ineffective or failed governance system. Not all researchers in institutions using animals for research can be compelled to submit their protocols for ethical review and approval. ARECs are inadequately resourced to carry out their functions, which include the monitoring of approved projects to ensure compliance with ethical standards in research using animals. This highlights the urgent need for establishing a national governance framework that would impose binding regulations on all research-producing organisations and researchers across the country to ensure that animals are used ethically in scientific studies.

b) Subtheme 2: Adherence to ethical research conduct is primarily driven by the necessity for publishing research findings and securing funding

Participants in AREC 2 indicated that researchers within the institution are primarily motivated by the imperatives of publication and funding to pursue ethical clearance for studies involving animal subjects and to comply with ethical principles governing such

research. Over the years, participants noted a pervasive attitude among researchers that suggests a lack of genuine concern for adhering to the institutional governance frameworks established to ensure the ethical treatment of research animals. Researchers' adherence to established institutional governance systems appears to be largely motivated by pressures, particularly from international funding agencies, which have strict ethical requirements for evidence of ethical approval. Additionally, the necessity for ethical reviews and approval of research protocols by the AREC is often viewed as a prerequisite for publication in peer-reviewed journals. Consequently, these factors emerged as the predominant motivations for researchers to seek ethical reviews and to align their practices with established ethical principles in animal research.

AREC Member 3 reported that he pursued ethical clearance only when publishers mandated the submission of an ethical clearance certificate. In instances where such certification was not a requirement, he proceeded to publish his work without obtaining ethical clearance.

> *"… if you wanted to publish and the people required it, then you were caught up. If they didn't require it, then you pass. And a lot of the work we did actually passed, I don't know for now, through the publications without going through ethics until one paper that I wanted to publish, and then the journal said, where is the ethical clearance? That is when stars began to fly in my eyes. In fact, it was around the same time I became a member of this committee."* **[M3]**

According to the experiences of AREC Member 3, researchers affiliated with his institution have conducted numerous studies without obtaining ethical clearance, because it was not required by the publishers prior to publication. The AREC administrator corroborated this claim, indicating that scientists within the institution typically submit their studies to the AREC for review only when explicitly requested to do so by international collaborators or journals:

> *"Lack of institutional policy on the subject also makes scientists very reluctant to submit their work for ethical clearance unless it is requested by their foreign partners and scientific journals during publication."* **[A2_N]**

She further explained during the interview:

> *"… others are confronted with international requirements, so they have no choice but to look for a system that has them [AREC]. So, they kind of remember that, okay, CSIR has some [AREC] in place, so we will go to them for approval. So that may be some of the challenges that they are having. Awareness is one. And the fact that they wait until an international partner request it before we can attempt to come for approval."* **[A2]**

AREC Administrator 2 shared that researchers only remember that the AREC exists when they are requested to submit their ethical approval certificates. Without the requirement by international bodies for ethical review prior to funding or publication, researchers do not voluntarily submit their protocols for ethical review.

Researchers are compelled to adhere to the processes and guidelines of institutional ARECs when they have an international grant or when they are submitting manuscripts to peer-reviewed journals for publication. This necessity has resulted in the voluntary submission of research protocols for ethical review by researchers. This observation is corroborated by Schoeman (2019) and Ndebele et al. (2023), who suggest that ethical clearance is obtained by researchers in Africa primarily to fulfil the requirements of funding agencies. In contrast, Ndububa et al. (2023) propose that the pursuit of ethical clearance may not be predominantly driven by funding imperatives, as their study revealed that nearly 70% of applications for ethical clearance were self-sponsored. However, this assertion by Ndububa et al. (2023) lacks empirical support, given that over 80% of the studies examined were conducted by undergraduate researchers, who typically do not require external funding. Moreover, the finding that approximately 70% of the studies submitted to the REC were self-sponsored does not necessarily indicate a lack of funding; it is plausible that researchers opted to self-fund the ethical clearance process to facilitate their acquisition of external funding. These

findings suggest that institutions in Ghana would benefit from the establishment of a national framework that provides authoritative guidance for their specific institutional guidelines and policies governing the ethical use of animals in research. Furthermore, the absence of such a national framework may contribute to institutional failures in ensuring compliance with ethical standards regarding the use of animals in scientific studies.

5.5 Chapter Conclusion

The purpose of this chapter was to present and discuss the demographic characteristics of participants. It also presented and discussed the findings of the first objective of this study, which was to explore and describe key stakeholders' understanding of the concept of 'animal research ethics governance'. Participants' understanding and experience with the existing governance for the ethical use of animals in scientific studies in Ghana and their respective institutions were also presented and discussed. The findings demonstrated that rules and regulations for the ethical use of research animals, as well as the existence of a governance structure or body that regulates their use, were the main components of the definition given by participants.

Considering that there is no explicit definition of 'animal research ethics governance' in the literature, the findings presented in this chapter provide a basis for a working definition of the concept. **'Animal research ethics governance' is defined as a broad concept used to describe the establishment of systems and practices including the enactment of laws and legislation, the establishment of oversight bodies and promulgation of policies, guidelines and standard operating procedures from national to institutional levels to regulate the use of animals in scientific studies, thereby ensuring that animals are used humanely in scientific studies.**

The findings further established the non-existence of a national framework, law or guidelines governing the use of animals in scientific studies in Ghana. Many participants were unaware of how the ethical use of animals in scientific studies in the

country was governed at the national level. However, they indicated the existence of institutional policies and guidelines adapted from international organisations. Additionally, participants identified that the ARECs in their respective institutions govern the use of animals in scientific studies, but there is voluntary compliance by researchers, occasioned only when required for international funding or scientific publication in peer-reviewed journals. This calls for the development of a national animal research ethics governance framework that will guide the ethical use of animals in scientific studies in all institutions in Ghana.

This chapter has proposed a working definition of the concept of 'animal research ethics governance', providing a foundation to further explore the existing animal research ethics governance systems and practices in Ghana, which will be useful in proposing an appropriate animal research ethics governance framework for the country. In Chapter Six, the findings of the second research objective, which was to explore the existing research ethics governance systems that promote the ethical use of animals in scientific studies in Ghana, are presented and discussed.

CHAPTER SIX
FINDINGS ON KEY STAKEHOLDERS' EXPERIENCES WITH EXISTING RESEARCH ETHICS GOVERNANCE SYSTEMS THAT PROMOTE THE ETHICAL USE OF ANIMALS IN SCIENTIFIC STUDIES IN GHANA

6.1 Introduction

The previous chapter presented the research findings related to key stakeholders' understanding of the concept of 'animal research ethics governance'. It also presented their experiences with animal research ethics governance in Ghana and their respective institutions. The findings suggest that key stakeholders used two broad ideas to explain animal research ethics governance: they perceived it to be a legal and regulatory framework as well as an oversight body established by a government and/or institution involving a governing body that has been given the authority to develop policies, guidelines and procedures for the ethical conduct of research using animals. Animal research ethics governance in Ghana was also found to be characterised by a lack of national legal and regulatory frameworks and a general lack of awareness with respect to how scientific studies using animals are governed in the country, reflecting the need to inform stakeholders about what governance entails. At institutions in Ghana, animal research ethics is governed through the use of institution-specific policies, procedures and ARECs.

This chapter presents a thorough analysis, discussion, and interpretation of the findings related to the second objective of the research, which sought to ***explore and describe key stakeholders' experiences with the existing research ethics governance systems that promote the ethical use of animals in scientific studies in Ghana***. The ensuing discussion and interpretations of findings are primarily grounded in the interviews conducted and the naïve sketches submitted by participants. Additionally, literature was employed to re-contextualise and substantiate the findings after presenting all the subthemes under specific main themes.

6.2 Key Stakeholders' Experiences with the Existing Research Ethics Governance Systems That Promote the Ethical Use of Animals in Scientific Studies in Ghana

To achieve the second objective of this study, the broad research question was: ***"What are key stakeholders' experiences with the existing research ethics governance systems that promote the ethical use of animals in scientific studies in Ghana?"*** To answer this broad question, participants were asked two main questions:

- *According to you, which governance systems promote the ethical use of animals in scientific studies?*
- *What has been your experience with the existing animal research ethics governance systems to promote the ethical use of animals in scientific studies?*

A total of nine pages (Times New Roman, font size 12, single spacing) of transcriptions from the interviews and five pages (Times New Roman, font size 12, single spacing) of participants' naïve sketches were analysed thematically. The detailed findings of the thematic analysis for each of the embedded cases (ARECs 1, 2 and 3) are presented in Appendices 6.1, 6.2 and 6.3, respectively. The findings with respect to the key quotes and codes from the participants' interviews and naïve sketches are also presented in Appendices 6.4 and 6.5, respectively. The findings of a cross-case analysis of participants' responses across all three embedded cases (ARECs) are presented in this chapter and summarised in Table 6.1. Table 6.1 therefore offers a summary of the main themes and subthemes that emerged from the codes generated from an analysis of participants' interviews and naïve sketches across all three ARECs.

Table 6.1: Summary of findings of cross-case analysis on the existing research ethics governance systems that promote the ethical use of animals in scientific studies in Ghana

Questions	Main Themes	Subthemes	AREC 1	AREC 2	AREC 3	Total Occurrence
According to you, which governance systems promote the ethical use of animals in scientific studies?	6.2.1.1 Use of institutional ARECs	a) Use of ARECs to govern the ethical use of animals for research	x	x	x	3
		b) Weak animal research ethics governance system using institutional ARECs		x	x	2
	6.2.1.2 Use of regulatory systems from international agencies	a) Application of animal research ethics governance systems from international donors and scientific journal publishers		x	x	2
		b) Benchmarking and reliance on international funders' ethical standards and requirements	x			1
	6.2.1.3 Lack of awareness about governance systems that promote the ethical use of animals for research in Ghana	a) Low level of knowledge of governance systems that promote the ethical use of animals for research in Ghana	x	x		2
What has been your	6.2.2.1 Positive experiences with	a) Appreciation of ARECs' activities and	x	x	x	3

Questions	Main Themes	Subthemes	AREC 1	AREC 2	AREC 3	Total Occurrence
experience with the existing animal research ethics governance systems to promote the ethical use of animals in scientific studies?	the animal research ethics governance systems in Ghana	the SOPs used by ARECs				
		b) Use of robust institutional systems, facilities and policies for animal research	x	X	x	3
	6.2.2.2 Negative experiences with the animal research ethics governance systems in Ghana	a) Inadequate resources for ARECs to conduct monitoring visits	x			1
		b) Researchers are unclear about ARECs' mission		x	x	2
	6.2.2.3 Desire for improvements in the animal research ethics governance systems in Ghana	a) Need for a national governance framework for the ethical use of animals in scientific studies	x	x		2
		b) Need for awareness creation and sensitisation on animal research			x	1

Source: Author's construct, 2025

A summary of the findings of the cross-case thematic analysis on the existing research ethics governance systems that promote the ethical use of animals in scientific studies in Ghana, as presented in Table 6.1, shows the main themes and subthemes that emerged from the interviews and naïve sketches. Table 6.1 also shows the number of occurrences of the subthemes across the three ARECs. It illustrates that some subthemes, such as the use of ARECs to govern the ethical use of animals for research, appreciation of ARECs' activities, the SOPs used by ARECs, and the use of robust institutional systems, facilities and policies for animal research, were common

across all three ARECs. Other subthemes, such as a weak animal research ethics governance system using institutional ARECs, the application of animal research ethics governance systems from international donors and scientific journal publishers, and researchers being unclear about ARECs' mission were responses that were common among participants from ARECs 2 and 3.

The common subtheme among participants from ARECs 1 and 2 was the expression of a need for a national governance framework for the ethical use of animals in scientific studies. Responses unique to AREC 1 were benchmarking and a reliance on international funders' ethical standards and requirements, and the experience of having inadequate resources for ARECs to conduct monitoring visits. The desire for awareness creation and sensitisation on animal research was a response unique to participants from AREC 3. This variance shows that participants had different experiences with respect to the existing animal research ethics governance systems in Ghana, depending on their respective institutions. Despite these differences, a subtheme that was common across all three ARECs included respect for the existing governance systems for the ethical use of animals for research in Ghana. A detailed presentation of findings related to each of the questions follows, with verbatim quotes from participants to support the arguments being made.

6.2.1 Governance systems that promote the ethical use of animals in scientific studies

Participants identified governance systems that promote the ethical use of animals in scientific studies as a framework put in place to ensure compliance with existing ethical standards for scientific studies using animals. Three main themes indicated in orange in Table 6.1, and further detailed in Table 6.2, emerged from the interviews and naïve sketches with respect to the governance systems that promote the ethical use of animals in scientific studies. These are:

- Use of institutional ARECs
- Use of regulatory systems from international agencies
- Lack of awareness about governance systems that promote ethical use of animals for research in Ghana

Table 6.2 also outlines the subthemes that emerged from each of the three main themes.

Table 6.2: Main themes and subthemes associated with the responses on the existing research ethics governance systems that promote the ethical use of animals in scientific studies in Ghana

Question	Main Themes	Subthemes
According to you, which governance systems promote the ethical use of animals in scientific studies?	6.2.1.1 Use of institutional ARECs	a) Use of ARECs to govern the ethical use of animals for research
		b) Weak animal research ethics governance system using institutional ARECs
	6.2.1.2 Use of regulatory systems from international agencies	a) Application of animal research ethics governance systems from international donors and scientific journal publishers
		b) Benchmarking and reliance on international funders' ethical standards and requirements
	6.2.1.3 Lack of awareness about governance systems that promote the ethical use of animals for research in Ghana	a) Low level of knowledge of governance systems that promote the ethical use of animals for research in Ghana

Source: Author's construct, 2025

The following subsections elaborate on these main themes, incorporating the subthemes and verbatim quotations from participants' interviews and naïve sketches to substantiate the arguments presented. A literature re-contextualisation follows all the subthemes to conclude the discussion on each main theme.

6.2.1.1 Main theme 1: Use of institutional ARECs

A significant majority of the key stakeholders affiliated with the three ARECs concurred that the ARECs within their respective institutions constitute the primary governance system that facilitates the ethical use of animals in scientific studies. Participants articulated that ARECs, which are responsible for reviewing research protocols and granting ethical clearance certificates, serve as the established governance system for ensuring ethical standards in animal research. This main theme is derived from two subthemes, which are as follows:

- Subtheme 1: Use of ARECs to govern the ethical use of animals for research
- Subtheme 2: Weak animal research ethics governance system using institutional ARECs

These are presented and discussed below with verbatim quotes to support each finding.

a) Subtheme 1: Use of ARECs to govern the ethical use of animals for research

Participants from all three ARECs identified their institution's AREC as the only governance system available. AREC Member 1 (AREC 1) stated simply:

> *"The only system I can mention is the IACUCs, the ethics committees."* **[M1]**

He elaborated:

> *"Institutions that have fully established Animal Ethics Committees with the full complement of specialised professionals on the committee are responsible for promoting the ethical care and use of animals in scientific research."* **[M1]**

AREC Member 4 (AREC 2) also explained the AREC's oversight role as a governance system:

> *"The governance systems that are in place have to do with the IACUC [AREC] which oversees and ensures that people do the right thing when it comes to research in the interest of animals used for research."* **[M4]**

In his naïve sketch, Researcher 3 (AREC 2) wrote:

> *"I'm only aware of the Institutional ethics review boards and their standard procedures as the governance system available currently."* **[N_R3]**

She confirmed this view during the interview by explaining:

> *"Apart from the bodies that have been set, the ethics committee, or institutional review boards, I don't know about any other thing, that is, an institution, or whether we even have by-laws or regulations that are used to control the use of animals in research."* **[R3]**

In addition to the ARECs, Administrator 2 (AREC 1) also identified the national biosafety committee as being responsible for research oversight. According to her, it depends on the ethical clearance from their AREC in order to make decisions. She stated:

> *"Okay, we have the ethics board; that is one. We have the Biosafety Committee, which is not under CSIR but is a national body. From time to time, they also depend on our approval to be able to take decisions at their level. So, I will say*

the ethics board and the biosafety committee. It is a national body with people from different institutions serving on its board as committee members." **[A2]**

Researcher 5 (AREC 3) explained that the AREC serves as their institution's governance system:

"For now, I can only talk about the ethical review board as something that is in place to ensure the ethical use of animals in research because some of the comments that come after you submit your protocol deal with how the animal is being catered for, the kind of pain you are coming to induce on the animal, and what your approaches are to minimising it. So, I can only speak for the ethical review board because, like I said, I have not come across any policy documents, but from the work that I have seen from the ethical review board at both KNUST and UHAS, I can say that is a sort of system to ensure that there is ethical use of animals." **[R5]**

b) Subtheme 2: Weak animal research ethics governance system using institutional ARECs

The governance systems for the promotion of the ethical use of animals for research in Ghana were considered by some participants as ineffective and inefficient. According to the participants, established ARECs are not very efficient in the discharge of their responsibilities. They perceived that the existing governance system is weak and unable to ensure strict adherence to ethical principles for the use of animals in scientific studies, since ARECs lacked the authority to put in place punitive measures for non-compliance by researchers.

A few participants described the existing governance system for the ethical use of animals in research using institutional ARECs as weak and dependent on researchers' willingness to voluntarily subject their proposed study for ethical review. There is no strict adherence to the ARECs' guidelines on the ethical conduct of research using animals, and no punitive measures are in place for non-compliance as part of the governance system currently in place, making the governance system weak.

Researcher 3 (AREC 2) explained that there is no system in place to check whether researchers have received ethical clearance for their studies or not:

> *"So, nobody will ask, 'did you get ethics approval for it?' or when you are not doing an experiment where you are going to keep animals, a lot of people not do it, that is, go for ethics approval. Even for just going around to collect samples from animals and things, no one will ask you anything."* **[R3]**

Researcher 3 (AREC 2) explained:

> *"So, it is all dependent on the PI [Principal Investigator] or the research team to decide if they feel they should go for ethics or not. For example, recently I went for ethics, and my work was just a questionnaire survey. But I did that because of the little knowledge that I got from studying abroad. Research like that, even a survey going out to interview people in the social sciences, even if it is the social sciences, you need ethics approval, and I had some colleagues who were asking, ahh, like this one too, did you go for it (ethics)?"* **[R3]**

According to AREC Member 3 (AREC 2), the existing governance system is ineffective because laboratory science is weak in the country compared to his experience in New Zealand. He explained:

> *"As I said, at the moment, I don't see much. You see, in laboratory science, the reason behind this is that laboratory science is very weak here. That is the first thing. And because laboratory science is weak, it has not necessitated a lot of strict adherences to ethics. Of course, field work using animals is also there, and so a lot of the procedures that we do—in fact, when I was working in New Zealand, we did procedures like fistulation, even oesophageal fistulation—were based on the things we took the animals through. Over there, we sought ethical clearance to be able to fistulate the animals. Here, no one would've gone through ethics; we did, and we tried some here as well. We did ruminant fistulation, and nobody required us to come for ethical clearance. You see, so if you ask what sort of systems exist, I will say that no, I don't see systems*

> *existing here. We may need to put systems in place. We may need to say that for every institution that uses animals, you have to have an IACUC in place, you have to submit to ABCD procedures before you are allowed to use your animal, and there should be a body policing, whatever we have said we would be putting in place. If we do not have those structures, then it will be the same business as usual."* **[M3]**

AREC Member 5 (AREC 3) blamed the ineffective existing animal research ethics governance system on the lack of national legislation in the country:

> *"Ok, so in Ghana, the holistic approach, as I said, is not available because of a lack of legislation in that particular frame, and so wherever it is existing, the institutions are doing it based on probably best practices from other universities outside of Ghana and then adopting such practices, and so in Ghana as a whole, there is no legislation available to ensure the ethical use of animals for research."* **[M5]**

The findings of the study suggest that the existing governance systems for the ethical use of animals are perceived as inadequate and ineffective in promoting the ethical use of animals in scientific studies. This inadequacy not only undermines the ethical treatment of animals during research but also poses significant institutional risks to research institutions, including potential financial and reputational damage. When compared to the governance systems in countries such as Australia (Morton & Whittaker, 2022; Olver et al., 2021; Timoshanko et al., 2017), Malaysia, Singapore, and South Korea (Cvek et al., 2017; Ogden et al., 2017), as well as various European nations (European Commission, 2010; Olsson et al., 2017; Pietrzykowski, 2021), the United States (Bradfield et al., 2018; USDA, 2020; Vasbinder & Locke, 2016) (Vasbinder & Locke, 2016) and South Africa (NHREC, 2024; Seth & Saguti, 2013), the animal research ethics governance framework in Ghana appears notably deficient. Researchers in Ghana may engage in unethical research practices without facing appropriate penalties, a situation that is exacerbated by the absence of SOPs and a comprehensive national framework to guide and regulate the ethical use of animals in research. This perspective is further supported by Ndebele et al. (2014), who argue

that research ethics committees in Ghana fail to operate effectively due to the lack of adequate SOPs. Pietrzykowski (2021) and Omutoko et al. (2023) also underscore the importance of SOPs for the effective functioning of ethics committees. For Ghana to have an effective animal research ethics governance system, it is essential for the country to establish legislation, guidelines, and SOPs.

The verbatim quotations provided earlier indicate that participants from all three ARECs recognised their institution's existing animal research ethics governance system as embodied by the ARECs themselves. This suggests that participants perceive ARECs as an important governance system for ensuring that animals are used ethically in scientific studies. This finding aligns with the assertion by Vasbinder and Locke (2016), as well as Díaz et al. (2020), that ARECs operate in almost every country where animals are used in research, and are an important component of the animal research ethics governance system for ensuring the ethical use of animals in scientific studies.

According to the literature, a research ethics governance system constitutes a structured framework that includes guidelines, principles, and oversight mechanisms aimed at safeguarding research participants, fostering integrity, and facilitating responsible research practices (Kim et al., 2024). Given that ARECs serve as oversight mechanisms, their identification by study participants as a governance system represents merely one facet of broader research ethics governance systems. This finding underscores the necessity for increased awareness creation among all stakeholders regarding the importance and components of animal research ethics governance, as well as the potential repercussions of an ineffective or inefficient governance system. Furthermore, this finding highlights the imperative for a comprehensive governance framework that integrates all elements of an animal research ethics governance system, thereby ensuring the establishment of a robust system dedicated to the protection of animal welfare during research endeavours.

6.2.1.2 Main theme 2: Use of regulatory systems from international agencies

The regulatory systems enforced by international agencies, including funding agencies and scientific journal publishers, were identified as systems governing the ethical use of animals in scientific studies in Ghana. Researchers who use animals in Ghana tend to adhere more strictly to the guidelines and regulations of international funding agencies and publishers since proof of ethical clearance from the local or institutional ethics committee is a condition for funding or the publication of manuscripts. Two subthemes emerged from the analysed data that contributed to this main theme:

- Subtheme 1: Application of animal research ethics governance systems from international donors and scientific journal publishers
- Subtheme 2: Benchmarking and reliance on international funders' ethical standards and requirements

Each of the subthemes is presented below with verbatim quotes to support these themes.

a) Subtheme 1: Application of animal research ethics governance systems from international donors and scientific journal publishers

Some participants in the study indicated that the existing governance system for animal research ethics, which promotes the ethical use of animals in scientific studies, is primarily shaped by the policies and regulations established by funding organisations and scientific journal publishers. AREC Administrator 3 (AREC 3) articulated that the governance systems in Ghana are significantly influenced by the international community, particularly funders and publishers, who mandate the procurement of ethical clearance certificates. This requirement functions as a governance system that ensures the ethical use of animals in scientific studies:

> *"Now, for publication, if you publish an article that requires animal ethics, they require the submission of a certificate, a clearance certificate, to indicate that*

> *you have fulfilled the requirements of that particular research. So, demanding an ethical clearance certificate is one of the governance systems that are in place or should be in place to be able to govern the ethical use of animals."* **[A3]**

This assertion was corroborated by AREC Member 5 (AREC 3), who stated:

> *"But if you want to look at it from an institutional point of view, there are instances where, for example, NIH has some specific guidelines or some things that they require in terms of animal ethics, and so if applicants are coming from certain institutions, they will have to show that they have such an ethics committee available. In fact, that was one of the reasons for setting up the AREC. It came out of that need. So usually, they will do it in a way to satisfy that particular agency and their guidelines."* **[M5]**

Researcher 5 (AREC 3) expressed a comparable viewpoint regarding the governance system, positing that it is significantly influenced by the stipulations set forth by international funding agencies:

> *"Yes, another thing has to do with funding agencies. Some of the funding agencies that I submitted some proposals to are always asking for documents indicating that you are only going to deal with the animals in your study. And I think without that particular document or file attached to the application; you are right away rejected. So, funding agencies are also ensuring, from my experience, that there is ethical use of animals. So, that is another system. So, I think for the ethical review board, I will say that is coming from the institutions and funding agencies that are also putting in. But in terms of national policies, I have not come across any."* **[R5]**

Additionally, Researcher 3 (AREC 2) acknowledged the role of ARECs as a governance system but asserted that the existing governance system is influenced by journal publishers who require ethical clearance certification before accepting manuscripts for publication.

> *"So, every institute in CSIR is supposed to be submitting their protocols to the ethics committee, and all that, but truth be told, if we are going to publish in some journals, we will not ask for ethics. I am sure there are a lot of protocols that will never go to the ethics board. There is no rule that will insist that you submit to the ethics committee for approval."* **[R3]**

The quotes above illustrate that the ethics governance systems established by funding agencies and scientific journal publishers are actively implemented in Ghana to promote the ethical use of animals in research contexts. In Ghana, research involving animal subjects is predominantly influenced by financial support from donor organisations, which stipulate adherence to ethical standards as a prerequisite for funding. Consequently, this necessitates that researchers seek ethical clearance from existing ARECs within the country. Moreover, researchers in Ghana are compelled to submit their protocols for ethical review and approval before conducting their studies because most scientific journal publishers demand evidence of ethical clearance before accepting or publishing manuscripts. Through this process, scientific journal publishers have established ethical guidelines and standards that ensure researchers conduct ethical research using animals. It is noteworthy that many researchers in Ghana tend to comply with local or institutional governance systems primarily when mandated by these external organisations to provide ethical clearance certificates.

b) Subtheme 2: Benchmarking and reliance on international funders' ethical standards and requirements

In order to benchmark the existing governance system in Ghana, some participants conducted a comparative analysis of the animal research ethics governance systems employed in various countries. Since Ghana currently lacks comprehensive national regulations or guidelines on the governance of scientific studies using animals, the participants indicated that the prevailing governance system is characterised by a dependence on the governance systems of other countries. This perspective was corroborated by AREC Administrator 1 (AREC 1), who affirmed:

> *"We follow international animal governance systems based on both US, European, and UK standards. So, the SOPs were not just put together for putting together sake, but they were put together following other existing governance structures and bodies in conformity with the US, Europe, and the UK. So, whatever structures exist there and whatever SOPs they are using to guide their animal research are what we have also put together to guide us. So, we don't work in a vacuum; we rely on these existing world bodies of animal research organisations."* **[A1]**

AREC Member 1 (AREC 1) also stated:

> *"Yes, I mentioned the US Animal Care and Use Guide. Then there is some other document, the Animal Welfare Act, which we base on, but most importantly, there is this guideline that is used now, the CIOMS [Council for International Organisations of Medical Sciences] guidelines. It gives you clear principles that you have to abide by if you want to use animals in research. That is the major guideline, though our documents are based on it."* **[M2]**

According to some participants from AREC 1, some institutions have ARECs as a governance system for promoting the ethical use of animals for research, but these ARECs are highly influenced by the governance systems existing in other countries. Thus, the findings in this study indicate that the ARECs in Ghana are significantly influenced by the governance systems of other countries, notably the United States and the United Kingdom, as well as by funding organisations and scientific journal publishers. This dependence on international governance systems has resulted in various institutions in Ghana adapting their systems from different countries. Furthermore, the findings corroborate the assertion made by Schoeman (2019) that prevailing research ethics governance systems are predominantly informed by international guidelines and perspectives from Euro-Western scholars, with minimal input from African academics. Moreover, the study reveals that the governance system through which researchers obtain ethical clearance for their studies is largely driven by the stipulations set forth by funding agencies and scientific journal publishers. In alignment with this observation, Kennedy et al. (2023) emphasise that by ensuring that

researchers adhere to established ethical standards in conducting research, funding agencies play a crucial role in research ethics governance. Consequently, by making ethical clearance certificates a prerequisite for funding, these agencies function as a crucial governance system that promotes the ethical use of animals in scientific studies. Despite these prerequisites' efficacy in promoting the ethical use of animals, African countries, including Ghana, should formulate indigenous and contextually relevant guidelines and policies to guide such studies. This objective can be realised by proposing a national animal research ethics governance framework, which would serve as the overarching framework governing the use of animals for research in Ghana.

6.2.1.3 Main theme 3: Lack of awareness about governance systems that promote the ethical use of animals for research in Ghana

A few participants expressed a lack of awareness regarding governance systems designed to promote the ethical use of animals in research. From the analysed data, one subtheme emerged that contributed to this main theme:

- Subtheme 1: Low level of knowledge of governance systems that promote the ethical use of animals for research in Ghana

This subtheme is further elaborated on using verbatim quotations from participant interviews and naïve sketches.

a) Subtheme 1: Low level of knowledge of governance systems that promote the ethical use of animals for research in Ghana

A few participants expressed inadequate knowledge and awareness of the existing animal research ethics governance systems in Ghana. There is a general low knowledge level among researchers regarding current governance systems in the country. Researcher 2 (AREC 1), for instance, indicated that he was not aware of any such governance systems available:

> *"From my perspective, I don't see any such systems around as of now. If I look at even the existing animal ethics committees, I am wondering whether there is any crosstalk between them. Whether, for example, they were set up independently or one was set up and helped the other, I'm not sure what relationship exists between and across them. So, I am not aware of any kind of system that is in place for the ethical use of animals in research."* **[R2]**

Researcher 1 (AREC 1) also stated in the interview that:

> *"Well, governance systems—I'm not really sure if I can talk to that because, on the governance side, I am more on the end-user side. So, I just assume that the IACUC is for the University of Ghana, because you have some of these international bodies that have grants, and they would expect that for animal research, they would naturally expect that whatever ethical approval I get is meeting international standards. When it comes to the governance system, I'm not sure I can talk about that because I am not well versed in that space."* **[R1]**

Researcher 4 (AREC 2) was entirely oblivious of the question and stated:

> *"I think the ethical clearance board should have been the best people to answer these questions. Then you should have different questions for us because these questions are not for us. I don't have any idea."* **[R4]**

Administrator 2 (AREC 2) also shared that the governance system for the ethical use of animals for research was characterised by low awareness, as quoted below:

> *"Low awareness, lack of national and international guidelines, lack of strong institutional policies and lack of government commitments and lack of commitments on the part of scientist to subject their research work for ethical clearance."* **[A2]**

These quotes show that, despite acknowledging the existence of ARECs, participants did not recognise the ARECs as part of a governance system. There was a low level of awareness among researchers regarding the animal research ethics governance systems in place that ensure the ethical use of animals for research.

The findings under this main theme suggest that the ARECs, which exist in only three institutions in Ghana, were the only animal research ethics governance systems currently in existence in the country. The identification of ARECs as a governance system for promoting the ethical use of animals for research aligns with Canario et al.'s (2022) definition of research ethics governance systems to include frameworks that ensure compliance with ethical standards in research activities. They identify the establishment of ethics committees and regulatory oversight mechanisms as examples of ethics governance systems. González-Esteban (2023) also confirms that the implementation of governance systems often includes elements like an ethics committee. International funding agencies and scientific journal publishers that ensure the ethical use of animals in scientific studies in Ghana were also identified as the second animal research ethics governance system, in light of the understanding that research ethics governance systems involve structural and institutional influences (Kennedy et al., 2023). Researchers voluntarily submit their protocols for review, particularly when required to do so by international funding agencies and publishers.

The findings ultimately suggest that some researchers lack awareness of the existing animal research ethics governance systems in place. Other research ethics governance systems, including institutional research offices and codes of ethics for researchers identified by Canario et al. (2022), were not mentioned by participants. The key stakeholders' experiences with the existing animal research ethics governance system in Ghana are presented in the next session.

6.2.2 Key stakeholders' experiences with the existing animal research ethics governance systems to promote the ethical use of animals in scientific studies

The study's findings show that participants had both positive and negative experiences with the existing animal research ethics governance system in Ghana. Their experiences were categorised into three main themes, indicated in blue in Table 6.1 and further detailed in Table 6.3. The main themes are:

- Positive experiences with the animal research ethics governance systems in Ghana
- Negative experiences with the animal research ethics governance systems in Ghana
- Desire for improvements in the animal research ethics governance systems in Ghana

Table 6.3 presents the main themes and subthemes that emerged from the data that relate to each of the three main themes.

Table 6.3: Main themes and subthemes associated with Key Stakeholders' experiences with animal research ethics governance systems in Ghana

Question	Main Themes	Subthemes
What has been your experience with the existing animal research ethics governance systems to promote the ethical use of	6.2.2.1 Positive experiences with the animal research ethics governance systems in Ghana	a) Appreciation of ARECs' activities and the SOPs used by ARECs
		b) Use of robust institutional systems, facilities and policies for animal research
	6.2.2.2 Negative experiences with the animal research ethics governance systems in Ghana	a) Inadequate resources for ARECs to conduct monitoring visits
		b) Researchers are unclear about ARECs' mission

Question	Main Themes	Subthemes
animals in scientific studies?	6.2.2.3 Desire for improvements in the animal research ethics governance systems in Ghana	a) Need for a national governance framework for the ethical use of animals in scientific studies
		b) Need for awareness creation and sensitisation on animal research

Source: Author's construct, 2025

A detailed presentation of the main themes and associated subthemes is presented in the following sections with verbatim quotes from study participants to support the findings.

6.2.2.1 Main theme 1: Positive experiences with the animal research ethics governance systems in Ghana

Participants from all three ARECs reported positive experiences with the existing animal research ethics governance systems in Ghana. Some of the positive experiences highlighted by participants included the establishment of ARECs, the existence of SOPs, and institutional guidelines that promote the ethical use of animals in scientific studies. The sentiments expressed by most participants were those of satisfaction with the processes for ethical review established by the ARECs, as well as the role played by the ARECs in ensuring that scientific studies using animals are conducted ethically within their respective institutions. This main theme is supported by two subthemes, which are delineated as follows:

- Subtheme 1: Appreciation of ARECs' activities and the SOPs used by ARECs
- Subtheme 2: Use of robust institutional systems, facilities and policies for animal research

These subthemes are presented and discussed below with verbatim quotes to support each finding.

a) Subtheme 1: Appreciation of ARECs' activities and the SOPs used by ARECs

Participants from all three ARECs shared that the ARECs in their institutions, as a governance system, have positively influenced the ethical use of animals in scientific studies in Ghana, particularly due to the ethics review process and the existence of institutional SOPs. Researcher 1 (AREC 1) shared his satisfaction with the work of the AREC and their SOP:

> *"… well, I think generally, my experience has been fine because, in my case, I submitted to the IACUC, and they got back to me. They asked for further clarifications, and I responded. There is a form I had to fill out, and then they get back to you via email, and the administrator is quite responsive, which is quite a good thing. What is most important is that people are responsive whenever there are follow-ups and clarifications that need to be addressed. So, I think the system they have is okay. When it comes to timelines, I think they have their timelines online so all prospective applicants can have a fair idea of the timelines, which I think is quite good."* **[R1]**

AREC Administrator 1 (AREC 1) also shared his appreciation of the existence of SOPs that guide the activities of the AREC and animal housing facilities:

> *"The current governance systems, per my experience, I think are so far so good. Like I said, we have a robust SOP, a well-equipped lab, the first-class in the country for animal research, and it is situated on this campus. We also have regulations and guidelines as to how even the lab could be used and how these animals are utilised and processed for research. So, there are strict guidelines involved. I think so far so good."* **[A1]**

AREC Administrator 1 further shared his experience regarding the composition and expertise of the AREC members and stated:

> *"Err, not just that, within a setup committee, we have varying expertise, people with different animal ethics backgrounds, and even people without animal research backgrounds on the committee, so that they can look at the animal research not just purely from the scientific point of view but also from a sociological, communal point of view. So, the committee is quite robust, and even a legal person is on board that also ensures that whatever we do, she looks at the legal aspect that talks about animal protection or animal welfare. So, I think I'm glad to be working on this for quite some time now, and so far, so good."* **[A1]**

In his naïve sketch, Researcher 2 (AREC 1) corroborated this assertion, emphasising:

> *"The committee members are quite knowledgeable and provide insight for improvement of protocols and avoidance of ethical breaches in animal handling. The committee also promotes the 3Rs of animal use for research".* **[N_R2]**

According to these participants, the AREC in their institution is composed of very experienced and knowledgeable people and provides a lot of support to researchers to ensure they adhere to ethical principles in research using animals, particularly when considering the 3R principles. Researcher 3 (AREC 2) also commended the institutional AREC for having SOPs that guide their operations in her institution:

> *"For my experience in Ghana, there are Ethics committees with standard procedures for submitting applications and reporting on the studies. The committee reviews protocols submitted to them, make recommendations and gives approval or disapprovals. I'm not aware of any standards and legislations at the national level that support this."* **[N_R3]**

Researcher 5 (AREC 3) commended the AREC for having guidelines that direct their operations and guide researchers in submitting protocols, as well as having reporting timelines and requirements:

> *"For now, in some cases, they have guidelines written to fulfil all righteousness, and in other cases, I think there are periodic reports you must submit. For Welcome Trust, I know every six months they require a report as to what you are doing with the animals. And even in KNUST here, after I obtained my ethical clearance, I am required to submit reports six months apart as to how the conditions of the animals I am using are."* **[R5]**

The quotes above indicate that some participants had positive experiences with the AREC, with specific reference to the existence of SOPs that are used by ARECs. Additionally, the ARECs' monitoring role in ensuring that researchers submit periodic reports for review was also identified by participants.

b) Subtheme 2: Use of robust institutional systems, facilities and policies for animal research

According to the experiences of participants from all three ARECs, the existing institutional systems in place are robust with appropriate facilities and policies for the ethical use of animals in scientific studies. AREC Administrator 1 (AREC 1) underscored the importance of having a robust governance system for the conduct of research using animals in institutions and confirmed the existence of such a robust system in his institution:

> "*Yeah, I think it's good to have very well structured, organised systems that govern the use of animals because it's not every research project that we can conduct directly on humans; we have to begin most of this research, especially when it comes to some discoveries, on animals. So, having a robust system that will enhance smooth research regarding animals is a very good thing, and I think my institution, the University of Ghana, has such a robust system in terms of lab, in terms of committee to oversee that, in terms of rigor, how serious we*

> *take the welfare and wellbeing of the animal research is top-notch, and for me, that is a very good thing. And we hope to keep that and improve and also ensure that we move steps ahead so we can have a nationwide board that will oversee whatever research that we do."* **[A1]**

From AREC Member 4's (AREC 2) perspective, the institution's animal research governance system includes a research office where senior officers of the institution and administrators have been appointed to oversee the work of the AREC.

> *"In this place, we already have a responsible senior officer and the administrators that are there. And then we have the IACUC, where we meet regularly and discuss issues. In the University, we have a whole research office. So, the IACUC reports to research and innovation, and they will take it up there. If there are issues, which we have found in a lot of them, we will report through them that we are not meeting our responsibilities because of this, that, and that. Then they will try to see how best they can resolve that issue. And the members are given that appointment for a period of time."* **[M4]**

AREC Administrator 3 (AREC 3) was content with the achievement of the AREC in the institution and indicated that levels of awareness and acceptance of the AREC have improved, and the AREC also receives the needed resources to inspect facilities.

> *"Now people have embraced it. For the committee, we have been inspecting the facilities, all the animal facilities on campus. We have organised programs and capacity-building programs for animal keepers to ensure that they perform their duties within ethical standards. That is why I'm saying that awareness has been created, and everybody is becoming aware that if I want to do this, this is required of me. And I think, in my view, it's a good development to preserve life."* **[A3]**

The establishment of robust animal research ethics governance systems by institutions is a positive step and will lead to ethical conduct among researchers in the use of animals for research. This finding is corroborated by Nabyonga-Orem et al.

(2021), who highlight that a robust governance system ensures compliance with ethical principles and protects study subjects. Additionally, the necessity of having robust ethics governance systems in Africa to stop exploitative research methods is emphasised by Schoeman (2019) and Staunton and De Vries (2020); these authors noted that research conducted in Africa has demonstrated that governance systems are sometimes only implemented in response to unethical activities. Ultimately, this study's findings suggest that some research-producing organisations in Ghana have established governance systems that regulate the use of animals in scientific studies within those institutions.

6.2.2.2 Main theme 2: Negative experiences with the animal research ethics governance systems in Ghana

While some participants shared positive experiences regarding the existing governance systems for the ethical use of animals in scientific studies in Ghana, others also shared some negative experiences with these governance systems. These negative experiences were derived from two subthemes, which are as follows:

- Subtheme 1: Inadequate resources for ARECs to conduct monitoring visits
- Subtheme 2: Researchers are unclear about ARECs' mission

These are presented and discussed below with verbatim quotes to support each finding.

a) Subtheme 1: Inadequate resources for ARECs to conduct monitoring visits

Inadequate resources to enable ARECs to conduct regular monitoring and site verification visits were shared as a negative experience by some participants from AREC 1. AREC Member 1 (AREC 1) talked about the lack of finances to enable the ARECs to conduct monitoring visits to inspect project sites:

> *"As of now, finances are even more of a problem. There are people who may want to do research, let's say in Cape Coast, and you find out there is no money*

> *to go there to inspect the facility. Because once you grant the ethics approval, the approval comes with a responsibility. And the university says we don't have money. What are you going to do? Do you see where we are?"* **[M1]**

AREC Member 2 (AREC 1) confirmed this claim by simply stating in his naïve sketch that:

> *"Inadequate resources for monitoring and site visits to ensure adherence to the approved protocols."* **[N_M2]**

Researcher 1 (AREC 1) also stated in his naïve sketch that, despite having a detailed checklist to ensure the ethical use of animals for research, the ARECs are unable to conduct verification visits to the project sites:

> *"In Ghana, UG, appears to have a detailed checklist for animal studies that enables the 3Rs to be followed. The detailed assessment requires verification of the venue of the animal facility and allows for random visits to the holding facility by the IACUC team, but they are unable to conduct these verification visits."* **[N_R1]**

According to AREC Members 1 and 2, although a system of ethics approval has been established in their institution, the institution needs to provide resources to ensure that its AREC lives up to expectations and is not limited only to reviewing and approving proposals, but also monitoring sites to see to it that researchers are doing what they said they would do. Researcher 1 also underscored the importance of verification at the study sites, but the AREC's inability to do so affects the enforcement of the 3R principles among researchers.

b) Subtheme 2: Researchers are unclear about ARECs' mission

Participants from AREC 2 and AREC 3 shared some challenging experiences with the use of ARECs as a governance system for the ethical use of animals for research.

Administrator 2 (AREC 2) narrated her challenges with the system in place in dealing with studies that have both human and animal subjects:

> *"Another challenge has to do with those who combine human research with animal research. In that kind of research, they are doing the animal research, but they need to interview one or two people in addition. So, it becomes a challenge. Where does the work fall? Does it go to the IRB, or does it come to the IACUC? So, what we have done in the past is take the component that deals with humans to the IRB to look at. Then there are the components that deal with the animal, and then the IACUC handles it as well. As in, we kind of separate the two so that it wouldn't look like… for some of them, we've had one challenge: the initial stages. It was just the IRB and the IACUC working together."* **[A2]**

She continued:

> *"My experience has been a bit challenging in terms of awareness. The awareness level is very low in Ghana at the moment. As I said earlier, a lot of people don't know about it, and those who do know are refusing to make use of the animal ethics committee…. Why should I? Maybe I'm dealing with animals; why should I come to you [AREC]? They feel animals don't have feelings and all that. So why are you concerned about the ethical aspect of animal research? So, the awareness is very low; just as a premium has been placed on the human aspect, I would wish they place the same premium on the animal aspect too. So that the work can flow, and the work of the ethics committee becomes a bit easier for them."* **[A2]**

AREC Member 5 (AREC 3) compared his experience with the governance system in Ghana with that of other jurisdictions:

> *"It is my experience with animal ethics in other jurisdictions or in other institutions. It is more robust even there than it is here, and to the point that you would not just have to get ethical approval for the use of animals; you would*

> *need to be licensed even before you can work with them and even attempt to apply for an approval. So it was that experience and understanding that made me realise that we are trying our best, which is good, but we shouldn't complain because even ours is not as good as we think it is. Even though we are not doing it as stringently as other institutions are, it is better than having nothing anyway."* **[M5]**

The quotes above provide evidence of various challenging experiences participants had with the existing animal research ethics governance system in Ghana. The findings from this main theme indicate that despite establishing ARECs as institutional governance systems, these ARECs lack adequate resources to function effectively and efficiently, particularly emphasising their inability to conduct monitoring visits to study sites. Additionally, due to the lack of legislation and clear guidelines at the national level to guide the institutional ARECs, some institutions do not have separate ethics committees for the review of protocols for human and animal subject research, respectively. Both types of studies end up being reviewed by the same ethics committee despite both committees being expected to have distinct mandates, membership and expertise. Pietrzykowski (2021) identified that ethics committees that review both human and animal research studies encounter issues, including procedural justice, impartiality, transparency, and the need to balance between fairness and efficacy in their operations and decision-making processes. Ahmed (2022) also noted that in such situations, many of the ethics committee members lack adequate training to review both human and animal subject studies, thereby impacting their ability to evaluate proposals effectively. He called for an increase in education and training for both ethics committee members and researchers in this regard. To address these challenges, Ghana needs a more robust governance system that will be adequately resourced and provide clear guidelines to researchers and ethics committees.

6.2.2.3 Main theme 3: Desire for improvements in the animal research ethics governance systems in Ghana

The third main theme that emerged from the interviews and naïve sketches pertains to the participants' expressed desire for enhancements to the existing governance systems regulating the ethical use of animals in research within Ghana. This observation indicates that the participants who advocated for such improvements were not wholly content with the existing governance systems in place for overseeing the ethical treatment of animals in scientific studies. However, it is worth noting that the participants did not perceive these experiences as negative; instead, they stated their experiences in the form of suggestions aimed at improving the existing governance system. The insights gleaned from these discussions can be categorised into two subthemes, which are as follows:

- Subtheme 1: Need for a national governance framework for the ethical use of animals in scientific studies
- Subtheme 2: Need for awareness creation and sensitisation on animal research

These are presented and discussed below with verbatim quotes to support each finding.

a) Subtheme 1: Need for a national governance framework for the ethical use of animals in scientific studies

Participants from AREC 1 and AREC 2 reiterated the need for establishing a national framework for the use of laboratory animals in Ghana. Researcher 2 (AREC 1) advocated for an overarching national regulatory body that will oversee and harmonise all governance systems in various institutions:

> *"So there needs to be some sort of overarching body that will also look out for what is happening on the ground and move to harmonise things … I think, just like I explained, even for the human ethics bodies, it will be good to have some*

> *regulatory authority that also looks at what ethics bodies are doing. There needs to be uniformity across."* **[R2]**

According to Researcher 2, the establishment of a national overarching regulatory framework or body will help streamline all governance systems in various institutions and ensure a standardised system across the country. AREC Member 3 (AREC 2) appealed for the passage of a law on the use of animals for research:

> *"I think that there should be a law; you know, there should be a law that requires us to do that [obtain ethical clearance prior to the conduct of research using animals]. Without these laws, what are we working up to? So, and the body to do that will be parliament. Parliament should put the legislation in place."* **[M3]**

He continued advocating for the commencement of animal rights advocates' activities in Ghana:

> *"You know, so you should have animal rights people here; they should have legislation, and they should have the institutional committees overseeing all these. If not, things will be as usual."* **[M3]**

In the foregoing quotes, some participants were advocating for a national animal research ethics governance framework, which will include the promulgation of laws, an oversight body and empowered civil society organisations interested in ensuring that animals are used ethically in Ghana for scientific studies.

b) Subtheme 2: Need for awareness creation and sensitisation on animal research

A few participants from AREC 3 also reiterated the need for improved awareness creation on the ethical use of animals in scientific studies in Ghana. AREC Member 5 (AREC 3) stated the need for education on the ethical use of animals for research:

> *"As a reviewer, I think most people don't know the extent to which animal ethics are required until they start to complete the form of this nature. So, a lot is being asked, and they probably have no idea how to manage that, and they probably are not thinking deeply about how they would do it when it happens. So, I think that there will be a need for a lot of education for people to understand what it entails to use animals and then why you cannot just stand one day and decide that you want to do research so the animal must suffer for it."* **[M5]**

Researcher 5 (AREC 3) also demanded researchers' and staff's continued education on the topic:

> *"But I believe that the various institutions need to educate their researchers and staff on ethical review boards on the ethical use of animals. It is something that we need to be educated on because, actually, no one tells you. No one tells you; you are not educated on all those things; you are just, it happens to you, then you learn from it."* **[R5]**

These quotes provide evidence of the fact that researchers and staff in some institutions, such as AREC 3, were unaware of the existence and functions of ARECs, particularly as a governance system for the ethical use of animals in scientific studies. Participants highlighted the recurring need for a national animal research ethics governance framework to govern the use of animals in scientific studies in Ghana. Eke et al. (2023) emphasise the imperative for a comprehensive national governance framework to regulate the ethical use of animals in scientific research, citing the prevalence of disparate regulations, ethical principles, and concerns regarding data quality. They argue for a procedural approach that enhances understanding and collaboration among different ethical perspectives. This assertion is further supported by Mohr et al. (2024), who also stress the importance of establishing a national governance framework aimed at enhancing the quality of research, promoting societal awareness of animal sentience, and improving animal welfare through rigorous ethics review processes and standards. The animal research ethics governance systems in Ghana will be streamlined, coordinated and consistent with universally accepted

regulations and guidelines with the development of a national governance framework for the ethical use of animals in scientific studies.

6.3 Chapter Conclusion

The objective of this chapter was to explore and describe key stakeholders' experiences with existing research ethics governance systems that promote the ethical use of animals in scientific studies in Ghana. The key stakeholders identified the ARECs within their respective institutions as the ethics governance systems for scientific studies using animals in the country. It was noted that these ARECs in Ghana predominantly rely on international ethical standards and guidelines, particularly those established by research funding bodies and scientific journal publishers. The study has shown that participants had both positive and negative experiences with the existing animal research ethics governance systems in Ghana. The main positive experiences mentioned included the existence of SOPs for ARECs, established institutional policies and facilities to support activities of the ARECs. Conversely, negative experiences were reported, including insufficient resources for ARECs to conduct monitoring visits at research sites where animal studies are undertaken, as well as a lack of clarity regarding the mission of ARECs among researchers. In light of these findings, participants proposed the establishment of a national animal research ethics governance framework that is sufficiently comprehensive to provide the needed guidance for all ARECs' operations and enhance their effectiveness and efficiency in Ghana.

Additionally, the findings indicated a significant gap in awareness among researchers and institutional staff regarding the governance systems in place for the ethical use of animals in scientific research within Ghana. Consequently, participants proposed the implementation of awareness-raising initiatives aimed at educating all researchers and institutional personnel about the ethical considerations associated with animal-based scientific studies.

These findings presented a meaningful depth of understanding of key stakeholders' experiences with the existing research ethics governance systems that promote the

ethical use of animals in scientific studies in Ghana. The next chapter presents the study's findings concerning key stakeholders' experiences with the existing research ethics governance practices that underpin the ethical use of animals in scientific studies in Ghana.

CHAPTER SEVEN
FINDINGS ON KEY STAKEHOLDERS' EXPERIENCES WITH EXISTING RESEARCH ETHICS GOVERNANCE PRACTICES THAT PROMOTE THE ETHICAL USE OF ANIMALS IN SCIENTIFIC STUDIES IN GHANA

7.1 Introduction

Chapter Six was dedicated to presenting the findings on the research ethics governance systems that promote the ethical use of animals in scientific studies in Ghana. The findings revealed that the establishment of ARECs within institutions in Ghana serves as a primary governance system for ensuring the ethical use of research animals across the country. Both positive and negative experiences regarding existing animal research ethics governance systems were reported. This chapter offers an analysis, discussion, and interpretation of the findings in relation to the third research objective, which aimed to ***explore and describe key stakeholders' experiences with the existing research ethics practices that promote the ethical use of animals in scientific studies in Ghana***. The ensuing discussion and interpretations of findings are predominantly based on the interviews conducted and the naïve sketches provided by participants. The main themes and their corresponding subthemes that resulted from the data sources are presented. Relevant literature is utilised to re-contextualise and validate the findings presented at the end of the discussion of each main theme.

7.2 Key Stakeholders' Experiences with Existing Research Ethics Governance Practices That Promote the Ethical use of Animals in Scientific Studies in Ghana

The third objective of this study aimed to answer the research question, ***"What are key stakeholders' experiences with the existing research ethics governance practices that promote the ethical use of animals in scientific studies in Ghana?"*** To address this research question, participants from each of the three ARECs were posed with two main questions:

- *According to you, which research ethics governance practices promote the ethical use of animals in scientific studies in Ghana?*
- *What has been your experience with the existing research ethics governance practices in place in your institution to promote the ethical use of animals in scientific studies in Ghana?*

The analysis encompassed a total of eight pages (formatted in Arial font, size 12, single spacing) of transcripts derived from interviews and four pages (also in Arial font, size 12, single spacing) of naïve sketches (from 12 participants) to answer these questions. A thematic analysis was conducted on the responses. Notably, it was observed that six out of the 12 naïve sketches did not directly address the question regarding research ethics governance practices that promote the ethical use of animals in scientific studies. To address this gap, the researcher clarified the concept for the participants during the interviews. Additionally, the researcher employed probing techniques so participants would elaborate on their responses.

A thematic analysis was conducted on a case-by-case basis of the findings from each AREC, followed by a cross-case analysis encompassing the three ARECs. Given the substantial volume of data collected, the results of the cross-case analysis are detailed in this chapter, supplemented by verbatim quotations from the participants' interviews and naïve sketches across all three embedded cases (ARECs). The commonalities and differences across the three ARECs are presented in the thematic presentation of the findings. The findings have thus been interpreted to establish key stakeholders' experiences with the existing animal research ethics governance practices that promote the ethical use of research animals in Ghana. A summary of the individual case analyses for AREC 1, AREC 2 and AREC 3 can be found in Appendices 7.1 to 7.3, respectively. Comprehensive findings, including significant quotations and codes from the interviews and naïve sketches, are presented in Appendices 7.4 and 7.5.

The findings are organised thematically, with main themes and subthemes corresponding to the main questions posed to participants, as illustrated in Table 7.1. The subthemes were developed through categorisation of the codes identified by the researcher from the interviews and naïve sketches. Based on the developed

subthemes, the researcher formulated the main themes. The subsequent sections explore key stakeholders' knowledge and experiences regarding animal research ethics governance practices that promote the ethical use of animals in scientific studies, with evidence provided through verbatim quotes from the interviews and naïve sketches.

Table 7.1 provides a summary of the findings derived from the cross-case analysis concerning the existing research ethics governance practices that promote the ethical use of animals in scientific studies in Ghana. The data indicate a consensus among participants from all three ARECs regarding the processes required for obtaining ethical clearance certificates, which are identified as the primary animal research ethics governance practice that participants thought promotes the ethical utilisation of animals in scientific studies. Participants from each AREC highlighted the importance of the preparation and submission of research protocols for ethical review and approval, alongside the activities undertaken by ARECs both prior to and following the granting of ethical approval, as essential governance practices that promote the ethical use of animals in research contexts. While some subthemes were acknowledged by participants from at least two of the ARECs, it is noteworthy that the participants' experiences of governance practices promoting ethical animal use were not uniformly shared across all three ARECs.

Table 7.1: Findings on the existing research ethics governance practices that promote the ethical use of animals in scientific studies in Ghana across ARECs

Questions	Main Themes	Sub Themes	AREC 1	AREC 2	AREC 3	Total Occurrence
According to you, which research ethics	7.2.1.1 Processes required for obtaining ethical clearance certificates	a) Preparation and submission of protocols for ethical review and approval	x	x	x	**3**
		b) Activities undertaken by ARECs that lead to the	x	x	x	**3**

Questions	Main Themes	Sub Themes	AREC 1	AREC 2	AREC 3	Total Occurrence
governance practices promote the ethical use of animals in scientific studies in Ghana?		attainment of ethical approval for research protocols, as well as those that occur after the granting of such approval				
	7.2.1.2 Refresher training and awareness creation are research ethics governance practices that could promote the ethical use of animals for research, but need improvement	a) Refresher training on animal research ethics for AREC members, researchers and students	x	x		**2**
		b) Awareness creation on the ethical use of animals for research	x	x		**2**
What has been your experience with the existing research ethics governance practices in place in your institution to promote the ethical use of	7.2.2.1 Positive experiences with research ethics governance practices at the institutions	a) AREC's support to researchers in the ethical clearance application and review process	x	x		**2**
		b) Monitoring and supervision practices that ensure the ethical use of animals for research	x		x	**2**
	7.2.2.2 Negative experience with research ethics	a) Inefficiencies in ethics application and review processes	x		x	**2**

Questions	Main Themes	Sub Themes	AREC 1	AREC 2	AREC 3	Total Occurrence
animals in scientific studies in Ghana?	governance practices at the institutions	b) Poor animal welfare considerations and research housing facilities		x	x	**2**

Source: Author's construct, 2025

In the subsequent sections, a more in-depth discussion of the findings is presented. This discussion addresses each of the research questions posed to the participants. The researcher's findings and arguments are supported by verbatim quotations from participants.

7.2.1 Key stakeholders' view of animal research ethics governance practices that promote the ethical use of animals in scientific studies

This section presents the findings addressing the question, "*According to you, which research ethics governance practices promote the ethical use of animals in scientific studies in Ghana?"* The analysis of the interviews and naïve sketches yielded two main themes, as illustrated in pink in Table 7.1 and further elaborated on in Table 7.2. These are:

- Processes required for obtaining ethical clearance certificates
- Refresher training and awareness creation are research ethics governance practices that could promote the ethical use of animals for research, but need improvement

Furthermore, Table 7.2 delineates the subthemes from which each of the main themes emerged.

Table 7.2: Main themes and subthemes from interviews and naïve sketches describing the research ethics governance practices that promote ethical use of animals in scientific studies in Ghana

Question	Main Themes	Sub Themes
According to you, which research ethics governance practices promote the ethical use of animals in scientific studies in Ghana?	7.2.1.1 Processes required for obtaining ethical clearance certificates	a) Preparation and submission of protocols for ethical review and approval
		b) Activities undertaken by ARECs that lead to the attainment of ethical approval for research protocols, as well as those that occur after the granting of such approval
	7.2.1.2 Refresher training and awareness creation are research ethics governance practices that could promote the ethical use of animals for research, but need improvement	a) Refresher training on animal research ethics for AREC members, researchers and students
		b) Awareness creation on the ethical use of animals for research

Source: Author's construct, 2025

Participants predominantly expressed the perspective that the governance practices pertaining to research ethics could be effectively assessed through the procedures involved in acquiring ethical clearance certificates from ARECs. Training and awareness creation on the ethical use of animals in scientific studies were identified by participants as an important animal research ethics governance practice for the ethical use of animals in scientific studies. The ensuing subsections provide a detailed examination of these main themes, incorporating the subthemes alongside verbatim quotations from interviews and naïve sketches to substantiate the arguments. A re-contextualisation of the literature is provided to conclude the discussion on each main theme.

7.2.1.1 Main theme 1: Processes required for obtaining ethical clearance certificates

The various activities leading up to the issuance of ethical clearance certificates or disapproval of proposed studies were identified by the key stakeholders as animal research ethics governance practices that promote the ethical use of animals for research. This main theme is derived from two subthemes, which are as follows:

- Subtheme 1: Preparation and submission of protocols for ethical review and approval
- Subtheme 2: Activities undertaken by ARECs that lead to the attainment of ethical approval for research protocols, as well as those that occur after the granting of such approval

In the following sections, the subthemes are presented with verbatim quotes from participants.

a) Subtheme 1: Preparation and submission of protocols for ethical review and approval

Participants indicated that the procedure for submitting proposals for AREC review entails several key steps. These include the completion of application forms, an administrative review of submitted applications, and the provision of education and guidance to researchers regarding the ethical considerations associated with animal research, as well as the specific requirements set forth by the AREC. For instance, AREC Administrator 3 (AREC 3) articulated in his naïve sketch that animal research ethics governance practices encompass the requirements for obtaining ethical clearance.

> *"Requirement of Ethical clearance for the commencement of research involving animals."* **[N_A3]**

From this participant's perspective, all requirements that researchers are expected to fulfil to receive ethical clearance from the AREC to enable them to commence their studies constitute animal research ethics governance practices. According to Researcher 1 (AREC 1), even the forms completed as part of the application process are part of the governance practices. He stated:

> *"Like I said, even the forms to fill out is part of the practices. The one that I am familiar with are very complicated"* **[R1]**

AREC Administrator 3 (AREC 3) also supported Researcher 1's assertion:

> *"So, the practice will be to complete a form, which will basically look at the source and the relevance of the work that is being done."* **[A3]**

According to AREC Administrator 2 (AREC 2), the governance practice also includes guidance and education for researchers prior to the submission of applications for ethical review by the AREC. She stated:

> *"On a day-to-day basis, I will say continuous education for anybody that we come into contact with. So, anybody who expresses interest in submitting for ethical clearance, we seize the opportunity to provide some kind of education and a basic explanation of what is expected of you as a researcher and what is expected of us as a board."* **[A2]**

b) Subtheme 2: Activities undertaken by ARECs that lead to the attainment of ethical approval for research protocols, as well as those that occur after the granting of such approval

Participants also identified animal research ethics governance practices to include the role played by ARECs in supporting researchers to obtain ethical clearance for their proposed studies. These include providing guidance, advice and education to researchers on the ethical use of animals for research. AREC Member 4 (AREC 2) summarised the AREC's animal research ethics governance practices by stating:

> *"Applications are taken and then sent to members for review. And then, recommendations are discussed. And the recommendation given to scientists as what they are supposed to do or what the gaps are. Then they will be able to either do that or have it rejected or accepted with corrections to what they are doing."* **[M4]**

Researcher 3 (AREC 2) also mentioned in her naïve sketch that:

> *"The Institutional Review Board, reviews submitted protocols and approves or disapproves them based on standard procedure. They also request for study progress report and closure report."* **[N_R3]**

Administrator 1 (AREC 1) added:

> *"So, the things we've been doing are to ensure that every research project that goes on is subjected to a committee and a thorough review of those protocols."* **[A1]**

AREC Member 4 (AREC 2) explained that the AREC provides advisory services to researchers as part of the review process to ensure the welfare of animals used in research. He stated:

> *"One critical issue you can easily see through the application is that if you are going to have an invasive intervention with the animal, and when you bring your list of investigators, straight away, we will see that there is something wrong. So, we try to encourage people to have a vet on the study who will give emergency attention to the animal in case there is anything. Or we even advise that the animal is not meeting its welfare. Yeah, so some of these things we look at deeply, and we will advise you."* **[M4]**

From Researcher 5's (AREC 3) perspective, governance practices include proper scrutiny of protocols that are submitted to the AREC and the application of the 3R principles:

> *"We need to really scrutinise the protocols that we will review and ask questions about; can we not replace this in-vivo study with in-vitro approaches? Is this the only way? So, we need to consider replacement if need be; we need to consider refinements if need be and then those are the three Rs, and we need to reduce the number of animals we use."* **[R5]**

AREC Member 2 (AREC 1) also mentioned the advisory services provided by the ARECs to ensure the humane use of animals for research. He explained:

> *"So, you see, even if you are doing something that requires a certain level of pain, the committee will advise you on how it should be done. So, practically, we make sure that it's mainly the welfare of the animal. Its paramount."* **[M2]**

He elaborated that ARECs have checks and balances to ensure the humane use of animals during the review process:

> *"So, for example, if you want to do some work and then we notice that when you give the injection, the animals will be in pain, we will advise that you take a second look at it. There are various ways to assess pain. So, we have some guidelines we use to assess pain. So, if you see that it is beyond the pain level, based on what you indicated in your proposal, we ask that you hold on and then revise. So, we have put in place checks and balances so that the welfare of the animal will be paramount. So, once that approval is given, the way you do the work, the committee will have to look at all that. When they approve it, then we make sure that we also have a system in place that checks the work that you are doing and how you are going about it."* **[M2]**

Administrator 3 (AREC 3) touched on the role of the AREC in monitoring and inspecting approved projects and animal facilities as a governance practice. He stated in his naïve sketch that:

> *"Animal Research Committee has the authority to inspect animals, their accommodation or experimental records at any time to be sure that procedures are being followed."* **[N_A3]**

ARECs' role in the monitoring of research using animals was also identified by Researcher 5 (AREC 3):

> *"Researchers are making sure the animals are well catered for and well cared for. So, if the institution does not have people who come around to check periodically, if reports are not submitted periodically, we will never know how the animals are cared for, especially how animals are disposed, and that is one of my biggest worries."* **[R5]**

AREC Administrator 3 (AREC 3) summarised the AREC's practices prior to and after submission of protocols for ethical review:

> *"So, when the applicant submits the form, the committee will look at it and then check if all the answers given are satisfactory. Once the committee thinks that it is satisfactory, it will give its approval. Once the approval is given, either annually, biannually, or quarterly, there will also be instances of the report from the applicant. I mean, if they are successful. They will have to provide reports of what has been done, and if the person needs a renewal, another application can be made. So, these are some of the structures and procedures that govern the use of animals for research."* **[A3]**

The views expressed by the participants reveal that animal research ethics governance practices encompass a wide range of activities, which are implemented mainly by ARECs. These practices include a range of activities, including support for researchers in preparing and submitting their protocols for ethical review, the review of submitted protocols by the ARECs, to the granting of an ethical clearance certificate to researchers. Post-approval activities, including monitoring by the ARECs, were also identified as part of the governance practices. This interpretation aligns with the findings of González-Esteban (2023), who characterises research ethics governance

practices as the specific actions and methodologies employed by researchers and institutions to operationalise the ethical principles delineated in research ethics governance systems. Additionally, González-Esteban (2023) states that within a research environment, governance practices are important activities to ensure that animal research ethics governance systems function effectively. The ethical review function of ARECs, as part of their animal research ethics governance practices, is confirmed by Díaz et al. (2020) and Pietrzykowski (2021), although they did not categorically indicate that these activities were part of ARECs' governance practices. Kalkan and Kekeçoğlu (2024) and Moore et al. (2021) also underscore the importance of post-approval monitoring conducted by ARECs.

From the foregoing, the activities identified by the participants that form part of ARECs' animal research ethics governance practices can be grouped into three phases, namely the pre-application, application and post-approval phases. The activities at each of these three stages are carried out by the AREC members and administrators. Figure 7.1 shows a conceptualisation of the three stages and activities performed by the ARECs.

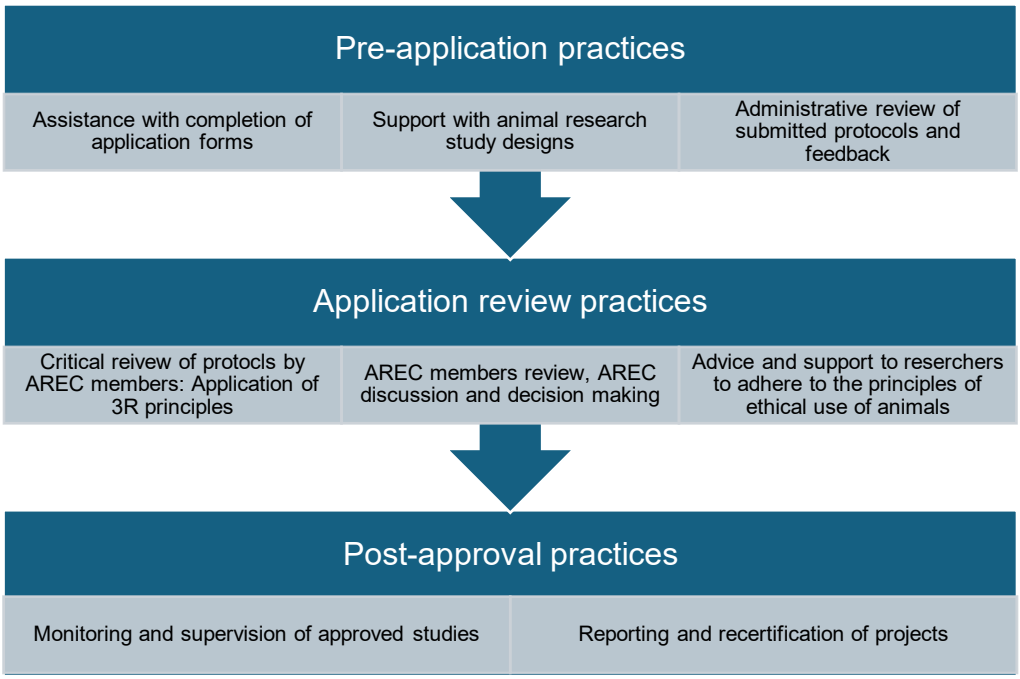


Figure 7.1: Animal research ethics governance practices that promote the ethical use of animals in scientific studies in Ghana

Source: Author's construct, 2025

Figure 7.1 illustrates that the pre-application phase encompasses activities such as assisting researchers in completing the AREC application form, providing support for the development of the research design section of proposals, and conducting an administrative review to ensure that all requisite documents are submitted in the appropriate order. These pre-application practices are primarily executed by AREC administrators to ensure adherence to established guidelines for the ethical use of animals. At the application review phase, participants identified practices including the critical evaluation of protocols by AREC members, guided by the 3R principles, discussions among AREC members during meetings, and, in certain instances, the provision of guidance to researchers as part of the review process (see Figure 7.1). Additionally, participants noted that post-approval practices, such as the monitoring and supervision of approved studies, reporting requirements for researchers, and the recertification of approved protocols by the AREC, as shown in Figure 7.1, are essential for promoting ethical animal research.

Guillén and Borkowski (2020), corroborated by Lopez-Baron et al. (2024), contend that there is a substantial difference between pre-application practices and post-approval practices carried out by institutions, caused by divergent contextual factors and differences in institutional policies. These differences, described by Guillén and Borkowski (2020) and Lopez-Baron et al. (2024), are a contributory factor to the lack of standard governance practices adopted by ARECs in Ghana. The need to identify and standardise animal research ethics governance practices that are contextual to Ghana, which will enhance the ethical use of animals in scientific studies in the country, is underscored by these findings.

7.2.1.2 Main theme 2: Refresher training and awareness creation are research ethics governance practices that could promote the ethical use of animals for research, but need improvement

The findings of the study indicate that the majority of participants also identified activities such as refresher training for AREC members and researchers, as well as awareness creation, as part of the animal research ethics governance practices that

ensure the ethical use of animals in scientific studies in Ghana. This main theme is derived from two subthemes, which are as follows:

- Subtheme 1: Refresher training on animal research ethics for AREC members, researchers and students
- Subtheme 2: Awareness creation on the ethical use of animals for research

The subsequent sections elaborate on these subthemes, incorporating verbatim quotes from participant interviews and naïve sketches to support the subthemes.

a) Subtheme 1: Refresher training on animal research ethics for AREC members, researchers and students

Conducting training and refresher training for AREC members, researchers and students was identified by some participants as a governance practice for the promotion of the ethical use of animals for research. The participants identified training based on some unpleasant experiences they had with respect to the ethical review and approval process as researchers or experiences they had with researchers as AREC members and administrators. Researcher 1 (AREC 1) stated it simply:

> *"The other thing is that people on such boards [ARECs] will need frequent training."* **[R1]**

However, Researcher 2 (AREC 1) offered a more thorough justification for why AREC members must receive training:

> *"I am wondering, for those who are on the animal ethics board now, whether one or all of them have the requisite training to be qualified enough to be there, and whether even those who were there from the beginning have had any refreshers over the period, because without that, many things are changing globally, and if you don't constantly refresh your knowledge, you get stuck in the old ways of doing things. Probably there is refinement that will make things move faster or happen better, but you are not aware, and you keep delaying*

what needs to be done. So, I think training our ethics committee members is very important. Of course, that will facilitate and help turn around time for all of these things." **[R2]**

AREC Member 3 (AREC 2) suggested that institutions must be assisted to put effective practices in place, particularly in the training of students, although no specific type of training or what the training should include was mentioned:

"I think one thing that can also be done, not just raise awareness, is to help the institutions put in place these measures. Identify the areas where animals are used. And especially with the students. First-year students, if for nothing at all, should be brought on board right from the beginning, and postgraduate students, before they touch animals, must go through ethical use training. They should have a course. You should have passed your certification before you started your work." **[M3]**

b) Subtheme 2: Awareness creation on the ethical use of animals for research

Awareness creation among stakeholders, including researchers, staff and students within research-producing organisations, was recognised by several participants as a critical component of research ethics governance practice aimed at promoting the ethical use of animals in research. The findings reveal that participants were of the view that the aforementioned stakeholders lack awareness of the ethical principles and guidelines governing the use of animals in research, thereby resulting in their unethical use of animals for these purposes. Consequently, the AREC's efforts to enhance awareness serve as an essential governance practice that promotes the ethical use of animals in scientific studies. As articulated by AREC Member 3 (AREC 2), the significance of awareness creation within institutions is paramount:

"What we have to do is try to reach out to institutions and create awareness. I am aware of some awareness-creation seminar that was organised some time ago. The frequency is another thing because of the resources." **[M3]**

Researcher 5 (AREC 3) also identified awareness creation or education as a governance practice and emphasised the lack of awareness among staff in the institution regarding the use of animals for research. In his naïve sketch, he mentioned that ethics governance practices entail:

> *"Establishing and enforcing of national laws on ethical use of animals in research, organising workshops, conferences etc to inform and train researchers on welfare and use of animals in scientific studies"* **[N_R5]**

During the interview, Researcher 5 emphasised his point by stating:

> *"Like I said, erm, education. We need to let our staff know about the use of animals, and we also need to enforce the use of the rules and regulations because if the animal houses or animal house facilities exist, regular visits to those places need to be conducted for us to indeed see that the animals are kept in the humane condition that we have written down on paper."* **[R5]**

These quotations indicate that participants in the study recognised the necessity of implementing training programmes for both AREC members and researchers, including students, but they did not provide specific details about what the training programmes should address or include. Also, the importance of awareness creation as a component of animal research ethics governance practices was highlighted by participants. Awareness creation and training as a component of animal research ethics governance practices are critical in ensuring that persons who use animals in scientific studies have received the requisite training and are certified to handle research animals. In some countries, including South Africa, there is established legislation requiring researchers, including students, to complete training on the use of animals in scientific studies before they participate in research using animals (Fischer & Rodrigues, 2018; NHREC, 2024). Also, Mohr et al. (2024) recommend regular training for AREC members to help maintain high ethical standards. Than et al. (2020) and Botchwey (2023) also argue that training and awareness creation enable researchers to learn and understand ethical principles, guidelines and legislation on the use of animals in scientific studies, thereby enhancing compliance

with these guidelines. These findings reveal the need to include components of animal research ethics governance in the development of a proposed animal research ethics governance framework. The integration of governance practices into an animal research ethics governance framework would serve as a guide to ARECs at research-producing organisations to develop governance practices that are contextual and relevant to the needs of their respective organisations.

7.2.2 Key stakeholders' experiences with research ethics governance practices at their institutions

This section presents findings that answered the question, "*What has been your experience with the existing research ethics governance practices in place in your institution to promote the ethical use of animals in scientific studies in Ghana?"* Participants shared both positive and negative experiences with research ethics governance practices at their respective institutions, which formed the main themes from the interviews and naïve sketches.

Table 7.3: Main themes and subthemes describing participants' experiences with the existing animal research ethics governance practices in institutions in Ghana

Question	Main Themes	Sub Themes
What has been your experience with the existing research ethics governance practices in place in your institution to promote the ethical use of animals in scientific studies in Ghana?	7.2.2.1 Positive experiences with research ethics governance practices at the institutions	a) AREC's support to researchers in the ethical clearance application and review process b) Monitoring and supervision practices that ensure ethical use of animals for research
	7.2.2.2 Negative experience with research ethics governance practices at the institutions	a) Inefficiencies in ethics application and review processes
		b) Poor animal welfare considerations and research housing facilities

Source: Author's construct, 2025

These main themes and the respective subthemes are shown in Table 7.3 and presented below with verbatim quotes from participants to support the discussion.

7.2.2.1 Main theme 1: Positive experiences with research ethics governance practices at the institutions

Participants shared some positive experiences they had with their institutions' existing ethics governance practices. These were particularly related to the ethics application process and the AREC's monitoring and supervision of scientific studies using animals to ensure adherence to ethical principles. This main theme is derived from two subthemes, which are as follows:

- Subtheme 1: AREC's support to researchers in the ethical clearance application and review process
- Subtheme 2: Monitoring and supervision practices that ensure the ethical use of animals for research

These subthemes are presented below with verbatim quotes from participants.

a) Subtheme 1: AREC's support to researchers in the ethical clearance application and review process

The support researchers receive from the AREC in the application and review of their protocol process was identified as a positive experience by some participants. Some participants asserted that the practice of ARECs reviewing protocols and providing guidance to researchers for improvement in their studies' design with respect to the use of animals is a very positive governance practice. AREC Member 2 (AREC 1) explained:

> *"You must provide justification for the use of the animal and the number of animals you are going to use. The type of animal you want to use and why you want to use that type of animal. If it is mice, why mice? If it is rats, why rats? If it is grasscutters or anything."* **[M2]**

AREC Member 4 (AREC 2) attributed his positive experience to the guidance the AREC offers researchers upon submitting their protocols.

> *"So, we try to encourage people to have a vet on the study who will give emergency attention to the animal in case there is anything. Or we even advise that the animal is not meeting its welfare. Yeah, so some of these things we look at deeply, and we will advise you."* **[M4]**

In addition to encouraging researchers on what to do, AREC Administrator 2 (AREC 2) also mentioned that the AREC provides support to everyone who needs support in writing their protocols and completing the AREC forms. The committee walks researchers through the application process:

> *"After the approval, if you still need any help, we will still provide that support system for anybody who needs it. If maybe somebody is not too familiar with the guidelines and needs further explanation, or if there is a recommendation from the board that someone is not too clear about, we assign you a board member who will walk you through the process and make sure that you get the needed understanding."* **[A2]**

The AREC's application of the 3R principles in reviewing and providing support to researchers was also identified as a positive experience with animal research ethics governance practices. AREC Member 1 (AREC 1) shared that:

> *"I've had positive experiences because some ethics committees understand and appreciate where the researcher is coming from, and they would want to apply the 3Rs principle."* **[M1]**

AREC Member 4 (AREC 2) further explained the AREC's practices in applying the 3R principles:

> *"So, if you are going to do work on animals, we look at the animal you are going to use. Is it sufficient, or is it more than necessary? So, if it is more than*

necessary because we are dealing with animal welfare, then we will recommend that you reduce the numbers. If it is possible you could do with its cells, why do you have to use lifeless animals because they will be suffering? So, we look at those 3Rs. And then the last R is welfare, concerning the welfare of the animal." **[M4]**

AREC Member 4 further talked about the support provided to researchers in identifying appropriate animal housing facilities for their studies:

"Unfortunately, there are very few places where animals can be kept for research. So, what we do is, if somebody is not going to do it at a recognised place, then we try to inspect the environment in which he is going to do the research. And when we inspect, we certify that the environment is okay, and then we give the go-ahead. So, these are some of the things we look at, and we try to advise researchers." **[M4]**

According to AREC Administrator 1 (AREC 1), despite experiencing challenges with some governance practices, the institution has come a long way in ensuring the ethical use of animals in scientific studies. He stated:

"I think so far so good. We still have a long way to go, but my institution has made a long stride. We've really, really improved because before, things were not like that. People were just conducting their own research anyway. But people are now aware that they have to submit their work through ethical clearance procedures." **[A1]**

b) Subtheme 2: Monitoring and supervision practices that ensure the ethical use of animals for research

The monitoring and supervisory activities of the AREC were also identified as a positive ethical governance practice experienced by participants. Researcher 1 (AREC 1) described his experience in the United States:

> *"Generally, once there is a supervising agency, there are supervisors—the people who actually verify that whatever people say they are doing is done. In some jurisdictions, for example, if I use my US experience, if you have a well-constructed animal laboratory, they are in a regulated environment and so on, you also have in-house veterinarians who monitors the behaviour of animals and give advice on what to do with the animals. In some instances, they either euthanise or recommend that the researcher euthanise the animals, and if you don't do it, you can be questioned for not doing it."* **[R1]**

He went on to discuss the significance of keeping an eye on research involving animals:

> *"So, with some of these measures put in place, it is difficult for anyone not to adhere to the ethical use of animals. If there is no monitoring, I can choose to do anything I want. Monitoring is important. Whatever system there is, we have to make sure that there is monitoring and checks and balances that make sure that once people know that they are being observed or monitored, they will conduct the research ethically. With the form that I filled out, it's a very good form, and on the form, there are times when I think they have to come around and monitor what you are doing, but this doesn't happen."* **[R1]**

AREC Member 1 (AREC 1) also shared his positive experience with the monitoring system by using CCTV cameras in China:

> *"I've had pleasant experiences in China, where they were quite supportive of the work; they understood it, and I saw their practices as also very interesting. There were things I learned from them. Sometimes people do not follow humane procedures but the good thing, and perhaps our system has to be strengthened, is that, in China, where the animals are kept, in theatre rooms, etc., they are all mounted with camara. So, they can monitor whatever you are doing. That is not available at my institution, so we need to do that."* **[M1]**

Researcher 5 (AREC 3) made a strong argument regarding the monitoring and supervision of research using animals. His experience was with the AREC requesting periodic reports.

> *"Researchers are making sure the animals are well catered for and well cared for. So, if the institution does not have people who come around to check periodically, if reports are not submitted periodically, we will never know how the animals are cared for."* **[R5]**

Although these accounts do not include experiences from Ghana, participants reported positive experiences with the ARECs' use of various strategies to monitor and supervise their studies, which gives a clear picture of the advantages of employing efficient monitoring practices while animals are being used for research.

The findings of the study indicate that participants reported positive experiences with ARECs concerning the governance practices to ensure the ethical use of animals in scientific studies. As previously discussed, participants viewed the activities of ARECs as governance practices, and their positive experiences were linked to the support they received during the protocol preparation and submission process, as well as the subsequent activities of the AREC following protocol approval. Participants indicated that they were assisted by the AREC during their protocol preparation, protocol submission and review, as well as the post-approval phases. These findings align with the established role of ARECs, which includes guiding researchers to minimise animal use and enhance animal welfare (Kalkan & Kekeçoğlu, 2024).

ARECs are tasked with evaluating research procedures and the scientific and ethical justification for the use of animals in research, ensuring compliance with relevant laws and ethical norms, as well as monitoring and supervising practices to guarantee the well-being of animals involved in research (Kalkan & Kekeçoğlu, 2024). Furthermore, Mooney-Somers and Olsen (2017) affirm that ethics committees, including ARECs, provide valuable guidance to researchers by assessing their qualifications, competence, and methodological rigour in ethical clearance applications. Also, the assistance provided to researchers by research ethics committees (including ARECs)

as they go through the ethics review process is highlighted by Gelling (2016). Wahyuwardani et al. (2020) and Mohr et al. (2024) also support this study's findings by emphasising the quality assurance functions performed by ARECs. These quality assurance functions include continuing reviews of protocols and research activities and monitoring approved projects to ensure compliance and adherence to ethical standards by researchers. The positive experiences articulated by participants are consistent with the objectives underpinning the establishment of ARECs. This suggests that, to a significant extent, the ARECs in the institutions where these positive experiences were reported are fulfilling their mandates.

7.2.2.2 Main theme 2: Negative experience with research ethics governance practices at the institutions

Despite some participants sharing positive experiences, others' experiences with their institution's animal research ethics governance practices were not very pleasant and therefore classified as negative. This main theme is derived from two subthemes, which are as follows:

- Subtheme 1: Inefficiencies in ethical application and review processes
- Subtheme 2: Poor animal welfare considerations and research housing facilities

The subthemes are presented below with verbatim quotes from participants' interviews and naïve sketches.

a) Subtheme 1: Inefficiencies in the ethics application and review processes

A few participants voiced their dissatisfaction with the ethics application and review process. In his naïve sketch, Researcher 2 (AREC 1) complained about the length of the protocol review application form. He stated:

> *"The only challenge has been how complicated and lengthy the application form is, requiring several hours of reading before one is able to satisfactorily complete the form."* **[N_R2]**

AREC Member 5 (AREC 3) shared his experience of researchers' inability to adequately complete the AREC review application form, leading to delays in the review and approval process. He stated:

> *"Even the form, most people don't fill it well and most of the time when they fill it, they leave some portions out without completing them and so normally we take it back to them for them to work on it. And I'm sure with that they would probably be learning and in the future they would do well when they apply."* **[M5]**

AREC Member 5 (AREC 3) looked at it from the perspective of a researcher and AREC member, and shared his experience with the cumbersome processes a researcher has to go through in submitting their application for ethical review:

> *"So, my personal experience will come in two parts. One, as a reviewer, and then two, as a researcher. As a researcher, not until now, the processes have been very cumbersome. Because if you want to submit an application, you have to provide very detailed information. It used to be a very bulky document to complete, but recently we have been trying to modify it and make it a bit simpler and more user-friendly for those who would like to apply for an ethics review."* **[M5]**

AREC Member 5 also shared the lack of awareness among researchers regarding the requirements for the ethical conduct of research using animals and called for education and awareness creation among researchers:

> *"But then, as a reviewer, I think most people don't know the extent to which animal ethics are required until they start to complete the form of this nature. So, a lot is being asked, and they probably have no idea how to manage that, and they probably are not thinking deeply about how they would do it when it happens. So, I think that there will be a lot of education for people to understand what it entails to use animals and why you cannot just stand one day and decide that you want to do research so the animal must suffer for it."* **[M5]**

Apart from the complicated application form, participants also shared their frustrations with respect to the long duration of the ethical review and approval process. Researcher 1 (AREC 1) expressed dissatisfaction over the length of time it took for the AREC to process applications for ethical reviews and the long waiting period between submitting protocols and obtaining an ethical clearance certificate. He stated:

> *"So, when it comes to that, let me think... so far, if I compare the feedback, I get from an animal ethics committee with what I get from the human ethics committee, it is much faster for the human ethics committee. I have stayed in one for almost 6 to 8 months before we could begin work, so I think there is a bit of laxity in terms of how they approach doing that kind of business."* **[R1]**

Researcher 2 (AREC 1) also expressed his displeasure with delays experienced with the AREC's review and approval process and the effects thereof:

> *"So if you delay, you are delaying every other process that must happen downstream, and I think some of those things need to be sort of checked; otherwise, we are becoming so much less competitive globally because, as I said, if I had to wait almost 6 to 8 months to get approval to do some work, someone in another place could get that in 1 month. By the time I start, they are already publishing. So that is a big challenge, and we need our administrators to understand that when I am pushing you to get something done, it is not because I'm pushing. It's because I'm looking at so many things, including competitiveness. Otherwise, we will just be wasting our time, and by the time you get any data out, it will become dead news."* **[R2]**

AREC Member 1 (AREC 1) alleged that certain AREC members are unable to adequately evaluate submitted proposals due to their lack of understanding, leading to the proposal's eventual rejection. He stated:

> *"I've also had negative experiences where some committees don't understand, and they would want to throw the baby, the bucket, and the water out."* **[M1]**

AREC Member 1 further shared other negative experiences he had with AREC members:

> *"And also, some of the negative experience I'll say is understanding between the veterinarians who oversee it, because every work must finally end up in a veterinarian's hands who will oversee the in-depth welfare of the animal, so some of them overreact, so the researcher is looking for something. I was looking for something pertaining to cancer, and the longer the animal stays in the work, the better for me because cancer does not develop overnight. I was going 36 months, and you have an animal that has gone 20 months, and you can see that in a few more months, I'll get good results, and there may just be a sore on the tail of the animal, and the veterinarian says no, sacrifice the animal. And that becomes very hard for the researcher. So those are some of the experiences I've had. There must be a good understanding of the work by the veterinarian and an appreciation of the work."* **[M1]**

b) Subtheme 2: Poor animal welfare considerations and research housing facilities

A few participants from ARECs 2 and 3 shared their unpleasant experiences with the animal welfare and housing facilities. According to AREC Member 3, the practice of researchers submitting protocols for ethical review is not motivated by their willingness to ensure the welfare of animals but rather to fulfil requirements for publications.

> *"My experience in Ghana has been that people submit their protocols for review not because of their interest in the animal but because of the requirements for publications. There are differences here, so we have to make people aware that I am doing it because of the animal. Not because of publication."* **[M3]**

He also shared his experience at the animal college in Ghana compared to the one in New Zealand, and concluded that in Ghana, nobody cares about the animals.

> *"Look at the animal college; that is the worst form of mistreatment of animals here, not even for the lab work. Animal College in Ghana is horrible. It is horrible. You see, I worked with animals in New Zealand, the college facilities, and all those things. My goodness, it's tops. Here, no, animal college is one of the poorest that you have. The animals are suffering, even to the point of slaughter. Nobody cares."* **[M3]**

Researcher 5 also shared his negative experiences with poor animal housing practices and insufficient resources for the humane use of animals. He expressed concern about the inhumane practices in the facilities where the animals are kept for research:

> *"The major issue, I would say, is maybe a lack of resources because the housing condition of the animals is not so good. You are keeping about 10 to 15 animals in a cage, which is supposed to have a maximum of 6. So it is quite questionable: the feed, you give them any kind of food, which is not ideal, and how the animals are handled is also a problem because the people handling the animals are not trained; they don't have the expertise in dealing with the animals, and the technicians who are working in the school of pharmacy teaching students on various animal models don't have any training on animal care. So those are my experiences—the things that we need to address immediately. So, along with coming in with a governance framework, it also comes with resources."* **[R5]**

He continued to talk about the AREC's inability to ensure that the guidelines for the ethical use of animals are being adhered to:

> *"Because there are guidelines, if we cannot go by those guidelines, why don't we make sure we have everything in place before we conduct research? We cannot house them. There are portions that deal with animal husbandry, and there are portions that deal with animal experimentation. There is a way of keeping animals in a well-humane environment that is in line with the guidelines. If you don't have such facilities, it is questionable. But the ethical review board must also consider that they are in; that is why I said they play a*

> *major role, so they must know what is available in an institution and then how to go about it."* **[R5]**

AREC Member 5 (AREC 3) also identified the construction and resourcing of animal housing by the institution as one of the governance practices that will ensure the ethical use of animals. He identified a lack of proper housing for research animals and stated:

> *"Institutions also need to have it at the back of their minds to build and resource the animal house. If a number of their research staffs are doing studies in that kind of area, then that institution must have a place to keep their animals. Because right now, not to snitch on my school, we are doing a lot of research involving animals, but we don't have an animal house facility, and the animals are kept in the lab where students are carrying out various experiments. So, you can already tell that animal welfare is not being taken care of; the institution is not enforcing those things."* **[M5]**

The negative experiences of participants are presented in the above quotations to show their discontent with the existing animal research ethics governance practices. The inefficiency of the ethics application and review process, which can contribute to delays in researchers initiating research studies, was one of the main concerns raised by participants. Inefficiencies in the ethics application and review processes were also identified by Mariani et al. (2023), which corroborates this finding. Their study revealed considerable variability in the ethics review process, with approval times ranging from 3 to 82 days, as well as discrepancies in risk assessments by ethics committees in 24% of the reviewed cases, indicating a lack of standardisation in the ethics review process across various committees. Similarly, delays were identified in the ethical review and approval process, particularly for multicentre studies in Australia by Buck et al. (2020). They argue that for multicentre studies, these delays averaged 203 business days, contributing to about 79% of the study time being spent on ethical review and approval processes. This delay was primarily attributed to the absence of a unified ethics review process and variability in the requirements for ethics applications, a concern also echoed in the current study. In addition, Jörgensen et al.

(2021) identified inefficiencies within Sweden's ethics review process, which included inconsistencies in the ethics application procedures and incomplete submissions.

Moreover, some studies, including that of Wahyuwardani et al. (2020), have highlighted a lack of awareness among researchers regarding the necessity of obtaining ethical clearance and the specific requirements associated with this process. Adherence to ethical standards on the use of animals in scientific studies in countries like Ghana is lacking as a result of an insufficient level of awareness and understanding of these standards by researchers, which ultimately affects the ethical use of animals in scientific studies. This assertion is confirmed by Akkaya and Güngör (2022), who emphasise that researchers fail to adhere to animal welfare principles mainly due to their lack of awareness of the ethical principles and standards in scientific studies using animals. Additionally, the findings concerning inadequate housing conditions for research animals are corroborated by Asebe and Gelayenew (2015) and Cait et al. (2022). This study's findings, regarding the existing animal research ethics governance practices for the ethical use of animals in scientific studies in Ghana, are summarised in Figure 7.2.

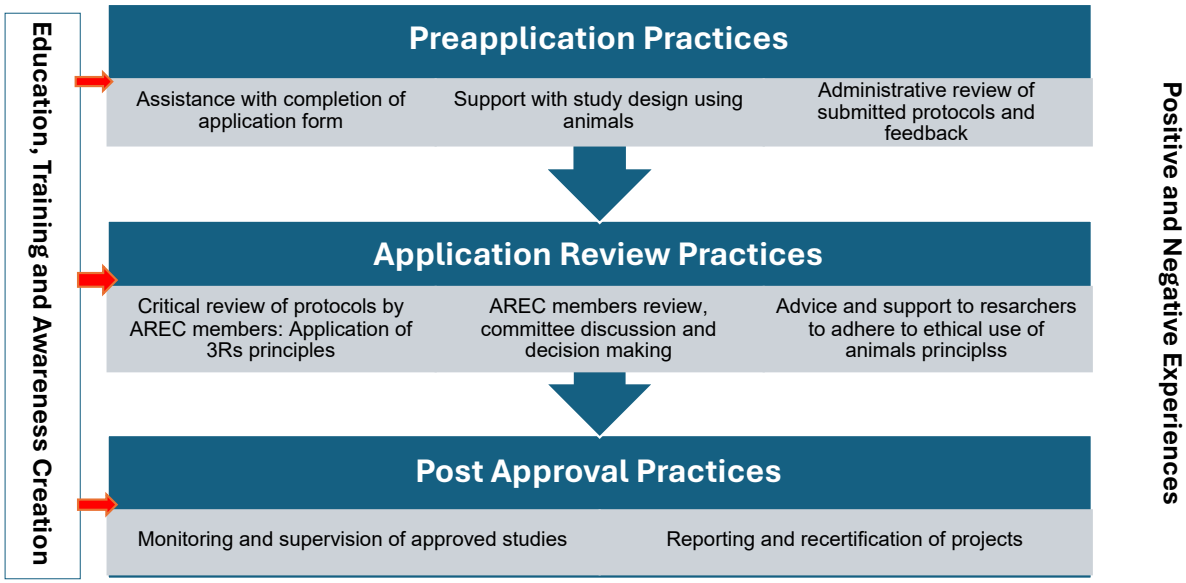


Figure 7.2: Experiences of key stakeholders of the existing research ethics practices that promote the ethical use of animals in scientific studies in Ghana

Source: Author's construct, 2025

Figure 7.2 shows that the animal research ethics governance practices for the ethical use of animals in scientific studies include pre-application practices, application review practices, and post-application practices. Figure 7.2 also shows that education, training and awareness creation among researchers, staff and students are other governance practices carried out by the ARECs that promote the ethical use of animals in scientific studies. This education and awareness creation occurs during the pre-application, application review and post-approval practices. The findings show that researchers, AREC members and AREC administrators had both positive and negative experiences with respect to the governance practices at the pre-application, application review and post-approval stages.

7.3 Chapter Conclusion

The objective of this chapter was to provide a thorough analysis, discussion, and interpretation of the findings pertaining to the third objective of this study. It sought to explore and describe key stakeholders' experiences regarding the existing research ethics governance practices that promote the ethical use of animals in scientific studies in Ghana. The study's findings indicate that animal research ethics governance practices are primarily encapsulated in the ethical approval practices of ARECs, which include pre-application practices, application practices and post-approval practices. Participants also underscored the need to conduct training and promote awareness creation among researchers, staff and students of research-producing organisations, as important governance practices for the ethical use of animals in scientific studies. The findings also revealed that participants had positive experiences, citing the AREC's support for researchers in the ethical clearance application and review process and the monitoring and supervision practices by the AREC. Negative experiences reported by participants included inefficiencies in ethical application and review processes, as well as poor animal welfare considerations and research housing facilities. From the foregoing, it is suggested that animal research ethics governance practices involve activities carried out particularly by ARECs (from pre-approval, approval and post-approval of protocols) that ensure the ethical use of animals in scientific studies. The subsequent chapter presents the study's findings relating to

participants' suggested strategies for promoting the ethical use of animals in scientific studies in Ghana.

CHAPTER EIGHT
RECOMMENDATIONS BY KEY STAKEHOLDERS FOR PROMOTING THE ETHICAL USE OF ANIMALS IN SCIENTIFIC STUDIES IN GHANA

8.1 Introduction

Key stakeholders' experiences with respect to the existing animal research ethics governance practices were presented and discussed in the previous chapter (Chapter 7). The findings identified the AREC's pre-application, application review and post-application approval activities as animal research ethics governance practices that promote the ethical use of animals for research. This chapter offers an analysis, discussion, and interpretation of the findings in relation to the fourth objective of the research, which aimed to ***explore and describe key stakeholders' suggestions to promote the ethical use of animals in scientific studies in Ghana***. The ensuing discussion and interpretations of findings are predominantly based on the participant interviews and their naïve sketches. The main themes and their corresponding subthemes are presented, and the researcher uses relevant literature to re-contextualise and validate the findings.

8.2 Key Stakeholders' Suggestions on How to Promote the Ethical Use of Animals in Scientific Studies in Ghana

The fourth objective of this study aimed to answer the research question, ***"What are the key stakeholders' suggestions for promoting the ethical use of animals in scientific studies in Ghana?"*** To address this research question, participants from each of the three ARECs were posed with three main questions:

- *How do you think the ethical use of animals in scientific studies can be promoted in Ghana?*
- *How do you think the ethical use of animals in scientific studies can be promoted in your institution?*
- *What do you think an animal research ethics governance framework to promote the ethical use of animals should include or address?*

These questions intended to solicit their ideas about the ways in which the ethical use of animals in scientific studies can be promoted in Ghana and in their respective institutions, and suggestions on the elements to be included in an animal research ethics governance framework. A total of 15 pages (Arial font type, size 12, single spacing) of interview transcripts and six pages (Arial font type, size 12, single spacing) of naïve sketches from participants answering these questions were analysed thematically. A case-by-case thematic analysis of the findings from each AREC was conducted, and then a cross-case analysis of the three ARECs was done.

This chapter presents findings of the cross-case analysis and is supported by verbatim quotes from participants' interviews and naïve sketches across all three embedded cases (ARECs). The commonalities and differences across the three ARECs are illustrated in the thematic presentation of the findings. The findings have been interpreted to describe the key stakeholders' suggestions for promoting the ethical use of animals in scientific studies in Ghana. A summary of the case-by-case analysis for each embedded case (AREC 1, AREC 2 and AREC 3) is presented in Appendices 8.1 to 8.3, respectively. The comprehensive findings with key quotes and codes from the interviews and naïve sketches are available in Appendices 8.4 and 8.5, respectively.

The findings are presented thematically with main themes and subthemes associated with each question. The subthemes were developed through the categorisation of the codes identified by the researcher from the interviews and naïve sketches. Based on the subthemes, the researcher formulated the main themes. The subsequent sections explore participants' suggestions regarding the promotion of the ethical use of animals in scientific studies in Ghana, with evidence provided through verbatim quotes from the interviews and naïve sketches. Table 8.1 provides a comprehensive summary of the findings derived from the cross-case analysis concerning the participants' suggestions regarding promoting the ethical use of animals in scientific studies in Ghana.

Table 8.1: Thematic findings on the key stakeholders' suggestions to promote the ethical use of animals in scientific studies in Ghana across ARECs

Questions	Main Themes	Subthemes	AREC 1	AREC 2	AREC 3	Total Occurrence
How do you think the ethical use of animals in scientific studies can be promoted in Ghana?	8.2.1.1 Developing a national animal research ethics governance framework	a) Establish a national governance body for the ethical use of animals in scientific studies	x	x		2
		b) Develop national legislation, standards and guidelines on the ethical use of animals in scientific studies in Ghana	x	x	x	3
	8.2.1.2 Organising intensive education and sensitisation on animal research ethics in Ghana	a) Educate and sensitise AREC members, researchers and students in institutions on animal research ethics	x	x	x	3
		b) Create awareness on the ethical use of animals in scientific studies among the public		x	x	2
How do you think the ethical use of animals in scientific studies can be promoted in your institution?"	8.2.2.1 Establish robust institutional ARECs and an oversight body to oversee the activities of ARECs at the institutional level	a) Establish well-resourced, efficient institutional ARECs	x	x	x	3
		b) Establish an institutional regulation system	x	x	x	3
	8.2.2.2 Train and create	a) Train staff of research-producing organisations			x	1

Questions	Main Themes	Subthemes	AREC 1	AREC 2	AREC 3	Total Occurrence
	awareness among staff of research-producing organisations and the public about the ethical use of animals for research	on the ethical use of animals for research				
		b) Create awareness about the roles and responsibilities of AREC and the importance of using animals ethically for research	x		x	2
What do you think an animal research ethics governance framework to promote the ethical use of animals should include or address?	8.2.3.1 Inclusion of laws, policies, and guidelines that are benchmarked with Western practices	a) Inclusion of laws, policies and guidelines	x	x		2
		b) Benchmark and adapt international guidelines and practices	x	x	x	3
	8.2.3.2 Inclusion of a training plan and sensitisation on the ethical use of animals for research	a) Include a plan for training researchers and AREC members and sensitising the public		x	x	2

Source: Author's construct, 2025

Table 8.1 presents an analysis of the similarities and differences among the three ARECs regarding participants' responses to the questions that were posed. Participants unanimously indicated the need to establish national legislation, standards and guidelines to promote oversight for the ethical use of animals in scientific studies. Participants also suggested the need to conduct training and sensitisation activities on the ethical use of animals in scientific studies for AREC members, researchers and students. Apart from participants from AREC 3, all other participants advocated for the establishment of a national entity or body that will be

responsible for ensuring that animals are used ethically in scientific studies in Ghana. This difference can be ascribed to the geographical location of AREC 3, which is not located in the country's capital. Consequently, there are no national regulatory bodies near AREC 3, with all such entities located in Accra, where AREC 1 and AREC 2 are located. Thus, participants from ARECs 1 and 2, having experienced the activities of such entities first-hand, perceived an urgent need for such a regulatory entity to oversee the ethical use of animals in scientific studies. Furthermore, the suggestion for an increase in public awareness on the ethical use of animals in scientific studies emanated from participants from ARECs 2 and 3 only. The rationale behind this divergence may be linked to the broader distribution of AREC 2's units across the country and AREC 3's location in a region with lower literacy levels compared to Accra. Participants from these ARECs recognised the necessity of public education on the ethical use of animals, unlike their counterparts in AREC 1, who are situated in a more educated community.

Regarding suggestions for enhancing the ethical use of animals in research within their respective institutions, Table 8.1 indicates that participants from all three ARECs collectively emphasised the establishment and adequate resourcing of ARECs at each institution, alongside the formulation of institutional policies and oversight bodies empowered to monitor AREC activities. While participants from AREC 2 did not propose awareness creation on the roles and responsibilities of ARECs, this suggestion was very strong among participants from ARECs 1 and 3. Participants from AREC 3 distinctively suggested that university staff should be trained on the ethical use of animals in scientific studies. This suggestion, which was only made by participants from AREC 3, can be understood since the AREC in the institution was established approximately five years ago, and researchers are not well-informed about the requirements for obtaining ethical clearance before using animals in their scientific studies.

The findings illustrated in Table 8.1 further reveal variations in participants' suggestions from the three ARECs concerning the elements to be incorporated into the governance framework for the ethical use of animals in scientific studies. The sole consensus among participants was the necessity to benchmark the proposed

framework with established international guidelines and practices, emphasising that existing international frameworks should inform the development of a national framework for ethical animal use in Ghana. However, participants also emphasised the need to develop a governance framework that incorporates the Ghanaian context.

Other suggestions, including the inclusion of laws, policies and guidelines in the development of a proposed framework, were offered by participants from AREC 1 and AREC 2 only. Furthermore, only participants from ARECs 1 and 3 suggested incorporating ARECs' composition into the governance framework. Conversely, participants from AREC 2 and AREC 3 suggested that a training plan on the ethical use of animals in scientific studies must be included in the proposed governance framework for the ethical use of animals in Ghana. Notably, only participants from AREC 3 recommended the inclusion of stakeholders in the governance framework for ethical animal use in scientific studies in Ghana.

Overall, while Table 8.1 highlights certain commonalities in the suggestions from participants across the three ARECs, it also underscores significant differences shaped by the unique experiences of the participants. In the sections that follow, a detailed description of the findings, which address each of the questions posed to participants, is presented. The presentation of the findings and arguments is substantiated by verbatim quotations from the interviews and naïve sketches.

8.2.1 How the ethical use of animals in scientific studies can be promoted in Ghana

This section presents the findings addressing the question, "*How do you think the ethical use of animals in scientific studies can be promoted in Ghana?"* The analysis of the interviews and naïve sketches yielded two main themes, as illustrated in peach in Table 8.1 and further elaborated on in Table 8.2. These are:

- Developing a national animal research ethics governance framework
- Organising intensive education and sensitisation on animal research ethics in Ghana

Furthermore, Table 8.2 delineates the subthemes from which each of the main themes emerged.

Table 8.2: Main themes and subthemes from interviews and naïve sketches describing how ethical use of animals can be promoted in Ghana

Question	Main Themes	Subthemes
How do you think the ethical use of animals in scientific studies can be promoted in Ghana?	8.2.1.1 Developing a national animal research ethics governance framework	a) Establish a national governance body for the ethical use of animals in scientific studies
		b) Develop national legislation, standards and guidelines on the ethical use of animals in scientific studies in Ghana
	8.2.1.2 Organising intensive education and sensitisation on animal research ethics in Ghana	a) Educate and sensitise AREC members, researchers and students in institutions on animal research ethics
		b) Create awareness on the ethical use of animals in scientific studies among the public

Source: Author's construct, 2025

The ensuing subsections provide a detailed examination of these main themes, incorporating the subthemes alongside verbatim quotations from interviews and naïve sketches from participants to substantiate the arguments. A re-contextualisation of the literature is provided to conclude the discussion on each main theme.

8.2.1.1 Main theme 1: Developing a national animal research ethics governance framework

According to participants from all three ARECs, a national overarching animal research ethics governance framework for the ethical use of animals in scientific studies in Ghana will help promote the ethical use of research animals across the country. This main theme is derived from two subthemes, which are as follows:

- Subtheme 1: Establish a national governance body for the ethical use of animals in scientific studies
- Subtheme 2: Develop national legislation, standards and guidelines on the ethical use of animals in scientific studies in Ghana

Participants suggested that by establishing a national governance body to oversee the ethical use of animals in scientific studies and developing national legislation, standards and guidelines, the ethical use of animals in scientific studies in Ghana can be promoted. These subthemes are presented below with verbatim participant quotes to support the arguments.

a) Subtheme 1: Establish a national governance body for the ethical use of animals in scientific studies

The findings showed that the majority of participants from ARECs 1 and 2 were of the view that one of the ways to promote the ethical use of animals in scientific studies in Ghana is by establishing a national oversight body that will put the right policies and guidelines in place and provide directives for using animals ethically for scientific studies in Ghana. AREC Member 1 (AREC 1) stated:

> *"I will advocate for the formation of a committee to develop the necessary national guidelines for animal research ethics. Once there is a committee in place, ... I think that that committee and authority must begin to think about national policy and ethics."* **[M1]**

AREC Member 2 (AREC 2) also perceived that the establishment of a national governance body will be the first step to ensuring the ethical use of animals for research in Ghana, creating systems to regulate institutional-level governance of scientific studies using animals. He stated:

> *"So, as a nation, once we have a national body in place that oversees and then provides some guidance, yeah, that is the first step. And then they will now become like an advisory or guide that will be making sure that the research, the*

university's research institution, also has their systems in place. Systems of governance in place. So that we will promote the welfare of the animals." **[M2]**

Researcher 2 (AREC 1) saw a great opportunity for Ghana to set up a national governing body at this time, since there are very few ARECs in the country. This proposed body can put appropriate systems in place that will guide the three existing ARECs and the establishment of any other ARECs in future. He stated:

"I think now that there aren't that many of them [ARECs], there is a good opportunity to build that overarching body to define certain things." **[R2]**

Researcher 2 added:

"So once such a body is formed, it will also make it easier for others who do not have the IACUCs [ARECs] to either quickly align with the existing one or, if there is a need to create a few more, do so more easily and swiftly." **[R2]**

Participants from AREC 2 also expressed the need for a national body that will govern and regulate the use of animals in scientific studies in Ghana. According to Researcher 3 (AREC 2), this will ensure uniformity in the systems and practices across all existing ARECs.

"Then maybe we should also have a national body that controls what happens in the various institutions and makes sure that there's uniformity. So, for instance, whatever is done at Noguchi is similar to CSIR,, and all that." **[R3]**

From Researcher 3's (AREC 2) perspective, having a national governance body will help control all the institutional ARECs, creating uniformity. She provided some suggestions regarding the structure of this proposed national body:

"We have the Ghana Standard Authority that defines the standard, and we have the Foods and Drug Authority under the Ministry of Health. So, maybe animal ethics can be under the veterinary services directorates. And then, maybe they

> *can have a board with members from various institutions that give ethics approval. Yeah, so that they come together and develop similar guidelines that will be regulated."* **[R3]**

The proposition by Researcher 3 offers a rationale for the creation of an oversight body dedicated to the use of animals in research within Ghana. In alignment with this perspective, AREC Member 4 (AREC 2) articulated the necessity for the centralised regulation of animal ethics in Ghana, asserting that such oversight is essential. She remarked:

> *"If there is no head, then all that everybody is doing is on their own, you don't know whether what someone is doing somewhere is right or wrong. So, I think the number one is to decide that this is where our head is. And then, who falls under that? Yeah, I think that is very important. Errr, in a country if there are no leaders, nothing will go on. So, I think they should just recognise CSIR, and then they will take it up from there and do other necessary restructuring or structuring."* **[M4]**

AREC Member 4 (AREC 2) proposed that his institution be designated as the principal research institution in Ghana, with the responsibility of leading the restructuring of animal research ethics within the country. He argued that a national governance body should be established and located within his institution to function as the regulatory authority overseeing the ethical use of animals in scientific studies across Ghana. This proposal was based on the fact that the institution has units across many parts of the country. Furthermore, AREC Administrator 1 (AREC 1) agreed with the notion that the establishment of a national governance body would significantly contribute to the promotion and maintenance of animal welfare standards during scientific studies using animals. This proposed national body would be tasked with conducting regular monitoring visits and assessments at various research institutions to ensure compliance with established policies and guidelines aimed at safeguarding animal welfare.

> *"The government must also ensure that it has a body that once in a while checks on the type of research that goes on in terms of how animals are handled or taken care of."* **[A1]**

He added that:

> *"Animals should not be handled anyhow, as far as research is concerned. An individual unit that conducts research on animals should have some sort of committee that regulates what these animals are subjected to prior to, during, and even after the research is conducted..."* **[A1]**

According to the participants, having an established national oversight body will serve as a reference point and regulator of scientific studies using animals in Ghana. The oversight body will provide guidance and put the necessary governance systems in place for the ethical use of animals for research purposes in Ghana. Griffin and Locke (2017), as well as Mohr et al. (2017), corroborate this finding by emphasising the need for a centralised body to ensure that ethical standards and scientific rigour in the conduct of scientific studies using animals are established and sustained. Mohr et al. (2017) also contend that establishing such a national oversight body would promote transparency and ensure accountability in the use of animals in scientific studies. This strategy, according to Mohr et al. (2017), will enhance public confidence in the conduct of research using animals. Ferdowsian et al. (2020) and Childers (2022) also argue that the gaps in national regulations and guidelines cannot be addressed without the establishment of a national oversight body. Without such a body at the national level, the ethical use of animals in scientific studies cannot be guaranteed in Ghana, as institutions will not have any national framework to regulate the activities of their ARECs.

b) Subtheme 2: Develop national legislation, standards and guidelines on the ethical use of animals in scientific studies in Ghana

Apart from establishing a national governance body for the ethical use of animals, the need to develop national legislation, standards and guidelines for the use of animals

in scientific studies also emerged from all three embedded cases (ARECs). Based on participants' responses, when national regulations, standards and guidelines are developed, they will serve as a framework for all institutions to follow, which will contribute to ensuring the ethical use of animals in scientific studies in Ghana. According to AREC Administrator 1 (AREC 1), it is critical for clear guidelines to be in place to guide everyone who uses animals for research because it is important for animals to be handled humanely. He stated:

> *"Animals should not be handled anyhow, as far as research is concerned. An individual unit that conducts research on animals should have some sort of committee that regulates what these animals are subjected to prior to, during, and even after the research is conducted. So, there must be clear guidelines as to how these animals can be handled."* **[A1]**

The guidelines should guide researchers who use animals for research on how to handle the animals at every stage of the research process. AREC Member 3 (AREC 2) mentioned the need for national legislation to guide all institutions and researchers.

> *"I have told you about the legislation. We need national legislation to guide everyone. And then try to get the animal ethics and animal rights people."* **[M3]**

According to AREC Administrator 2 (AREC 2), the development of a national guideline on the use of animals for research in Ghana will serve as a framework that will guide the ARECs in their tasks. The ARECs will understand the limits of their oversight and responsibilities. Without such a national guideline, various ARECs perform different functions, which are not standardised in the country.

> *"So, what I will want to say is that a national guideline should be developed, which will make the work easier for local IACUCs to know what exactly is expected of them nationally and internationally as well."* **[A2]**

Researcher 3 (AREC 2) underscored the importance of national legislation to provide legal backing to the work of the ARECs.

> *"And if there is no legislation backing what they [ARECs] do, there should be legislation so that if there are punitive measures, people will take them seriously and will like to follow the rules. I think that's about it."* **[R3]**

From Researcher 3's perspective, the ARECs operating currently in the country do not have any legal backing and are, consequently, unable to enforce their policies and guidelines to compel researchers to conduct their scientific studies using animals ethically. From AREC Member 5's perspective, legislation on the use of animals in scientific studies in Ghana will bind all institutions and individuals who use animals for research purposes to act in specific ways in accordance with the provisions of the law. Citing Ghana's national procurement law, which regulates all procurements in the country as an example, having a similar law on the use of animals in scientific studies will serve a similar purpose of regulating everyone who uses animals for research. AREC Member 5 (AREC 3) also believed that with national legislation in place, various institutions will draw from that legislation to develop specific institutional structures and guidelines for the ethical use of animals for research.

> *"So, I think that as a country, we should have some legislation. I would want to see that. I give the example of the Ghana Procurement Act, which is binding on all public institutions, state institutions, or public institutions, so you cannot procure just like that because you are bound by that law. If we have national legislation spelling out clearly that we cannot use animals the way we want and that there are rules and regulations surrounding the ethical use of them, then that will be binding on all research institutions, and so every research institution would have to apply itself to that rule and probably would have to develop their own structures based on that legislation. So, I think that it should be a top-down approach. What I'm saying is that there should be legislation that is applicable to every institution. They pick it, and then they operate it in their own institutions, but then there will be some commonalities because it comes from the same legislation."* **[M5]**

AREC Member 5 (AREC 3) further shared another example from the United Kingdom, where the national legislation provides a framework for institutions' governance of scientific studies using animals:

> *"I will give you an example of another jurisdiction, like the United Kingdom, for example; these are enshrined in their rules and regulations, so when you go to an institution and they are telling you to fill out some forms or there are some mandatory things that would have to be done in terms of animal work, they always quote the home office, which is like their central government, and that the central government would be coming to check, so they need to be sure that after every animal is born, they should be able to account for its life until it passes away."* **[M5]**

There should be a national legislation that can be quoted to support the activities of the institutional ARECs. Without such legislation, it is difficult for institutions in the country to enforce certain systems and practices aimed at promoting the ethical use of animals for research. Researcher 5 (AREC 3) also confirmed the need for national regulations:

> *"In Ghana, we need some regulations on that to protect the animals and the indigenous animals in Ghana. I said indigenous because we want to promote diversity. I said that because how animals behave out there and how they behave over here are totally different. So, we want to have a national law that protects the use of animals. Their use domestically—you know what we have—as well as in scientific studies. Then, from there, various institutions must come up with their own guidelines and then work with them."* **[R5]**

According to Researcher 5, a national regulation or legislation will help protect how animals are used for research in Ghana, which will protect indigenous animals in the country. He called for a more contextualised legislation that addresses the Ghanaian context. In his opinion, other institutions will develop guidelines from the national regulation. This will be a top-down governance approach whereby a national regulation is developed to provide overarching guidance to all institutions in Ghana for

the development of institution-specific guidelines that govern the use of animals for research in these institutions.

The study's findings reinforced the need to develop a national research ethics governance framework by establishing a national governance body for the ethical use of animals in scientific studies and the development of national legislation, guidelines and policies for these studies. Silverman (2017) and Oates (2022) confirm that national governance bodies are crucial for promoting research ethics by ensuring participant protection and data credibility; therefore, they offer an important governance structure to ensure research ethics. Silverman (2017), however, cautioned that with a national governance body in place, communication and role clarity between national bodies and ethics committees are vital for ensuring the ethical conduct of research. Establishing a national body to oversee the ethical use of animals in scientific studies in Ghana must therefore be done in a way that ensures communication between the national body and the institutional ARECs, and their roles are clearly defined. In their study, Canario et al. (2022) emphasised that there is a need to establish governance bodies at the national level to promote ethical research conduct and to ensure compliance with ethical standards and effective oversight of research activities. Moreover, although Canario et al. (2022) focused on research ethics governance for public health emergencies such as COVID-19, their recommendation also applies to the governance of scientific studies using animals, where a strong national ethics system can help promote the ethical use of animals for research.

Compliance with regulations and standards by all stakeholders, particularly researchers, becomes easier with a compelling national oversight body with legal backing. Other authors, including Kolstoe and Pugh (2023), Nabyonga-Orem et al. (2021) and Silverman (2017), also emphasise the essential role a national research ethics governance body plays in promoting ethical research and protecting research participants, ensuring data credibility, and upholding ethical standards in research endeavours. Nabyonga-Orem et al. (2021) emphasised the need for national governance bodies to be established to promote research ethics in Africa and the need to strengthen legislation, policies and coordination structures to enhance ethics integrity and public trust in research. From the preceding claims, the study's findings

corroborate what other researchers have espoused as a way of promoting research ethics. Although these studies did not focus on animal research ethics governance, establishing a national ethics governance body cuts across all research, irrespective of the study participants. With no national governance body currently existing in Ghana for the ethical conduct of research in general, this study unearthed the urgent need for the country to establish a national animal research ethics governance body. It will ensure that research conducted in Ghana using animals meets all national and international ethical standards and assures research integrity and the humane use of animals for research.

8.2.1.2 Main theme 2: Organising intensive education and sensitisation on animal research ethics in Ghana

Participants proposed that the promotion of ethical practices in the use of animals in scientific studies in Ghana could be effectively achieved through the organisation of comprehensive educational and sensitisation initiatives focused on animal research ethics nationwide. This recommendation stemmed from the participants' perception of a significant deficiency in education and awareness regarding the ethical use of animals within both the scientific community and the broader population, as evidenced in Chapters Five to Seven. This main theme is derived from two subthemes, which are as follows:

- Subtheme 1: Educate and sensitise AREC members, researchers and students in institutions on animal research ethics
- Subtheme 2: Create awareness on the ethical use of animals in scientific studies among the public

These subthemes are presented below, with verbatim participant quotes to support the arguments.

a) Subtheme 1: Educate and sensitise AREC members, researchers and students in institutions on animal research ethics

Educating and sensitising researchers who handle research animals and are responsible for the conduct of research using animals was identified as one important way of promoting the ethical use of animals in research. The findings from the first objective of this study (Chapter 5) showed that researchers were uninformed and improperly trained on the use of animals for research. Researcher 1 (AREC 1) therefore suggested that researchers should be educated on this aspect. He stated:

> *"Well, obviously, that goes to the users of these animals, people like me who use animals for research. I think there should be education that animal research goes beyond just the idea that I need animals, and I get the animals and use them for my research."* **[R1]**

AREC Administrator 3 (AREC 3) also suggested in his naïve sketch to promote the ethical use of animals in scientific studies in Ghana, and researchers who use animals for research should be educated on their responsibilities:

> *"Education on the responsibilities of researchers regarding the use of animals, in accordance with enabling Act or guidelines, should be intensified."* **[N_A3]**

Educating and sensitising researchers is seen as an obvious activity that can promote the ethical use of animals in scientific studies in Ghana. Researchers are very critical when it comes to promoting the ethical use of animals, as they are the ones responsible for the research, and if they are not properly educated and sensitised on the ethical use of animals, the status quo regarding animals' use for research in Ghana, where researchers do not show concern for animals, will persist.

According to AREC Member 4 (AREC 2), although the researcher is responsible for the ethical conduct of research, everyone involved in research, particularly students, must also be educated to ensure a general improvement in the ethical use of animals for research in Ghana.

> *"And the people need to be educated too. Nobody knows unless you are a researcher. Yeah, the students come; they don't know what is ethical. They write a proposal, and you say, okay, how are you going to obtain your ethics? Then it is now that they realise that they have to obtain ethics permission before they come, or they have to change the whole subject. Yeah, so I think some of these things will really promote the regulation of research in this country."* **[M4]**

Students must be educated on research ethics in general and the ethical use of animals, even before they get to their final year. This approach could enhance their understanding of research ethics and the importance of including ethical clearance in their research plans. AREC Member 3 (AREC 2) also added that education on the ethical use of animals in scientific studies must start with institutions and individuals within the institutions.

> *"The sensitisation should start with institutions and individuals within the institution. Somebody should rally them around and let them understand that it goes beyond the committee, it goes beyond seeking publication to the extent of making sure that the animals are not mistreated, not necessarily in the use for research because researchers can be horrible. And I've cut animals several times, sutured them several times, and pushed things into them several times without ethical clearance. Right from sixth grade, from school, I'll buy my own guinea pigs and open them up for all kinds of things without any guidance. I try to do all kinds of things with the animal. Look at that, and how many people are like me doing all kinds of things? Nobody told me those days about ethical or humane use."* **[M3]**

From his personal experience, AREC Member 3 reiterated the importance of educating students on the ethical use of animals in scientific studies in Ghana. AREC Administrator 2 (AREC 2) also added that members of the ARECs should be trained to promote the ethical use of animals for research. She stated:

> *"We should have expertise in the system to be able to provide training or capacity-building for both the IACUC board members and the researchers as well. And anybody who will need any form of support. I will want to say that such systems put in place locally or nationally should be put in place."* **[A2]**

b) Subtheme 2: Create awareness of the ethical use of animals in scientific studies among the public

Awareness creation was identified as an essential strategy for promoting the ethical use of animals in scientific studies in Ghana. This subtheme provides suggestions from participants pertaining to how the ethical use of animals can be promoted in Ghana, which is different from the awareness creation discussed in Chapter Seven (Section 7.2.1.2), which focused on existing animal research ethics practices that can promote the ethical use of animals in scientific studies. The lack of awareness, even among researchers, students and lay people who do not use animals for research purposes, was identified as the main cause of the inhumane and unethical use of animals for research in Ghana. Awareness creation was also identified by AREC Member 3 (AREC 2) as the first thing to be considered in promoting the ethical use of animals in scientific studies in Ghana. In his view, if awareness creation increases across the entire country, it will draw people's attention to the fact that animals also have some rights, which must be protected by treating them humanely.

> *"Well, the first thing is awareness. We need a lot of awareness creation. If we get a lot more people raising awareness that animals also have self-right, then people's attention will be drawn towards it."* **[M3]**

Researcher 4 (AREC 2) also shared her experience to buttress the point of creating awareness to promote the ethical use of animals for research:

> *"The promotion should be like, maybe most organisations should have a committee for ethical clearance. So, like yesterday, a student from the University of Ghana contacted me to ask if we could do ethical clearance at our place. I'm sure he also doesn't know that the school gives ethical clearance. So*

maybe there should be more education on it and where to access such things. So that it will be easier even at the master's level or first-degree level, people can apply for this clearance easily for their research work. If I had used it in my first or second degree, I could have answered maybe the questions you asked earlier. So, I think awareness is important. It's creating awareness for researchers in the animal sector." **[R4]**

AREC Member 3 (AREC 2) also shared his experience to illustrate the need for massive awareness creation in all communities in the country. According to AREC Member 3, this would be a daunting task, as the level of ignorance about the humane use and treatment of animals among the Ghanaian population is very high.

"You're going to have a daunting task. You know, when I was the director of the animal research institute, there were encroachers on our land, and I was trying to stop them. Someone held my neck and said, "Wo, w3 gyimi paaa, wo kor suku nu, mboa sem nkoaa na wo sua ye. Wo kor suku nu mboa nsem nkoa na ewor wu trimu, na mboa asem na do di no, wa gyimii [translated: when you went to school, all your studies were about animals, and that is all you have in your head. You are behaving like an animal. You are a fool]." When we are thinking about human beings, you are thinking of animals and where they will sleep. What sort of person are you? What sort of person are you, Err? So, you went to school all this time to try and throw people out of their homes because of animals? Right. So, that is the reality. That is the reality. And we are here, hitting and killing animals." **[M3]**

Based on AREC Member 3's experience, he was seen as a fool for protecting animals over humans among the general population when he tried to protect animals from people who were encroaching on the research site. Animals are hit and killed without any mercy in many areas of Ghana, so for individuals and researchers to talk about the ethical use of animals is perceived as foolishness to the ordinary Ghanaian. This calls for significant effort to be put into awareness creation among the general populace on the need to protect animals and to use or treat them humanely. From

AREC Administrator 3's (AREC 3) perspective, this awareness creation must start with children in basic schools.

> *"We need to go down to every day's development. The primary schools and other things to educate them about the importance of nature, including animals, so that we start from there, and once they are acceptable down there, it becomes easier for us when you come to the higher educational institutions, and when you are practising, we should get there. As well as everybody else, everybody must acknowledge the importance of life, especially when it comes to dealing with animals, so that we minimise the harm and suffering that they normally go through."* **[A3]**

According to AREC Administrator 3, with the education of the general public from the primary school level regarding the humane use of animals in general and for scientific studies in particular, children will grow to understand and appreciate the need to treat animals humanely. As a result, when they become students at tertiary levels or researchers, it will be easier for them to ensure the humane and ethical use of animals for research. Researcher 5 (AREC 3) simply suggested that:

> *"The use and care of animals in scientific studies should become a national conversation, and appropriate regulations should be put in place."* **[N_R5]**.

From Researcher 5's view, once the ethical use of animals in scientific studies becomes a national discourse in the media (print and electronic), the general public will become sensitised and educated on the humane use of animals in general and for scientific studies in particular.

Cultural practices in Ghana have a profound impact on the treatment of animals, which, in turn, significantly influence animal welfare outcomes (Qekwana, Mccrindle et al., 2019). The participants indicated the need for educational programmes that will enhance awareness on the ethical use of animals in scientific studies among researchers, staff at research-producing organisations, students, and the general public. Stankovic and Stankovic (2014), as well as Sivasubramaniam et al. (2021),

corroborate this assertion by indicating the important role that education and awareness creation play in reducing instances of research misconduct. They further argue for the compulsory inclusion of education on research ethics in academic curricula to improve knowledge and awareness of ethical research conduct, thereby preventing unethical practices and ensuring compliance with established ethical standards and guidelines. Furthermore, education and awareness creation on research ethics are essential for ensuring that ethical principles are adhered to by researchers and students in conducting their research (Sivasubramaniam et al., 2021). Knight's (2023) views align with this perspective, asserting that educational initiatives and awareness campaigns surrounding research ethics are critical for the professional development of researchers and fostering ethical reflection across diverse research contexts. Knight (2023) further confirms that effective educational interventions and certified training programmes have demonstrably enhanced knowledge and attitudes regarding research ethics, underscoring the necessity for ongoing educational efforts to uphold ethical standards in research.

Also, education and sensitisation on research ethics are crucial to upholding ethical principles in academia, guiding researchers and students in conducting ethical research practices effectively (Sivasubramaniam et al., 2021). Research ethics education has been found to be particularly vital for health sciences research involving humans, animals, tissues, and cells to ensure the protection of participants' rights and welfare (EL-Khadry et al., 2020; Gazibara et al., 2020). Knight (2023) shares the same perspective that education and awareness creation on research ethics are crucial for researcher development and ethical reflection in various research contexts. Knight (2023) confirms that effective educational interventions and certified training have been shown to significantly increase knowledge and positive attitudes towards research ethics and related issues, emphasising the importance of continuous education to uphold ethical standards in research. Also, MacArthur Clark et al. (2019) argue that it is imperative to enhance transparency and communication in research using animals to garner public support and funding for research, which can only be achieved through education and awareness creation. Initiatives such as the development of informational pamphlets and questionnaires targeted at adolescents

can significantly influence the perceptions of the younger generation concerning the ethics of animal experimentation (Kim et al., 2017).

The aforementioned studies collectively underscore the critical role education and awareness creation play in promoting the ethical use of animals in scientific studies at all levels. MacArthur Clark et al. (2019) observed that the scientific community has not been proactive in communicating the significance of the ethical use of animals in scientific studies to the general public in lay language, thereby sustaining the view of unethical animal use in scientific studies held by many. This observation by MacArthur Clark et al. (2019) emphasises the urgent need for sensitising the general public on the role of animals in scientific studies and their ethical use. In summary, education and awareness-creation activities were identified by participants as imperative for advancing the ethical use of animals in scientific studies in Ghana.

8.2.2 How the ethical use of animals in scientific studies can be promoted in institutions

This section presents the findings addressing the question, "*How do you think the ethical use of animals in scientific studies can be promoted in your institution?"* This question was posed to explore participants' ideas and suggestions on the promotion of the ethical use of animals in scientific studies in their respective institutions. The analysis of the interviews and naïve sketches yielded two main themes, as illustrated in blue in Table 8.1, and further elaborated on in Table 8.3. These are:

- Establish robust institutional ARECs and an oversight body to oversee the activities of ARECs at the institutional level
- Train and create awareness among staff of research-producing organisations and the public about the ethical use of animals for research

Furthermore, Table 8.3 delineates the subthemes from which each of the main themes emerged.

Table 8.3: Main themes and subthemes from interviews and naïve sketches describing how ethical use of animals can be promoted in Institutions

Question	Main Themes	Subthemes
How do you think the ethical use of animals in scientific studies can be promoted in your institution?	8.2.2.1 Establish robust institutional ARECs and an oversight body to oversee the activities of ARECs at the institutional level	a) Establish well-resourced, efficient institutional ARECs
		b) Establish an institutional regulation system
	8.2.2.2 Train and create awareness among staff of research-producing organisations and the public about the ethical use of animals for research	a) Train staff of research-producing organisations on the ethical use of animals for research
		b) Create awareness about the roles and responsibilities of AREC and the importance of using animals ethically for research

Source: Author's construct, 2025

The ensuing subsections provide a detailed examination of these main themes, incorporating the subthemes alongside verbatim quotations from interviews and naïve sketches from participants to substantiate the arguments. A re-contextualisation of the literature is provided to conclude the discussion on each main theme.

8.2.2.1 Main Theme 1: Establish robust institutional ARECs and an oversight body to oversee the activities of ARECs at the institutional level

The findings suggest that it is imperative for research-producing institutions to establish ARECs in order to promote the ethical use of animals in scientific studies. These ARECs would be responsible for reviewing research protocols involving animal subjects. In addition to the establishment of ARECs, participants also suggest that institutional oversight bodies, such as research integrity boards, must be established to monitor and oversee the activities of ARECs. Participants emphasised that the establishment of ARECs must be accompanied by adequate resources to ensure their

effective and efficient operation. Furthermore, participants suggested that the ARECs must have a well-structured procedure for ethics application and protocol reviews to encourage researchers to submit their protocols for ethical review. By putting these practices in place, researchers will submit their protocols for ethical approval, thereby promoting the ethical use of animals in scientific studies in Ghana. The subthemes from which this main theme emerged are:

- Subtheme 1: Establish well-resourced, efficient institutional ARECs
- Subtheme 2: Establish an institutional regulation system

These subthemes are presented below with verbatim participant quotes to support the arguments.

a) Subtheme 1: Establish well-resourced, efficient institutional ARECs

To promote the ethical use of animals in institutions, participants from all three ARECs (embedded cases) highlighted the imperative for institutions to establish dedicated ARECs. These committees should be equipped with the necessary resources to effectively fulfil their functions, and institutional practices regarding ethical clearance should be streamlined to enhance efficiency. It is essential for institutions to recognise that the absence of ARECs tasked with conducting ethical reviews of proposed research studies undermines researchers' ability to ensure the ethical conduct of research. It is therefore critical that research-producing organisations establish research ethics governance systems such as ARECs to oversee and guide researchers in the conduct of scientific studies using animals. As articulated by AREC Member 5 (AREC 3):

> *"The institutions should be aware of concerns regarding ethics, and that is important. Bad ethics is bad science, and so if you don't have any ethics review, any ethics committee, or any ethics structures, then whatever they are doing there is not helping anyone, so I think it is best for institutions to realise this."* **[M5]**

According to Researcher 1 (AREC 1), one of the best ways to promote the ethical use of animals in scientific studies in institutions in Ghana is to establish ARECs in all institutions where animals are being used for research purposes and resource these ARECs to function well.

> *"Well, maybe the only thing that I will suggest or recommend is that every institution in which they have staff using animals for research should do their best to establish this IACUC [AREC] because once they have it, it is a professional body or committee that would be equipped with all the resources to manage animal research in those institutions. That, I think, will be one of the best ways to go."* **[R1]**

AREC Member 3 (AREC 2) also stated the need for institutions to establish ARECs in order to promote the ethical use of animals in scientific studies:

> *"… making sure that the IACUCs [ARECs] are established at the institutional level. It becomes critical here that if the institutions are doing it themselves, then it will go up to the national level."* **[M3]**

AREC Member 1 (AREC 1) was specific about the need to provide adequate resources to enable the ARECs to function well and carry out their responsibilities. He stated:

> *"The structure [AREC] must be equipped logistically to be able to fulfil its mandate to the fullest. Animals cannot talk. A human being can talk, leave the place, and report. Animals cannot talk, which means that the committee should be tooled to be able to make onsite visits to evaluate ongoing research. Then they will report to a higher body."* **[M1]**

AREC Member 1 was very passionate about the need to resource ARECs to enable them to conduct monitoring visits at project sites where animals are kept for research purposes. AREC Member 4 (AREC 2) also spoke passionately about the need for ARECs to be resourced to enable them to conduct monitoring visits.

> *"I think they should expand the IACUC [AREC] centres. That will promote it. They should be resourced. Because sometimes we feel like going out to monitor what we have approved that should be done, but the resources are not there. It takes a long time before they will give us the opportunity to go out."* **[M4]**

He explained that due to inadequate resources, the AREC is often unable to conduct monitoring visits at sites where research using animals is being conducted to ascertain and certify if humane procedures are being used on the animals. Researcher 3 (AREC 2) further suggested that the ARECs should be equipped and mandated to conduct training for researchers who apply for ethical approval. She shared her experience from Australia:

> *"I think, like they were doing in Australia, the ethics committees shouldn't just be giving approvals; they should train applicants. Train and educate applicants about the ethical use of animals because they can make a recommendation and you are somewhere else. You don't know whether the person is really practising it or not. But you need to be educated. And then, if the person is educated, then the information goes on, and they will also let their colleagues know about it."* **[R3]**

According to Researcher 3, once the ARECs train researchers and the researchers gain the necessary knowledge, this knowledge will be transferred to their peers and students and eventually lead to the promotion of the ethical use of animals in scientific studies. The AREC should therefore not only be interested in reviewing and approving protocols but also have training as part of its main functions to promote the ethical use of animals for research. AREC Member 5 (AREC 3) suggested that institutional ARECs should be established to solely review scientific studies using animals. Currently, in his institution, the ethics committee reviews both human and animal subject research, although the composition of the ethics committee may not be appropriate to review both:

> *"And the other thing is, when it comes to ethics, we are trying to separate them. So, there are protocol review committees, scientific and protocol review committees, but they have added ethics to it, and they are doing everything, not specifically animals. So, they receive for animals, but then the truth is that they may not have all that is required in terms of membership, and so if they have a committee that does the universal approval, it is not the best, so even though animal research ethics is in existence, we are not getting as many protocols as we should because the other committees are receiving them. But gradually, we are telling them that when they see the animal component, they should revert to us and tell the applicant to submit to our committee for ethics as well."* **[M5]**

With the current situation in the institution, the AREC is not receiving a lot of applications from researchers because the RECs are reviewing and approving both human and animal subject research. AREC Member 5 therefore suggests that a robust AREC be formed, and other RECs be educated on their roles and responsibilities to ensure the proper division of labour. Researcher 5 (AREC 3) also suggested the formation of an AREC separate from the institutional REC as a way of promoting the ethical use of animals for research in the institution. He described the AREC as a subcommittee that should be formed under the REC to focus on studies using animals.

> *"In my institution, a sub-committee of REC should be formed that solely focuses on animal research ethics"* **[N_R5]**

Another strategy participants suggested to help promote the ethical use of animals in scientific studies in institutions is to simplify the ethics application process. According to participants, delays in ethical reviews are due to the cumbersome and inefficient ethics review processes established by ARECs. Researcher 2 (AREC 1) stated:

> *"Simplifying the process is very key; of course, streamlining things so that you can have a very good turnaround time is also very important because, like I said, without that, it makes us uncompetitive."* **[R2]**

Researcher 2 believed that the turnaround time for ethical review and approval would be greatly improved if the application process, systems and practices were simplified and properly streamlined. This will, in turn, make the institutions more competitive globally. Researcher 2 further explained that the application forms should also be simplified.

> *"…I also think we need to streamline the process because the ethics application form is quite a long one; I can't even remember it being over 20 pages of questions, some of them with terminology you don't even understand. Some of the animal ethics forms are so complicated that I always have to get someone from our animal experimentation unit to help me complete them, and all that takes away from you."* **[R2]**

To promote the ethical use of animals in institutions, ARECs must be established and resourced. The ARECs' processes and practices in the ethical review and approval of studies using animals should be simplified to make it easier for researchers to submit protocols for ethical review.

b) Subtheme 2: Establish an institutional regulation system

In addition to establishing ARECs, the study's findings showed that participants also mentioned the need for an institutional oversight body to supervise the activities of ARECs to promote the ethical use of animals in scientific studies in institutions in Ghana. They indicated the need for a strong institutional regulatory policy, which should be enforced to ensure that researchers comply with institutional policies. AREC Administrator 2 was very passionate about this suggestion when she stated:

> *"Within my institution, I will say we need an institutional policy as well. The experience gathered over the years is that it is not enough to set up the committee and just expect people to patronise it. We need an institutional policy, a strong one to back it, that will compel your institutional members to be the first to comply with what you have put or set in place for them. So, these institutional policies are very important. Don't just set it up and think everybody*

> *knows about it, and they will work by maybe some default or kind of patronise it. No, it's not enough. You need to back it up with some policies. Some enforcement will push them to actually take it seriously."* **[A2]**

According to AREC Administrator 2, researchers in the institutions do not take the ARECs seriously because there is no institutional policy backing their activities. Therefore, in addition to establishing more ARECs, institutions must have strong policies that should be enforced so researchers can take them seriously and submit their protocols for ethical review and approval before the commencement of studies involving the use of animals. AREC Member 1 (AREC 1) also stated:

> *"So, putting the committee there is good. Getting the personnel there is good. But the next tier above them that should have that oversight responsibility should also be held accountable."* **[M1]**

From AREC Member 1's perspective, despite putting the AREC in place and appointing personnel to manage the AREC, every institution must also have an oversight body that will have the responsibility of ensuring that the ARECs are operating and adhering to some standards. The situation where ARECs are established and left on their own without any higher oversight body means some ARECs operate without accountability, which does not promote the ethical use of animals in scientific studies. Researcher 5 (AREC 3) further explained how this oversight body will operate in institutions:

> *"It's not like it is going to be different from what is there nationally, but the institutional one is going to be like a second check, a second oversight, and because they are there with the researcher in the same institution, you are able to periodically monitor whether the study is in line with the guidelines that have been given."* **[R5]**

With this suggestion, institutions are to have an institution-wide oversight body responsible for research integrity that will, as part of its mandate, oversee the activities

of the ethics committees and researchers at the institutional level and ensure the responsible conduct of research.

Available literature confirms these findings that the establishment of ARECs is an important step to ensuring the promotion of the ethical use of animals in scientific studies. ARECs play an important role in ensuring animals are used ethically in scientific studies by promoting the welfare of animals and researchers, as well as ensuring scientific rigour. They oversee the ethics review processes, monitor animal care and use, and enforce training and competence standards (King & Zohny, 2021; Mohr et al., 2024) Ethics committees promote the ethical use of animals for research by overseeing researchers' responsibilities, studies' composition, review processes, training, and quality assurance, aligning with universal principles and local contexts in Africa (Mohr et al., 2024). Animal ethics committees can promote the ethical use of animals for research by addressing the psychological burden on laboratory personnel, ensuring their well-being alongside animal welfare (King & Zohny, 2021). González-Esteban (2023) also confirms that ethics committees have an important role in the ethics infrastructure, ensuring ethical research and innovation. The infrastructure must function at the institutional level, and there should be cooperation with the national level. In addition to confirming the importance of having institutional ARECs, Lõuk (2023) suggests institutional policies and procedures to safeguard researchers and for the public to have trust in the ethics infrastructure.

From the foregoing, the findings of this study reveal that the establishment of ARECs is vital for the promotion of animal research ethics in institutions, aligning with the literature. However, most authors limit their arguments to the importance or critical role played by ARECs in the institutions to ensure the ethical conduct of research, but do not suggest the establishment of an additional oversight body at the institutional level, as suggested by some participants in this study.

8.2.2.2 Main theme 2: Train and create awareness among staff of research-producing organisations and the public about the ethical use of animals for research

Training and awareness creation among university staff and the general public emerged as one of the important ways in which the ethical use of animals in scientific studies can be promoted in institutions in Ghana. The subthemes from which this main theme emerged are:

- Subtheme 1: Train staff of research-producing organisations on the ethical use of animals for research
- Subtheme 2: Create awareness about the roles and responsibilities of AREC and the importance of using animals ethically for research

These subthemes are presented below with verbatim participant quotes to support the arguments.

a) Subtheme 1: Train staff of research-producing organisations on the ethical use of animals for research

To promote the ethical use of animals in scientific studies, participants suggested that institutions train researchers on the humane use of research animals. Researchers should be compelled to get some form of certification to handle animals for research, as suggested by Researcher 5 (AREC 3):

> *"The ethics board must insist or should ensure that whoever submits protocols has some certification regarding the use of animals."* **[R5]**

He further explained:

> *"Workshops can be conducted to teach or train. You must always ensure that the people who are going to handle animals are experts in doing that. You need to train people to do those kinds of things, care for the animals, and conduct*

> *the various experiments that they do. So, as part of the ethical review process, you can ask if the researcher or any member of the team has had any training in that area, and the person can show the certificate."* **[R5]**

According to Researcher 5, there is currently no structured training in Ghana for the ethical use of animals in scientific studies. Most researchers learn on the job and from their supervisors, which shows the need to have training workshops for researchers. These training workshops should be certified so that researchers can have certificates that prove they have undergone training on the humane and ethical use of animals for research.

> *"From my experience, most of the skills we acquired were acquired through experience. We hardly attend conferences and workshops where they are giving us certificates, but through mentorship from your supervisor, you learn, so if there is a track record, that is fine. But if there isn't a track record but the person has some certificate to show, that one is acceptable."* **[R5]**

In addition to training researchers, participants also suggested training for undergraduate and graduate students on the ethical use of animals. Administrator 3 (AREC 3) stated in his naïve sketch:

> *"Higher education institutions must put in place systems to ensure that they operate within established conventions and guidelines, as a measure to ensure integrity of their operation. Undergraduate programmes must contain courses on research ethics to ensure that students appreciate the important place of animals in teaching and learning."* **[N_A3]**

AREC Member 5 (AREC 3) suggested that the entire university community should be trained on the ethical use of animals in scientific studies. From his experience, such an educational endeavour takes time to yield the desired results.

> *"There is a need to educate the university community. It should be done. We are doing it, but it is still not yielding results. It's more like a gradual thing. It's gradually yielding, though, but we need to do more."* **[M5]**

b) Subtheme 2: Create awareness about the roles and responsibilities of AREC and the importance of using animals ethically for research

Several participants emphasised the importance of raising awareness regarding animal research ethics and the pivotal role of ARECs in promoting the ethical use of animals in research. According to the perspective of AREC Member 2 (AREC 1), it is imperative to enhance the visibility of ARECs through initiatives aimed at informing stakeholders about the committee's functions. Furthermore, there is a critical need to educate departmental heads, ensuring that they encourage their students to submit research protocols to the AREC for ethical review.

> *"Within the institutions, we should establish bodies [ARECs], and we need to make the group more visible. Yes, more visible. It is there, but it is not being enforced fully in all departments. All heads of departments must be made aware that any student work that involves an animal must go through the IACUC [AREC]."* **[M2]**

AREC Member 2 (AREC 1) continued to suggest that the AREC must create more awareness about what they do:

> *"What I am saying is that the unit in charge of ethics must work harder to make their presence known to the university community. Their activity, the role, and all that in the committee [AREC] so that everybody is aware."* **[M2]**

AREC Administrator 1 (AREC 1) also underscored the need for greater awareness to be created on the work of the AREC and facilities available to promote the ethical use of animals for research, despite having existing systems in place. He stated:

> *"Within my institution, we have the systems in place now, and we are doing everything to create more awareness so people will be more aware of the facilities that we have and the fact that you can't just conduct animal research anyhow and you would have to subject them through the ethics committee."* **[A1]**

AREC Administrator 1 indicated that the AREC in his institution had commenced educating all units in the institution regarding their use of animals for research and the need for them to submit their protocols for ethical review and approval before they conduct their studies.

> *"So, awareness. So, we have started, last semester, we went to unit by unit that conduct research on animals to let them know that your unit is likely to conduct research on animals and that anytime you are thinking of research involving animals, you need to speak to us [AREC] first. While you have the concept and a proposal at hand, you can talk to us, and we will be able to guide you on how to proceed so that your research can be smooth and then you will also not cause any harm to any animal that you will be using in your research."* **[A1]**

Administrator 3 (AREC 3) suggested that awareness should be created in the daily lives of individuals to consciously preserve lives and the ecosystem.

> *"I think it should not be limited to research. In our daily lives, we should acknowledge the importance of life. The preservation of wildlife is the preservation of our ecosystem. It should be part of us, not only for research purposes."* **[A3]**

The creation of awareness regarding the treatment of animals extends beyond the realm of research to encompass broader wildlife conservation efforts within the country. Cultural norms in Ghana significantly influence how animals are treated, even in research settings, since the cultural significance of animals is prioritised over their ethical treatment (Qekwana et al., 2019). This phenomenon has led to unethical practices against animals, such as sacrificing animals as a component of their

traditional religious rituals in some communities in Ghana (Qekwana et al., 2019). Specifically, the Akan ethnic group employs animals in rituals intended to cleanse evil and sin (Asamoah, 2020). Also, cultural practices like hunting conflict with modern animal welfare (McPherson et al., 2016).

To promote the ethical use of animals in scientific studies in Ghana, it is important to first cultivate a basic understanding of humane handling and the use of animals among the general population. Once this foundational knowledge is established and embraced, it will facilitate the education of researchers, enabling them to adopt ethical principles in their scientific inquiries involving animals. Moreover, the recommendation to train staff at research-producing organisations on the ethical use of animals in scientific studies is crucial. Such training will provide staff with the needed knowledge and skills to handle animals ethically while using them to conduct scientific studies, thereby ensuring animal welfare outcomes (Knight, 2023). In addition, such training encourages the ethical conduct of research and social responsibility among staff employed at research-producing organisations (Llacsa Soto, 2019). Ultimately, animal welfare considerations will be ingrained in the staff of research-producing organisations through training and awareness creation on the ethical use of animals in scientific studies.

8.2.3 Participants' suggestions of elements to be included in an animal research ethics governance framework that will promote the ethical use of animals in scientific studies in Ghana

This section presents the findings addressing the question, "*What do you think an animal research ethics governance framework to promote the ethical use of animals should include or address?"* The intention was to solicit ideas from participants that could be incorporated into the development of the governance framework for the ethical use of animals in scientific studies in Ghana. The analysis of the interviews and naïve sketches yielded two main themes, as illustrated in green in Table 8.1 and further elaborated on in Table 8.4. These are:

- Inclusion of laws, policies, and guidelines that are benchmarked with Western practices
- Inclusion of a training plan and sensitisation on the ethical use of animals for research

Furthermore, Table 8.4 delineates the subthemes from which each of the main themes emerged.

Table 8.4: Main themes and subthemes from interviews and naïve sketches describing participants' views on items to include in an animal research ethics governance framework in Ghana

Question	Main Themes	Subthemes
What do you think an animal research ethics governance framework to promote the ethical use of animals should include or address?	8.2.3.1 Inclusion of laws, policies, and guidelines that are benchmarked with Western practices	a) Inclusion of laws, policies and guidelines
		b) Benchmark and adapt international guidelines and practices
	8.2.3.2 Inclusion of a training plan and sensitisation on the ethical use of animals for research	a) Include a plan for training researchers and AREC members and sensitising the public

Source: Author's construct, 2025

The ensuing subsections provide a detailed examination of these main themes, incorporating the subthemes alongside verbatim quotations from interviews and naïve sketches from participants to substantiate the arguments. A re-contextualisation of the literature is provided to conclude the discussion on each main theme.

8.2.3.1 Main theme 1: Inclusion of laws, policies, and guidelines that are benchmarked with Western practices

Participants from AREC 1 suggested the inclusion of laws, regulations, and policies in the governance framework. In their view, these should be adapted from Western practices while also ensuring that these laws and policies depict the Ghanaian context. The subthemes from which this main theme emerged are:

- Subtheme 1: Inclusion of laws, policies and guidelines
- Subtheme 2: Benchmark and adapt international guidelines and practices

These subthemes are presented below with verbatim participant quotes to support the arguments.

a) Subtheme 1: Inclusion of laws, policies and guidelines

A governance framework for the ethical use of animals in research must include information on rules, regulations, and guidelines governing their use in Ghana. This will provide the standards for the use of animals in research across all institutions in the country. Researcher 1 (AREC 1) stated during the interview that laws on the ethical use of animals in research should be included in the framework:

> *"Well, I think the establishment of laws … important to be captured in the framework."* **[R1]**

Researcher 2 (AREC 1) also suggested the inclusion of clearly defined guidelines that will serve as a framework to guide all stakeholders' conduct in the ethical use of animals in scientific studies.

> *"I think it needs to have clearly defined terms and guidelines because when people are working with guidelines that are clear, the room for everyone is reduced, but when they are very generalised, then you create room for people to sort of do things and still justify it because of the lack of clarity."* **[R2]**

Researcher 3 (AREC 2) also shared that:

> *"It should have something like the standards for the use of animals because I don't think it's just for the research institutions or the universities. Pharmaceutical companies, etc., if we are doing serious research, all use animals, so there should be guidelines and standards for institutions that use animals. There should be legislation because having papers that are not backed by any legislation doesn't give them weight."* **[R3]**

From Researcher 3's perspective, the legislation should cover all institutions that use animals in research and not only educational and research institutions. The framework must contain information on national legislation for the use of animals in scientific studies, which will also add weight to all publications of research conducted using animals.

Researcher 2 (AREC 1) provided a detailed explanation:

> *"I think a document like that should have general things, but it should drill down to some specific areas that we expect to see in ethical bodies. So how are ethical bodies supposed to run, even with reporting lines, because who is watching the watchman? If they are supposed to guide how things are done, but who is watching how they are doing what they are doing? All of that needs to be detailed so that there is no ambiguity in terms of the rules and guidelines, which probably you are looking at as a law to guide that. They should be very clear so that there is no ambiguity and room for people to go around issues and do things."* **[R2]**

b) Subtheme 2: Benchmark and adapt international guidelines and practices

In calling for Ghanaian context-specific guidelines and policies, participants suggested that existing international documents must be consulted and adapted to the Ghanaian

context. AREC Member 2 (AREC 1) stated that the existing international laws, guidelines and policies should guide the development of a Ghana-specific framework.

> *"I think we should look at the same guidelines as well as the Animal Welfare Act document that should guide us. Most countries—a lot of countries—have some of these policy documents already."* **[M2]**

He justified this view by stating that animals are the same everywhere, so existing documents should guide the development of a framework for Ghana:

> *"Animals are animals, which is why we have IACUC documents, which are kind of universal. With reference to those documents, we can work out something that will suit our context but does not take away the welfare of the animals."* **[M2]**

Researcher 3 (AREC 2) also suggested adapting international guidelines and tailoring them to the Ghanaian context:

> *"Oh, I think we can adapt. We always adapt, and then we can tailor it to our environment because not everything that is done there can be applied to the latter here. But if there is, let's say, an international code or something that everybody has subscribed to, then it means that everyone is supposed to follow it. Then we cannot change it to suit us. Yeah, but if there is nothing like that in their guidelines, then we can tailor the guidelines to our environment."* **[R3]**

AREC Administrator 2 (AREC 2) confirmed the need to include existing international standards and guidelines, which must be contextualised to the Ghanaian situation. She stated:

> *"I think it should be contextualised. Because every culture has its own uniqueness. I want to believe that Ghana might have a unique culture, beliefs, or moral beliefs. That may be slightly different from somebody in a developing country in terms of how we appreciate animals, how we treat animals, how we*

> *value animals, and all that. I'm sure there will be something. We should look out for that uniqueness and capitalise on it for Ghana. We shouldn't pick from outside and dump on our people. What if it's not applicable to us?"* **[A2]**

AREC Administrator 2 believed that Ghana has some unique attributes with respect to its culture, beliefs and cultural practices regarding animals. Therefore, any framework that will be developed to govern the use of animals for research should incorporate this contextual uniqueness to make the framework applicable to the Ghanaian context. Researcher 2 also suggested that a governance structure should be defined and contextualised to the Ghanaian setting for easy adoption and application.

> *"I know you need to define a structure that will work efficiently for our part of the world. I know that between us and the west, normally you would have even cultural practices that would sometimes make something that is probably standard in the west does not work here, so we need to have a structure that is customised to our setting. Contextualised. Yes, that is very important."* **[R2]**

AREC Member 5 (AREC 3) suggested the inclusion of the 3R principles:

> *"I think we should look at the NC3Rs document and see how best we can adopt it. Adopting that one, yeah. Not entirely everything, because some of the things over there are crazy. We should tailor it to what our conditions are. And I think it would help because Welcome Trust is based in the UK, and one of the things they will ask is that you confirm that the protocols that you will use with the animals you are going to work with and how you are going to handle them are in line with UK laws. Because we don't have, yeah, so we need to have something that we can also put there so that whatever we are doing is in line with our laws."* **[R5]**

The aforementioned quotations substantiate participants' recommendations to incorporate laws, policies, and guidelines aligned with Western practices into a governance framework aimed at promoting the ethical use of animals in Ghana. This

recommendation aligns well with the assertion by Wallis (2023) that integrating laws, policies and guidelines into governance frameworks will guarantee ethical oversight and align practices with national legislation, thereby enhancing the quality of research and promoting the ethical use of animals in scientific studies. Such frameworks foster a culture of responsibility and transparency by holding researchers accountable (Alagarsamy et al., 2022). Mohr et al. (2017, 2024) agree with this assertion and add that the inclusion of laws, policies and guidelines in a governance framework guarantees ethical oversight and aligns practices with national legislation, thereby enhancing the quality of research.

Moreover, participants expressed the view that it is insufficient to only include laws, policies and guidelines in the governance framework; instead, it is important to also benchmark these laws, policies and guidelines against those of other countries. It is vital to benchmark and adopt international guidelines and practices in scientific studies using animals to ensure that animals are used ethically across different cultural and regulatory contexts. Benchmarking of governance frameworks developed from international frameworks is important to ensure their alignment with existing international standards. Wallis (2023) highlights that countries with comprehensive regulations, such as Australia and Malaysia, serve as exemplary models for effective governance frameworks in animal research. Wallis (2023) asserts that it is important for countries that are yet to develop their governance frameworks to benchmark and adapt existing frameworks to enhance governance and adherence to ethical standards with scientific studies using animals. Consequently, to develop an animal research ethics governance framework for Ghana, it is essential to draw comparisons with the existing governance frameworks of other countries.

Additionally, considering South Africa as a leading example in Africa with a well-developed governance framework, it is crucial to benchmark against South Africa and other African nations, as contextual similarities may exist. Mohr et al. (2024) confirm that local cultural, religious and socioeconomic contexts must be considered in developing guidelines. Mohr et al. (2024) further propose that research-producing organisations in Africa must benchmark and adapt international animal research ethics in alignment with current national legislation and standards. Doing this, according to

them, will ensure ethical oversight and incorporate universal principles with respect to the ethical use of animals in scientific studies. Jain et al. (2017) and Olsson et al. (2022) also confirm the importance of benchmarking and the adaptation of international guidelines to ensure consistency and the promotion of animal welfare standards. Bayne and Turner (2019) concur that the adoption of best practices in animal research ethics is promoted through benchmarking against international guidelines and standards. It is therefore imperative to ensure that the proposed animal research ethics governance framework for research-producing organisations in Ghana aligns with internally accepted guidelines and standards to enhance animal welfare and scientific rigour.

8.2.3.2 Main theme 2: Inclusion of a training plan and sensitisation on the ethical use of animals in research

Participants expressed the desire to incorporate a capacity-building plan into the proposed animal research ethics governance framework. The plan should also focus on sensitising the general population and not only researchers. The subtheme from which this main theme emerged is:

- Subtheme 1: Include a plan for training researchers and AREC members and sensitising the public

This subtheme is presented below with verbatim participant quotes to support the arguments.

a) Subtheme 1: Include a plan for training researchers and AREC members and sensitising the public

Participants from ARECs 2 and 3 recommended the inclusion of a plan to train researchers and AREC members, as well as a plan for sensitising the public on the need for ethical animal research. Researcher 3 (AREC 2) simply stated:

"*And it should include things like training …"* **[R3]**

In addition to proposing that a capacity-building plan should be included, AREC Administrator 2 (AREC 2) advocated specifically for a curriculum for researchers and AREC members. She stated:

> *"Then, there should be some capacity-building. Do we need to set up some curriculum? Some basic curricula that maybe researchers can go and take that will provide maybe basic ethics principles and guidelines and training for a researcher to know what is expected of them as researchers? What is expected of me as an IACUC board member? We need to develop something. Something has to be there. So, all those things have to come into the framework. That is what I am expecting to see in the framework."* **[A2]**

Having a training plan and curricula that all researchers and AREC members must undergo before either reviewing protocols involving the use of animals or using animals for research will equip these actors to understand their respective responsibilities and the knowledge they require to play their roles more efficiently. This outcome will ensure that animals are used more humanely in conducting scientific studies. AREC Administrator 3 (AREC 3) also suggested that, in addition to training, there should be public sensitisation:

> *"I will say education should be a major thing as far as the framework is concerned. Education, sensitisation at all levels of our society, and then the churches, the chiefs, and all other things must acknowledge some of these things."* **[A3]**

All levels of society must be targeted with educational messages on the humane use of animals in general and specifically on the ethical use of animals for research. Various channels should be considered for the dissemination of this information, including sensitisation in churches, mosques, and communities to raise awareness.

According to Researcher 5 (AREC 3), education and sensitisation discussions must include various topics:

> *"The governance framework should include or address but not limited to the following: respect for animals' dignity, possibility of considering options to replace the use of animals where applicable, considering and balancing suffering of the animals and benefit of the scientific study, possibility of reducing the number of animals, Possibility of minimising the risk of suffering and improving animal welfare, Requirement of expertise on animals, requirement of due care"* [**N_R5]**

From the above quote, Researcher 5 suggested that education and sensitisation should focus on the 3R principles of replacement, reduction and refinement.

The aforementioned quotes suggest that a capacity-building plan must be incorporated into the proposed animal research ethics governance framework to be developed to enhance ethical standards, improve animal welfare, and promote responsible research practices. Mohr et al. (2024) contend that incorporating such a capacity-building plan will ensure that all stakeholders have the requisite knowledge and skills to use animals ethically in conducting scientific studies. In effect, the welfare of animals used in research can be significantly improved when the competencies of researchers and staff at research-producing organisations involved with the use of animals for research are confirmed. Moreover, Brink and Lewis (2023) affirm that a well-structured capacity-building plan can lead to superior animal care practices. Wallis (2023) further underscores the significance of incorporating a capacity-building plan into a governance framework, highlighting that it guarantees all personnel engaged in animal research will receive appropriate training, thereby fostering ethical practices, ensuring compliance with regulations, and enhancing the overall welfare of research animals.

8.3 Chapter Conclusion

The objective of this chapter was to present and discuss the study's findings concerning participants' recommendations for promoting the ethical use of animals in scientific studies in Ghana. The findings suggest that in order to promote the ethical use of animals in scientific studies, it is important to establish governance systems and practices at both national and institutional levels. Participants, including researchers, AREC members, and AREC administrators, unanimously advocated for the implementation of a national governance system and practices that delineate a structured approach to the ethical use of animals in scientific studies, extending from the national to the institutional level. There is a pressing need for the development of laws, guidelines and an oversight body at the national level to govern the ethical use of animals in scientific studies in Ghana that is adapted from existing international policies and guidelines. Such measures would provide the necessary legal foundation and overarching framework that institutions and researchers can adhere to in their ethical practices.

The promotion of ethical standards within institutions in Ghana can be facilitated by the establishment of robust ARECs across all research facilities engaging in animal studies. Furthermore, it is imperative to provide adequate resources for the efficient and effective functioning of these ARECs. Education and training on the ethical use of animals in scientific studies must be mandatory for staff and students of research-producing organisations. Additionally, there is an urgent need to create awareness among the general population with respect to the humane treatment of animals, thereby promoting the broader societal commitment to ethical research practices.

Participants also recommended that the proposed animal research ethics governance framework in Ghana must have contextualised laws, policies and guidelines that will be understood and implemented within the cultural context of Ghana. Moreover, participants further recommended the inclusion of a capacity-building plan into the proposed animal research ethics governance framework to educate and sensitise ARECs, researchers, students and the general public.

The subsequent chapter concentrates on phase two of this study, which aims to propose a conceptual animal research ethics governance framework for research-producing organisations in Ghana. This phase entails interpreting key stakeholders' experiences of existing animal research ethics governance systems and practices to promote the ethical use of animals in scientific studies in Ghana. In the next chapter, the findings from the empirical phase of the study, as presented in Chapters Five to Eight of this thesis, were used as a foundational basis to develop an animal research ethics governance framework for research-producing organisations in Ghana.

CHAPTER NINE
DEVELOPMENT OF A PROPOSED CONCEPTUAL ANIMAL RESEARCH ETHICS GOVERNANCE FRAMEWORK FOR THE ETHICAL USE OF ANIMALS IN SCIENTIFIC STUDIES IN RESEARCH-PRODUCING ORGANISATIONS IN GHANA (PHASE TWO)

9.1 Introduction

The findings of the empirical phase (phase one) of this study were presented in Chapters Five to Eight of this thesis. These chapters enabled an in-depth understanding of the concept 'animal research ethics governance', as well as key stakeholders' experiences with existing governance systems and practices that promote the ethical use of animals in scientific studies in Ghana. In this chapter, the second and final phase (phase two) of the study, which aimed to ***propose a conceptual animal research ethics governance framework for research-producing organisations to promote the ethical use of animals in scientific studies in Ghana,*** is presented. This chapter is specifically devoted to addressing the research question: ***"Which key components should be included in a proposed conceptual animal research ethics governance framework for research-producing organisations to promote the ethical use of animals in scientific studies in Ghana?"*** This question was answered by interpreting key stakeholders' understanding of animal research ethics governance, their experiences with existing animal research ethics governance systems and practices in Ghana, and their suggestions on the components of an animal research ethics governance framework, as articulated in Chapters Five through Eight. Consequently, the focus of this chapter is on developing and describing a proposed conceptual animal research ethics governance framework for research-producing organisations in Ghana. In order to achieve the objective of this chapter, the purpose, description, core assumptions and components of the conceptual animal research ethics governance framework are presented sequentially.

9.2 Purpose of Developing a Conceptual Animal Research Ethics Governance Framework

The conceptual animal research ethics governance framework was developed to provide a visual tool and a network of related concepts that show the relationships between concepts (van der Waldt, 2020; William, 2024) to promote the ethical use of animals in scientific studies in research-producing organisations in Ghana. Developing a conceptual framework supported a structured approach to a deeper understanding of the complex nature of the governance systems and practices that promote the ethical use of animals by research-producing organisations in Ghana (Tumiran, 2025). Furthermore, developing a conceptual framework aided the researcher in using concepts from the empirical phase to explore the alignment between the concepts to better organise and implement effective strategies for promoting the ethical use of animals in scientific studies in research-producing organisations in Ghana. The conceptual animal research ethics governance framework serves as a point of reference for advocating for the ethical use of animals in scientific studies in research-producing organisations in Ghana.

9.3 Description of the Conceptual Animal Research Ethics Governance Framework Development Process

To develop a proposed conceptual animal research ethics governance framework for research-producing organisations in Ghana that will promote the ethical use of animals in scientific studies, a comprehensive understanding of various ethical principles and theoretical frameworks presented and discussed in Chapter Two was necessary. As noted in Chapter Two (Section 2.3.4), virtue ethics emphasises the importance of character and moral virtues in the process of ethical decision-making on the use of animals in scientific studies (Walker, 2020b). It encourages key stakeholders in animal research to engage in self-reflection regarding their motives and the ethical ideals they strive to embody (Hursthouse, 2012). Virtue ethics seeks to harmonise the principles underlying animal rights theories and utilitarian approaches (Rocklinsberg et al., 2017), thereby advocating for a context-sensitive examination of the interactions between humans and animals. This philosophical view aligns with the objectives of

this study, which sought to develop a context-sensitive governance framework for the ethical use of animals in scientific studies. To this end, virtue ethics served as the primary theoretical framework in developing the conceptual animal research ethics governance framework for research-producing organisations to promote the ethical use of animals in scientific studies in Ghana. Attention was paid to the contextual issues regarding the African and Ghanaian philosophical views on the use of animals for research, which aligns with the virtue ethicists' context-specific examination of the interactions between humans and animals in assessing the ethical use of animals in scientific studies (Killoren & Streiffer, 2020).

To develop the conceptual framework, the practice-oriented theory proposed by Dickoff et al. (1968), as explained in Chapter Four (Section 4.16), was employed, since it provides a structured approach and a thinking map for developing a conceptual framework. Dickoff et al.'s (1968) theory was ideal because of its practice-oriented nature, which makes it easy to translate the developed conceptual framework into practice. Also, the six interconnected components of the theory (agent, recipient, context, terminus, procedure, dynamics) are sufficient to capture all essential aspects of an animal research ethics governance framework to promote the ethical use of animals in scientific studies in Ghana.

To develop the conceptual framework, the findings from the empirical phase (phase one) of the study were analysed and synthesised. The concepts emerged from the themes derived from the interviews and naïve sketches in the empirical phase of the study by addressing the six critical questions of Dickoff et al. (1968). Consequently, the conceptual animal research ethics governance framework emphasises key stakeholders' responsibilities in ensuring the ethical use of animals in scientific studies in research-producing organisations in Ghana.

9.4 Core Assumptions Underpinning the Conceptual Animal Research Ethics Governance Framework

The findings obtained from the empirical data (see Chapters 5 to 8) in phase one of this study, the theoretical framework adopted by the researcher to understand the

ethics of animals' use in research, and the scientific literature that supported the empirical data, served as the basis for the assumptions that guided the conceptual animal research ethics governance framework's development. Therefore, the following assumptions formed the basis for developing the conceptual animal research ethics governance framework:

- Animals are sentient beings, which means that animals can experience feelings of pain, hunger, pleasure and fear (Browning & Birch, 2022; Chapouthier, 2020). This assumption justifies the need for the ethical use of animals in scientific studies. Consequently, there is a need for moral considerations in using animals for research, which has led to the establishment of laws, guidelines and policies by various countries and research-producing organisations (Stonebridge et al., 2022).

- Departing from the animal rights philosophy articulated by Regan (1986), which asserts that animals possess certain inalienable rights to exist free from exploitation and harm, within the African context, animals are not seen to have rights equal to those of humans. However, they have rights as members of the community that deserve moral considerations (Samuel, 2023).

- From the findings of this study, animal research ethics governance is a broad concept that describes how the use of animals for research is regulated through the enactment of laws, establishment of oversight bodies, and promulgation of policies and guidelines from the international (macro) through national (meso) to institutional (micro) levels to ensure the ethical use of animals in scientific studies (Section 5.4.1).

- Findings from the empirical phase of the study showed that existing institutional governance policies and guidelines in Ghana are adapted or adopted from international ethical standards and guidelines, particularly those established by research funding bodies and scientific journal publishers (Section 5.4.2).

- Researchers voluntarily comply with existing guidelines only when required to do so for international grants or scientific publications in peer-reviewed journals

(Section 5.4.3); thus, compliance should be enforced by establishing governance systems to compel researchers to comply.

- ARECs at research-producing organisations are identified as resembling the main ethics governance system for scientific studies using animals in Ghana (Section 6.2.1).

- Governance practices that promote the ethical use of animals in scientific studies are primarily encapsulated in the ethical approval procedures of the AREC. These procedures encompass three key phases: pre-application practices, application review practices, and post-approval practices (Section 7.2.1).

- Education, training, and awareness creation initiatives aimed at researchers, research managers and administrators, staff involved with scientific studies using animals, and students of research-producing organisations are essential governance practices for promoting the ethical use of animals in scientific studies (Section 7.2.1.2).

- In agreement with the virtue ethics philosophical theory, animal research ethics governance requires a context-sensitive examination of the interactions between humans and animals, particularly in assessing the morality of scientific studies using animals.

9.5 Components of the Conceptual Animal Research Ethics Governance Framework

In presenting the conceptual framework, the researcher first provides a description of each of the components employed in developing the conceptual framework. Following this, the researcher provides a graphic presentation of the conceptual animal research ethics governance framework and a description of the steps necessary to achieve the purpose of the framework.

9.5.1 Description of the components of the conceptual animal research ethics governance framework

Key concepts that were employed in developing the conceptual animal research ethics governance framework were derived from the themes that emerged from analysing the qualitative data in the empirical phase of the study. From the findings presented in Chapter Five, the concept of 'animal research ethics governance' was defined as a broad term used to describe **the establishment of systems and practices including the enactment of laws and legislation, the establishment of oversight bodies and promulgation of policies, guidelines and standard operating procedures from national to institutional levels to regulate the use of animals in scientific studies, thereby ensuring that animals are used humanely in scientific studies**. Animal research ethics governance thus involves the establishment of structures, systems and practices that regulate the activities of all stakeholders involved in research using animals to ensure their ethical use.

Using Dickoff et al.'s practice-oriented theory, this understanding of the concept of 'animal research ethics governance' was used to guide the development of the conceptual animal research ethics governance framework. In developing the conceptual animal research ethics governance framework, Dickoff et al.'s (1968) original ordering of the components, which is agents, recipients, context, terminus, process and dynamics, as described in Chapter Four, Section 4.16, was changed to provide a more logical flow in the components for developing an animal research ethics governance framework. The revised sequence of the components of the framework and related questions aligned to the sequence proposed by Uys (2021) is offered below:

1. Context – "*In what context is the activity performed?"*
2. Agents – "*Who or what conducts the activity?"*
3. Recipients – "*Who or what is the beneficiary or recipient of the activity?"*
4. Dynamics – "*What is the source of energy for the activity?"*
5. Process – "*What is the activity's guiding process, technique, or protocol?"*
6. Terminus – "*What is the activity's final goal?"*

With the revised sequence as shown above, the context within which animal research ethics governance takes place is described first to set the stage for other activities. Additionally, considering that the framework is based on the assumption that animal research ethics governance is context-sensitive, the context within which animal research ethics governance will be implemented was described first. Second, the agents responsible for implementing and ensuring the ethical use of animals in scientific studies are described, followed by a description of the recipients of the governance framework. This structure is suitable because the recipients benefit directly from the actions of the agents. The dynamics or source of energy for the activity agents perform is then described, followed by a description of the guiding process, followed by the agents to ensure the ethical use of animals in scientific studies. Finally, the endpoint or terminus of developing the animal research ethics governance framework is described. The terminus, which is the final goal of the animal research ethics governance framework, is placed last to show it as the final point or desirable target to be achieved after going through all the processes within the governance framework.

The revised sequence enabled the researcher to better explain the flow of activities within the context of animal research ethics governance, and also enabled a more logical presentation of the developed conceptual governance framework to enhance its comprehension. This revised sequence was necessary to ensure that everyone who reads or sees the conceptual framework will first understand the framework within the context in which it was developed. This will enhance the comprehension and adoption of the governance framework. Explanations and answers to each of the aforementioned questions are provided in Table 9.1.

Table 9.1: Explanation of components identified for developing the conceptual animal research ethics governance framework

Component	Question	Identified source for the activity
Context	In what context is the activity performed?	• ***Macro-context:*** Global/international regulatory and legal environment, which includes international laws, policies, guidelines and principles for the ethical use of animals in scientific studies • ***Meso-context:*** National regulatory and legal environment, which includes national laws, guidelines and regulatory bodies for ensuring the ethical use of animals in scientific studies • ***Micro-context:*** Institutional policies, guidelines, SOPs and governance structures, such as RECs established to ensure the ethical use of animals in scientific studies
Agents	Who or what conducts the activity?	• Heads of research-producing organisations • AREC members • Research managers
Recipients	Who or what is the beneficiary or recipient of the activity?	• Research-producing organisations • Animals

Dynamics	What is the source of energy for the activity?	• Virtue ethics theory – 6R Principles
		  ○ Animal welfare 3Rs
		  ○ Animal rights 3Rs (African context)

Process	What is the activity's guiding process, technique, or protocol?	• Animal research ethics governance systems: institutional policies, guidelines and ARECs • Animal research ethics governance practices: SOPs, capacity-building and awareness creation
Terminus	What is the activity's final goal?	• Ethical use of animals in scientific studies in Ghana

Source: Author's construct, 2025

The visual representation of the animal research ethics governance conceptual framework for the ethical use of animals in scientific studies in Ghana is presented in Figure 9.1 and discussed in the next sections.

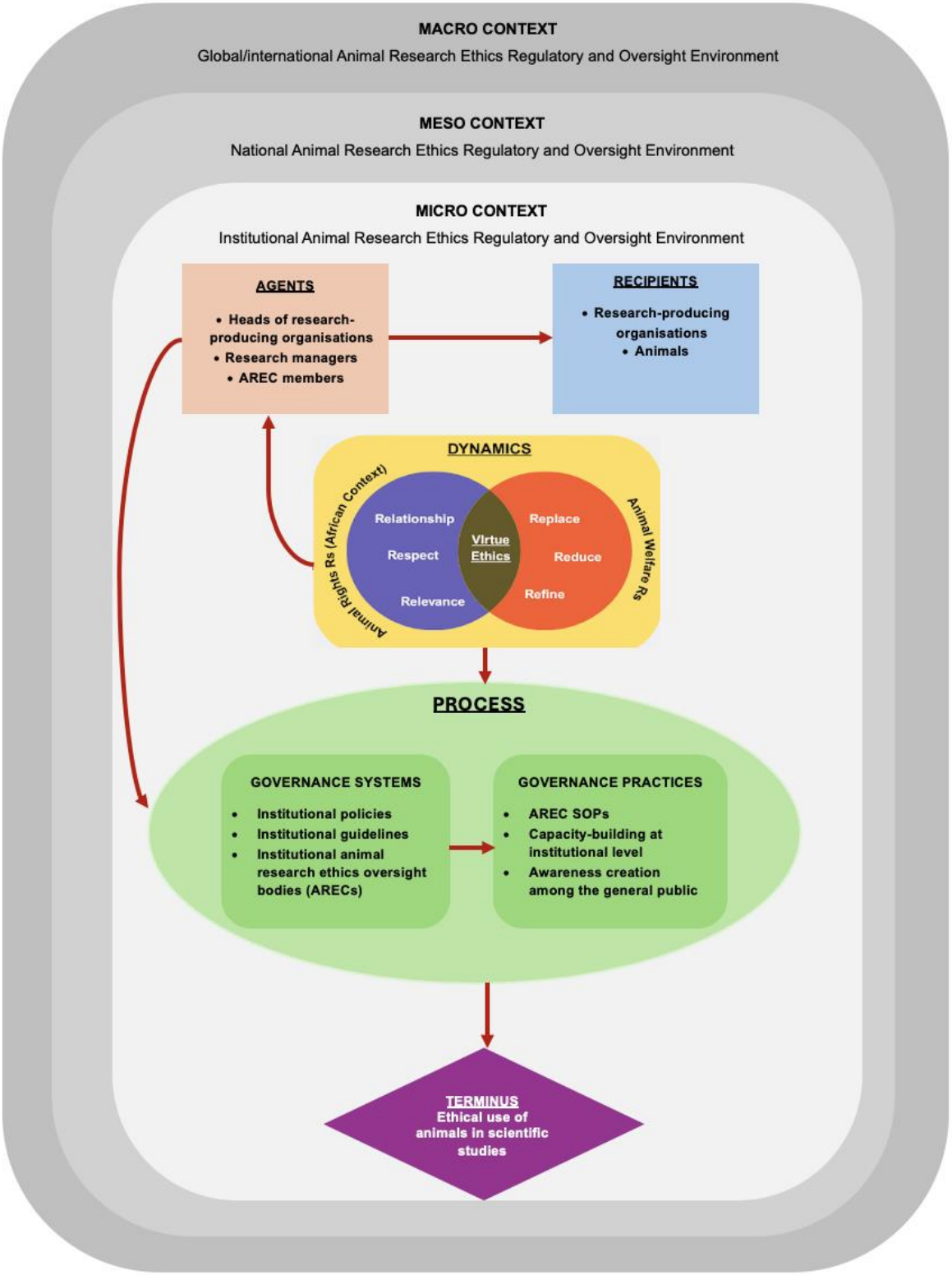


Figure 9.1: Animal research ethics governance framework for the ethical use of animals in scientific Studies in Research-producing organisations in Ghana

Source: Author's construct, 2025

9.5.2 Explanation of the significance of the colours employed in developing the conceptual animal research ethics governance framework

The selection of colours used to develop the conceptual animal research ethics governance framework has no direct bearing on the promotion of the ethical use of animals in research. Like many other frameworks, including the 12Rs framework developed by Brink and Lewis (2023), the choice of colours in developing this framework ensures visual differentiation, cognitive processing and aesthetic appeal. The use of different colours for various components of the framework helps readers distinguish between the dynamics of the various components of the framework, such as the context, agents, recipients, process, dynamics and terminus. Each of these components was given a different colour to aid readers in easily identifying and understanding the distinct areas of focus within the framework and how they relate to each other. Also, the different colours used for each component enhance cognitive processing by making the information more accessible, easier to remember, and visually identify key aspects within each component. Furthermore, using different colours for the components of the framework gives it an aesthetic appeal, makes the framework more visually appealing, and encourages interest from all stakeholders to engage with the framework. This will help promote the adoption and implementation of the framework.

9.5.3 Description of the components of the animal research ethics governance framework for the ethical use of animals in scientific studies in Ghana

This section provides a detailed description of the components of the animal research ethics governance framework developed for promoting the ethical use of animals in scientific studies in Ghana.

9.5.3.1 Context

The setting or the environment in which the ethical use of animals in scientific studies in research-producing organisations in Ghana will take place describes the context of the conceptual animal research ethics governance framework. As shown in Figure 9.2,

the context was organised into three interrelated settings: macro-context, meso-context and micro-context.

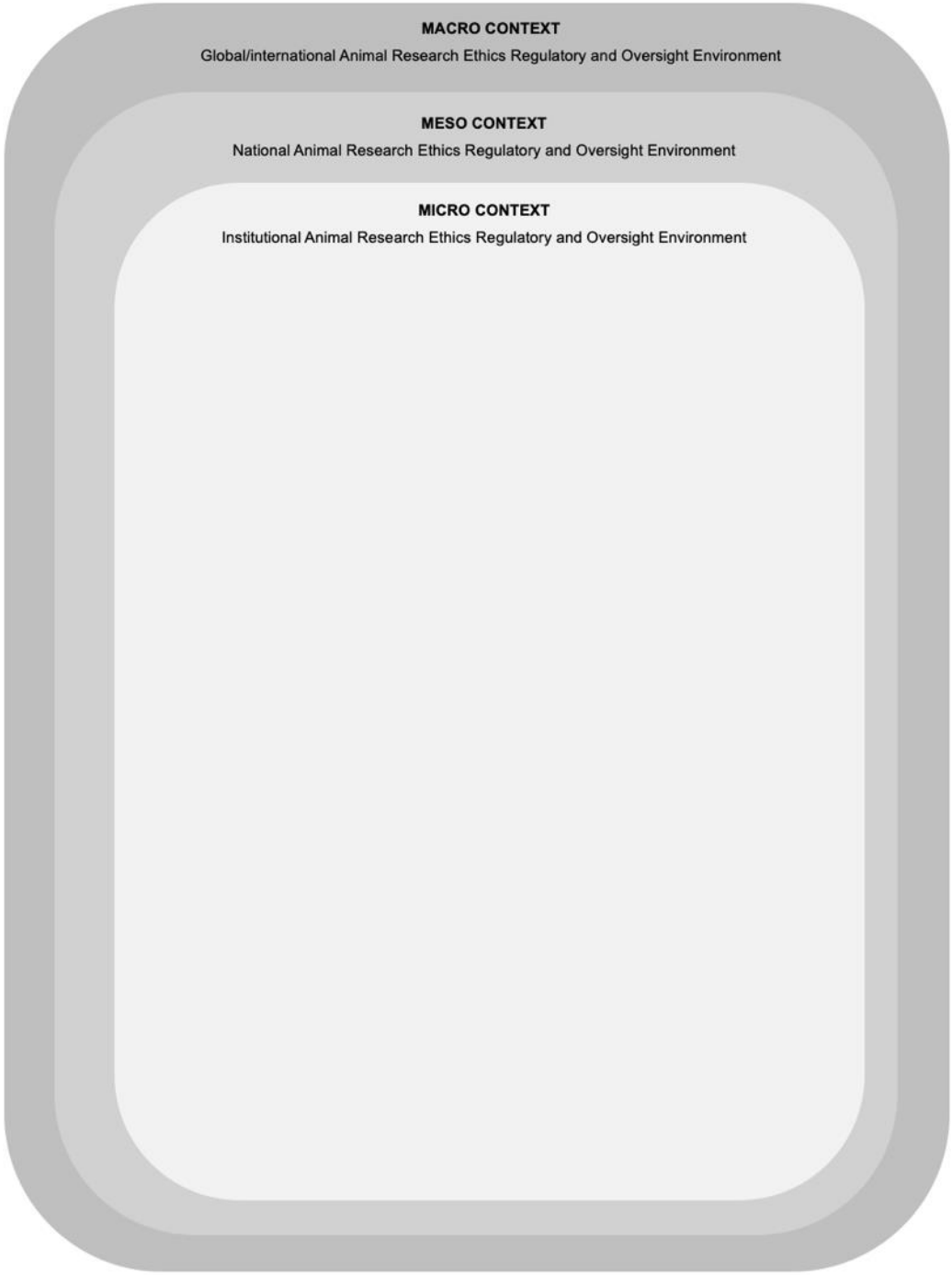


Figure 9.2: Interrelated settings for promoting ethical use of animals in scientific studies in Ghana

Source: Author's construct, 2025

The macro-context is represented by the outer dark grey frame, the meso-context is represented in the middle lighter grey frame, and the very light grey area in the middle represents the micro-context within which the ethical use of animals in scientific studies in research-producing organisations in Ghana takes place. These frames show that the macro, meso and micro contexts are interconnected. The ethical use of animals in scientific studies in a specific research-producing organisation in Ghana is influenced by both the meso and macro contexts. Each of the three interconnected settings (context) is presented and discussed below.

a) Macro-context

The macro-context refers to the global or international regulatory environment, which facilitates the ethical use of animals in scientific studies in all countries, including Ghana. These include laws, guidelines, policies and principles established by international organisations and have been accepted globally to govern the ethical use of animals in scientific studies. As discussed extensively in Chapter Three of this thesis, international laws, guidelines and principles, such as the Basel Declaration (Section 3.3.1.1), the CIOMS-ICLAS International Guiding Principles for Biomedical Research Involving Animals (Section 3.3.1.2), the WOAH Terrestrial Animal Care Code (Section 3.3.1.3), and the PREPARE and ARRIVE guidelines (Section 3.3.1.4) are applied internationally across most countries, including Ghana. Other existing international guidelines include the Guide for the Care and Use of Agricultural Animals in Research and Teaching (2010), the World Organisation for Animal Health (OIE) animal welfare standards, the Organisation for Economic Co-operation and Development (OECD), principles for Good Laboratory Practice (GLP), and the International Organization for Standardization animal welfare requirements (ISO 10993–2), which are currently in place and providing guidance for using animals in scientific studies globally and in Ghana.

Organisations like the American Association for Laboratory Animal Science (AALAS) and the Association for Assessment and Accreditation of Laboratory Animal Care International (AAALAC International) also play an essential role in establishing and

promoting the highest standards for animal care globally through voluntary assessment and certification initiatives. Additionally, researchers are required by international research funding agencies to adhere to ethical principles and submit their research protocols to ARECs for ethical review and approval before conducting their studies. By doing so, these international funding agencies ensure that researchers who access funding from them adhere to international ethical protocols and guidelines for the use of animals in scientific studies. Also, as part of the guidelines of scientific journal publishing companies, researchers are required to submit their protocols for ethical review and approval and provide evidence of the same (Delos Reyes, 2023; Kaladharan et al., 2021). Researchers are also required to adhere to the ARRIVE and PREPARE guidelines (Section 3.3.1.4).

The findings from this study confirm that the ethical use of animals in scientific studies in Ghana is influenced by international laws and guidelines (Section 5.4.3). Researchers in Ghana are compelled to submit protocols for ethical review because of their desire to either publish in an international peer-reviewed scientific journal or receive funding from an international organisation (Section 5.4.3), which is regulated by internationally accepted principles, regulations and guidelines. Funding institutions and scientific journals enforce these international guidelines and principles by ensuring that researchers adhere to them (Sawicka-Gutaj et al., 2022; Seneviratne, 2023; Westmore et al., 2023). Also, due to the lack of a national guideline, various institutions have identified different combinations of these international principles and guidelines and adapted them to govern scientific studies using animals in their respective institutions. Consequently, ARECs derive their ethical guidelines and policies from international guidelines, which researchers adhere to in order to satisfy requirements for publishing scientific papers in peer-reviewed scientific journals. Thus, the ethical use of animals in scientific studies in research-producing organisations in Ghana is influenced by the international governance or regulatory environment.

b) Meso-context

The meso-context refers to the Ghanaian national regulatory and oversight environment for the ethical use of animals in scientific studies. This encompasses

laws, guidelines and oversight bodies established at the national level to ensure that animals are used ethically in scientific studies in research-producing organisations in Ghana. Ghana currently has two legal documents related to the use of animals. These are the Criminal Code of 1960 (ACT 29), which addresses offences relating to animals in general, and the Wild Animals Preservation Act, 1961 (ACT 43), which makes provision for the handling of wild animals with a focus on hunting, and animal export and import (Section 3.3.2.6). Neither laws explicitly mention nor make any provision for the use of animals in research.

The review of available literature, as presented in Chapter Four of this thesis, revealed that the legal regime in Ghana is inadequate either because legislation has been slow or the laws are old and obsolete (Hau et al., 2014, 2018). This assertion was confirmed by participants in the empirical phase of the study; they emphasised that Ghana lacks the requisite legislation or legal regime to regulate the use of animals in scientific studies. For that reason, existing ARECs depend entirely on international guidelines and principles to govern scientific studies using animals in their institutions (Section 6.2.1.2). The empirical phase of this study also revealed that research using animals in Ghana is conducted in the context of a lack of national guidelines and oversight authority or body responsible for ensuring that animals used for scientific studies in Ghana are used ethically (Section 5.4.2.1).

The findings of this study also showed that Ghana currently lacks a national oversight body responsible for ensuring research integrity (including ethical use of animals in scientific studies) within research-producing organisations (Section 5.4.2). Participants strongly recommended the establishment of such a national oversight body that will be responsible for formulating policies and guidelines for the ethical use of animals in scientific studies (Section 8.2.1). Currently, there is no clarity on a specific governmental ministry or agency at the national level with the overall oversight responsibility for animal research in Ghana. This phenomenon emphasises the need for a national regulation that will provide clear guidelines and oversight to a specific government ministry or agency that will focus on the ethical use of animals in scientific studies in research-producing organisations in Ghana.

The Ministry of Education (MoE) and the Ministry of Environment, Science and Technology (MEST) currently have oversight responsibilities for the conduct of research in higher education and research institutions in Ghana, respectively (Abdulai et al., 2019; Yawson, 2009). Working through the Ghana Tertiary Education Commission (GTEC), an agency of the MoE, the Ministry ensures the formulation and coordination of policies and guidelines for the accreditation and provision for quality assurance of tertiary institutions in Ghana. The quality assurance function of the GTEC includes ensuring the right systems are in place in all tertiary institutions for the conduct of research. Additionally, the Council for Scientific and Industrial Research, an agency of the MEST in Ghana, also has the mandate to pursue the implementation of government policies within scientific research and development and to coordinate all aspects of scientific research in the country.

Despite their mandates, these institutions are only required to cooperate and liaise with universities and the private sector on matters of research. This makes it difficult for the MEST to provide oversight through the CSIR of research conducted across the country. Adding to this complexity, despite the two ministries' mandate, the Ministry of Health, through the Ghana Health Service, is generally acknowledged by researchers as having de facto responsibility for coordinating and leading the establishment of national research priorities (Laar et al., 2020). However, the mandate of the service is limited only to protecting human subjects used in research within the health facilities in the country. The Ghana Food and Drugs Authority (GFDA), another agency of the Ministry of Health, also has the mandate to regulate food, drugs (herbal/allopathic/veterinary), and other products, as well as the conduct of clinical trials in Ghana (Parliament of Ghana, 2012). The GFDA's mandate is limited to regulating food and drugs for animals and does not extend to regulating animal studies or pre-clinical trials using animals.

From the foregoing, it is evident that Ghana is a unique context where there is no law and no single oversight body for ensuring research integrity, including the ethical use of animals in scientific studies, although there are several institutions or agencies that are involved in research. The framework in Figure 9.2 acknowledges this context within which research using animals is conducted and recommends a more regulated

research environment with national laws, guidelines and a national oversight body with authority to ensure the ethical use of animals in scientific studies by providing oversight, coordination and monitoring for ARECs in the country. The body upholding a regulated research environment would also have the authority to adjudicate on matters that may arise at research-producing organisations regarding research misconduct or the unethical use of animals in scientific studies. Such a measure would ensure a more regulated environment where animals are used humanely for scientific purposes in Ghana.

A vital focus of the framework relates to the indigenous traditional and cultural context of Ghana, which also plays an important role in how animals are handled and used for scientific studies in the country. There is a high likelihood that the cultural beliefs and practices in Ghana influence the manner in which animals are perceived and handled in scientific studies in the country, similar to the effect cultural beliefs and practices have on the handling and use of animals in general in Ghana (Awuah-Nyamekye, 2012; Morgan, 2020). Indigenous beliefs and traditional rituals, such as the concept of *"sasa"* in the Akan culture, contribute to the conservation of some endangered species in Ghana due to the taboo system that prevents such animals from being killed (Section 2.3.5.2). Traditional Ghanaian communities, such as the Akan ethnic group, have strong beliefs in the spiritual significance of certain animals, which are believed to harbour spirits that cause harm if they are harmed (Agyekum, 2023; Arhine et al., 2024; Awuah-Nyamekye, 2012). These beliefs contribute to the conservation of some species in Ghana. Furthermore, in localities where traditional beliefs and practices are upheld, various animal species are protected. However, despite these traditional beliefs and practices on the use of certain species of animals, hunting, as an occupation and for traditional festivals such as *Aboakyere,* continues in Ghana. Generally, the Ghanaian society believes in the virtue ethics philosophy of animals, where the welfare of animals, as well as their rights as members of the community (similar to the ubuntu concept in South Africa), are paramount in considerations for their use (Morgan, 2020; Samuel, 2023).

In summary, scientific studies using animals in Ghana are conducted in a context without a national legal regime. This illuminates the influence of international

guidelines and regulations (macro context) on the governance of the ethical use of animals in scientific studies in Ghana. Most research-producing organisations currently rely on or adapt existing international regulations and guidelines to guide the oversight or governance of such studies in their respective institutions (Kalkan & Kekeçoğlu, 2024). Within this context, there is no national law that backs institutional governance systems established to ensure the ethical use of animals in scientific studies. Consequently, the system relies on the 'virtues' of individual researchers to adhere to ethical principles in using animals for research (Section 5.4), which is problematic because researchers have different virtues based on their individual beliefs. This can result in the unethical use of animals by some researchers who do not see any problem in treating animals inhumanely in the absence of a law to guide them on how to use animals in scientific studies. As a country, Ghana needs an updated legal regime that provides specific laws and guidelines on the use of animals in scientific studies and for the establishment of national governance systems and practices that will promote animals' ethical use in research.

c) Micro-context

The micro-context refers to the oversight environment at the institutional level for the ethical use of animals in scientific studies. These include policies, guidelines and procedures developed to ensure the ethical use of animals in research-producing organisations. All researchers who use animals in scientific studies in Ghana are employed by research-producing organisations. These researchers are thus guided by their respective organisational policies and guidelines on these animals' ethical use.

The current study's findings showed a context of inadequate institutional policies and guidelines, as well as non-adherence to institutional guidelines by researchers (Section 5.4.3) at institutions where research ethics guidelines exist. Research-producing organisations in Ghana can currently be described as having weak governance systems and practices, with institutions unable to enforce policies and guidelines that will ensure the ethical use of research animals. As a result, several studies are conducted at these institutions without any ethical review or approval of protocols. To ensure the ethical use of animals in research-producing organisations in

Ghana, robust institutional policies and research ethics guidelines, empowered by the existence of national laws, are required. Participants shared that all institutions where animals are used for research purposes must put animal research ethics policies, guidelines and SOPs in place and establish ARECs for the review of protocols prior to the conduct of research. These must be backed by a national law or guideline to compel all researchers to comply with the institution's established policies and guidelines (Section 8.2.1).

The current micro-context within research-producing organisations in Ghana makes it easy for researchers to use animals in unethical ways, thereby causing undue pain, suffering and death to these animals. Additionally, both research-producing organisations and researchers who use animals in research are affected because they lose research funding and publications in high-impact journals, since the integrity of the research conducted in such organisations cannot be ascertained by international research funding organisations and journal publishers.

9.5.3.2 Agents

In the conceptual framework (Figure 9.1), the agents refer to individuals with authority in research-producing organisations to act and ensure the ethical use of animals in scientific studies in their institutions. The agents in this context are individuals who possess autonomy and the ability to act within their respective research-producing organisations to ensure the ethical use of animals in scientific studies. They include individuals responsible for ensuring that the right governance systems and practices are put in place for the ethical use of animals in scientific studies in research-producing organisations in Ghana. These include heads of research-producing organisations (vice chancellors, rectors or directors of these organisations), research managers and AREC members. Agents are represented in the conceptual framework by a light orange coloured square that is connected to other parts of the framework with red arrows (see Figure 9.3).

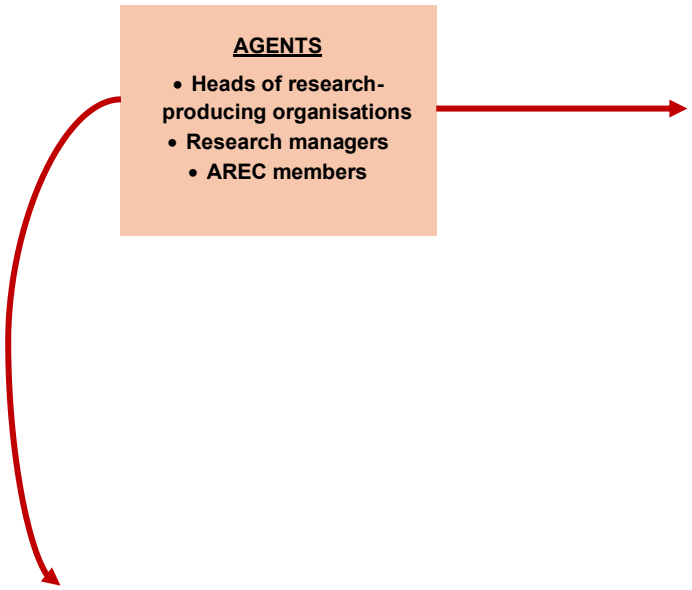


Figure 9.3: Agents for promoting the ethical use of animals in scientific studies in Ghana

Source: Author's construct, 2025

The red arrows show the pathways for action. The recipients (research-producing organisations) are illustrated by the red arrow that points from the light orange square on the right, indicating the beneficiaries of the activities performed by the agents. The red arrow pointing from the light orange square on the left suggests that the actions taken by the agents may influence the procedures (governance systems and practices) within research-producing organisations. The agents identified in this framework are described as follows:

a) Heads of research-producing organisations

Heads of research-producing organisations are responsible for ensuring that the right systems are in place within their institution so that animals are used ethically in scientific studies. Activities of the heads of research-producing organisations include the establishment of institutional ethics frameworks and policies, the provision of institutional support for research integrity initiatives, the establishment of institutional oversight bodies and teams, as well as the provision of resources required for animal research ethics governance in their institutions (Berghaeuser et al., 2024). Zhaksylyk et al. (2023) highlight that heads of research-producing organisations offer direction,

education and support to researchers, thereby enhancing compliance with ethical standards and promoting a culture of research integrity within their organisations. This leadership on the ethical use of animals in their institutions will significantly enhance the quality and credibility of research produced at these institutions.

The findings of the study also showed that the ethical use of animals in scientific studies can be promoted through the establishment of the right systems and practices at the institutional level. The heads of research-producing organisations therefore have the responsibility of establishing the required institutional systems (including the establishment of ARECs in institutions without these committees). However, there is a lack of comprehensive ethical research training among researchers, including heads of research-producing organisations in Ghana, particularly considering the country's complex context within which scientific studies using animals are conducted (Appiah, 2020). This study suggests enhanced animal research ethics training for all heads of research-producing organisations in Ghana to bridge the gap between knowledge and practice (Coleman, 2023). They need to attain the required knowledge to ensure adequate governance systems and practices are established in their respective organisations.

b) Research managers

Research managers are professionals who oversee and facilitate the management of research activities within research-producing organisations, including universities, hospitals and research institutes. Research management is an evolving profession (Poli et al., 2023; Romano et al., 2023) characterised by a diverse skill set that encompasses project management, compliance and regulations. Research managers provide oversight over various aspects of research, including grant applications, grant management, research ethics administration, intellectual property administration, research and grant capacity-building, and institutional research performance measurement.

Research managers play a crucial role in research ethics in general and in the ethical use of animals in research-producing organisations. Research managers ensure

compliance with ethical guidelines, facilitate communication between researchers, ARECs, animal care staff and funders to help uphold research norms and reduce the risk of unethical research conduct (Resnik et al., 2023). Research managers in ARECs oversee compliance with AREC guidelines, facilitate ethical clearance processes, and promote awareness among researchers (Smith, 2023). They also ensure a balance between the needs of researchers and that of animals, while navigating institutional transparency and ethical considerations on the use of animals for research (Brunt & Weary, 2021). Consequently, research managers are identified as one of the key actors (agents) necessary for ensuring that animals are used ethically in scientific studies.

Notwithstanding the important role played by research managers, their capacity is not known in Ghana. No empirical study has provided insights into the capacity and effectiveness of REC administrators, including administrators of ARECs (Owusu et al., 2022). Additionally, because most research ethics capacity-building efforts have been focused on AREC members (Mulondo et al., 2022), AREC administrators lack the needed competence to carry out the tasks and responsibilities necessary to ensure the ethical use of animals in scientific studies. To address this capacity gap, the Southern African Research and Innovation Management Association developed a professional competency framework (PCF) aimed at identifying a set of key competency areas for research managers and administrators (Southern African Research and Innovation Management Association, 2024). The PCF identifies three levels of research managers, namely research administrators, research managers and research leaders. The PCF also identify nine competency areas for research management, of which the sixth competency area focuses on research ethics and integrity. The research ethics and integrity competency area is dedicated to promoting and supporting research ethics and integrity, compliance and responsible research conduct (Southern African Research and Innovation Management Association, 2024). To ensure that research managers have the capacity to provide the services required for the ethical use of animals in scientific studies, the PCF outlines which competencies and skills research managers must possess at each level as research administration professionals, research management professionals, or research leader professionals.

This study suggests that research managers who provide services that promote the ethical use of animals in scientific studies must acquire the relevant competencies and skills, at the most basic level, in the area of animal research ethics and integrity. This strategic objective might involve strategically aligned training with the PCF. In addition, research-producing organisations should promote the professionalisation of research managers and administrators either as research administration professionals, research management professionals or senior research management professionals, according to the International Professional Recognition Council (Dyason & Pillay, 2023; Kerridge et al., 2024; Williamson et al., 2024). Obtaining these competencies and professional recognition will ensure that research managers in Ghana who work on animal research ethics have the requisite knowledge, skills and professional recognition to carry out their roles.

c) AREC members

AREC members were also identified in this study as important actors (agents) in ensuring that scientific studies using animals are conducted in an ethical manner in research-producing organisations in Ghana. AREC members review research protocols submitted by researchers and provide guidance to these researchers to ensure the ethical use of animals in their studies (Schuppli, 2011). Additionally, AREC members ensure that high ethical standards of animal welfare are maintained in research-producing organisations by conducting monitoring and oversight visits to study sites (Mohr et al., 2024). Together with research managers, AREC members conduct training and sensitisation activities on the ethical use of animals in scientific studies among researchers, research-producing organisations, and the public. These activities by AREC members and AREC administrators, as described by study participants (Section 7.2.2.1), contribute immensely to ensuring the ethical use of animals in research-producing organisations in Ghana.

Although AREC members provide these services, this study also revealed that there were inefficiencies in the conduct of their roles as AREC members, and the AREC members are unable to monitor approved studies to ensure that researchers adhere to the ethical principles (Section 7.2.2.2). It is suggested that AREC members must

undergo regular training to make them more efficient in the conduct of their roles, and they should be adequately resourced to conduct monitoring visits to project sites to ensure that researchers are adhering to all ethical standards in the conduct of their studies. Considering the important role played by AREC members, they are a crucial element in ensuring the ethical use of animals in scientific studies in research-producing organisations in Ghana, and so have been listed as one of the agents in this framework.

9.5.3.3 Recipients

The primary recipients identified in the conceptual animal research ethics governance framework (Figure 9.1) are research-producing organisations in Ghana where animals are used in scientific studies, and the animals being used in these studies. In the conceptual framework (Figure 9.1), the proposed recipients are visually portrayed with a blue square, as demonstrated in Figure 9.4.



Figure 9.4: Recipients: Research-producing organisations and animals
Source: Author's construct, 2025

With the establishment of appropriate governance systems and practices for the ethical use of animals in scientific studies, research-producing organisations and animals will be the ultimate beneficiaries. Research conducted in these institutions will be seen to be credible, resulting in increased research funding and peer-reviewed publications for researchers in the organisation (Palm & Lindblom, 2024). Animals will also benefit because they will be treated more humanely when used in scientific studies (Brink & Lewis, 2023). With good governance systems and practices in place, researchers will most likely have their protocols reviewed faster, and their studies will be conducted within a strict regulatory framework, making the outcome of their studies

more reliable. Consequently, the scientific community and funders will have more trust in the scientific quality and integrity of research conducted in these organisations, thereby increasing funding opportunities for research and scientific publications by the researchers (Chaudhry et al., 2022).

These organisations may ultimately see an improvement in their international rankings since good animal research ethics governance at the institutions will ensure accountability, transparency, and improved ethical standards, which will help attract other international researchers and collaborations. Also, a good animal research ethics governance system and practices will ensure the welfare and humane treatment of animals throughout the research process (Brink & Lewis, 2023). With established governance systems and practices, harm to animals will be minimised through an independent and thorough review and harm-benefit analyses of proposals aimed at using animals for research purposes (Martin, 2022). There will also be enhanced animal welfare standards through the establishment of national laws and guidelines on the use of animals for research and improved oversight through the establishment of oversight bodies that will prioritise animal care and the welfare of animals used in scientific studies (Codecasa et al., 2021; Nagarajan et al., 2021).

From the findings of this study, governance in scientific studies using animals is aimed at enacting laws and establishing oversight bodies at the meso and micro levels to ensure that animals are treated humanely by researchers. Also, Chapters Five and Six of this thesis, which presented findings on existing governance systems and practices for the ethical use of animals in scientific studies, suggested that having well-structured and efficient governance systems and practices in place could positively impact the research organisation.

9.5.3.4 Dynamics

Dynamics in this context refers to the source of energy, driving force or motivation to promote the ethical use of animals in scientific studies. In the conceptual framework (Figure 9.1), the theory of virtue ethics (Section 2.3.4) was used to explain the energy source to promote the ethical use of animals in scientific studies in research-producing

organisations in Ghana. A 6Rs framework is introduced. It is a structured approach to the ethical use of animals in scientific studies, encompassing the globally accepted 3R principles (Section 2.4.1) representing animal welfare (replacement, reduction and refinement) as proposed by Russel and Burch (1959). It also includes the indigenous African animal rights 3Rs (relationship, respect and righteousness), offering a contextual view of how animals are to be treated within the African context, where the conceptual framework will primarily be implemented. By presenting extra Rs in addition to the globally accepted animal welfare principles proposed by Russel and Burch (1959), the 6Rs serve as a comprehensive guide to ensure the ethical use of animals in scientific studies. It reflects the myriad factors to consider in scientific studies, specifically when using animals in Ghana.

The 6R principles are built on the assumption that various moral theories and principles can be integrated to allow for a more flexible approach to ethical considerations in animal research, accommodating different ethical viewpoints and cultural contexts as depicted in the virtue ethics philosophy. The 6R principles also operate with the assumption that animal welfare and animal rights within the context of indigenous African philosophy are interdependent. This means that for animals to be treated humanely in research, their welfare and rights within the indigenous African context must be considered together. Within the indigenous African context, animal rights and animal welfare are necessary to ensure the humane use of animals in scientific studies. Both animal rights and animal welfare have equal importance. Figure 9.5 shows the suggested conceptualisation of virtue ethics and the 6Rs framework as the energy source for the ethical use of animals in scientific studies in research-producing organisations in Ghana.

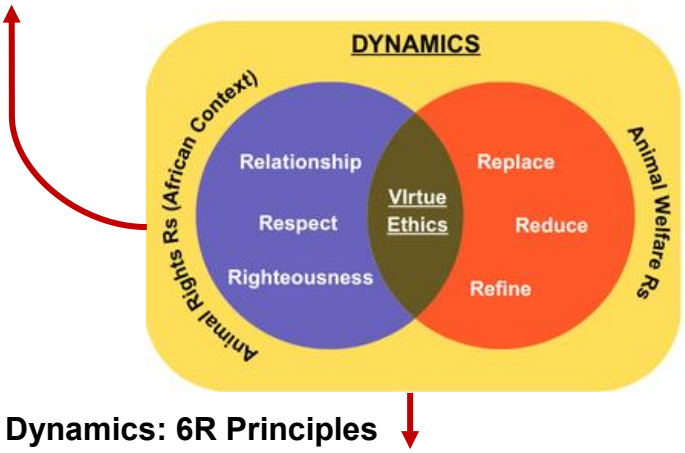


Figure 9.5: Dynamics: 6R Principles

Source: Author's construct, 2025

a) Description of the 6R principles diagram

The fundamental principle underlying the 6Rs framework is the promotion of ethical animal research in research-producing organisations in Ghana. Figure 9.5 shows two intersecting circles, representing animal rights Rs within the African context (relationship, respect and righteousness) depicted in a purple circle, and animal welfare Rs (replacement, reduction and refinement) depicted in an orange circle, respectively. It is proposed that the intersection of the two circles shows the interconnectedness of animal welfare and animal rights, which results in the implementation of virtue ethics principles or philosophy. This concept is a modification of the 12Rs framework proposed by Brink and Lewis (2023). The 6Rs are replace, reduce, refine, relationship, respect and righteousness. These Rs are described in more detail in the following sections.

- ***Animal Rights Rs (African Context)***

This domain focuses on the rights of animals as members of the community within the African context. Unlike Western individualistic frameworks, African philosophy is characterised by its communal approach and the moral significance of community, which includes animals and the environment (Wiredu, 1996; Ugwu et al., 2025; Gyekye, 1997). The animal rights Rs are depicted in the purple circle in Figure 9.5:

- **Relationship:** This principle focuses on the relationship between animals and humans in the traditional African setting, where animals are not seen as 'objects' available for human use but are seen as members of the community. Humans, according to the African and Ghanaian context, have a relationship with animals living in a community and are interdependent on each other. This espouses the ubuntu principle, which emphasises that "I am because we are". As described in Section 2.3.5.1, African ethics primarily emphasise the harmonious relationship between humans, animals and the environment (Horsthemke, 2017). The relationship between humans and animals is at the core of the ethical and ecological view inherent in the ubuntu concept (Samuel, 2023).

- **Respect:** Respect refers to considerations for the well-being of animals by everyone who uses animals in scientific studies. This includes the rights and confidentiality of animal owners and communities, as well as respect for animals as members of the community. Including 'respect' in the 6Rs addresses the concerns of authors, including Walker (2020), who recommended its addition to the 3R principles by arguing for respect for animals' rights and dignity. Additionally, within the context of Ghana, animals are held in high regard and integrated into the cultural, spiritual and social life (Agyekum, 2023). Animals have both spiritual and moral significance within the Ghanaian context (Adu-Gyamfi, 2011; Agyekum, 2023; Francis, 2009). Some animal species are therefore protected from harm and indiscriminate killing within the Ghanaian context (Awuah-Nyamekye, 2012). Consequently, there is a high level of respect given to these animals within the indigenous Ghanaian context, and this respect can promote the ethical use of animals in scientific studies in the country.

- **Righteousness:** Righteousness represents the researcher's ability to be fair, good, noble, worthy and earnest (Brink & Lewis, 2023). Righteousness considers a researcher's values that ensure fairness towards animals and marries that with globally diverse cultural, religious, and/or social values related to responsibility, respect and legislative requirements. Righteousness

encompasses cultivating a character that reflects compassion, transparency and dedication to the greater good, which researchers are encouraged to inculcate. Researchers' exhibition of righteousness will ensure public trust and the promotion of ethical values in the conduct of research (Pasricha, 2023).

- ***The Animal Welfare Rs***

This domain includes principles focused on the ethical treatment of animals in research. It underscores the importance of respecting animal welfare and ensuring a reduction in animal suffering during scientific studies. The animal welfare Rs are depicted in the orange circle in Figure 9.5. These represent the 3R principles by Russel and Burch (1959), namely replacement, reduction and refinement. As discussed extensively in Chapter 2 of this thesis, the 3R principles have been accepted globally to be central to the ethical use of animals in scientific studies. Most international and national regulations on the use of animals for research are premised on the 3R principles. Introducing the 3R principles has contributed enormously to the ethical use of animals in scientific studies. The 3Rs are:

- **Replace:** The replace principle encourages researchers to find alternatives to using animals in experiments, either through the use of non-sentient models, humans, human tissue or animal tissue (Hubrecht & Carter, 2019).

- **Reduce:** This principle implies the reduction of the number of animals used for scientific studies by using the minimum number necessary to achieve valid scientific results when replacing the use of animals with other alternatives is not feasible (Hubrecht & Carter, 2019).

- **Refine:** This principle focuses on optimising experimental procedures and animal care to minimise pain, suffering and distress when using animals in scientific studies (Hubrecht & Carter, 2019). This includes proper housing conditions for animals or administering anaesthesia to reduce pain in animals to minimise risk of suffering, without unduly compromising scientific quality.

Next is an explanation of the intersection of the two circles. The intersection represents the virtue ethical philosophy on the use of animals in scientific studies (Walker, 2020b) that offers a compelling framework for addressing animal ethics by emphasising character traits and moral virtues that guide human interactions with animals. Virtue ethics describes the principle backing the 6Rs (replacement, reduction, refinement, relationship, respect and righteousness) that enhances our understanding of the moral obligation towards animals. It encourages the cultivation of virtues that promote harmonious existence between humans and animals (Adamson & Somma, 2024). The animal welfare Rs (replacement, reduction and refinement) described by Camenzind and Eggel (2022), as rooted in a utilitarian ethics framework, and the animal rights Rs (relationship, respect and righteousness), which follow the animal rights philosophy but within the African and Ghanaian context, together provide the virtue ethics philosophy. This philosophy tries to combine both the utilitarian philosophy and the animal rights philosophy and promotes virtues among researchers and everyone who uses animals. In summary, the 6R principles represent a comprehensive set of principles that may guide the ethical use of animals in scientific studies in Ghana (African context), focusing on animal welfare and animal rights in the context of indigenous African philosophies on animals.

9.5.3.5 Process

The process for this animal research ethics governance conceptual framework (Figure 9.1) refers to the guiding techniques or protocols for ensuring the ethical use of animals in scientific studies in research-producing organisations in Ghana. From the findings of the empirical phase of this study, the process to promote the ethical use of animals in scientific studies in research-producing organisations in Ghana should include the establishment of robust animal research ethics **governance systems** and animal research ethics **governance practices** at the institutional level. The visual illustration to suggest how this process for the governance of scientific studies using animals in Ghana will work is presented in Figure 9.6.

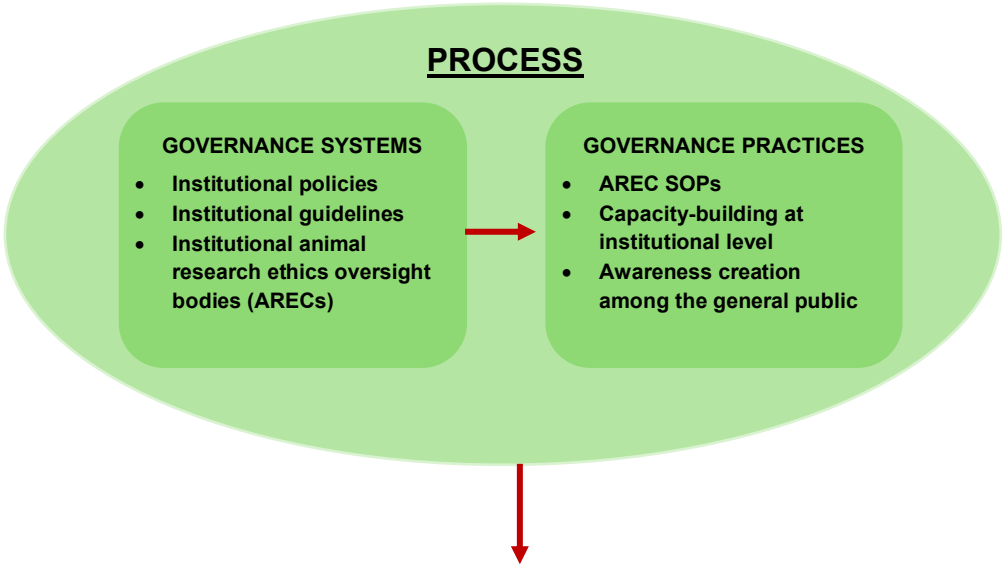


Figure 9.6: Process: Animal research ethics governance systems and practices

Source: Author's construct, 2025

a) Animal research ethics governance systems

As described in Chapter Three (Section 3.3), animal research ethics governance systems encompass the regulatory and oversight frameworks designed to safeguard the rights and welfare of animal subjects involved in research endeavours. It is suggested that animal research ethics governance systems involve the establishment of policies, guidelines and oversight committees to oversee research activities and ensure compliance with ethical principles (Matandika et al., 2023). The findings of the empirical phase of the study revealed that animal research ethics governance systems must be established at the institutional levels to ensure the ethical use of animals in scientific studies (Section 8.2). The following animal research ethics governance systems were suggested by study participants in the empirical phase of the study (Chapter 6) and have been included in this conceptual framework for ensuring animals' ethical use in research-producing organisations in Ghana.

As indicated in Section 9.3.3.1 above and revealed in the findings (Chapter 6), animal research ethics governance systems in research-producing organisations in Ghana operate within a larger context of both international and national laws, policies and guidelines. The proposed institutional animal research ethics governance systems

described below may operate within the broader macro and meso contexts of governance systems.

- **Institutional Animal Research Ethics Policies**

Institutional animal research ethics policies are critical components in ensuring the ethical use of animals in scientific studies and upholding ethical standards in research-producing organisations in Ghana. These organisations are required to develop and implement policies that fit the Ghanaian context as well as specific organisational or institutional contexts. Thus, it is proposed that research-producing organisations must consider the cultural, religious and socioeconomic contexts of their locality and the population they serve when developing these policies. In this respect, it is further suggested that animal research ethics policies must be guided by the proposed 6R principles described in Section 9.3.3.4 above. The proposed 6Rs are fundamental in guiding scientific studies using animals in Ghana. They are also consistent with the proposal by Mohr et al. (2024) that the establishment of institutional policies must be guided by universal principles for the use of animals in scientific studies and the institutional context, which includes the cultural, religious and socioeconomic contexts. It is also proposed that the components of such policies must include the following: provisions for adherence to national and international laws, key principles of animal research ethics, which should be rooted in the 6R principles described above, the structure and function of ARECs, ethics review processes (application and review processes), oversight and monitoring, training and education requirements, quality assurance, roles of other key stakeholders, responsibilities of institutions and institutional officials, non-compliance to ethical principles, and measures to manage non-compliance. These components must reflect the context within which the research-producing organisations operate, including existing cultural, socioeconomic, legal and regulatory frameworks (Mohr et al., 2024).

- **Institutional Animal Research Ethics Guidelines**

Unlike policies that are more formal, high-level declarations or statements by institutions that set clear expectations and requirements (Teshome, 2020; Tomé, 2023), guidelines are general statements, advice, recommendations and administrative instructions designed to achieve policy objectives (Delos Reyes, 2023;

Kaladharan et al., 2021). Institutional animal research ethics guidelines are the regulations established by institutions to oversee the use of animals in the institution and ensure that animals are used ethically and humanely (Khan, 2024). A further suggestion is that institutional animal research ethics guidelines must align with national laws and institutional policies to help in enhancing the quality of research and promote the well-being of animals used for research.

Animal research ethics guidelines at the institutional level should be designed to ensure that animals are used ethically. Institutional animal research ethics guidelines must emphasise universal ethical principles while also considering contextual issues. Within the Ghanaian context, it is important to consider the cultural, religious, political and socioeconomic diversity of the people when developing guidelines for the ethical use of animals in scientific studies (Mohr et al., 2024). Elements of institutional animal research ethics guidelines may include oversight of animal ethics in the institution, responsibilities of institutions and committees, ethics review processes, quality assurance and monitoring of research using animals, ethical reviews of protocols, and ensuring the welfare of animals used in research at the institution.

- **Institutional Animal Research Ethics oversight bodies**

Institutional oversight bodies are essential for promoting research integrity by ensuring that research is conducted ethically and responsibly (Horn, 2017). The findings presented in Chapter Six revealed that key stakeholders suggested the establishment of institutional animal research ethics oversight bodies. Study participants suggested that, as part of the governance systems for the ethical use of animals in scientific studies at the institutional level, all research-producing organisations must establish oversight bodies. In some of the institutions, research offices exist with oversight responsibility over the research ethics governance in the institution (Section 6.2.2), while others have established ARECs. In fact, all key stakeholders indicated the establishment of ARECs as the main oversight body for animal research ethics governance in their respective institutions. For an animal research ethics governance framework, the following oversight bodies are recommended for research-producing organisations.

- Research Integrity Offices or Committees
- Research Offices or Research Management Offices with research ethics oversight
- ARECs

Depending on the size, it is suggested that research-producing organisations should either have all these bodies or at least one (ARSO, 2025). In all cases – every research-producing organisation where animals are used for scientific studies – it is suggested that an AREC should be established to oversee the ethical use of animals in research. The functions of each of these oversight bodies are described briefly below.

- ***Research Integrity Offices or Committees***

Institutional research integrity offices are oversight bodies established either as an office or a committee (depending on the requirements of the institution) focused on maintaining research ethics (Jeruss & Cunningham, 2023). This mainly entails supporting researchers to obtain ethical approval and governance for human, animal, and biological research. Research integrity offices are important oversight bodies at the institutional level for maintaining research integrity and protecting humans and animals used in research from harm. They ensure researchers comply with existing ethical standards and address issues related to the unethical conduct of research in the institution (Ahmed, 2022). Research integrity offices can foster a culture of responsible research conduct by addressing concerns such as compliance versus ethical responsibility, collaboration ethics, authorship, publication ethics, and plagiarism (Horn, 2017). By establishing research integrity offices, the integrity and trustworthiness of research conducted in these institutions will be significantly enhanced (Horn, 2017). The research integrity offices aim to instil a culture of ethics among researchers by providing education and training on the responsible conduct of research (Horn, 2017; Stavale et al., 2022). They also conduct independent investigations into cases of research misconduct, such as data fabrication, data falsification and plagiarism (Jeruss & Cunningham, 2023).

Most institutions in Ghana do not have research integrity offices. The roles and functions of the research integrity offices described above are consequently part of institutional research offices. For the efficient and effective governance of scientific studies in research-producing organisations, it is suggested that research integrity offices need to be established to maintain the integrity of research conducted in these organisations in Ghana, particularly where animals are used in scientific studies.

- ***Research Offices or Research Management Offices***

Research offices in research-producing organisations are dedicated units within the organisation that are responsible for supporting researchers by managing administrative tasks related to research activities. These include partnership building, pre- and post-award services, statutory compliance management, providing guidance on funding opportunities, as well as facilitating ethical research conduct (Ayyar, 2023; Kerridge, 2023; Kerridge et al., 2024). Research offices are responsible for overseeing research governance, compliance and research policy implementation (Moan et al., 2023). In some research-producing organisations, research offices have oversight responsibilities over research ethics in the institution. Thus, research ethics and integrity responsibilities are vested in the research office. Where institutions are unable to create research integrity offices as autonomous units, the establishment of research offices can serve the role of research ethics oversight, ensuring the ethical use of animals in scientific studies.

- ***ARECs***

The animal research ethics governance systems at an institutional level proposed by the study's participants include the establishment of institutional ARECs in all research-producing organisations where research is conducted with animals. The key stakeholders interviewed identified the ARECs within their respective institutions as the ethics governance system for scientific studies using animals in the country. As discussed in Chapter Three (Section 3.3.3.1), ARECs are essential governance systems for ensuring ethical conduct in research. The oversight role of ARECs in the governance of scientific studies using animals has also been discussed in Chapter Three (Section 3.3.3.2).

The composition of ARECs is critical for the effective review of proposed studies that will ensure animals are used ethically in scientific studies. Considering that there is currently no standard requirement for the composition of ARECs in Ghana, this study proposes the following membership of ARECs in accordance with global best practices, as discussed in Chapter Three (Section 3.3.3.3), and upon consideration of the Ghanaian research and cultural context.

It is proposed that the AREC must include individuals with diverse expertise, including experts in veterinary medicine, ethics, and non-scientific members, to ensure balanced decision-making in agreement with the suggestion by Mohr et al. (2024) and Wallis (2023). For this reason, it is suggested that in the Ghanaian context, ARECs must include a minimum of five members as follows:

1. Veterinary expert – A veterinarian member must be a requirement of all ARECs in Ghana (as stipulated in all ARECs globally). Due to their training and expertise in animal health and welfare, they are uniquely positioned as animal welfare advocates and will be able to balance scientific progress with ethical obligations (Hernandez et al., 2022).
2. A scientist who has considerable experience using animals in scientific studies – Scientists who use animals in research have a depth of understanding that is essential for evaluating the scientific validity of research proposals. Additionally, such scientists would be familiar with existing animal research ethics principles that guide the use of animals in scientific studies (Martin, 2022). When experienced scientists are included in ARECs, they will provide valuable insights into the AREC's discussions on the scientific and ethical merits of proposed studies.
3. Legal expert or lawyer – The inclusion of legal experts or lawyers in the membership of ARECs is important for ensuring compliance with national and international regulations on the ethical use of animals in scientific studies. Legal experts on the AREC can help bridge the gap between ethical considerations and legal requirements, which will ensure that the decisions of the AREC are both ethically sound and legally compliant (Hoss et al., 2020; Weinberg & Am, 2012).

4. Lay member – This is a non-scientific member from the community who is not affiliated with the research-producing organisation. The lay person must preferably be an advocate for the ethical use of animals or have considerable experience with keeping and handling animals. This person must not be affiliated with the research-producing organisation. The inclusion of the lay member will ensure that public concerns are represented. Lay persons are critical members of the AREC because their involvement ensures that decisions of the AREC are not solely based on scientific or institutional interests but also focus on broader societal and ethical considerations (Holthaus et al., 2020).
5. Traditional leader – A non-scientific member of the community who is a traditional leader is suggested to illuminate traditional beliefs and perspectives, ensuring that the treatment of animals is consistent with the beliefs and practices of the people in the locality. Although universal ethical principles apply in all contexts, the inclusion of a traditional leader is required because the implementation of guidelines varies across regions (Mohr et al., 2024); particularly in the Ghanaian context, where traditional leaders are the custodians of tradition and indigenous knowledge. Their membership in the AREC will demonstrate how traditional and indigenous beliefs and practices are valued within the Ghanaian context. Additionally, traditional leaders are deemed to be deeply rooted in local communities and are custodians of the cultural values of the people (Olaopa & Ogundare, 2023). Therefore, as members of the AREC, they will ensure that ethical considerations in the use of animals in scientific studies are culturally sensitive and aligned with the values and norms of the community they represent. The traditional leaders will also ensure that decisions made by the ARECs are made with a deep understanding of local customs and traditions with respect to the use of animals (Olaopa & Ogundare, 2023). Their membership in ARECs will foster trust between the community and the research-producing organisation and enhance community engagement.

The AREC membership suggested above reflects the minimum number and expertise levels of AREC members in Ghana. Research-producing organisations can include other members depending on the specific contexts of the organisation and the

availability of specific experts within the organisational context. This proposed minimum of five AREC members, as described above, aligns with that of the United States of America, where a minimum of five members is required for their AREC. Other countries such as Australia, South Korea, China and New Zealand required a minimum of between three and four members (Section 3.3.3.3). South Africa, however, requires a minimum of nine members on the AREC (NHREC, 2024). For the countries named above, membership includes at least a veterinarian, a scientist or researcher who uses animals and a layperson who is not affiliated with the institution. The uniqueness of the proposed composition of the ARECs in Ghana, as presented in this thesis, is the inclusion of a traditional leader. This proposal acknowledges the important role traditional leaders play in protecting indigenous Ghanaian beliefs and practices with respect to animals, thereby promoting their ethical use in research. Putting the governance systems described above in place could provide the needed framework through which to guide and promote the ethical use of animals in scientific studies in research-producing organisations in Ghana.

b) Animal research ethics governance practices

The animal research ethics governance framework provided in Figures 9.1 and 9.6 suggests that animal research ethics practices should be derived from established governance systems. As presented in Section 3.4 of Chapter Three, research ethics governance practices are the specific actions and methodologies employed by institutions to implement the ethical principles outlined in research ethics governance systems (González-Esteban, 2023). In Figure 9.1, it is proposed that the governance systems in place may ensure that research governance practices are carried out within established legal frameworks and institutional systems. This linkage between the animal research ethics governance systems and practices is depicted by the use of a red arrow directed from the governance systems to the governance practices (Figure 9.6), illustrating that the proposed governance practices can only be efficient if the required governance systems are in place.

The empirical phase of the study identified AREC practices at different stages of the ethical review and approval process (pre-application, application review and post

approval practices), explained in Chapter Six of this thesis and summarised in this framework as 'AREC Standard Operating Procedures'. Other governance practices identified from the study's findings include capacity-building and awareness creation on the ethical use of animals in scientific studies. A detailed description of the governance practices is provided below for a better understanding of how they can contribute to the ethical use of animals in scientific studies.

- ***AREC Standard Operating Procedures***

SOPs for ARECs are documented procedures designed to provide a structured framework within which ARECs conduct their activities. SOPs are designed to ensure transparency, procedural justice and ethical integrity in scientific studies using animals. SOPs are essential for maintaining high standards in animals' ethical use in research, and should thus be in place for the effective functioning of an AREC.

The content of SOPs for ARECs should include a detailed description of the functions of the AREC, composition and constitution of the AREC, duration of AREC membership, rights and responsibilities of AREC members, how AREC meetings are to be organised and held, research ethics approval application procedures, procedures for reviewing protocols for scientific studies using animals, procedures for communicating AREC decisions to researchers, procedures for monitoring approved research, AREC's record-keeping and archiving procedures. The SOPs should also contain procedures for supporting researchers during the ethics application and submission process, procedures for supporting researchers to understand the AREC's communication based on reviewed protocols, and post-monitoring support to researchers to ensure the humane treatment of animals being used for research. Finally, procedures for addressing researchers' concerns regarding their protocols and the AREC's communication are vital (Díaz et al., 2020a).

- ***Capacity-Building***

Capacity-building (also referred to as education and training) among AREC members, AREC administrators, researchers, students and all staff of research-producing organisations, particularly staff working directly with animals, was identified in the empirical phase of this study as an important governance practice to be included in

this framework. Capacity-building can improve the ethical use of animals in scientific studies in research-producing organisations in Ghana. Capacity-building will entail either the development or adaptation of a certification curriculum for researchers who use animals to ensure they acquire the competencies required for using animals in research before they are allowed to embark on such studies independently. It is suggested that training for researchers and students should cover topics on the ethical aspects of using animals in scientific studies, including the 6R principles (replacement, reduction, refinement, relationship, respect and righteousness), pain recognition, anaesthesia, humane endpoints, as well as proper and adequate housing for experimental animals. Other topics to be included are national and institutional guidelines and policies on the use of laboratory animals and the SOPs of the institutional ARECs. Capacity-building must also include practical skills training in animal handling, husbandry and welfare assessment, which will be essential for ensuring that animals do not undergo unnecessary pain (Mohr et al., 2023).

Regular education and training for AREC members and AREC administrators on current ethical issues in the use of animals in scientific studies is also suggested as a practice that will ensure they keep abreast of current issues on the topic. This will lead to an improvement in the process and quality of reviews of proposed studies. Suggested training topics for AREC members also include the 6Rs principle (replacement, reduction, refinement, relationship, respect and righteousness), pain recognition, anaesthesia, humane endpoints, as well as proper and adequate housing for experimental animals. Other topics specific to AREC members should include the role and functions of ARECs, harm-benefit analyses, ethical reviews of protocols and the importance of protecting animals used for scientific studies, national laws, as well as institutional policies and guidelines on the ethical use of research animals.

It is further suggested that AREC administrators must participate in capacity-building activities that will enhance their knowledge and skills in research ethics and integrity. Topics should focus on the full research cycle, philosophies of research ethics and integrity, acceptable norms of integrity, administration of research ethics, processes, procedures, systems and records, administration of research integrity processes and compliance, and operating electronic databases (Southern African Research and

Innovation Management Association, 2024). In addition to strengthening ARECs, capacity-building will also ensure that researchers are equipped with the requisite knowledge and skills to navigate ethical dilemmas effectively. Workshops, continuing education, and awareness creation sessions are vital to enhance the understanding of animal research ethics among all staff of research-producing organisations in Ghana, particularly those involved with the use of animals in scientific studies.

- ***Awareness Creation***

Awareness creation and sensitisation of all staff employed at research-producing organisations where animals are used, and the public, was identified in the empirical phase of this project as one of the ways in which the ethical use of animals in scientific studies can be promoted in Ghana. The findings of the study revealed low levels of awareness among the scientific community and their surrounding community members (general public) about existing governance systems and practices for the ethical use of research animals. Conducting awareness and sensitisation programmes was identified as a governance practice necessary for ensuring that animals are ethically used for scientific studies. Awareness creation will also help improve knowledge and understanding among community members on ethical issues linked to the use of animals for research.

Awareness creation is an essential governance practice, which involves educating researchers, policymakers and the public on the ethical considerations, regulations and importance of animal welfare (Khan, 2024). Manzoor (2023) also underscores the importance of awareness creation as a governance practice for the ethical use of animals in research by promoting understanding of ethical standards and the importance of humane treatment for animals. Members of ARECs are usually given the responsibility within research-producing organisations to conduct awareness creation activities.

From Figure 9.6, the red arrow directed away from the process suggests the positive effect of instituting effective and efficient animal research ethics governance systems and practices that may result in the expected outcome (terminus), which is the ethical use of animals in scientific studies. In the next section, the terminus is discussed.

9.5.3.6 Terminus

The final goal of implementing this animal research ethics governance framework was to ensure the ethical use of animals in scientific studies in Ghana. The researcher also intended for animals to benefit from the established animal research ethics governance systems and practices. The terminus in the conceptual framework is represented as a purple-coloured diamond, as shown in Figure 9.7.



Figure 9.7: Terminus/Outcome: Ethical use of animals in scientific studies in Ghana

Source: Author's construct, 2025

The terminus represents the endpoint of the animal research ethics governance framework and the desired outcome being reached. From Figure 9.1, a red arrow directed towards the terminus and away from the process components of the framework demonstrates the theory-practice relationship assumption of Dickoff et al. (1968). The animal research ethics governance framework proposes that the 6R principles provide the needed impetus for establishing and implementing robust animal research ethics governance systems and practices in research-producing organisations in Ghana, which should result in the ethical use of animals in scientific studies. Lessons learnt from the implementation of the governance framework over time can be used to improve the animal research ethics governance systems and practices, and vice versa. Since Dickoff et al.'s theory is flexible enough to adjust to changing conditions, as the ethical use of animals in scientific studies evolves, so too can the framework allow for improvements to be made to the governance systems and practices to further promote their ethical use in Ghana.

Governance frameworks for the ethical use of animals are developed to ensure a balance between scientific progress and the welfare of animals (Khan, 2024). To achieve this balance, there is a need for all key stakeholders, including researchers, AREC members, AREC administrators, policymakers and the general public, to collaborate and ensure that animals are used ethically in scientific studies in Ghana. The ethical use of animals will ensure they are not seen merely as tools for research but as sentient beings deserving of ethical consideration (Martin, 2022). This approach will foster a culture of respect and responsibility towards animals, which can lead to improvements in the way animals are perceived and treated by everyone. Ultimately, the ethical use of animals in scientific studies will reduce their pain, stress and discomfort, which will result in animals exhibiting their natural behaviours (Smith, 2023), thereby providing better research outcomes and improved quality of life for the animals (Martin, 2022).

9.6 Chapter Conclusion

This chapter focused on the actualisation of phase two of the study, which aimed to propose a conceptual animal research ethics governance framework for research-producing organisations in Ghana in order to promote the ethical use of animals in scientific studies in the country. The conceptual animal research ethics governance framework was developed using the practice-oriented theory of Dickoff et al. (1968), findings from the empirical phase of the study, and the scientific literature reviewed.

It is evident that animal research ethics governance frameworks are implemented within specific contexts with unique characteristics. Consequently, the animal research ethics governance framework developed in this study was developed within the Ghanaian context and must be interpreted within this context. The animal research ethics governance framework developed in this study is driven by the 6R principles (replacement, reduction, refinement, relationship, respect and righteousness), which provide the impetus for the implementation of the governance framework to achieve its desired objective of ensuring the ethical use of animals in scientific studies.

Furthermore, the individuals responsible for acting to ensure that the animal research ethics governance framework is implemented (agents) were identified as a key component of the framework. It is also important to identify and define the governance systems and practices that must be established and carried out within the context and driven by the identified principles to achieve the desired outcome of the governance framework. Ultimately, this governance framework is aimed at ensuring that animals are used humanely in scientific studies in research-producing organisations in Ghana, thereby ensuring that animals are respected and valued as members of the community and not viewed as tools for research. Thus, the beneficiaries of the framework must be identified to ensure that the developed governance framework will be beneficial to the targeted population.

This animal research ethics governance framework was developed for easy implementation by considering the Ghanaian context, and therefore can be applied within the Ghanaian and other similar contexts. In the next chapter, an overview of the study, its conclusions, contribution, limitations, recommendations and novelty are presented.

CHAPTER TEN
CONCLUSION AND RECOMMENDATIONS

10.1 Introduction

The preceding chapters provided context and justified the purpose of this study by providing a background and objectives of the study (Chapter 1), a review of literature on the topic (Chapters 2 and 3) and a detailed description of the methodology followed to achieve the study's objectives (Chapter 4). In Chapters Five through Eight, the findings of each of the study's objectives were presented. Chapter Nine offered a proposed conceptual animal research ethics governance framework for the ethical use of animals in scientific studies in research-producing organisations in Ghana. This chapter (Chapter 10) concludes the research with a brief description of how the aim of the study was achieved. The conclusions and implications derived from the findings of each objective, contributions of the study, study limitations, recommendations and the novelty of this study are also discussed. The researcher's reflection on the PhD journey concludes the chapter.

10.2 Processes to Achieve the Objectives and Conclusions of the Study

Overall, the study aimed to propose an animal research ethics governance framework for research-producing organisations by interpreting key stakeholders' experiences of existing animal research ethics governance systems and practices to promote the ethical use of animals in scientific studies in Ghana. The study therefore sought to answer the central research question, "*Which existing animal research ethics governance systems and practices can inform a proposed conceptual framework for research-producing organisations to promote the ethical use of animals in scientific studies in Ghana?*" The study was carried out over two sequential but interrelated phases in order to achieve this overall purpose. Phase one (empirical phase) focused on ***gaining a deeper understanding of the experiences of key stakeholders with existing animal research ethics governance systems and practices that promote the ethical use of animals in scientific studies in Ghana***. Phase two (conceptual framework development phase) proposed a conceptual animal research ethics

governance framework for research-producing organisations by interpreting key stakeholders' experiences with existing animal research ethics governance systems and practices, with the goal of promoting ***the ethical use of animals in scientific studies in Ghana***. An overview of each phase, along with the specific objectives stated for the study, follows. The implications of the findings and concluding ideas are also presented in this section.

10.2.1 Phase one: Empirical phase

Four research objectives were addressed in this phase. To achieve these objectives, semi-structured interviews were conducted, and naïve sketches were received from participants who were purposively selected. The researcher also kept a reflective diary, which allowed him to capture subjective experiences, thoughts, and feelings about the interviews and experiences shared by study participants. A thematic analysis of the collected data was then conducted. The following conclusions are presented together with the implications of these main findings for each objective of phase one of the study.

10.2.1.1 Conclusions of research objective 1

This study's first objective was to explore and describe key stakeholders' understanding of the concept of 'animal research ethics governance'. This first objective was realised in Chapter Five. The conclusion drawn from the findings is that although the concept of 'animal research ethics governance' is not clearly defined in the literature and the participants had not been exposed to it previously, they were able to make sense of the concept. However, participants lacked a holistic understanding of all the components of the concept of 'animal research ethics governance'. The participants were only able to recognise key components that form part of its overall meaning (Section 5.4). The term 'animal research ethics governance' was generally understood by participants to mean both the existence of rules and regulations for ensuring the ethical use of animals in scientific studies and the existence of governance structures such as ARECs to regulate the use of animals in scientific studies. This finding means that there is no single understanding of the

concept of 'animal research ethics governance' among key stakeholders (researchers, AREC members and AREC administrators) in Ghana. This finding can affect how the ethical use of animals in scientific studies is governed in the country, and ultimately impact the welfare of animals used in scientific studies in Ghana.

The differences in the way key stakeholders interpreted the concept of 'animal research ethics governance' means their implementation of governance systems and practices will differ based on their understanding of the concept. This will result in inconsistencies in the interpretation and application of ethical standards across research-producing organisations. The lack of a common understanding can further result in differences in governance practices that are likely to compromise the ethical use of animals in scientific studies, as institutions will adopt varied ethical standards. It is therefore imperative that key stakeholders have a shared understanding of the concept of 'animal research ethics governance' to establish governance systems for the ethical use of animals and facilitate compliance. A shared understanding and a comprehensive definition of the concept would support the development of guidelines and foster a culture of using animals humanely for scientific studies. This conclusion is supported by Ferdowsian et al. (2020), who emphasise that clarity and consistency in defining governance and regulatory concepts promote a culture that prioritises the ethical use of animals in scientific studies.

Subsequently, considering that there is no explicit definition of 'animal research ethics governance' in the literature (Section 3.2.2), this study proposes the following definition: ***Animal research ethics governance is defined as a broad concept used to describe the establishment of systems and practices including the enactment of laws and legislation, the establishment of oversight bodies and promulgation of policies, guidelines and standard operating procedures from national to institutional levels to regulate the use of animals in scientific studies, thereby ensuring that animals are used humanely in scientific studies.***

This proposed definition of 'animal research ethics governance' considers four important components:

1. Animal research ethics governance is a broad concept – The proposed definition acknowledges that the concept of 'animal research ethics governance' is broad, which means that it can be understood in different ways and encapsulates different components.
2. Animal research ethics governance involves the establishment of systems and practices – The proposed definition acknowledges and emphasises that animal research ethics governance includes established systems and practices, which include the enactment of laws, guidelines, oversight bodies and SOPs.
3. Animal research ethics governance regulates – The proposed definition also acknowledges that animal research ethics governance seeks to regulate how animals are used for scientific studies. This regulation is achieved when the appropriate systems and practices (as stated in point two above) are established.
4. Animal research ethics governance ensures the humane use of animals in scientific studies – The proposed definition also makes it clear that the purpose of 'animal research ethics governance' is to ensure that animals are used humanely in scientific studies. The ultimate goal is that animals will undergo humane treatment when used for scientific studies.

10.2.1.2 Conclusions of research objective 2

This study's second objective was to explore and describe key stakeholders' (researchers, AREC members and AREC administrators) experiences with the existing research ethics governance systems that promote the ethical use of animals in scientific studies in Ghana. The findings for this objective were presented and discussed in Chapter Six. The first conclusion made under this objective is that there is an overreliance on ARECs at research-producing organisations; they are predominantly perceived as the only and most important governance system (see, Section 6.2.1.1). This implies that apart from ARECs at the institutional levels, participants do not recognise other governance systems, which include laws,

guidelines, national oversight bodies, institutional policies and SOPs (see, Section 3.3). This finding also implies that apart from ARECs, there are no other animal research ethics governance systems established within their context. This finding further confirms the important role that ARECs play as part of the animal research ethics governance system (see, Section 3.3.3.2) and the recognition of ARECs by the participants as a body responsible for ensuring ethical conduct in scientific studies using animals. Identifying ARECs as the main animal research ethics governance system also has the potential to lead to a more standardised ethics review process across institutions within Ghana. This can ultimately result in consistency in the evaluation of protocols by ARECs and facilitated dialogue among all AREC stakeholders (researchers, AREC members and AREC administrators) to promote ethical awareness and responsibility within the research community. The implication is that, if deficient national ethics governance systems continue to persist in Ghana, the humane use of animals in scientific studies may not receive full attention. It is therefore imperative that ARECs are considered the main link in the ethics governance systems of Ghana.

Second, it was concluded that research-producing organisations and ARECs in Ghana depend significantly on the international ethical standards and guidelines from funding organisations and scientific journal publishers. The lack of national standards and guidelines in Ghana was a contributing factor. This finding is critical because it illuminates the current gap within Ghana's animal research ethics governance system, which includes the lack of national oversight bodies, national guidelines and laws to govern how animals can be used more humanely in research, leading to the over-reliance on international guidelines and standards. The problem with an over-reliance on international guidelines and standards is that research-producing organisations in Ghana are adopting guidelines that were not developed within the Ghanaian context. This affects their application in the Ghanaian context, thereby leading to non-adherence and unethical use of animals in scientific studies. This could also lead to a lack of credibility of the research conducted in Ghana. This finding is important because it shows that there is a lack of uniformity in the ethical guidelines and standards established in research-producing organisations in Ghana. Various institutions adhere to the guidelines and regulations stipulated by specific funders and

journal publishers, which likely each have standards and guidelines specific to their needs. This implies a lack of a unified governance system that regulates and provides standardised laws and guidelines for the use of animals in scientific studies in Ghana. This lack of uniformity affects adherence to ethical standards, thereby leading to the unethical use of animals in research. Establishing and enforcing a unified national governance system that provides localised and contextual principles and practices will promote adherence to ethical guidelines and ensure the ethical use of animals in scientific studies in Ghana. This could ultimately contribute to the humane use of animals and enhance the credibility of scientific studies using animals in Ghana.

The third conclusion under the second objective is that key stakeholders had both positive and negative experiences with existing animal research ethics governance systems in Ghana. This finding provides an indication of the strengths and weaknesses as well as opportunities and challenges in existing animal research ethics governance systems in the country. Positive experiences among key stakeholders included the presence of well-documented SOPs that guide the operations of ARECs, as well as the availability of institutional systems, facilities, and policies that support the activities of ARECs. This implies that despite the unavailability of a national animal research ethics governance system, some research-producing organisations have established institutional governance systems for the promotion of ethical conduct in scientific studies involving animals. Conversely, negative experiences included insufficient financial and logistical resources for ARECs to conduct monitoring visits to research sites where animal studies are undertaken, as well as a lack of clarity regarding the mission of ARECs among researchers. The implication of this finding is that, if these negative experiences persist, adherence to ethical conduct in research cannot be ascertained and enforced, thereby perpetuating the unethical use of animals in research. The negative experiences identified in this study provide a good understanding of challenges and weaknesses with the existing governance of scientific studies using animals, serving as a guide for the development of an effective national governance system. The identified weaknesses in existing governance systems had to be considered when developing a national and institution-specific governance system to ensure its effectiveness for the humane use of research animals.

10.2.1.3 Conclusions of research objective 3

The study's third objective was to explore and describe key stakeholders' experiences with the existing animal research ethics governance practices that promote the ethical use of animals in scientific studies in Ghana. The third research objective was realised in Chapter Seven, where the findings were presented and discussed. The first conclusion drawn from the findings on this objective is that animal research ethics governance practices that promote the ethical use of animals in scientific studies are primarily encapsulated in the ethical approval procedures and processes of the ARECs (Section 7.2.1). These procedures encompass three key phases of the ethical review and approval process: pre-application practices, application review practices, and post-approval practices. The implication of this finding lies in the realisation that appropriate practices and procedures are required at all three phases to ensure effective animal research ethics governance. The findings further imply that if ARECs do not put effective procedures in place at each of these phases, it will undermine their effectiveness in ensuring the ethical use of animals in scientific studies. These findings provide clarity on the governance practices that ensure animals are used humanely in scientific studies. It further clears ambiguity with respect to the components of animal research ethics governance practices. Also, the specific ethics approval practices to be carried out by research-producing organisations that will ensure animals are used ethically in scientific studies would not be known without this finding. Therefore, this finding provides a clear scope of what animal research ethics governance practices should cover. The findings will enable all stakeholders to identify the specific actions and processes that research-producing organisations must employ to implement ethical principles and guidelines, ensuring the humane use of animals in scientific studies in Ghana.

Second, the researcher concluded that key stakeholders have both positive and negative experiences with the existing animal research ethics governance practices relating to the ethical approval procedures and processes of ARECs across the three phases (Section 7.2.2). Their positive experiences include the AREC's support for researchers during the ethics review and ethics approval process, as well as the

monitoring and supervision practices performed by the ARECs. The implication of this finding is that the support provided to researchers by ARECs positively influences researchers' willingness to adhere to ethics guidelines established within the institution. This further implies that ARECs promote the ethical use of animals in scientific studies through the support provided to researchers during the ethics application, review and post-approval phases.

Negative experiences included inefficiencies in ethics application and review processes, as well as poor animal welfare considerations and research housing facilities. The implication is that some of these negative experiences will deter some researchers from applying for ethical clearance prior to the conduct of their study, which might result in unethical research conduct and affect the credibility of research findings. Also, this finding implies that animals are not handled humanely and provided with the right housing facilities, which impacts the credibility and results from scientific studies using animals in Ghana. By identifying and understanding the positive and negative experiences of key stakeholders, the formulation of policies and guidelines on the ethical use of animals that will address the concerns and needs of all stakeholders will ensue. Without insight into the positive and negative experiences key stakeholders faced, the developed governance framework will be ineffective and will not lead to the humane use of animals in scientific studies. Additionally, if key stakeholders' negative experiences with existing animal research ethics governance practices are not known, appropriate and effective measures will not be put in place to protect animals used in scientific studies. Consequently, identifying these positive and negative experiences was critical in the development of an appropriate governance framework that will ensure the ethical use of animals in scientific studies in research-producing organisations in Ghana.

The final conclusion for the second objective of this study is that education, training and awareness creation, aimed at researchers, staff of research-producing organisations who are involved with scientific studies using animals, and students are essential governance practices that will promote the ethical use of animals in scientific studies (Section 7.2.1.2). The current level of knowledge and awareness of animal research ethics among researchers, students and staff of research-producing

organisations who are involved with scientific studies using animals is low in Ghana (Section 7.2.1.2.a). If educational programmes are not created, the knowledge gap among key stakeholders will persist and perpetuate the unethical use of animals in scientific studies in research-producing organisations in Ghana. Such a situation will ultimately result in a lack of research integrity and the global scientific community's unacceptance of scientific studies conducted in Ghana using animals. The knowledge gap will also result in a reduction of external research funding since proposals written by researchers from Ghana will lack rigour with respect to the humane treatment of animals in scientific studies. Educational programmes, training and awareness-creation activities will therefore bridge the knowledge gap among all stakeholders and enhance the ethical use of animals in scientific studies. This outcome will enhance the credibility of scientific studies using animals conducted in Ghana. This conclusion aligns with the NHREC guidelines (2024), which requires everyone who uses animals in scientific studies to undergo training and competency assessments.

10.2.1.4 Conclusions of research objective 4

This study's fourth objective was to explore and describe the key stakeholders' suggestions to promote the ethical use of animals in scientific studies in Ghana. This objective was realised in Chapter Eight, where the findings of this objective were presented and discussed. The first conclusion emanating from the findings of this objective is the need for laws and guidelines at the national level on the use of animals in scientific studies aligned with existing international laws and guidelines but contextualised to fit the Ghanaian cultural context (Section 8.2.1.1). Thus, the need for a national animal research ethics governance system adapted and contextualised from existing international animal research governance systems was evident. Without a national governance system, there is no overarching guidance provided to research-producing organisations in the country. This means that each research-producing organisation decides whether to create institutional governance systems or not, and those that have institutional governance systems lack uniformity across the country. This makes it difficult to standardise governance systems and practices across all research-producing organisations in the country and affects the credibility of research produced using animals in Ghana. Ultimately, animals will experience more suffering

and even death if there are no national animal research ethics governance systems to regulate their use in scientific studies in Ghana. Establishing a national legislation and guidelines for the ethical use of research animals will provide an overarching framework from which institutional animal research ethics governance systems can be established in Ghana. They will ensure that animals are used humanely in scientific studies in research-producing organisations and enhance the credibility of such studies in Ghana.

Second, this study concludes that existing ARECs in Ghana need to be adequately resourced (financial, human and logistical resources) to enable them to fulfil their mandate effectively (Section 8.2.2.1). This means that the existing ARECs are currently not receiving adequate financial, human and logistical resources to carry out their mandate. When ARECs are not provided with the resources they need to conduct a thorough and independent review of proposed studies, the ethics review process will not be robust enough to identify all the potential risks involved in the studies and point them out to the researcher. In such instances, studies that should have been stopped due to non-compliance with international and national ethics regulations and guidelines would be permitted, leading to the conduct of research that subjects animals to inhumane practices and unnecessary death. Also, when ARECs are not adequately resourced with human, financial and logistical support, they will not be able to conduct regular monitoring site visits to ascertain and ensure that researchers are conducting research using animals according to approved protocols. In such instances, researchers and their staff may have a tendency to conduct unethical research knowing that their projects will not be monitored. This affects the credibility of research conducted in such research-producing organisations and their ability to attract additional research funding and collaborators. Moreover, animals will also suffer unduly and may even die due to unethical research conduct being allowed because of the lack of resources for ARECs or other bodies to regularly monitor the conduct of scientific studies using animals. It is therefore essential that research-producing organisations make adequate resources available to ARECs to enable them to function effectively and efficiently to enhance the credibility of studies conducted in the organisation and protect animals from undue suffering and death.

10.2.2 Phase two: Conceptual animal research ethics governance framework development phase

The second phase of this study proposed a conceptual animal research ethics governance framework for research-producing organisations by interpreting key stakeholders' experiences of existing animal research ethics governance systems and practices to promote the ethical use of animals in scientific studies in Ghana. This purpose was realised in Chapter Nine, where the conceptual animal research ethics governance framework is presented and discussed. The implications of not developing an animal research ethics governance system include a lack of harmonised governance systems and practices to govern scientific studies using animals, and a continued lack of ethical oversight with respect to the use of animals in many research-producing organisations in Ghana. This situation will ultimately result in cases of inhumane animal use in research, which will affect the credibility of research results, thereby affecting funding for research using animals in Ghana. This situation can lead to a reduction in new scientific discoveries using animals in scientific studies in Ghana.

The objective of this phase of the study and how it was achieved are presented in the next section. The conclusions reached from the realisation of these objectives, as well as their implications, are also presented in the sections that follow.

Objective 5: The fifth objective was to propose an animal research ethics governance framework for research-producing organisations by interpreting key stakeholders' experiences of existing animal research ethics governance systems and practices to promote the ethical use of animals in scientific studies in Ghana. Dickoff et al.'s (1968) practice-oriented theory was employed to achieve this objective using findings from the empirical phase (phase one) of the study. Dickoff et al.'s (1968) practice-oriented theory provides a structured approach and a thinking map for developing a conceptual framework. It asks six questions that must be answered for a conceptual framework to be useful (Section 9.5.1).

Phase two of the study provided the following conclusions:

- It is proposed within the context of Dickoff et al.'s (1968) practice-oriented theory that the key components to be included in a proposed conceptual animal research ethics governance framework for research-producing organisation to promote the ethical use of animals in Ghana include: the context (macro, meso and micro) within which the governance framework will be implemented; agents or stakeholders responsible for implementing the governance framework (AREC members, research managers, heads of research-producing organisations); the recipients or beneficiaries of the governance framework (animals, research-producing organisations); the process or procedure to be followed (governance systems and practices) that will lead to the achievement of the purpose of the framework, which is to ensure the ethical use of animals in scientific studies; the dynamics or motivation behind the development and implementation of the governance framework (virtue ethics); and the terminus or the outcome of the governance framework (ethical use of animals in scientific studies) (Section 9.5.1). The content of the components was important for inclusion in the conceptual animal research ethics governance framework because they provide a comprehensive list of factors that are necessary for developing and effectively implementing a governance framework that will ensure animals are used humanely in scientific studies. Without identifying the content of these components, it would have been difficult to develop a governance framework for the ethical use of animals in Ghana that is contextual and possibly easy to implement to ensure that animals are used humanely in scientific studies. Thus, without this content, no governance framework would be developed, and the status quo of unregulated research using animals in Ghana, where animals undergo undue suffering, would perpetuate. The identification of these components and putting them together to develop a governance framework makes it possible to create a structured and systematic approach to ensuring that animals used in scientific studies in Ghana are used ethically.

- Second, it is concluded that virtue ethics is a suitable theoretical perspective to promote the ethical use of animals in scientific studies in research-producing organisations in Ghana (Section 2.3.4). The virtue ethics theory combines both the utilitarian philosophy and the animal rights philosophy and promotes virtues among researchers (Section 2.3.4). This perspective of virtue ethics is less frequently

adopted in other theories and frameworks aimed at ensuring the ethical use of animals in scientific studies (Walker, 2020). Most animal research ethics principles and frameworks are developed based on either the utilitarian or animal rights philosophy, with each arguing for the relevance of either a utilitarian or animal rights approach to animal welfare (Arnason, 2020; DeGrazia & Beauchamp, 2019). The virtue ethics philosophy becomes very relevant as it combines the advantages espoused by both schools of thought.

- Additionally, the virtue ethics perspective is relevant particularly within the African context. Unlike the rights-based theories that emphasise the moral entitlements of animals and the utilitarian theories, which focus on the experiences of animals, virtue ethics focuses on the significance of the researcher's character and moral virtue, which is promoted and encouraged within the African context. Due to its emphasis on contextual considerations surrounding the use of animals in scientific studies (Walker, 2020), virtue ethics is considered an ideal theory, particularly within the African animal philosophical context. It emphasises the interconnectedness of humans, animals and the environment, suggesting a duty of care and respect for animals (Section 2.3.5) rather than domination or outright animal rights as understood in the utilitarian and rights-based approaches, respectively (Sections 2.2.2 and 2.3.3). From the foregoing, the ethical use of animals in scientific studies within the African context might be compromised if the theoretical basis is limited to the utilitarian or rights-based approaches, as these approaches alone do not align with African indigenous beliefs and practices. Thus, without promoting virtue ethics within the African context, animals could continue to suffer inhumane treatment at the hands of researchers.

- Consequently, this study concludes that the 3R principles proposed by Russel and Burch (1959) are a necessary condition for the ethical use of animals in scientific studies, but not a sufficient condition. Therefore, they are inadequate to ensure that animals are used humanely for scientific studies within the Ghanaian context. The 3R principles are grounded in the utilitarian philosophy and not necessarily the animal rights philosophy, as it anticipates that animal-based studies will be carried out but may require some tweaking of their proposed procedures to ensure that

animals are used humanely (Curzer et al., 2016; Müller, 2023). The 3R principles, therefore, cannot be the only ones to be applied in a virtue ethics philosophy, which combines both the utilitarian and rights-based philosophies for the humane use of animals. Applying only the 3R principles within the African context will result in animals being used for research without considering their rights and the interconnectedness of humans, animals and the environment as espoused in the virtue ethics philosophy. This could result in the inhumane use of animals within the African context.

- This study therefore proposes the 6R principles (replacement, reduction, refinement, relationship, respect and righteousness) for the ethical use of animals in scientific studies in research-producing organisations in the Ghanaian context. They encompass the globally accepted 3R principles representing animal welfare (replace, reduce, refine), as proposed by Russel and Burch (1959), and indigenous African animal rights (relationship, respect, righteousness), providing a contextual view of how animals are to be treated within the African context. The ‘relationship’ principle emphasises the interconnectedness and inter-reliance between humans and animals (Samuel, 2023). Adding ‘respect’ emphasises respect for the rights and dignity of animals as members of the community in the African context. ‘Righteousness’ emphasises the virtues of fairness, goodness to all, and nobleness that the researcher within an African context strives to achieve, which will make them accepted and respected within society (see Section 9.5.3.4 for a detailed presentation on the 6R principles).

  The 6R principles also operate with the assumption that animal welfare and animal rights within the context of indigenous African philosophy are interdependent and must be considered together to promote the ethical use of animals in scientific studies. This means that for animals to be treated humanely in research, their welfare and their rights within the indigenous African context must be considered together. If such consideration is not made in the conduct of research using animals within the Ghanaian and other African contexts, researchers will fail to use animals humanely in the conduct of scientific studies using animals. Their focus will likely

only be on fulfilling the 3Rs, which are inadequate in ensuring that animals are used ethically within the African context.

- Finally, the study suggests that the implementation of the animal research ethics governance framework proposed in this study could ensure that animals used for research in Ghana and similar contexts will be treated humanely. The framework has been developed within the Ghanaian context, and contextual issues relating to the use of animals in the country, as well as existing animal research ethics governance systems and practices, have been considered and incorporated into the development of the governance framework. Furthermore, the developed governance framework provides guidance on the governance systems and practices that must be established nationally and at research-producing organisations to ensure that animals receive humane treatment. If this proposed governance framework is not implemented, the status quo of unethical or inhumane use of animals in scientific studies in Ghana could result in a gradual loss in the credibility of research using animals in Ghana, and a reduction in funding and scientific peer-review publications.

10.3 Contributions of the Study

This study's contribution is based on its originality and novelty. This study aimed to propose an animal research ethics governance framework for research-producing organisations by interpreting key stakeholders' experiences with existing animal research ethics governance systems and practices, with the goal of promoting the ethical use of animals in scientific studies in Ghana. The contributions of this study to theory, the body of literature with respect to animal research ethics, and methodology are presented as follows:

10.3.1 Contribution to theory

This is the first study conducted with the specific aim of exploring and interpreting specific key stakeholders' (researchers, AREC members and AREC administrators) experiences to develop an animal research ethics governance framework for

research-producing organisations in Ghana. It is the first time an animal research ethics governance framework has been developed, concentrating solely on how the ethical use of animals in scientific studies must be governed in the country. The development of a proposed animal research ethics governance framework for research-producing organisations to promote the ethical use of animals in scientific studies in Ghana, the first of its kind, is thus the study's main theoretical contribution. Also, this study emphasises the importance of contextual factors shaping ethics governance by incorporating the Ghanaian and African concept of animal welfare and animal rights into the proposed framework.

This study introduces the 6R principles, which add to the body of frameworks and theories proposed for promoting the ethical use of animals in research. The novelty and uniqueness of the 6R principles lie in the contextualisation of the virtue ethics theory to animal welfare for promoting the ethical use of animals in scientific studies in Ghana. This study thus applies the virtue ethics theory to the African indigenous context (explained in Section 9.5.3.4). This contributes to the discourse on the theoretical foundations and philosophical arguments on the use of animals in scientific studies. Ultimately, this study contributes to the broader intellectual discourse on ethics theories for the use of animals in scientific studies and promotes the ethical use of research animals. Finally, this study makes a substantial contribution to theory by successfully applying Dickoff et al.'s (1968) theory to the field of animal research ethics governance. This application of Dickoff et al.'s (1968) practice-oriented theory to this field demonstrates that the theory is versatile and can be applied to different fields; it is not limited only to the nursing context for which it was proposed.

10.3.2 Contribution to the body of knowledge

This study made a useful contribution by gathering key stakeholders' perspectives on existing animal research ethics governance systems and practices that promote the ethical use of animals in scientific studies in research-producing organisations in Ghana. One of the key outcomes of this study was a definition of 'animal research ethics governance', as stated in Section 10.2 of this thesis. This definition was made possible by the researcher's ability to understand how the key stakeholders

(researchers, AREC members and AREC administrators) perceived the concept of 'animal research ethics governance' through the experiences they shared with him. Since no explicit definition currently exists for 'animal research ethics governance', this study contributes to the body of literature that provides a definition and enhances understanding of the concept.

Additionally, this study contributes to the limited literature regarding the experiences of researchers, AREC members and AREC administrators on the governance of ARECs, particularly within the context of developing countries. There is a plethora of literature on ethical arguments and philosophies with respect to the use of animals in scientific studies (Viviani, 2023). The uniqueness of this study's contribution to literature is with respect to the African and Ghanaian context, where there is very little literature on animal research ethics governance. This study therefore contributes to the body of literature with respect to existing animal research ethics governance systems and practices for promoting the ethical use of animals in scientific studies within an African context. This study also contributes to the body of knowledge on the theory and philosophy of animals and their use for scientific studies by applying the virtue ethics theory to animal research ethics governance within the Ghanaian and African context. There are a few studies on indigenous African philosophical arguments on the ethics of using animals in scientific studies. This study contributes to this overall body of knowledge and adds a perspective of the Ghanaian context, which is limited in the available body of knowledge.

10.3.3 Contribution to methodology

This study also made a methodological contribution, which can be considered for future research. The study's contribution to methodology stems from the effective use of the qualitative research approach to explore concepts that were previously unexplored to generate a rich volume of information with respect to the ethical use of animals in scientific studies in Ghana. Using a qualitative approach, specifically the use of semi-structured interviews, generated a depth of information that helped the researcher in understanding existing animal research ethics governance systems and practices in research-producing organisations in Ghana. This is one of a few studies

that have successfully demonstrated the use of qualitative approaches to unearth valuable information in the field of animal research ethics and animal research ethics governance that quantitative approaches may miss.

Additionally, this study's methodological contribution is evident in the use of naïve sketches as a data collection tool to complement and triangulate data from semi-structured interviews. The naïve sketches assisted the researcher in reviewing participants' responses before conducting the interviews, helping the researcher to identify the components of the phenomenon being investigated to explore factors in greater depth. This process facilitated the gathering of rich data and information to address the study's objectives. The naïve sketches also allowed the study participants to review the interview questions prior to the interviews, which helped them to prepare adequately for the interview. By using naïve sketches, participants shared a lot of rich information that supplemented the outcomes of the study.

Furthermore, the use of an inductive data analysis approach to identify themes in similar studies about which little is known is one of the methodological contributions of the study. The researcher had an open mind to identify as many themes as possible that emerged from the data, without any pre-determined themes, helping the researcher to explore the phenomenon to gain a greater depth of understanding and description of the phenomenon. The successful use of an embedded single case study design to explore a given phenomenon about which little is known is another methodological contribution of this study. By employing this research design, the researcher was able to understand and describe the phenomenon being investigated within the Ghanaian context, using participants' unique experiences at their institutional levels. Contextual sensitivity is crucial among heads of research-producing organisations and ARECs who must tailor their governance strategies to align with specific organisational realities and stakeholder expectations, while also providing a description of the national picture with respect to the phenomenon.

10.4 Limitations of the Study

Despite the valuable insights generated and contributions made by this study, some limitations were noted, and the findings should be read and understood in light of these limitations.

10.4.1 Theoretical limitations

This study focused on developing a proposed conceptual animal research ethics governance framework that may be limited to Ghana. The researcher did not intend to make predictions, establish cause-and-effect relationships of the research phenomenon, or generalise the findings of the study using the qualitative approach selected for the study. The goal of this study was to obtain an in-depth understanding of existing animal research ethics governance systems and practices in Ghana to propose a conceptual animal research ethics governance framework for research-producing organisations in the country. Consequently, the findings of this study reflect the intricacies of the Ghanaian context, making it difficult to generalise the findings, although the study can be transferred to other contexts within Africa, other regions in the global south and the global north. In applying this study to other contexts and interpreting the study's findings, it is imperative to carefully consider the contextual factors that may influence the findings' applicability.

Second, this study relied on Dickoff et al.'s (1968) practice-oriented theory to identify six components to develop the animal research ethics governance framework. Considering the complexity of animal research ethics governance, depending only on the six components identified from Dickoff et al.'s (1968) survey list could be an oversimplification of the complex system, so that other intricate factors with respect to animal research ethics may not have been captured in the framework.

10.4.2 Methodological limitations

The study was restricted to three research-producing organisations with established ARECs in Ghana. This implies that only purposively sampled key stakeholders

(researchers, AREC members and AREC administrators) in these three organisations were allowed to participate in the study. The objectives of the study required key stakeholders with knowledge of Ghana's existing animal research ethics governance systems and practices, which are exclusive to research-producing organisations where ARECs have been established; this led to the decision to conduct the study at the three selected organisations. Also, a purposive sample of research-producing organisations and study participants was chosen as the best sampling strategy to help the researcher address the research questions. Consequently, this study was limited to only exploring the perspectives and experiences of key stakeholders (researchers, AREC members, and AREC administrators) with respect to animal research ethics governance and the ethical use of animals in scientific studies in Ghana. The study excluded other stakeholders, such as heads of research-producing organisations, students, animal rights non-governmental organisations, and the general populace, particularly community members, as they were deemed not to possess adequate experience of the research questions being explored. It is probable that the aforementioned groups, as well as other stakeholders, might have had different experiences and viewpoints on the phenomenon being explored if they had been included. Therefore, since this study was restricted to the experiences of researchers, AREC members, and AREC administrators at institutions where ARECs have been established, the findings cannot be generalised without first establishing their applicability to different contexts. Consequently, it is essential to note that the value of this study lies not in its generalisability, but rather in the depth of knowledge and understanding of the phenomenon that has been uncovered.

Also, considering the subjective nature of in-depth interviews, where the quality of collected data depends largely on the researcher's skills and experience, there is the likelihood of several kinds of bias occurring. For instance, the style of questioning adopted by the researcher may have affected the kinds of responses that were provided. Participants may have modified their answers to what they felt would appear more socially acceptable.

As described earlier in Section 4.9 of this thesis, in one of the research-producing organisations, gatekeepers influenced access to participants by selecting study

participants based on the inclusion criteria stated by the researcher. This may have resulted in selection bias, where gatekeepers provided names of stakeholders they were comfortable providing responses in a way that protects the organisation. This may have restricted the diversity of voices in the study. Moreover, the positionality of the researcher may have influenced the interpretation given to the experiences and perspectives shared by study participants. While reflexivity was prioritised, some researcher bias is likely to have occurred throughout the research process. This means that some of the responses and interpretations given to the data may be subjective. This must be taken into consideration in further interpretations and uses of this study's findings.

10.5 Recommendations

Based on the conclusions derived from the study, its contributions, as well as its limitations, the following recommendations are made to address the identified limitations:

10.5.1 Recommendations for future research

A follow-up study to evaluate and validate the proposed conceptual animal research ethics governance framework developed in this study is recommended. The validation must specifically focus on the clarity, specificity, consistency, appropriateness and relevance, comprehensiveness, adaptability, generalisability, practicality and usefulness (van Dyk et al., 2021; Walker & Avant, 2019) of the animal research ethics governance framework. It is further recommended that a follow-up study be conducted with a group of specialists who will be presented with the conceptual animal research ethics governance framework developed in this study for evaluation and validation. These specialists could include specialists in animal ethics and animal welfare advocates, civil society organisations, ethicists, legal experts, governance experts and specialists in conceptual framework development. It is further recommended that the body of experts must be both local (from Ghana) and international. Because the framework was developed for the Ghanaian context, it is recommended that the validation be done first in Ghana, followed by a validation by an international panel of

experts. In addition to fostering a holistic approach to animal research ethics governance that may be applied to a larger African and global context, an evaluation by a group of specialists would help ensure that the conceptual animal research ethics governance framework developed in this study is meaningful and comprehensive.

A quantitative study to assess the level of knowledge, attitudes and practices of researchers, students, staff of research-producing organisations who are involved with scientific studies using animals, heads of research-producing organisations, national policymakers, animal rights activists, civil society organisations and the general public (on the ethical use of animals in scientific studies) is recommended. Considering that this study excluded some of these stakeholders and the research sites were limited, a quantitative survey with a broader set of stakeholders and study sites as a follow-up to this research will be useful in developing strategies for implementing the proposed governance framework. Additionally, the study's findings suggest a low level of knowledge and awareness of animal research ethics in research-producing organisations and among the general public. The proposed study will provide data to explore the extent of the knowledge gap among these key stakeholders to inform how training and awareness-creation modules will be developed to fill the necessary knowledge gaps, and change attitudes and practices with respect to the use of animals in scientific studies. This proposed quantitative study will further test the generalisability of this study's findings.

10.5.2 Recommendations for government and policymakers

The study's findings suggest a lack of national laws governing the ethical use of animals in scientific studies in Ghana and an outdated Criminal Code. It is recommended that the Government of Ghana, through the Ministry of Science, Technology and Innovations, in collaboration with the MoE and the Ministry of Health, lead the development of a national law on the ethical use of animals in scientific studies in Ghana. This process can be facilitated by heads of research-producing organisations through stakeholder meetings, which will also create an opportunity for the findings of this study to be shared with them. National legislation can be developed by adapting existing national laws and legislations from other countries; however, they

must be adapted to the Ghanaian context. A national law on the ethical use of animals will provide a framework for establishing other governance systems, such as the development of national guidelines and policies to oversee the ethical use of animals in scientific studies in Ghana. The development of this law will also create an enabling environment that will facilitate the implementation of the proposed animal research ethics governance framework developed in this study for the promotion of animals' ethical use in research in Ghana. With this law in place, all key stakeholders, particularly researchers, will be more careful and will ensure that animals are used humanely in their scientific studies. Compliance with ethical practices in research-producing organisations and among researchers will be improved. Furthermore, the establishment of this law will add Ghana to the list of countries in Africa with well-established legal frameworks on the ethical use of animals in scientific studies, which will enhance research funding and the credibility of research conducted in Ghana.

Second, this study recommends the review of the Criminal Code (ACT 29) (Parliament of Ghana, 1961) led by the Office of the Attorney General of Ghana. The current criminal code is the only existing law in Ghana that allows people to be prosecuted for allowing animals' unnecessary suffering, but its application to scientific studies is vague, and most of the provisions in this criminal code are outdated. In the absence of a legislation governing the ethical use of animals for scientific purposes in Ghana, this study recommends immediate steps by key stakeholders – particularly civil society organisations interested in animal rights and the humane use of animals, animal rights activists, and heads of research-producing organisations – to initiate the process of engaging the parliament of Ghana and the Office of the Attorney General to review the Criminal Code and add some specificity with respect to offences related to the use of animals in scientific studies. Having more specificity in the Criminal Code will promote adherence to ethical practices by everyone who handles animals, particularly for research purposes, thereby improving the humane use of animals in general and specifically in scientific studies in Ghana.

It is further recommended that the Ghanaian government, led by the Ministry of Science, Technology and Innovation, establish a national animal research ethics governance oversight body to regulate the ethical use of animals in scientific studies

in Ghana. This oversight body must be given the powers to certify all ARECs and monitor ARECs' activities to ensure adherence to national standards for the ethical use of animals in scientific studies. The development of national guidelines for the ethical use of laboratory animals will form part of the responsibilities of the proposed national oversight body. The goal of these guidelines should be to provide precise information and appropriate guidelines that should be adhered to in the use of animals in research-producing organisations in Ghana. Additionally, establishing such a body will facilitate the implementation of the conceptual animal research ethics governance framework developed in this study.

10.5.3 Recommendations for research-producing organisations

As identified in the study's findings, there is a significant knowledge and capacity gap among researchers, staff and students of research-producing organisations who are involved with the use of research animals, with respect to their ethical use. This study therefore recommends that research-producing organisations develop a training and capacity-building plan, and a certification course, for researchers and students who use animals in scientific studies, as well as technicians who assist students and researchers in keeping animals for research purposes. Research-producing institutions must develop mandatory animal research ethics training programmes that focus on ethical research practices using animals, compliance with international, national and institutional regulations and guidelines, and the importance of integrity in research within the Ghanaian context. It is further recommended that all researchers undergo a basic training programme and receive certification as a requirement for review and approval of protocols submitted to the AREC for ethical clearance.

Regular training of institutional ARECs is also recommended to ensure that members of the ARECs have the requisite knowledge and skills to review protocols that aim to use animals in scientific studies. Additionally, AREC administrators must undergo training and regular capacity strengthening to equip them with the requisite knowledge and skills on the administration of ARECs, particularly, on the laws, guidelines and policies governing the use of animals in scientific studies, administrative processes, data management and record-keeping. It is further recommended that AREC

administrators be provided with financial resources to enable them to obtain professional status with the International Professional Recognition Council (IPRC) as professional research administrators or managers (Williamson et al., 2024) responsible for AREC administration. This will enhance their knowledge and confidence to play their roles well, support researchers, and promote the ethical use of research animals in the organisation.

It is recommended that regular workshops and seminars be organised by research-producing organisations to address emerging ethical issues in scientific studies using animals. Organising such workshops and seminars will provide the needed opportunity for participants to discuss and share knowledge and ideas with respect to the ethical use of these animals. The institution of capacity-building initiatives, as recommended, will improve the ethical use of animals in scientific studies in research-producing organisations and enhance the credibility of studies using animals, thereby leading to increased research funding and stakeholder trust in the outcomes of research using animals in Ghana.

The study further recommends that all research-producing organisations in Ghana where research animals are used must establish animal research ethics governance systems and practices, including the establishment of an institutional AREC, institutional animal research ethics policies, guidelines and procedures, as well as an effective monitoring system that will ensure research using animals in such institutions is well-regulated and conducted in a humane manner. This recommendation emanates from the study's findings that suggest an inadequate number of ARECs and institutional policies and guidelines to govern the use of animals in research. The composition of ARECs must align with the recommended AREC membership outlined in this study to ensure that members of the AREC fit the Ghanaian context and align with international guidelines.

Additionally, the institutional policies and guidelines must be adapted from existing ones and contextualised to reflect the Ghanaian cultural beliefs and practices with respect to animals. Furthermore, the developed policies and guidelines must be reviewed regularly and updated to keep pace with evolving ethical considerations in

scientific studies using animals. Implementing this recommendation will ensure a more robust animal research ethics governance system and practices that will ensure animals are used ethically in scientific studies in research-producing organisations in Ghana. This will ultimately protect the animals from inhumane activities in the name of research and enhance the credibility of the research conducted in these settings.

10.6 Novelty of this Study

This study has produced a novel conceptual animal research ethics governance framework for the ethical use of animals in scientific studies in research-producing organisations in Ghana based on its findings. The proposed animal research ethics governance framework is unique because it is the first of its kind to be developed with the Ghanaian cultural context in mind. It is tailored directly to promoting animal research ethics governance within the Ghanaian cultural context and other contexts similar to that of Ghana. The proposed governance framework further provides new insights into proposed frameworks for the ethical use of animals in research.

This study uniquely proposes the 6R principles for the ethical use of animals, which builds on other frameworks developed by researchers, particularly Russel and Burch (1959) and Brink and Lewis (2023), who introduced the 3R principles and the 12Rs framework, respectively. Additionally, the 6R principles uniquely contextualise virtue ethics theory to animal research ethics within the Ghanaian context. Due to its uniqueness and contextualisation to the Ghanaian society, the proposed conceptual animal research ethics governance framework, if implemented, will promote the ethical use of animals in scientific studies in research-producing organisations in Ghana.

10.7 A Reflection on the Doctoral Journey

As this doctoral journey comes to an end, it is imperative to take a moment for introspection on the experiences that have shaped my understanding and experience as a PhD student. As I reflect, the quote that readily comes to mind is that of the Osagyefo Dr Kwame Nkrumah, who said, “At long last, the battle is ended…”. Indeed, this PhD journey was a battle for me; I had to juggle various competing needs at the

same time, including conducting this study, which was very time-consuming, while keeping up with my work and family demands.

My first few days as a PhD student were filled with excitement and anxiety, since I had yearned for this opportunity for several years and yet was not sure what to expect. I vividly remember the words of my supervisor when she said, “Alright Fidelis, now the journey begins …”. I did not understand that the statement was pregnant with a lot of meaning, caution and encouragement. The journey truly began and was not a straight route. I was initially not sure of my ability to go through this entire journey, and so I hesitated in informing friends and family about it. I did not want to be seen as someone who started his PhD and could not complete it, as I had heard several stories about other people who started their PhDs and were either unable to complete it or spent several years on the journey. Considering that I had to combine my PhD journey with a full-time job and family responsibilities, I felt the weight of responsibility and expectations on me, but I was determined to travel this path. Somehow, I was cautiously optimistic that I was going to sail through because I had friends who had also gone through this process, and as someone working in an academic environment, the motivation to complete this journey was even greater.

As the journey started, and after submitting and receiving feedback from my supervisors on my first draft proposal, it quickly dawned on me that I was in for a long haul. The realisation that a lot more was expected of me, and the need to unlearn certain things to be able to learn new things, was evident. It was a revelation that I had a lot more to learn and that the PhD journey was not going to be a smooth and short one, but long and complex, with twists and turns and occasional dead ends. Indeed, there were times I did not know how to proceed with the research, times I had to sit for hours and days thinking through my research without putting a single word on paper. There were times I contemplated discontinuing the whole PhD idea altogether.

Nevertheless, these challenges turned out to be an integral part of my development as an academic. By going through this challenging experience, I was compelled to be more resilient and adaptable to various circumstances. I believe these qualities will remain vital for my academic and research life. It has been a very transformative

experience marked with sustained perseverance, curiosity and self-discovery. It has also taught me the need to have a strong support system as an individual. My supervisors were always ready to support and encourage me during difficult times. The encouragement from my family and friends also served as a motivation, and the thought of disappointing them urged me on.

The PhD journey has evolved for me. I initially viewed it as a set of credentials that required reading and reproducing what was read in one's own words, but I quickly came to understand that the PhD journey is an ongoing process of apprenticeship and mentoring where you dispose yourself to acquire knowledge and skills from your supervisors and other scholars on how to conduct research and contribute to the body of knowledge in your field. Knowing how much I still have to learn and the amount of responsibility I have to ensure that I use the knowledge gained from this PhD for the public good has fostered a sense of humility in me.

To conclude, this has been a transformative experience. The journey has shaped more than my research competence; it has reshaped my identity as an individual and as a scholar. I now have a deeper understanding of how complex knowledge production is and the need to be committed to one's field with integrity and rigour. I carry with me the invaluable lessons learnt and experiences gained during this doctoral journey as I progress with my academic endeavours. I am grateful for the challenges, the growth and the privilege to join the community of scholars.

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APPENDICES[1]

Appendix 4.1: Ethical Clearance Certificates

UNISA university of south africa

UNISA-CAES HEALTH RESEARCH ETHICS COMMITTEE

Date: 13/02/2022

Dear Mr Anumu

NHREC Registration # : REC-170616-051
REC Reference # : 2022/CAES_HREC/038
Name : Mr FEY Anumu
Student #: 69971048

Decision: Ethics Approval from 10/02/2022 to 31/01/2027

Researcher(s): Mr FEY Anumu
[redacted]

Supervisor (s): Dr R Visagie
visagrg@unisa.ac.za; 012-429-2478
[redacted]
Prof EL Kempen
kempeel@unisa.ac.za; 011-471-2241
[redacted]

Working title of research:

Ethical use of animals in scientific studies in Ghana: Proposing a research ethics governance framework

Qualification: PhD Agriculture

Thank you for the application for research ethics clearance by the Unisa-CAES Health Research Ethics Committee for the above mentioned research. Ethics approval is granted for five years, **subject to submission of yearly progress reports. Failure to submit the progress report will lead to withdrawal of the ethics clearance until the report has been submitted.**

The researcher is cautioned to adhere to the Unisa protocols for research during Covid-19.

Due date for progress report: 31 January 2023

The progress report is available on the college ethics webpage: https://w2.unisa.ac.za/www.unisa.ac.za/sites/corporate/default/Colleges/Agriculture-%26-Environmental-Sciences/Research/Research-Ethics.html

University of South Africa
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[1]Original copies of the ethics clearance certificates and gatekeeper permissions (without the redactions) can be made available for audit purposes, if needed.

*The **low risk application** was **reviewed** by the UNISA-CAES Health Research Ethics Committee on 10 February 2022 in compliance with the Unisa Policy on Research Ethics and the Standard Operating Procedure on Research Ethics Risk Assessment.*

The proposed research may now commence with the provisions that:

1. The researcher will ensure that the research project adheres to the relevant guidelines set out in the Unisa Covid-19 position statement on research ethics attached.
2. The researcher(s) will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.
3. Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study should be communicated in writing to the Committee.
4. The researcher(s) will conduct the study according to the methods and procedures set out in the approved application.
5. Any changes that can affect the study-related risks for the research participants, particularly in terms of assurances made with regards to the protection of participants' privacy and the confidentiality of the data, should be reported to the Committee in writing, accompanied by a progress report.
6. The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the specific field of study. Adherence to the following South African legislation is important, if applicable: Protection of Personal Information Act, no 4 of 2013; Children's act no 38 of 2005 and the National Health Act, no 61 of 2003.
7. Only de-identified research data may be used for secondary research purposes in future on condition that the research objectives are similar to those of the original research. Secondary use of identifiable human research data require additional ethics clearance.
8. No field work activities may continue after the expiry date. Submission of a completed research ethics progress report will constitute an application for renewal of Ethics Research Committee approval.

Note:
*The reference number **2022/CAES_HREC/038** should be clearly indicated on all forms of communication with the intended research participants, as well as with the Committee.*

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Yours sincerely,

[redacted]

[redacted]

Chair of UNISA-CAES Health REC

[redacted]

[redacted]

Executive Dean : CAES

[redacted]

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UNIVERSITY OF HEALTH AND ALLIED SCIENCES
Institute of Health Research

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RESEARCH ETHICS COMMITTEE

PMB 31
Ho Volta Region
Ghana

email: rec@uhas.edu.gh

My Ref: **UHAS-REC A.1 [153] 22-23**

24th October, 2022

ETHICAL CLEARANCE CERTIFICATE

The Research Ethics Committee of the University of Health and Allied Sciences reviewed and unanimously approved your research proposal on agenda **for Initial Submission** at its full board meeting held on 22nd September, 2022 subject to the conditions provided below.

Protocol Identification Number:	**UHAS-REC A.1 [153] 22-23**
TITLE OF PROTOCOL:	**"Ethical use of animals in Scientific Studies in Ghana: Proposing a Research Ethics Governance Framework."**
PRINCIPAL INVESTIGATOR:	**Fidelis E.Y. Anumu**
REPORTING:	This approval requires that you submit six-monthly review reports of the protocol to the Committee and a final full review to the Research Ethics Committee at the completion of the study. You are required to report all serious adverse events related to this study to the Committee within seven (7) days verbally and fourteen (14) days in writing.
MONITORING:	The Committee may observe, or cause to be observed, procedures and records of the study during and after implementation.
MODIFICATION:	Please note that any significant modification of this project must be submitted to the Committee for review and approval before its implementation.
PUBLICATION:	As part of the review process, it is the Committee's duty to review the ethical aspects of any manuscript that may be produced from this study. You will therefore be required to furnish the Committee with any manuscript for publication.
EXPIRY DATE:	**This ethical clearance is valid till 23rd October, 2023.**

Please always quote the protocol identification number in all future correspondence in relation to this protocol.

[redacted]

CHAIRPERSON, RESEARCH ETHICS COMMITTEE

Cc: Director, IHR

Appendix 4.2: Sample Permission Letter to Institutions Requesting Permission to Conduct Study

Fidelis E. Y. Anumu
[redacted]

28th July, 2022.

The Coordinator
[redacted]
Head office, Accra

Dear Sir,

REQUEST FOR PERMISSION TO COLLECT DATA

I am a PhD student at the University of South Africa (UNISA). I am conducting a study titled, ***"Ethical use of animals in scientific studies in Ghana: Proposing a research ethics governance framework"***. The aim of the study is to generate a deeper understanding of existing animal research ethics governance systems and practices in Ghana. This will enable me to generate a proposed animal research ethics governance framework that promotes the ethical use of animals in scientific studies in Ghana.

This is a qualitative study and I intend to interview five people from your institution as follows:

- Two (2) researchers who use animals in their research and have experience submitting their protocols to the Animal Research Ethics Committee
- Two (2) members of the Animal Research Ethics Committee and
- The Animal Research Ethics Committee Administrator

I have obtained ethical clearance from the UNISA – College of Agriculture and Environmental Sciences Health Research Ethics Committee for the conduct of this study. I should be very grateful if you could permit me to access individuals from your institution as stated above.

Please see attached, ethical clearance certificate for your kind perusal.

Thank you.

Yours sincerely,

[redacted]
Fidelis E. Y. Anumu

Appendix 4.3: Sample Institutional Permission Letter Granting Permission for Conduct of the Study

[redacted]

[redacted]
ACCRA
GHANA
WEST - AFRICA
[redacted]

TEL: [redacted]
FAX:
E-MAIL:
WEBSITE:

Our Ref:.....

16th December 2022
Date:.....

Fidelis E. Y. Anumu

Institute of Health Research

University of Health and Allied Sciences

PMB 31, Ho

Dear Sir,

RE: REQUEST FOR PERMISSION TO COLLECT DATA

I write with reference to your letter dated 28th July 2022 requesting for permission to interview our board members on the topic ***"Ethical use of animals in scientific studies in Ghana: Proposing a research ethics governance framework"***.

The board have considered and granted permission to you to carry out the data collection with our board members. Below are the details of two (2) members of the Animal Research Ethics Committee and the Animal Research Ethics Committee Administrator

1. [redacted]
2.
3.

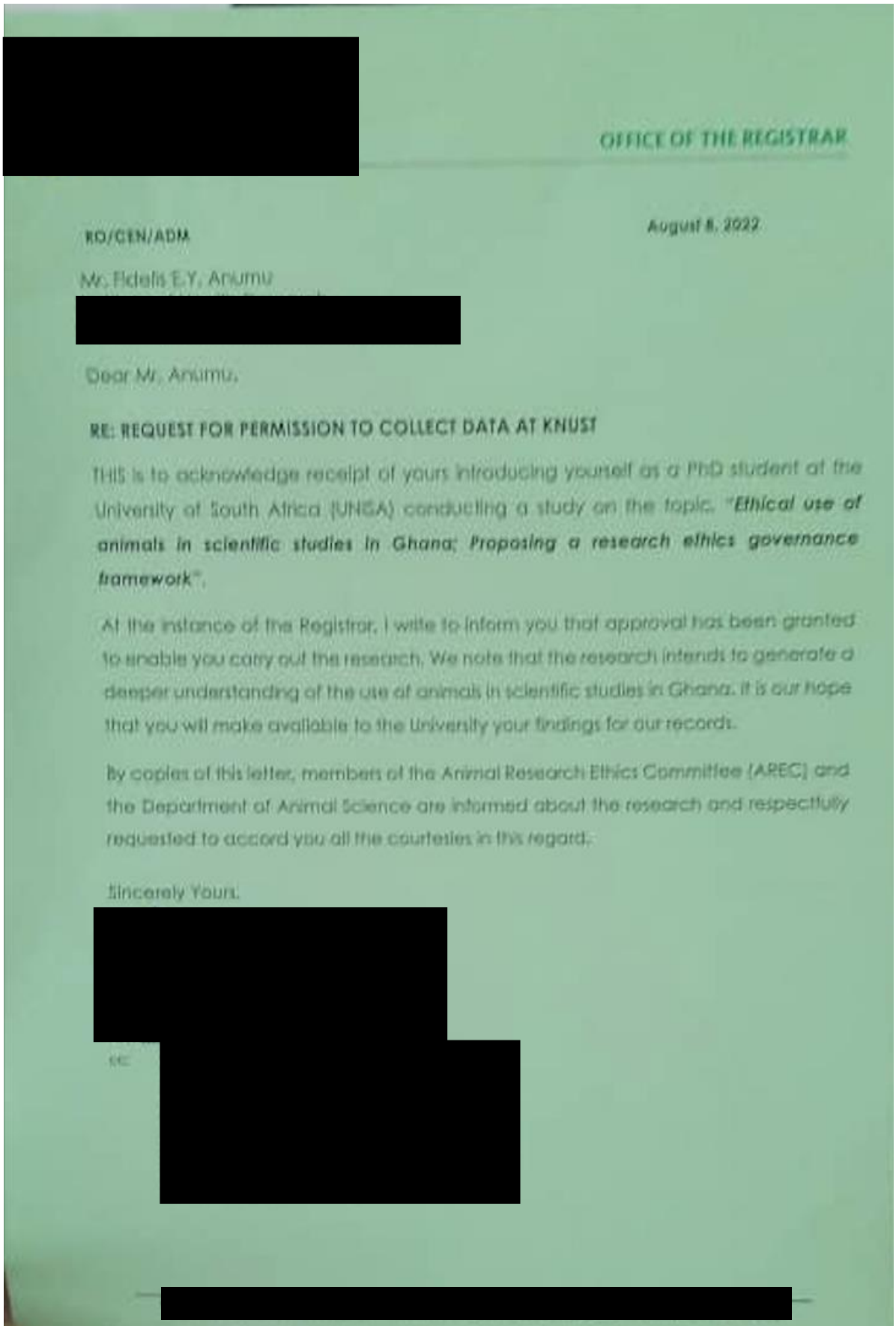
The proposed researchers for the study are;

[redacted]

Thank you for contacting the [redacted]

Yours faithfully

[redacted]



[redacted]

OFFICE OF THE REGISTRAR

RO/GEN/ADM

August 8, 2022

Mr. Fidelis E.Y. Anumu

[redacted]

Dear Mr. Anumu,

RE: REQUEST FOR PERMISSION TO COLLECT DATA AT KNUST

THIS is to acknowledge receipt of yours introducing yourself as a PhD student at the University of South Africa (UNISA) conducting a study on the topic, "***Ethical use of animals in scientific studies in Ghana; Proposing a research ethics governance framework***".

At the instance of the Registrar, I write to inform you that approval has been granted to enable you carry out the research. We note that the research intends to generate a deeper understanding of the use of animals in scientific studies in Ghana. It is our hope that you will make available to the University your findings for our records.

By copies of this letter, members of the Animal Research Ethics Committee (AREC) and the Department of Animal Science are informed about the research and respectfully requested to accord you all the courtesies in this regard.

Sincerely Yours,

[redacted]

cc:

[redacted]

[redacted]

Appendix 4.4: Sample Email to Participants

From: Fidelis Anumu <fanumu@uhas.edu.gh>
Date: Thursday, 22 December 2022 at 11:18 AM
To: sylviaafriyie.squire@gmail.com <sylviaafriyie.squire@gmail.com>
Subject: Interview Guide - Ethical Use of Animals

Dear Dr. Squire,

My name is Fidelis Anumu, a staff of the University of Health and Allied Sciences and a PhD student at the University of South Africa. My PhD study is on the *"Ethical Use of Animals for Scientific Studies: Proposing a Research Ethics Governance Framework".*

As part of the study, I intend to interview some researchers who use animals for research. I sent a request to the CSIR Headquarters and was given your name and email address to contact you (please see letter attached).

I should be very grateful if you could please help me by responding to the interview guide attached. I kindly need you to answer the questions and then I will interview you (using the same guide) to get a deeper understanding of your answers.

Please also see attached, the information sheet and consent form for your review and consent.

Thank you very much in anticipation of a prompt response to my request.

Fidelis Anumu.

Best regards

Appendix 4.5: Semi-structured Interview Guide

ETHICAL USE OF ANIMALS IN SCIENTIFIC STUDIES IN GHANA: PROPOSING A RESEARCH ETHICS GOVERNANCE FRAMEWORK

Interview Guide

Please provide answers to the following questions. Answers can be provided on this sheet.

Section A: Warm Up/Introductory Questions

1. Please provide me with a brief overview of your involvement in animal research?
2. Could you please tell me how familiar you are with animal Research Ethics?

SECTION B: Understanding of the concept 'Animal Research Ethics Governance'

As you know, it is important that research involving the use of animals meet certain requirements. The focus of this research, as explained in the informed consent documentation is to generate a deeper understanding of existing animal research ethics governance systems and practices to generate an animal research ethics governance framework. Governance generally focuses on setting standards, procedures, and processes to oversee the control and direction of something.

3. How do you understand the term 'Animal Research Ethics Governance'?
   (a) How do you think the ethical use of animals in scientific studies are currently governed in Ghana? (b) In your institution?

SECTION C: Experiences of existing research ethics governance systems that promote the ethical use of animals in scientific studies

4. According to you, which governance systems promote the ethical use of animals in scientific studies?
5. What has been your experience with the existing animal research ethics governance systems to promote the ethical use of animals in scientific studies?

SECTION D: Experiences of existing research ethics governance practices that promote the ethical use of animals in laboratory studies in Ghana

6. According to you, which research ethics governance practices promote the ethical use of animals in scientific studies?

7. What has been your experience with the existing research ethics governance practices in place in your institution to promote the ethical use of animals in scientific studies?

SECTION E: Suggestions to promote the ethical use of animals in scientific studies in Ghana.

8. (a) How do you think the ethical use of animals in scientific studies can be promoted in Ghana? (b) In your institution?
9. What do you think an animal research ethics governance framework to promote the ethical use of animals should include or address?

Appendix 4.6: Sample Naïve Sketch

ETHICAL USE OF ANIMALS IN SCIENTIFIC STUDIES IN GHANA: PROPOSING A RESEARCH ETHICS GOVERNANCE FRAMEWORK

Interview Guide

Please provide answers to the following questions. Answers can be provided on this sheet.

Section A: Warm Up/Introductory Questions

1. Please provide me with a brief overview of your involvement in animal research?

I am a neuropharmacologist who uses animals in drug discovery research. Most of my research involves animal behaviour measurements following the introduction of a drug/plant extract. I supervise the oral, subcutaneous, and intraperitoneal administrations of drug/extracts to experimental animals.

2. Could you please tell me how familiar you are with animal Research Ethics?

As a scientist, I know from my training and experience that "bad ethics is bad science" and as such I always apply for research ethics approval for all my research studies. I have submitted several ethic applications to Research Ethics Committees and I do my research after approval of such applications. I have also been a member of the [redacted] Institutional Animal Care and Use Committee [redacted] since its inception in to date. As I member, I have reviewed a lot of applications to the committee.

SECTION B: Understanding of the concept 'Animal Research Ethics Governance'

As you know, it is important that research involving the use of animals meet certain requirements. The focus of this research, as explained in the informed consent documentation is to generate a deeper understanding of existing animal research ethics governance systems and practices to generate an animal research ethics governance framework. Governance generally focuses on setting standards, procedures, and processes to oversee the control and direction of something.

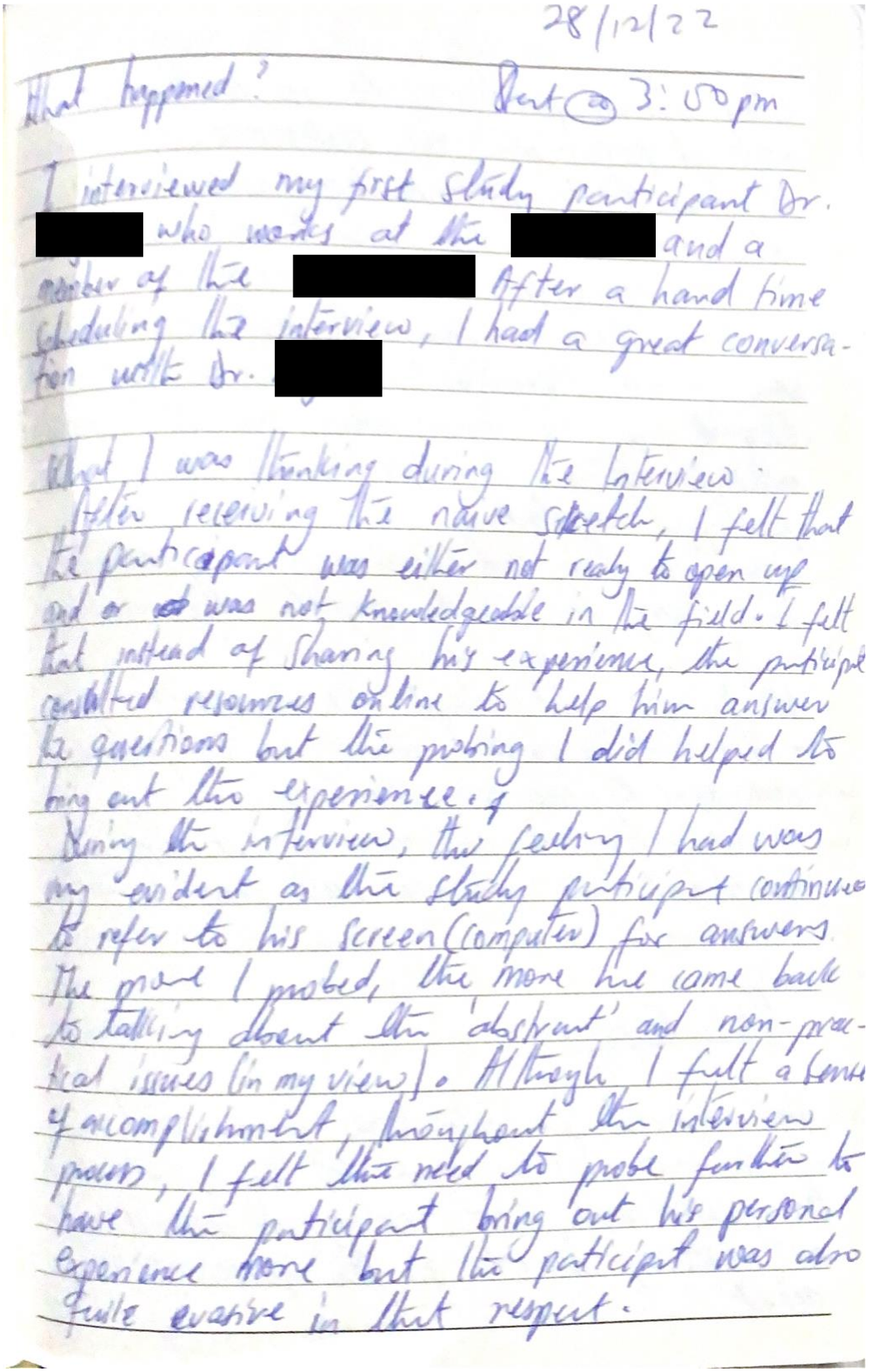
3. How do you understand the term 'Animal Research Ethics Governance'?

I understand the term "Animal Research Ethics Governance" as the procedures or processes or persons directing or controlling how animal research ethics are done. I see it also in terms of legislative instruments empowering or safeguarding the officials involved in animal research ethics.

4. (a) How do you think the ethical use of animals in scientific studies are currently governed in Ghana? (b) In your institution?

In Ghana, I do not know any specific Act of Parliament about animal research ethics and governance, from which institutions will formulate their own guidelines or frameworks. In the University of Ghana, there is a structured governance system for animal research ethics with the establishment of the [redacted] Institutional Animal Care and Use Committee [redacted]. The [redacted] has a research ethics policy. In

Appendix 4.7: Sample Reflective Diary



28/12/22

What happened? Start @ 3:50pm

I interviewed my first study participant Dr. [redacted] who works at the [redacted] and a member of the [redacted] After a hard time scheduling the interview, I had a great conversation with Dr. [redacted]

What I was thinking during the interview:
After receiving the naive sketch, I felt that the participant was either not ready to open up and or was not knowledgeable in the field. I felt that instead of sharing his experience, the participant consulted resources online to help him answer the questions but the probing I did helped to bring out the experience.
During the interview, the feeling I had was my evident as the study participant continued to refer to his screen (computer) for answers. The more I probed, the more he came back to talking about the 'abstract' and non-practical issues (in my view). Although I felt a sense of accomplishment throughout the interview process, I felt the need to probe further to have the participant bring out his personal experience more but the participant was also quite evasive in that respect.

The study participants in most cases did not differentiate his experience as a member of the AREC from his experience as a researcher who uses animals for research and also the one managing an animal experimentation facility. I had to keep clarifying to get a sense of who he was referring to when he said 'we'. Overall, I feel happy about this first interview although at a point during the interview, the participant received a call and had someone wait for him and so looked like he was in a hurry for us to complete the interview.

What was good about the experience
- We had a cordial discussion. The participant was open to answering questions.
- The participant was available at the scheduled time and was well prepared for the interview.

Bad Experience

Having seen the interview guide and remembering his answers to the questions, the participant kept moving all around and not focusing directly on the questions being asked.

What I make of the Situation

It is a good start, pertinent issues emerged from the interview. The interview brought out more issues which were not stated in the naive sketch. I need to find a way of controlling or guiding participants to they stay focused on the question and not move to other questions before they are asked. In doing this, I also have to be careful to allow them to flow.

What else ~~~~ could have been done / what could have been done differently.

I should have indicated to the participant that I may contact him again if I need any clarification or additional information.

I wish I asked the participant to move away from the desk and not refer to the internet during the discussion so that we discuss his experience and not what is online. I will try this in the next interviews if I face the same challenge.

In the introduction, I have to make it clear that I am not assessing their level of knowledge but want to understand their experiences with the governance system and so they do not need to refer to other resources

~~ended~~ @ 3:38pm.

Appendix 4:8: Sample Interview Transcript

INTERVIEW WITH PARTICIPANT AREC 3

DATE: 31ST MARCH, 2023

DURATION: 38:33 Minutes

I: Alright thank you very much for your time and accepting to be part of this study erm, so this is the study looking at the ethical use of animals for scientific studies in Ghana. At the end of the day we want to propose a governance framework for the use of animals in animals, erm in Ghana for scientific studies. Erm to start if you can please tell me in brief about yourself, your involvement with animal studies so far.

R: Yeah thank you very much erm I am basically I'm an animal scientist erm not too sure how long I have been an animal scientist (laughs) but erm since my undergraduate I added zoology, moved on to applied animal science, then finally to animal science. I've worked in the animal production area for all of my life until I've come on retirement. So, yeah erm I will say that I am an animal person. Thanks

I: Erm so you are a member of the animal research ethics committee

R: It is rather the CSIR (Council for Scientific and Industrial Research) Institutional IRB/IACUC yes.

I: Oh so it is the same committee they do both human and animal study review?

R: Yes, when protocols come for erm animal use then those of us responsible or with backgrounds in animal use, the protocols are referred to us. Yes.

I: Okay so, in term of the experience on the committee how long has it been?

R: No, I started with them erm I am not too historic so this you can't get me (laughs). So, I started right at the inception of the committee and I've been on it.

I: So at least it has been more than 10 years?

R: If the committee is over 10 years then (laughs). Sometimes I can't even remember my date of birth (laughs)

I: So how familiar are you with animal research ethics, ethics of the use of animals

R: As I said I have been a member of the IACUC right and so, I should say that I am quite familiar I wouldn't say that I am very familiar but quite familiar. As to the level to where we have moved or to the best of our knowledge, yes I would say that I am quite familiar with animal use ethics.

I: So, this study is on governance of the use of animals. As you know it is very important that when we are using animals, we need to meet certain requirements, certain standards erm so,

the focus of this study is to see what is existing within the governance in the system and to have a deeper understanding of your experiences as a member of the animal ethics committee. So, how do you, understand the term animal research ethics governance.

R: Yh until, until you brought it up it was new to me, yes erm we've always done things according to erm, fortunately and unfortunately for me, I am not the one responsible for the management aspect of the committee and so, I've worked based on how far I've been given protocols and what should be done. Governance in this case is a new concept to me not too sure what it entails and how my work fits into it.

I: So not really about the work at this point but your understanding. Your layman's understanding of

R: Well of course, the layman's understanding of governance will be how structured, who overseas what, in terms of animal use and who is making sure that whatever is agreed upon is in place. Erm that is what I will say my understanding will be like.

I: So, in looking at the governance like what you have just explained, putting things in place making sure things are done right in terms of the use of animals within the country currently what would you say is currently happening when it comes to the governance?

R: Now it's a much more of a voluntary thing that as people submit the IACUC,

I: So at this point we want to look at the national one before we come to the institutional one

R: Nationally, I don't see anything in existence. I don't see that there is policing of animal use as I know elsewhere. I have had the opportunity of working in the US with animals even New Zealand with animals and over there, there are strict adherence to rules such that if you were using animals unethically, they can come and stop your work. Here, nobody is policing anything and so, just this morning I was telling one of my colleagues that we did some work on grasscutters and later on we saw that we were really punishing the animals (laughs) ignorantly. Nobody told us anything, right, and so, looking at the different jurisdictions I've worked in I will say there is nothing at all.

I: So, within the institution?

R: Within the institution, not until this committee was setup, nobody required us to do anything so a lot of my work that was done using animals here was done without any ethical clearance. I just did things the way I know how and even now it is still voluntary. Nobody is requiring that, no, you can't do this with animals by using them. You choose to submit yourself to it. And IACUC will now come in and direct you. Mm governance here is very rudimentary.

I: So, from the discussion, apart from the IACUC is there any other governance system within the institution?

R: No, no, I co-incidentally, I served as the director before I left and so erm if there is anything I would have known but there was nothing erm all we did was because the IACUC was there you try and bring your work to the IACUC and as I said it is voluntary and you chose to. If you wanted to publish and the people required it then you were caught up. If they didn't require it then you pass. And erm a lot of the work we did actually passe, I don't know for now, passed

through the publications without going through ethics until one paper that I wanted to publish and then the journal said where is the ethical clearance? That is when stars began to fly in my eyes. (laughs). In fact it was around the same time I became a member of this committee yes.

I: So, erm with governance, it means like you rightly said putting some systems in place erm to help ensure that the right thing is done ethically. So, in your view, which systems promote the use of animals ethically?

R: Erm systems in term s of structures here or?

I: Yes

R: As I said at the moment I don't see much. You see laboratory science, the reasons behind this is that laboratory science is very weak here. That is the first thing. And because laboratory science is weak that has not necessitated a lot of strict adherence to ethics. Of course, field work using animals is also there and so a lot of the procedures that we do, in fact erm we where I was working in New Zealand, we did procedures like fistulation, even we did oesophageal fistulation and you could see the things we took the animals through. Over there we sought ethical clearance to be able to fistulate the animals. Here, no body would've, we did, we tried some here as well. We did erm ruminant erm ruminant fistulation and nobody required us to come for ethical clearance. You see, so, if you ask what sort of systems exist I will say that no I don't see systems existing here. We may need to put in place systems right. We may need to say that erm for every institution that uses animals, you have to have an IACUC in place erm you have to submit to ABCD procedures before you are allowed to use your animal and there should be a body to policing whatever we have said we would be put in place. If we do not have those structures, then it will be same business as usual.

I: Is there any other, in terms of recommendation when it comes to the systems? You mentioned institutions should have the IACUC in place, is there any other thing that came to mind?

R: Oh, I think that there should be law, you know there should be a law that requires us to do that. Without these laws, what are we working up to. So, and the body to do that will be parliament. Parliament should put in place the legislation to say that erm if you deal with animals, then ABCD and sometimes this lobbyists erm how do you call them animal ethics people you know

I: Civil society organizations?

R: Yes yeah yeah, Civil society organizations they do that. They are very good at policing

I: Yes

R: No, I mean in New Zealand they were the people who will come and throw you off

I: Animal right activists (Laughs)?

R: That is animal rights. Hey, they will come. One PhD student, his sheep, they went and left the sheep, and let the sheep go. Before he got his experiment they had left. You know, so you should have animal rights people here, they should have legislation and they should have the institutional committees overseeing all these. If not, things will be as usual.

I: Okay thank you. So we have we have systems and practices. So the systems are the things we've talked about. The practices are the day-to-day stuff that go on particularly within the institution just to ensure that things are done right. Do you have any experience on some of these practices?

R: Mm no because I did not do much, in fact my work in these areas did not really, well, maybe I should say the work that we did in the US they, before we the experiments done, we had the committee members come to us and give us what we should do and what we should not do. And where we were working with the animals, over there we were looking at harvesting embryos, harvesting erm ova and all those things. They stood by us (laughs) yes somebody was in the lab

I: A member of the ethics committee?

R: Yes, he was in the lab to oversee what we were doing, you know. So, if you were mishandling the animal, they will say that no don't do it this way, do it that way. We were students and of course we were researchers as well. It was a six weeks course but before they are allowed to have that kind of training, they made sure that a member was there to guide how we were handling the animal, how we were managing all those animals. She was right there in the lab with us

I: But has that been your experience here in Ghana?

R: No (laughs) not at all. Who cares?

I: So, in terms of practices you don't really see or what will you say about it?

R: Oh no it hasn't started. Well yes, we haven't started at all. If I look at my experience in the US in handling of lab, as I said laboratory work here is poor. It is very poor. I mean if you want to look at laboratory mice, breeds, species you want erm where do you go? Who are the breeders? They are not there. So you do whatever you think it is right. You know, maybe if you went to Mampong or you went to Noguchi (Noguchi Memorial Institute for Medical Research). Noguchi has a well-structured lab. P3 lab over there and with all those animals over there. Maybe they may have certain practices that may help. Of course I've been to their lab before, before you enter their lab. And I will not say they are specifically around animal use. But their practices form the general laboratory. All right, the animal use aspect will be something else I don't know what they do.

I: Yes. So, with what you have just explained, the question that comes to mind is so what is the ethics committee, the IACUC doing?

R: Yes, so what have to do is to try and reach out to institutions and create that awareness. I am aware of some awareness creation seminar that was organized some time back. The frequency is another thing because of maybe errrrm ….

I: Resources?

R: Yes resources. And I think one thing that can also be done is not just awareness, is to help the institutions put in place these measures. Identify the areas where animals are used. Animal

research the universities, the animal science departments , the biology departments they will all use animals and these are centres they should reach out to. And especially with the students. First year students if for nothing at all should be brought on board right from the beginning and post graduate students before they touch animals for their work must be made to go through ethical erm they should have a course. Elsewhere I know before you touch your animal, before you start your work, you go through certification. That is the word

I: The word that you wanted to use ….

R: Yes. You go through certification. You should be, you should have passed your certification before you start your work. So, these are some of the things that ……

I: And that is not happening?

R: No no no no it hasn't started at all. You see, the whole thing must start with the law. The legislation. When there is a legislation then everybody will be forced to work to meeting the requirement of the legislation. Then the other thing is the pressure group erm animal right people. If the animal rights people come in, erm yes they may keep raising awareness erm don't ask me whether it can exist here. The way you like killing all kinds of animals. (laughs) we are killing animals everywhere. You know, I had an interesting experience. I was on the farm with my brother and he said a chameleon has bitten him. I said no, chameleons don't bite (laughs) you know, I have to calm him down or else he was going to kill the chameleon. You know chameleons don't bite. So, there is nothing like a chameleon has bitten me. You see, so we have to understand animals. All they do and what they don't do, their importance to us. We don't seem to care. even animals on the IUCN (International Union for Conservation of Nature) red list are killed and nobody cares. They kill them and display them by the road side. Everybody is passing and the police are passing and the game and wildlife people are passing and they are even selling those animals to them.

I: They are buying some

R: Yes (laughs), You see, people are killing them and you will be surprised game and wildlife officers are even buying them. So, nobody, nobody is looking at animal use for laboratory work at all. Maybe your work should bring about that kind of awareness. Whether you can get, rally people around.

I: That is what I am hoping to do. Because my little reading I've done is that like you just said it doesn't exist in Ghana. I mean look at the number of institutions and people doing this small small animal research and within the whole country there are only three ethics committees that look at animal

R: Mm

I: Ahaa KNUST, Legon and CSIR

R: And for me even these are voluntary

I: Exactly (laugh)

R: You know they are voluntary

I: Yh

R: They tell you come, come and, they they coax people to come because of publication

I: Yes, yes

R: Not because of the interest in the animal. There are differences here so we have to make people to know that no I am doing it because of the animal. Not because of erm ….

I: You know, I think you mentioned a very important point. It's it's, the driving force is publication and not so much about welfare of the animal per say

R: No no look at animal college that is the worst form of mistreatment of animals here not even for the lab work. Animal college in Ghana is horrible. It is horrible. You see I worked with animals in New Zealand and the college facilities and all those things … my goodness, it's tops. Here, no, animal college is one of the poorest that you have. The animals are suffering even up to the point of slaughter. Nobody cares.

I: I am not surprised you are mentioning New Zealand because in my readings it is one of the countries that I noticed New Zealand, Australia, America that have very strict erm ….

R: They have high experienced growth New Zealand and the US. Yes high experienced growth. I was in New Zealand for my masters' and in the US during my PHD, of course I didn't do the whole program over there but I had study visits to equip myself with a number of the techniques. Yes. And as I said, using the animals, somebody was standing right in the lab. Right in the lab with us so, how do you go wrong?

I: After going through certification and everything there is someone in the lab?

R: Yes someone is …

I: Here there is no system like that for certification and you just do…. So, these are

R: Yes

I: Hmm. So looking at all these, how do you think the ethical use of animals can be promoted in Ghana?

R: Well, the first thing is the awareness. We need a lot of awareness creation. Yes, and if we get a lot more people erm raising the awareness that animals also have self-right. Erm then people's attention will be drawn towards it. You're going to have a daunting task …

I: Hm …

R: Yes of course, you're going to have a daunting task. You know when I was the director of the animal research institute there were encroachers on our land and I was trying to stop them somebody held my neck and said that…, do you speak some twi?

I: Yes I do

R: "Wo wa gyimi paaa, wo kor school mboa sem nkoaa na wo sua ye. Wo kor school mboa nsem nkoa na ewor wu trimu, na mboa asem na do di no, wa gyimii (when you went to school all you studies was about animals and that is all you have in your head. You are behaving like an animal. You are a fool) (Laughs)

I: Yes, yes

R: When we are thinking about human beings you are thinking of animals, where animals will sleep. What sort of person are you.

I: So, it tells you the mentality

R: What sort of person are you err. So, you went to school all this while to try and throw people out of their homes because of animals?

I: Yeah yeah

R: What sort of thing is in your head?

I: Yeah

R: Right. So, (laughs) that is the reality, that is the reality. And we are here hitting and killing animals, you know.

I: so, for the sensitization and with your experience how and who do you think can do it to make it effective?

R: Erm how and who? It should start with institutions, individuals within the institution. Now that we have had fortunately for us three IACUCs erm with these three IACUCs, somebody should rally them around and let them understand that it is, it goes beyond the committee, it goes beyond seeking publication to the extent of making sure that the animals are not mistreated not necessarily in the use for research because researchers can be horrible. No no, we can do all kinds of things to animals and you know, I had an experience in the US that we were looking at embryonic stem cells, human embryonic stem cells and as I said the other day I was offered a whole lab. It could have been a center. An internationally recognized centre. That was the time when the Korean guy that forged data bla bla was caught. So, they wanted an alternative to, so, I would've been at that level. I said I can't cope with that but I am very comfortable with doing animal embryonic stem cells. You see? do you get the difference?

I: Yes I am getting, yes (laughs)

R: And look I was just doing it

I: Exactly

R: Without any

I: Stress

R: No, no, no, no. like human I can't bring myself to doing that

I: Yeah

R: And I've cut animals several times, I sutured them several times, pushed things into them several times, nothing it doesn't …..

I: Alright

R: Right from the sixth form, you know right from the sixth form, I, from school I'll buy my own guinea pigs and open them up for all kinds of things without any guidance

I: (laughs) wow

R: I buy my own guinea pigs open them up and try to look at all the parts. Try to do all kind of things with the animal. Look at that and how many people are like me doing all kinds of things? Nobody told me those days about …..

I: No ethical? Humane use?

R: No no no no.

I: So apart from the sensitization is there any other thing that we can do nationally

R: No no I have told you about the legislation

I: Yes the legislation

R: And then try to get the animal ethics, animal right people. these are the three things that I will suggest.

I: Okay. Within the institution what can be done? Institutional level?

R: The institutional level on the micro scale, sensitization and making sure that the IACUCs are established at the institutional level. It becomes critical here if the institution are doing themselves then it will go up to the national level.

I: Okay what is your view about not legislating at that national level but maybe policy guidelines SOPs at the institutional level?

R: Why will they do that? You get it?

I: Okay

R: Human beings by nature are not law abiding. We don't submit ourselves to doing what I right. Something must push us to doing what is right. The SOPs and all those things are fine. It is the same thing. It is a motivation for publications as I said

I: Hahahahaha…I like that point. Hahahahah

R: I like publishing, I like it so much. And so, anything I will do to get my paper published, I would want to do it. And if they say pass it through ethics, then I will go. After that, what else? So, if I'm not looking beyond publishing, what else? And of course, over here, certain procedures, serious procedures may not be going on that infringes so heavily on … because of the weakness in laboratory science. Drug testing is not prevalent here where they are applying creams that are burning the skin of animals before it comes into the lab. Yes, we are not seeing that here. Errm, where they are pushing dosages that will just throw the animal off. You know, errmm, I never knew, I never knew that some of the treatment for err errrh artificial reproductive technology are painful. But interferon-tor is very painful. When they inject the animal, you will be…wow! It will be …., just mucous will be coming out of it. And we wanted to push a tube through the oesophagus of a sheep to the rumen. I couldn't believe what human beings are doing to do to the animals. They force the animal to swallow this stuff, push it down down down. Of course, because of the ethical issues, you don't use too many of them. Errm, you make sure that errmm…lubrication is there and doing it a bit more gently. But the animal was bleeding. I don't know what happens in a human when they are doing ermm laparoscopy and all that. I don't know.

I: I've not heard about profuse bleeding and all that.

R: Ermm, well, it wasn't profuse bleeding but they were scars. I don't know, but for the animals, we just did it.

I: I'm sure after that, you just left the animal, or you did some …..

R: Oh no, we managed it.

I: Hahahah…Huhhhuh…you've done a lot

R: Ya ha mboa no (we have really worried the animals)

I: Hahahaha

R: We will be here and they will start chasing us.

I: Hahahah

R: Yeah, they will start chasing us.

I: Hahah, ok, errr finally, if looking at what I want to do, developing a framework, like governance framework, what would you suggest? What will be your recommendation of something that it should contain?

R: Yeah, for the time being, maybe you have to get errh, this policy frameworks to be set up within the institutions, and you have to more of sensitizing them to do this kind of things, you have to look at SOPs, you have to look at, is there even the possibility of getting the vice chancellors committee will say that because these are the institutions normally, we use them. We don't have private laboratories here. So, when they are doing that, then the vice chancellors committee will begin to accept that these things must be set up within our institutions maybe maybe we may be getting something.

I: That, that is within the University.

R: Yes

I: But other institutions?

R: No, you see, when it starts within the University, it is the start. When you get them to accept it, you can easily move to the others like the CSIR, Ghana Health Service Research Institutes, and other research institutions. I'm sure Noguchi will have something. If they don't have, you could get there to try to see what they do.

I: Alright, thank you very much.

R: I hope I have helpful to you.

I: Very very very very very helpful. I got a lot of information. Huhhuhuhuha

R: I've not wasted your time.

I: Nooo, thank you very much.

Appendix 5.1: The Thematic Analysis Findings on Researchers, AREC Members and AREC Administrators' Understanding of Animal Research Ethics Governance from Case 1

OBJECTIVE 1: To explore and describe Researchers, AREC Members, and AREC Administrators' understanding of the concept 'animal research ethics governance' AREC 1									
Objective	**Main Themes**	**Sub-Themes**	**Codes**	**Participants Labels**					
				#R1	**#R2**	**#M1**	**#M2**	**#A1**
Researchers, AREC members and AREC Administrators' understanding of Animal Research Ethics Governance	A body that develops policies and guidelines for ethical conduct of research	Policies and guidelines for the ethical conduct of research	*Animal ethics policy*				x	x
			Guide on how animal research is conducted					x
			Guidelines for working with animals		x			
			Provision of guidelines			x	x	
		Formal structure or system for the ethical conduct of research	*Governance structure*					x
			Governance of animal usage	x				
			Governance	x		x		x
			Formal structure		x			
		Governing body for the ethical conduct of research	*Roles and responsibilities for animal usage*				x	
			A group responsible for oversight				x	
			Proper ethics committees accountable to some authority			x		
			Control of animal usage in research					x
			Provision of documents				x	
			Giving licenses				x	
		System of administration and oversight for the ethical conduct of research	*System that overlooks an activity*			x		
			Systems that monitor an activity			x		
			Systems that regulate an activity			x		
			Systems put in place by office holders					x
	Legal and regulatory framework for ethical conduct of research	Rules and regulations for the ethical conduct of research	*Legal framework*	x	x		x	x
			Legal regulations	x	x			
			Regulatory framework	x			x	
			Adherence to rules and general laws	x				
			Adaptation to international laws	x				

OBJECTIVE 1: To explore and describe Researchers, AREC Members, and AREC Administrators' understanding of the concept 'animal research ethics governance'				AREC 1				
Objective	**Main Themes**	**Sub-Themes**	**Codes**	**Participants Labels**				
				#R1	**#R2**	**#M1**	**#M2**	**#A1**
		Standards, practices, and procedures for the ethical conduct of research	*Standard practices*					x
			Ethical standards	x	x	x		
			Procedures					x
			Standard operating procedures (SOPs)					x
		Ensuring animal welfare in the ethical conduct of research	*Animal research ethics*					x
			Ethical use of animals	x	x	x	x	
			Animal welfare		x		x	
			Wellbeing of animals		x			
	Oblivion of animal research ethics governance	**Lack of awareness about animal research ethics and governance**	*Lack of awareness*	x				
			Lack of knowledge	x				
			Acquiring knowledge of animal research	x				
			Acceptable animal research			x		
Governance of the ethical use of animals for research in Ghana	**Lack of national legal and regulatory framework for ethical use of animal for research in Ghana**	**Lack of specific regulation for ethical use of animals for research**	*Availability of the Ghana Criminal Code 1960 Act 303*				x	
			Criminal code not capturing research using animals	x				
		Lack of national policies and guidelines for ethical use of animal in Ghana	*Inconsistent standards*					x
			Lack of national policy or guidelines				x	
			Lack of governing policy			x		
		Lack of national governance structure for ethical use of animal in Ghana	*Ineffective governance of animal usage*		x			
			Lack of national governance structure		x		x	
			Poor collaboration			x		
	Lack of governing body for ethical use of animals for research in Ghana	**Lack of governing body for ethical use of animal in Ghana**	*Lack of a national animal ethics board*					x
			Availability of a semi-animal body for animal welfare					x
			Ineffective animal research committees			x		
			Insufficient institution-specific ethics committees					x
			Lack of committees with oversight of animal welfare and animal research					x
			Lack of national oversight		x	x		x

OBJECTIVE 1: To explore and describe Researchers, AREC Members, and AREC Administrators' understanding of the concept 'animal research ethics governance' **AREC 1**

Objective	Main Themes	Sub-Themes	Codes	Participants Labels				
				#R1	#R2	#M1	#M2	#A1
		Lack of national oversight for ethical use of animals' compliance	*Lack of national coordination*		x			
			Lack of enforcement of the criminal code				x	
			Lack of adherence				x	
			Lack of professionalism in the animal ethics committees			x		
		Lack of ethical use of animals for research	*Failure to ensure animal rights*				x	
			Lack of animal welfare				x	
			Government influence, politics and obstacles			x		
		Lack of awareness about how ethical use of animals for research is currently governed in Ghana	*Lack of knowledge of the existing governance framework*	x				
			Lack of awareness of the existing governance framework	x	x			
	Need for a national framework for an ethical use of animal in Ghana	Need for legislation and national animal use policy in Ghana	*Need for policy development nationally*				x	
			Need for a national framework or policy	x				
			Need for ARECs to meet international standards	x				
			Need for animal ethical forums			x		
			Need for legislation					x
			Need for animal welfare					x
		Need for an establishment of ethical use of animal governing body in Ghana	*Need for an overarching body to play a supervisory role*		x		x	
			Need for an animal research governing body in Ghana	x		x		
Governance of the ethical use of animals for research at the institutions in Ghana	Use of institutional specific policy and procedure of ethical use of animals for research	Institutional policy specifics	*Institutional guidelines for the use and care of animals*	x		x		
			SOPs for the use of animal ethics					x
		Availability of animal ethics committees	*Existence of AREC in the institution*		x	x	x	
			Availability of institutional structure			x		
			AREC governs ethical use of animals	x		x	x	
			Advocate animal rights			x	x	
			Ensure animal welfare			x		

OBJECTIVE 1: To explore and describe Researchers, AREC Members, and AREC Administrators' understanding of the concept 'animal research ethics governance' **AREC 1**

Objective	Main Themes	Sub-Themes	Codes	Participants Labels				
				#R1	#R2	#M1	#M2	#A1
		Institutional processes and practices to ensure ethical use of animals for research at the institutions	*Receipt of protocols*				x	
			Reviews of protocols				x	
			Investigate animal welfare issues				x	
			Make recommendations about the protocol				x	
			Provide scientific justification				x	
			Awareness creation at institutional level			x		
		Adherence to the 3R principle at the institutions	*Adherence to refinement*			x	x	
			Adherence to reduction			x	x	
			Replacement principle			x	x	
	Failure to ensure compliance to institutional animal research ethics governance systems	**Institutional failures to ensure compliance of ethical use of animals**	*Lack of supervision*				x	
			Lack of awareness and availability of animal ethics committees in other institutions		x			
			Limited resource challenge				x	
			Lack of follow-up or monitoring				x	
			Unethical use of animals for research			x		
			Injustice			x		
		Need for efficient ethical use of animals compliance process at the institutions	*Need to address breaches in ethics use of animals*			x		
			Need for institutional ethics policy for both human research and animal research				x	x
			Ensure use of animals for teaching and learning			x		
			Need to ensure animal welfare				x	x

Appendix 5.2: The Thematic Analysis findings on Researchers, AREC Members and AREC Administrators' Understanding of Animal Research Ethics Governance from Case 2

OBJECTIVE 1: To explore and describe Researchers, AREC Members, and AREC Administrators' understanding of the concept 'animal research ethics governance'				AREC 2				
Objective	**Main Themes**	**Sub-Themes**	**Codes**	**Participants Labels**				
				#R3	**#R4**	**#M3**	**#M4**	**#A2**
Researchers, AREC members and AREC administrators' understanding of Animal Research Ethics Governance	A body that develops structure and guidelines for ethical conduct of research	Structure and guidelines for ethical conduct of research	*Structure*	x		x		
			Guidelines	x				
		Governance structure for ethical conduct of research	*Independent body*					x
			A board with oversight on the use of animal ethics for research	x		x		x
			Authority and management	x	x	x	x	
	Legal and regulatory protection for ethical conduct of research	Rules and regulations for ethical conduct of research	*Rules*	x				
			Regulations		x		x	
			Control over the use of animals	x				
			Monitoring	x		x		
		Standards and processes for ethical conduct of research	*Standards*	x				
			Processes	x	x		x	
		Ethical use of animals for research	*Research governance*	x				x
			Research integrity					x
			Animal welfare					x
			Animal dignity					x
	Oblivion of animal research ethics governance	Lack of awareness about animal research ethics governance	*Lack of clarity*			x		
			Lack of knowledge			x		
			Uncertainty			x		
			New concept			x		
Governance of the ethical use of animals for	Lack of national legal and regulatory framework for	Lack of specific regulation for ethical use of animals for research	*Lack of regulation*			x		
			Reliance on international regulations					x
			Lack of guidelines					

OBJECTIVE 1: To explore and describe Researchers, AREC Members, and AREC Administrators' understanding of the concept 'animal research ethics governance'				AREC 2				
Objective	**Main Themes**	**Sub-Themes**	**Codes**	**Participants Labels**				
				#R3	**#R4**	**#M3**	**#M4**	**#A2**
research in Ghana	**ethical use of animal for research in Ghana**	**Lack of national policies and guidelines for ethical use of animal in Ghana**	*Lack of national document on governance of animal research*	x				
		Lack of national governance structure for ethical use of animal in Ghana	*Lack of a national animal ethics governance system*	x		x		x
			Animal ethical issues frustration					
			Ethical concerns			x		
	Lack of governing body for ethical use of animals for research in Ghana	**Lack of governing body and its oversight for ethical use of animals' compliance in Ghana**	*Lack of a national animal ethics board*			x		
			Lack of supervision	x				
			Lack of oversight	x				
			Lack of policing on animal use			x		
			Need for an animal governing body in Ghana	x		x		x
		Lack of awareness about how ethical use of animals for research is currently governed in Ghana	*Lack of awareness*	x		x		
			Lack of knowledge		x			
			Unfamiliarity and uncertainty	x	x			
			Unaware of national standards		x		x	
Governance of the ethical use of animals for research at the institutions in Ghana	**Use of institutional specific policy and procedure of ethical use of animals for research**	**Rudimentary institutional specific policy**	*Institutional governance*			x		
			Reliance on collaboration with international partners					x
			Relies on international regulations	x				
			Rudimentary governance			x		
		Availability of animal ethics committees	*Use of the AREC*		x	x		x
			Existence of AREC			x		
			No ethics committee until 10 years ago			x		
		Procedures and processes for ethical use of animals at the institutions	*Application to the AREC*		x			
			Review of protocols by the AREC	x	x	x		x
			Approval of protocols by the AREC	x	x	x		x

OBJECTIVE 1: To explore and describe Researchers, AREC Members, and AREC Administrators' understanding of the concept 'animal research ethics governance' AREC 2									
Objective	**Main Themes**	**Sub-Themes**	**Codes**	**Participants Labels**					
				#R3	**#R4**	**#M3**	**#M4**	**#A2**
			Ensuring compliance					x
	Failure to ensure compliance to institutional animal research ethics governance systems	**Institutional failure to ensure compliance of ethical use of animals**	*Lack of enforcement*			x		
			Lack of compliance with AREC					x
			Lack of awareness of AREC					x
			Lack of patronage of AREC					x
		Compliance of animal ethical standards is voluntary	*Seeking ethical approval is voluntary*			x		
			Voluntary compliance with the AREC			x		
		International donors and research publication brings about ethical use of animal compliance	*Adhering to AREC due to international requirements*			x		x
			Ethics motivated by requirements for publication			x		

Appendix 5.3: The Thematic Analysis Findings on Researchers, AREC Members and AREC Administrators' Understanding of Animal Research Ethics Governance from Case 3

OBJECTIVE 1: To explore and describe Researchers, AREC Members, and AREC Administrators' understanding of the concept 'animal research ethics governance' AREC 3

Objective	Main Themes	Sub-Themes	Codes	Participants Labels		
				#R3	#M5	#A3
Researchers, AREC members and AREC administrators' understanding of Animal Research Ethics Governance	A body that develops structure and guidelines for ethical conduct of research	Systems and guidelines for ethical conduct of animal research	*Guidelines on keeping animals for research*	x		x
			Systems			x
			Activity			x
			Norms	x		
		Governance structure for ethical conduct of research	*Adherence to laws*	x		
			Conformance of rules			x
			Adherence to rules	x		x
			Governance of animal use	x		
			Administration		x	
			Directing and controlling		x	
			Societal sustenance			x
		Governing body for ethical conduct of research	*Position holders*		x	
			Agents			x
			Powers enshrined on individuals		x	
	Legal and regulatory framework for ethical conduct of research	Rules and regulations for ethical conduct of research	*Set of rules*	x		
			Set of regulations	x		
			Set of laws	x	x	
			Regulations and legislation		x	x
		Standards and processes for ethical conduct of research	*Procedures*		x	
			Process		x	
			Standards		x	
		Ensuring animal welfare in ethical conduct of research	*Ensure sanity*			x
			Ethical use of animals	x		

OBJECTIVE 1: To explore and describe Researchers, AREC Members, and AREC Administrators' understanding of the concept 'animal research ethics governance' AREC 3						
Objective	**Main Themes**	**Sub-Themes**	**Codes**	**Participants Labels**		
				#R3	**#M5**	**#A3**
			Animal care	x		
			Animal welfare	x		
			Animal rights	x		
Governance of the ethical use of animals for research in Ghana	**Absence of national legal and regulatory framework for ethical use of animal for research in Ghana**	**Absence of specific regulation for ethical use of animals for research**	*Lack of legislation and policy*	x	x	x
			Only institutional regulations available		x	
			Criminal code not covering use of animals for research		x	
			Reliance on international collaboration			x
	Absence of governing body overseeing ethical use of animals for research in Ghana	**Absence of governing body and its oversight for ethical use of animals' compliance in Ghana**	*Lack of a national animal ethics board*		x	
			Need for an animal governing body in Ghana		x	x
			Unregulated institutional ARECs		x	
		Insufficient awareness about how ethical use of animals for research is currently governed in Ghana	*Lack of knowledge*	x		
			Lack of awareness		x	
			Uncertainty about inclusion in national constitution	x		
Governance of the ethical use of animals for research at the institutions in Ghana	**Use of institutional specific policy and procedures on ethical use of animals for research**	**Institutional policy specifics**	*Availability of institutional use of animal ethics policies*	x	x	x
			Availability of guidelines	x	x	
			Institutional structure		x	
		Availability of animal research ethics committees	*Use of AREC*	x		
			Organizational guidelines being used by the AREC	x		
			Availability of animal ethics committee		x	
			Review protocols	x		

OBJECTIVE 1: To explore and describe Researchers, AREC Members, and AREC Administrators' understanding of the concept 'animal research ethics governance' AREC 3						
Objective	**Main Themes**	**Sub-Themes**	**Codes**	**Participants Labels**		
				#R3	**#M5**	**#A3**
		Ethics review underpinning animals research ethics compliance at institutions	*Approve protocols*	x		
	Failure to ensure compliance to institutional animal research ethics governance systems	**Institutional failures to ensure compliance of ethical use of animals**	*Lack of awareness*			x
			Lack of information			x
			Improper regulation			
		Need for efficient ethical use of animals governance process at the institutions	*Need to convert guidelines into laws and regulations*	x		
			Animal welfare	x		
			New policy			x
			Currently in the learning process			x

Appendix 5.4: Comprehensive Findings with Respect to the Key Quotes and Key Codes from the Participants in Objective 1 from AREC 1 to AREC 3

OBJECTIVE 1: To explore and describe Researchers, AREC Members, and AREC Administrators' understanding of the concept 'animal research ethics governance'. **AREC 1**

NUMBER	INTERVIEW QUESTION GUIDE	KEY QUOTATIONS CREATED FROM THE PARTICIPANTS' NARRATIVES	KEY CODES CREATED FROM THE NARRATIVES	TRANSCRIPT REFERENCE FROM ATLAS
Q1 A	Assessing the understanding of the term 'Animal Research Ethics Governance'	Animal research ethics governance... Well, I'm not sure I have... I can say I'm an expert on that, or I can say I'm exposed to that in the sense of the policy aspect. **[AREC 1, Researcher 1]**	*Lack of awareness, lack of knowledge*	1:2 ¶ 9
		But I think that would have to do with the general regulations. At least in the US, for example, I know they have laws, so there are actual laws that govern the use of animals. That governance structure, at least in my lay understanding, will have to encompass rules and regulations. Just as we have various laws governing the use of animals for human consumption, in research there should also be general laws. **[AREC 1, Researcher 1]**	*Legal framework, legal regulations, rules and regulations, governance structure, general laws, governance of animal usage*	1:3 ¶ 11
		Maybe what I would think of is since some of these are already established in other jurisdictions, we may have to modify them or tweak them to suite our local context because ultimately, apart from the animal rat which are important, what researchers would also need to understand is that for example if the animals are not ethically handled and then are not put in the right environment, then sometimes the results that are obtained may not really give, may not be useful when it comes to its interpretation and possible application or extrapolation to humans and those, I think when researchers or users of animals for research get to understand, then I think, maybe, supposing some of these could help so that people don't spend resources conducting animal research but then the results are really useless, more or less, so I think it should be seen in that	*Adherence to general laws, adaptation to international laws, ethical use of animals, acquiring knowledge of animal research, ethical standards*	1:4 ¶ 13

OBJECTIVE 1: To explore and describe Researchers, AREC Members, and AREC Administrators' understanding of the concept 'animal research ethics governance'. **AREC 1**

NUMBER	INTERVIEW QUESTION GUIDE	KEY QUOTATIONS CREATED FROM THE PARTICIPANTS' NARRATIVES	KEY CODES CREATED FROM THE NARRATIVES	TRANSCRIPT REFERENCE FROM ATLAS
		light of making sure that results from research using animals. **[AREC 1, Researcher 1]**		
		So, I will explain that as a formal structure that should be in place to spell out the rules and guidelines for working with animals. This will determine whether what one wants to do with animals is necessary or not. To define some scope of, for example, what you want to do, how many animals do you need so that you are not told you are overusing animals for the fact that they are available, so there are basically rules and guidelines for regulating how animal experimentation is done so that there is no "abuse" or misuse of animals. **[AREC 1, Researcher 2]**	*Formal structure, rules, guidelines for working with animals, ethical use of animals, animal welfare, legal framework, regulations, wellbeing of animals, ethical standards*	1:24 ¶ 73
		Well, when we talk of governance, we are looking at a system that overlooks an activity. That monitors an activity, that evaluates an activity, that regulates an activity. That is governance. So, if we are talking about governance concerning the ethics of the use of animals, then we are saying that we must have proper ethics committees that should be accountable to some authority. So, first of all, the ethics committee itself should have guidelines as to how they will accept work for animal research. **[AREC 1, Member 1]**	*System that overlooks an activity, systems that monitors an activity, systems that regulates an activity, ethical use of animals, proper ethics committees accountable to some authority, guidelines, acceptable animal research, governance, ethical standards*	1:34 ¶ 105
		Yeah, I think in terms of us, it has to do with the provision of some guidelines and a regulatory framework within which people can operate. So, there must be a group that will be responsible for the use of, responsible for, and oversee the use of animals, and that comes with the provision of necessary documents. I think it should even extend to giving licenses to people who operate an animal facility, or I don't know about the veterinary science, but I think there is some aspect of that there. It involves a body that will come up with some policies and	*Provision of guidelines, regulations, regulatory framework, legal framework, policies, ethical use of animals, animal welfare, governing body, roles and responsibilities for animal usage, a group responsible for oversight, provision of documents, giving licenses, a body that develops policies and guidelines*	1:55 ¶ 173

OBJECTIVE 1: To explore and describe Researchers, AREC Members, and AREC Administrators' understanding of the concept 'animal research ethics governance'. **AREC 1**

NUMBER	INTERVIEW QUESTION GUIDE	KEY QUOTATIONS CREATED FROM THE PARTICIPANTS' NARRATIVES	KEY CODES CREATED FROM THE NARRATIVES	TRANSCRIPT REFERENCE FROM ATLAS
		guidelines as to the use of animals. So, it involves a body that will come up with the various guidelines and a framework within which people who work with animals will operate. I think basically that is what it is. **[AREC 1, Member 2]**		
		So, basically, procedures, standard practices, and systems are put in place to govern or control how animals are used in research. So, animals are not abused, animals are not handled anyhow, and animals are not taken for granted during the process of research. So basically, something that will guide the users of these animals in their research. **[AREC 1, Administrator 1]**	*Legal framework, systems, governance, control of animal usage in research, guidelines, procedures, standards, practices*	1:64 ¶ 205
		These systems are put in place basically, not necessarily by the researchers, but in our parts, by the administrative offices that manage how research on animals is conducted. And some of these systems, some of these structures, can be in the form of the SOPs (standard operating procedures) of how animal research is conducted. Or an overall ethics policy that also stipulates how animal research will be conducted. So, this could be governance structures that will guide how animal ethics is conducted. **[AREC 1, Administrator 1]**	*Systems put in place by office holders, standard operating procedures (SOPs), standard practices, animal ethics policy, animal research ethics, governance structures, ethical use of animals, guide on how animal ethics is conducted*	1:65 ¶ 207
Q1 B	Assessing how the ethical use of animals in scientific studies is currently governed in Ghana	So well, I haven't checked, and I don't know, for example, in the legal framework in Ghana, if there is any law governing the use of animals for research. I don't know if there is. There could be, but I am not aware of any. But in a place like the US, they already have an established law, so in Ghana, if we have a law and a national body, then it can even cover all research using animals or the general use of animals, even for consumption. **[AREC 1, Researcher 1]**	*Lack of awareness, lack of knowledge*	1:6 ¶ 17

OBJECTIVE 1: To explore and describe Researchers, AREC Members, and AREC Administrators' understanding of the concept 'animal research ethics governance'. **AREC 1**

NUMBER	INTERVIEW QUESTION GUIDE	KEY QUOTATIONS CREATED FROM THE PARTICIPANTS' NARRATIVES	KEY CODES CREATED FROM THE NARRATIVES	TRANSCRIPT REFERENCE FROM ATLAS
		The body will ensure that people who use animals for any purpose adhere to certain regulations and standards that will be appropriate. I think what the IACUCs are doing, let's say the one at the [redacted] for example, should meet international standards, but then there should be at least a very minimum standard for everyone in the country, so we can say that something is happening. I think having that national framework or policy would help. **[AREC 1, Researcher 1]**	*Lack of awareness of the existing governance framework, need for an animal research governing body in Ghana, need for ARECs to meet international standards, need for a national framework or policy.*	1:7 ¶ 20
		No, nationally, I would doubt if there is anything happening because even for human ethics review committees, there is even a struggle there. There are so many of them now, but there is no governing structure even for that one. There are now moves I see to have an overseeing body that can oversee how all of these different ethics committees are running what they are doing and also to facilitate, I mean to unify what they are doing such that one doesn't have to get ethics approval in every small committee that is along the path. I know there are talks now to have an overarching body at the national level to oversee some of these and to also create some harmonization. So, when it comes to animals, I doubt if there is really anything happening at the national level. **[AREC 1, Researcher 2]**	*lack of national governance structure, need for an overarching body to play a supervisory role, ineffective governance of animal usage, skepticism, lack of awareness, lack of coordination, lack of oversight, lack of regulation*	1:26 ¶ 78
		You know, it's difficult to try and get a governing policy that will oversee various institutional activities. It's always difficult because of political things. Because if you want to do some research and somebody is at the top there, he doesn't like you, and he stops your research, you get where I'm coming from, with flimsy excuses... So those are the things that, if you want to have one umbrella, you may create problems in the end. **[AREC 1, Member 1]**	*Lack of governing policy, lack of oversight, government bureaucracy, politics, obstacles, need for a governing body*	1:36 ¶ 111

OBJECTIVE 1: To explore and describe Researchers, AREC Members, and AREC Administrators' understanding of the concept 'animal research ethics governance'. **AREC 1**

NUMBER	INTERVIEW QUESTION GUIDE	KEY QUOTATIONS CREATED FROM THE PARTICIPANTS' NARRATIVES	KEY CODES CREATED FROM THE NARRATIVES	TRANSCRIPT REFERENCE FROM ATLAS
		The African for that matter is different. Because the mind of the African is different so we must look at it in our context, to adopt it and to adapt it. I'll give you an example. When it comes to promotions in Ghana, what do we see? Every institution has its own promotional criteria, promotional you know, standards etc. In South Africa, every promotion goes to the National NRF, National Research Foundation. It's a neutral body and they will work but you know, not in Ghana. Go to Cameroon, promotion is by government. So, much as the idea looks good, I will rather not say, do say you are looking for an overall governance body, you are going to stifle research, I can tell you, you will stifle research in this country. **[AREC 1, Member 1]**	*Government influence, cultural context, research stifling, need for governing body*	1:37 ¶ 113
		I've got a lot of experience. Even with animal research, committees who have to read your protocols have misread the protocol, and you see they wanted to kill the work. So, we are a different group of people, which is why I won't opt for that, but rather we can also have a forum. We can have, let's say, a forum of animal ethics committees in the various universities to discuss things and make resolutions that, to me, are a better way of looking at it. Forums and conferences are, to me, a better way of looking at it. **[AREC 1, Member 1]**	*Poor collaboration, research stifling, ineffective animal research committees, a lack of professionalism in the animal ethics committees, and the need for animal ethical forums,*	1:38 ¶ 115
		As far as, to the best of my knowledge, we don't have any such guidance in place nationally. What I can also cite here is that there is a criminal code, and in the criminal code, if you look at it carefully, there is a portion that I think talks about how animals can be used in various forms, so even if you are using animals for sporting activities, there are some guidelines. The way you maltreat, and handle animals is in our books nationally. But how many of us have seen anybody prosecuted for even kicking a dog? Naturally, our psyche is like this: these are animals, so they are for our use for our benefit, so we can use them for food and anything you want, but I think beyond that, if you are using them	*Lack of governance structure, availability of the criminal code, lack of adherence, need for an overarching body to play a supervisory role, animal welfare, legislation, lack of enforcement of the criminal code*	1:56 ¶ 177

OBJECTIVE 1: To explore and describe Researchers, AREC Members, and AREC Administrators' understanding of the concept 'animal research ethics governance'. **AREC 1**

NUMBER	INTERVIEW QUESTION GUIDE	KEY QUOTATIONS CREATED FROM THE PARTICIPANTS' NARRATIVES	KEY CODES CREATED FROM THE NARRATIVES	TRANSCRIPT REFERENCE FROM ATLAS
		for science, for the benefit of humans, therefore they must be treated well. So nationally, I don't know of anybody or any organized body that oversees some of these things. In some institutions, even now, it is coming up strongly, so most universities now have ethics committees. **[AREC 1, Member 2]**		
		Yeah, I think that this is the Ghana Criminal Code 1960 Act 29. Yes, if you go to 303, it talks about all those. I don't know of any other documents. It captures important issues. I mean, the criminal code captures a lot of important welfare issues. **[AREC 1, Member 2]**	*Availability of the Ghana Criminal Code 1960 Act 303,animal welfare, criminal law*	1:57 ¶ 179
		Yes, the research component is not there, but in a way, it talks about if you are using animals for any research. Let me see, I think somewhere, any owner is guilty of committing cruelty if he fails to give reasonable care and supervision in respect of the protection of the animal from an act of cruelty. So, there must be humane use of the animals. So, this needs to be developed further into a policy document that will guide us nationally. **[AREC 1, Member 2]**	*Failure to ensure animal rights, lack of animal welfare, need for policy development nationally, Criminal code not capturing research using animals, lack of national policy or guidelines*	1:58 ¶ 181
		I think we don't have a national ethics board at the moment, it is not also every institution that has committees that look at animal welfare and animal research or ethics. So, the few we have manage and operate these committees by themselves i.e the institution themselves. So, there is no national overarching body that oversee, of course we have the animal welfare centre, we have the wildlife that also look at the interest of animal in the wild. But when it comes to the proper research ethics regarding animals, it's the individual institutions that have developed their own systems and structures to govern how research is conducted on these animals. **[AREC 1, Administrator 1]**	*Institution-specific ethics committees, lack of committees with oversight of animal welfare and animal research, lack of national oversight, lack of national ethics board, inconsistent standards, need for an overarching body to play a supervisory role*	1:66 ¶ 208

OBJECTIVE 1: To explore and describe Researchers, AREC Members, and AREC Administrators' understanding of the concept 'animal research ethics governance'. **AREC 1**

NUMBER	INTERVIEW QUESTION GUIDE	KEY QUOTATIONS CREATED FROM THE PARTICIPANTS' NARRATIVES	KEY CODES CREATED FROM THE NARRATIVES	TRANSCRIPT REFERENCE FROM ATLAS
		We don't have a national animal research ethics board. But we have semi-unit, semi-animal bodies that look at animal welfare in general. But not necessarily animal research ethics or the ethics of animal research. **[AREC 1, Administrator 1]**	*Lack of a national animal ethics board, availability of a semi-animal body for animal welfare, lack of an animal research ethics body nationally*	1:67 ¶ 210
		So, in most cases, any document that, for instance, the Ghana Wildlife Association used to govern their operation is referred to by most animal researchers. So, like I said, we don't have any... just like in human subject ethics, where there is nothing like a national board that governs human subject ethics. So, the same thing when you come to animal ethics: we don't have a national board. But you could find pockets of laws, pockets of regulations, and any other documents that people refer to. For example, the animal welfare law. **[AREC 1, Administrator 1]**	*Lack of a national animal ethics board, availability of animal welfare laws for reference, pockets of laws, regulation for reference*	1:68 ¶ 212

CON'T: OBJECTIVE 1: To explore and describe Researchers, AREC Members, and AREC Administrators' understanding of the concept 'animal research ethics governance'. **AREC 1**

NUMBER	INTERVIEW QUESTION GUIDE	KEY QUOTATIONS CREATED FROM THE PARTICIPANTS' NARRATIVES	KEY CODES CREATED FROM THE NARRATIVES	TRANSCRIPT REFERENCE FROM ATLAS
Q1 C	Assessing how the ethical use of animals in scientific studies is currently governed in institutions	At the [redacted] there is the Institutional Animal Care and Use Committee (IACUC). Maybe all other institutions, for example, UCC (University of Cape Coast), don't have such a committee. It's now that they are trying to adopt it. The [redacted] has a body, the IACUC, that governs the use of animals for research. **[AREC 1, Researcher 1]**	*The AREC governs the use of animals for research, institutional policy specifics*	1:8 ¶ 22
		From where I sit, like I said, until you mentioned two other animal ethics committees, I wasn't aware of any other one. Luckily for me, I sit at a place where I have access to the animals ethics committee we have. Although, I am familiar with the fact that it exists, I think over the last six years like I mentioned, I have had about 3 or 4 projects that use animals. **[AREC 1, Researcher 2]**	*Existence of AREC in the institution, lack of awareness and availability of animal ethics committees in other institutions*	1:28 ¶ 83
		We do have extensive guidelines that will let us take into consideration, first and foremost, the welfare of animals. So, it's not just the ethics committee, you know, that is granting the ethics, but we also look at the use and care of the animals. So, there are two things here: how do you use them, and how do you care for them? **[AREC 1, Member 1]**	*Institutional guidelines for the use and care of animals and the availability of animal ethics committees*	1:39 ¶ 118
		So, at the end of the day, we have the 3R formula that we use. We want to look for refinement in any research to be sure that, you know, maybe somebody puts in research that uses 100 rats. Can we refine it in such a way that you may not even need rats at all? Maybe you need mice, or somebody puts in that I need mice, but we refine it to say, no, even that. Considering the volume of blood that you may need and the kind of work you are proposing to do, let's refine your work so that you don't go and use the mice and later come back and say it didn't work. Then we also look at the reduction. **[AREC 1, Member 1]**	*Adherence to refinement, adherence to reduction, use of the 3R principle*	1:40 ¶ 120

CON'T: OBJECTIVE 1: To explore and describe Researchers, AREC Members, and AREC Administrators' understanding of the concept 'animal research ethics governance'. **AREC 1**

NUMBER	INTERVIEW QUESTION GUIDE	KEY QUOTATIONS CREATED FROM THE PARTICIPANTS' NARRATIVES	KEY CODES CREATED FROM THE NARRATIVES	TRANSCRIPT REFERENCE FROM ATLAS
		You know, refinement, reduction... We have to reduce the numbers that you intend to use for animal work as much as possible. This is quite relevant. I think I forgot the 3rd R. The 3Rs govern animal use, and there are also 5Fs; you can find out what those also stand for. So, the committee looks at this and works with it. Ethics governance is under the Office of Research, Innovation, and Development (ORID). Yeah, and the composition of the committee is such that it should meet its goals. So, you have specialties from various places, genetics people, pharmacology, clinical pathology, toxicology... so, without that, it means that the governance structure is weak. And then it means that it is not properly related to the overall ruling structure. **[AREC 1, Member 1]**	*Adherence to refinement, adherence to reduction, use of the 3R principle, use of the 5Fs concept, availability of animal ethics committees,*	1:41 ¶ 122
		Yes, at the institutional level, there still hasn't been an understanding of the need for an animal ethics committee. If we all understand that, why would a human ethics committee take it upon itself to review documents for animal research? I mean, it tells you that there is something wrong. I mean, if you don't really appreciate the university's structure, So, these are breaches that we really need to address. Because the committee is... it's like human rights. The purpose is to protect animals, animal welfare, and the proper use of them for research, teaching, etc., but not only research; some use it for teaching and demonstration as well. Even as an ethics committee, we are still going around; there are still people or faculty members in the university who do not even know of a committee like that in the university, and therefore they do what they feel is right. **[AREC 1, Member 1]**	*Availability of animal ethics committees, need to address breaches in ethics use of animals, use of animals for teaching and learning, availability of institutional structure, education an awareness creation at institutional level*	1:42 ¶ 124
		You must put yourself in the shoes of an animal if somebody has to determine your fate and the person is not a competent person. It's like you have a clinical or medical problem; a heart specialist must look at you; and you have a skin specialist who is sitting there and taking decisions for you. I mean, it's not right, it's not fair, it's	*Advocacy of animal rights, ensuring ethical use of animals, injustice, and unethical use of animals for research*	1:43 ¶ 126

CON'T: OBJECTIVE 1: To explore and describe Researchers, AREC Members, and AREC Administrators' understanding of the concept 'animal research ethics governance'. **AREC 1**

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		immoral, and it's unethical for a human research ethics committee to review protocols for the conduct of research using animals. **AREC 1, Member 1]**		
		Yeah, so if I am using ours as a reference, we have a committee in place that receives protocols and then reviews and then recommends. But basically, what the committee does is look into the welfare issue, so if you are going to use animals, for example, if you want to do malaria work, you want to use mice, and you propose that you want to use 20 mice per group, or something, we have to be concerned with the fact that there is this concept; we are guided by the three Rs concept. We have 3Rs, which are reduction, replacement, and refinement, so we are guided mainly by these things. I usually want to add a fourth aspect of the R, which is respect. So, when you are working with the animal, you must respect it because it is going to give you more important information. **[AREC 1, Member 2]**	*Receipt of protocols, reviews of protocols, making recommendations about the protocol, availability of animal ethics committees, investigating animal welfare issues, ensuring adherence to the 3Rs concept, reduction principle, refinement principle, replacement principle, and ensuring ethical use of animals*	1:59 ¶ 184
		So, we are guided by these ones, and then we look at them. So, if you have proposed using 20 mice, but based on the work, we think that if you use 5 mice, it is representative enough, we will recommend that you revise, so there comes in a reduction. The other thing we also look at is: if that work can be done in vitro, then why do you still want to do it? If there has been some work done in vitro and you want to move further from the cell to the organ or the system, then you must have a strong justification for why you want to know. So, we are guided by this and then other documents such as the Animal Welfare Act, and then the Americans have this guide for the care and use of animals. We have developed a policy that is based on that. **[AREC 1, Member 2]**	*Adherence to the 3Rs concept, upholding the Animal Welfare Act, Internal guidelines for the care of animals, provide scientific justification.*	1:60 ¶ 188
		The major challenge we have here is that somebody wants to do some work in Cape Coast or something and brings a document for review. In governance, it is not only the document the person brings, but you also have to	*Limited resource challenge, lack of supervision, lack of follow-up or monitoring*	1:61 ¶ 188

CON'T: OBJECTIVE 1: To explore and describe Researchers, AREC Members, and AREC Administrators' understanding of the concept 'animal research ethics governance'. **AREC 1**

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		follow up. You visit the site. You have to be sure of where the person is going to conduct the study. And then periodically, in the course of the work, you also have to go and check whether they are adhering to the recommended protocol. But that has been lacking because of limited resources. I'm sure you understand. **[AREC 1, Member 2]**		
		So, it is the IACUC that governs it (ethical conduct of research using animals) and we use the 3Rs and I add a forth one which is respect. You must respect the animals. **[AREC 1, Member 2]**	*AREC governs ethical use of animals, adherence to the 3 Rs, respect, and animal welfare.*	1:62 ¶ 190
		So, in my institution, it is mainly through the ethics policy that we have. The ethics policy covered both human research and animal research. And then we also have a specific document, which is the standard operating procedure for the use and care of animal ethics, which also governs our daily operations as far as animal research is concerned. **[AREC 1, Administrator 1]**	*Institutional ethics policy for both human research and animal research, SOPs for the use of animal ethics, ensuring animal welfare*	1:70 ¶ 217

OBJECTIVE 1: To explore and describe Researchers, AREC Members, and AREC Administrators' understanding of the concept 'animal research ethics governance'. **AREC 2**

NUMBER	INTERVIEW QUESTION GUIDE	KEY QUOTATIONS CREATED FROM THE PARTICIPANTS' NARRATIVES	KEY CODES CREATED FROM THE NARRATIVES	TRANSCRIPT REFERENCE FROM ATLAS
Q1 A	Assessing the understanding of the term 'Animal Research Ethics Governance'	So, governance generally focuses on setting certain standards, procedures, and processes that will oversee, have a general oversight of, and control over the use of animals for scientific studies. **[AREC 2, Researcher 3]**	*Standards, procedures, processes, general oversight, control over use of animals, scientific studies, animal research,*	1:9 ¶ 31
		So, governance is about ruling and having control over something. So it is about the systems that are put in place to control the use of animals in research, or, yeah, by industries, etc. **[AREC 2, Researcher 3]**	*Control over use of animals, ruling, animal research*	1:10 ¶ 33
		Animal research ethics governance is controlled by setting standards, etc. to control the use of animals in research. **[AREC 2, Researcher 3]**	*Setting standards, control*	1:11 ¶ 35
		To a layperson in animal research ethics governance, I would say that it is the thing that governs the use of animals, like maybe, the number of animals to even use, and when you are taking blood samples, how are you going to take them? So, the things that will govern the researcher to use the animals in your research. **[AREC 2, Researcher 4]**	*Governing the use of animals, regulation, guidelines*	1:29 ¶ 90
		Yeah, until you brought it up, it was new to me. Yes, we've always done things; fortunately, and unfortunately for me, I am not the one responsible for the management aspect of the committee, and so I've worked based on how far I've been given protocols and what should be done. Governance in this case is a new concept to me, and I am not too sure what it entails or how my work fits into it. **[AREC 2, Member 3]**	*Lack of clarity, lack of knowledge, uncertainty, new concept*	1:44 ¶ 133
		Well, of course, the layman's understanding of governance will be how structured it is, who oversees what in terms of animal use, and who is making sure that whatever is agreed upon is in place. Erm, that is what I will say my understanding will be like. **[AREC 2, Member 3]**	*Structure, oversight, authority, monitoring*	1:45 ¶ 135
		Yeah, it's a term. It is used to describe the processes involved in animal research, regulations, and management. Yeah, that's what I think. **[AREC 2, Member 4]**	*Processes, regulations, management*	1:63 ¶ 197

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		So, if you talk about animal research ethics governance, it's a board or an independent body that is set aside to actually look at the ethical use of animals. That means you look at the integrity of the animals being used in research. More or less, the animal becomes the research participant that we are using for research purposes to collect data of any form. So, we need to look at the main use of such animals; we need to look at the dignity of such animals; and we also need to look at the scientific validity of the whole work that you want to do. And lastly, consider the relevance of the work that you want to do as well. You look at that. And other research integrity-related issues. **[AREC 2, Administrator 2]**	*Independent body, a board, oversight on the use of animal ethics for research, animal welfare, animal dignity, research governance, and research integrity*	1:71 ¶ 224
Q1 B	Assessing how the ethical use of animals in scientific studies is currently governed in Ghana	So, we are talking about Ghana; I haven't seen any documents. All I know is that we have ethics committees that you submit your application to. Maybe they have some training, then they will make recommendations, and you do your work. So far, I haven't even had anyone come to monitor what I do. The belief is that you are doing what you are supposed to do, and then you submit your report. **[AREC 2, Researcher 3]**	*lack of awareness, lack of supervision, no national documents, lack of oversight*	1:13 ¶ 39
		So, I think, as I said, maybe the committees have documents that they use. For example, in Australia, you go through training, so they mention some of the regulations and all that, but for our system, you get approval, then there are recommendations. They think your protocol is not good and all that, but as to whether they have particular standards they follow and whether there are documents, I haven't seen anything like that. I have not seen any documents. I don't know. Maybe the various committees have one national body that they belong to, but I don't have an idea about that. **[AREC 2, Researcher 3]**	*Lack of awareness of an existing national governance framework, need for an animal governing body in Ghana, unfamiliarity, lack of clarity or guidelines, lack of knowledge, lack of national document on governance of animal research, unaware of national standards*	1:14 ¶ 41
		Like I said, I know about it, but this is my first time answering this question. I don't think I can give a genuine response because it's my first time applying for	*Uncertainty, lack of knowledge*	1:31 ¶ 94

OBJECTIVE 1: To explore and describe Researchers, AREC Members, and AREC Administrators' understanding of the concept 'animal research ethics governance'. **AREC 2**

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		it, and like I asked you earlier, apart from [redacted] which organizations are giving ethical clearance, and you mentioned them. **[AREC 2, Researcher 4]**		
		Nationally, I don't see anything in existence. I don't see that there is policing of animal use, as I know elsewhere. I have had the opportunity to work in the US with animals, even in New Zealand with animals, and over there, there is strict adherence to rules such that if you are using animals unethically, they can come and stop your work. Here, nobody is policing anything, and so, just this morning, I was telling one of my colleagues that we did some work on grasscutters, and later on, we saw that we were really punishing the animals ignorantly. Nobody told us anything, right, and so, looking at the different jurisdictions I've worked in, I will say there is nothing at all. **[AREC 2, Member 3]**	*Lack of animal ethics governance systems nationally, Lack of a national animal ethics board, need for an animal governing body in Ghana, ethical concerns, animal ethical issues frustration, lack of regulation, lack of policing on animal use, lack of awareness*	1:47 ¶ 140
		In Ghana, for what I know, we don't have a governance system in place. What we did when we were setting up our board was fall under international regulations to be able to guide the development of the SOPs that we used over there. And I'm sure that is what most of the institutions that have it in place are doing. I cannot speak very well for them, but for us, we don't have a governance system. Mostly, we fall on international bodies. Yes, in Ghana. **[AREC 2, Administrator 2]**	*Lack of a national governance system, reliance on international regulations, uncertainty, and the need for an animal governing body in Ghana*	1:73 ¶ 228
Q1 C	Assessing how the ethical use of animals in scientific studies is currently governed in institutions	In my institution, we have an ethics committee that reviews and approves protocols. I think we had one workshop to introduce why we need to apply for ethics and all that. I want to believe they have subscribed to some international standards or codes, but I don't know about the details. **[AREC 2, Researcher 3]**	*Use of an AREC that reviews protocols, approves protocols, and relies on international regulations*	1:16 ¶ 45
		I don't know. The [redacted]ead office is handling it. So, at each institute, if you are a researcher, you apply to the ethics committee at the head office. So, they will review your proposal, your materials, and methods, and how you are going to use them. So, they bring, I think, other	*Use of the AREC, application to the AREC, review of protocols by the AREC, approval of protocols by the AREC,*	1:33 ¶ 99

OBJECTIVE 1: To explore and describe Researchers, AREC Members, and AREC Administrators' understanding of the concept 'animal research ethics governance'. **AREC 2**

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		researchers on board in your area. When they read it, they will review it and give you a response. **[AREC 2, Researcher 4]**		
		Within the institution, not until this committee was setup, nobody required us to do anything, so a lot of my work that was done using animals here was done without any ethical clearance. I just did things the way I knew how, and even now, it is still voluntary. Nobody is requiring that; no, you can't do this with animals by using them. You choose to submit yourself to it. And the IACUC will now come in and direct you. The governance here is very rudimentary. **[AREC 2, Member 3]**	*Use of AREC, reviews protocol, approves protocols, rudimentary governance, No ethics committee until 10 years ago, seeking ethical approval is voluntary*	1:48 ¶ 145
		So, apart from the IACUC, there is no other governance system within the institution; even that is voluntary. It's much more of a voluntary thing that, as people submit to the IACUC. **[AREC 2, Member 3]**	*Existence of AREC, Voluntary compliance with the AREC, institutional governance, lack of enforcement*	1:49 ¶ 147
		No, no, I co-incidentally served as the director before I left, and so if there is anything I would have known, but there was nothing. All we did was, because the IACUC was there, you tried to bring your work to the IACUC, and as I said, it was voluntary, and you chose to. If you wanted to publish and the people required it, then you were caught up. If they didn't require it, then you pass. And a lot of the work we did actually passed, I don't know for now, through the publications without going through ethics until one paper that I wanted to publish, and then the journal said, Where is the ethical clearance? That is when stars began to fly in my eyes. In fact, it was around the same time I became a member of this committee. **[AREC 2, Member 3]**	*Voluntary compliance with the AREC, lack of enforcement, ethics motivated by requirements for publication*	1:50 ¶ 149
		Okay, for now, what we have is that, because we have the IACUC in place, we expect that everybody who is doing research related to animals will first and foremost bring it to the ethics board for the ethics board to look at it and approve the ethical aspect of the scientific soundness of	*Use of AREC, reviewing protocols, approving protocols, ensuring compliance, and regular monitoring of compliance*	1:75 ¶ 233

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		the work before the person goes ahead or proceeds with data collection and all that. And ideally, from time to time, we do monitor to find out if they are complying with the guidelines set aside or if they are doing something different from what we have approved. I mean, the IACUC. **[AREC 2, Administrator 2]**		
		Mmmm, I will say it is not for everybody. I'm very confident there are other research projects going on that do not come to our board (IACUC). **[AREC 2, Administrator 2]**	*Voluntary compliance with the IACUC, lack of enforcement, lack of compliance with IACUC*	1:76 ¶ 235
		Yes, within the institution that does not patronize the board (IACUC). One, it could be an issue of awareness. They are not aware. Others are confronted with international requirements, so they have no choice but to look for a system that has them. So, they kind of remember that, okay, [redacted] has some (IACUC) in place, so we will go to them for approval. So that may be some of the challenges that they are having. Awareness is one. And the fact that they wait until an international partner request it before we can attempt to come for approval. **[AREC 2, Administrator 2]**	*Reliance on collaboration with international partners, lack of awareness of IACUC, lack of patronage of IACUC, adhering to IACUC due to international requirements*	1:77 ¶ 237

OBJECTIVE 1: To explore and describe Researchers, AREC Members, and AREC Administrators' understanding of the concept 'animal research ethics governance'.
AREC 3

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Q1 A	Assessing the understanding of the term 'Animal Research Ethics Governance'	Okay, so, governance I mean, if you say governance, what comes to mind is a set of rules, regulations, and laws that people must abide by or live with. So, if you talk about animal research ethics and governance, I believe it will be a set of regulations and laws you must adhere to if you are going to involve animals in your study. You are going to use them as your experimental protocol. So, that is my general understanding of the term animal research ethics governance. So, I mean ethical use, such that everything you are doing is humane to the animal, because you don't want to get on the wrong side of the animal rights activists who are always speaking against the use of animals in research. Yes, so that is what I think it is. **[AREC 3, Researcher 5]**	*Set of rules, set of regulations, set of laws, ethical use of animals, animal welfare, animal rights, governance, adherence to laws*	1:17 ¶ 51
		So, basically, governance is about the set of rules, regulations, and norms that researchers must adhere to if they are going to use animals in their scientific study. It goes beyond using them in your experiment and considers their housing, their welfare, and their care. So, all those things must come into play: how to ethically care for the animal that you are going to use, their welfare, their well-being, and then how they are going to be affected by the experiment you are going to conduct. Are the procedures you are going to use humane? What is the damage, trauma, and even suffering the animal is going to go through? All these things must be captured in it. **[AREC 3, Researcher 5]**	*Adherence to rules, regulations, norms, use of animals in scientific study, animal care, animal welfare, ethical use of animals*	1:18 ¶ 53
		Governance entails answering the question, what should you do when you are housing the animal, and what condition should they be in? and all those things. I think that is my understanding of it. **[AREC 3, Researcher 5]**	*Guidance, guidelines on keeping animals for research*	1:19 ¶ 55
			Adherence, procedures, position holders, process,	1:51 ¶ 156

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AREC 3

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		I look at governance more as directing and controlling. So, I was thinking about procedures, processes, and even people who are involved in directing and controlling animal research. How animal research ethics are done. And then, I was also thinking about governance in terms of certain powers enshrined in certain individuals or organizations involved in animal research ethics. So, I didn't. I wasn't looking at it as just general standards or general procedures for the animal procedures themselves, but in terms of administration, in terms of position holders, in terms of legislation or laws that will ensure that that is done. **[AREC 3, Member 5]**	*laws, legislation, directing and controlling, standards, powers enshrined on individuals, administration*	
		Governance is an activity that ensures conformance of rules and other regulations to ensure that the system perfectly works for the good of the human community or something, and therefore, if you say you are a researcher, then you must adhere to the rules, and adherence to the rules is being monitored by somebody, some institution, or some agents. And therefore, at any point in time, you must be guided by the rules. **[AREC 3, Administrator 3]**	*Activity, Adherence, conformance of rules, regulations, systems, guidelines, governance, agents, ensure systems work*	1:78 ¶ 244
		One is always guided by the rules, and you play by the rules and do everything by the rules. So, in a way, governance is to ensure that there is sanity in the system. At least we are to protect creation. Whatever we have on this earth, especially where life matters, no matter whether we are animals or other things, there are rules to ensure that the rules are not breached or infringed upon, and that is, I mean, for the sustenance of our society and to ensure that the right things are done. **[AREC 3, Administrator 3]**	*Rules, systems, societal sustenance, governance of animal use, ensure sanity,*	1:79 ¶ 246
Q1 B	Assessing how the ethical use of animals in scientific studies is	I don't really know how they are governed in Ghana. I have not come across any policies. Genuinely, I haven't seen any policies on the net. I don't know if our constitution captures animal welfare, yeah. Even as a start, animal welfare not to talk about their uses in scientific studies; I don't know about it. So, but I have had protocols reviewed and accepted by KNUST and UHAS, so perhaps	*Lack of knowledge, lack of policy, uncertainty about inclusion in national constitution*	1:21 ¶ 60

OBJECTIVE 1: To explore and describe Researchers, AREC Members, and AREC Administrators' understanding of the concept 'animal research ethics governance'.
AREC 3

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	currently governed in Ghana	they have their own policies that have not been made public to us, the researchers. **[AREC 3, Researcher 5]**		
		Yeah, I think, in Ghana, it is not an act of legislation by the government. I tried searching to see if there is any law in Ghana that prescribes how animal research ethics should be governed or done; there was none. The only thing I could find was the criminal code, which was talking about offenses against animals, and it was just listing; some of them are even very funny. I saw one of them that says, You cannot use a cattle without informing the owner, so but generally there is nothing like that, so institutions in Ghana where research is being done have taken it upon themselves to put some structures and some measures in place to be able to operationalize this. The other key thing is that it is the way research output is being received. So, if you want to publish any research work involving animals, you need to have or show evidence; sometimes they even request the ethical review evidence that you have gone through some ethics in the use of animals. There are others that will require you to complete a form called the ARRIVE form, and then they want you to be guided even in reporting your research using those guidelines. **[AREC 3, Member 5]**	*Lack of a national animal ethics board, need for an animal governing body in Ghana, lack of awareness, lack of legislation, only institutional regulations available, criminal code only covers offences against animals, criminal code not covering using animals for research,*	1:52 ¶ 160
		So all these in a way push scientists in Ghana even though there is no legislation by the country; this will drive any scientist to be looking for that, so a lot of the institutions are having it (AREC) now, but in very quasi, like in very little sometimes just in the department saying they have ethics committees which do not even exist, and probably it will just be one person who is receiving and authorizing that the research has been approved, the ethics application has been approved. **[AREC 3, Member 5]**	*Use of institutional ethics committees, lack of awareness, lack of legislation, unregulated institutional ARECs*	1:53 ¶ 160

OBJECTIVE 1: To explore and describe Researchers, AREC Members, and AREC Administrators' understanding of the concept 'animal research ethics governance'.
AREC 3

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		I think over the years, as I said, the university established this thing in 2020, and the whole process was completed in 2021, where we were appointed in January. It appears that over the years, many things were overlooked, and therefore, in the course of that, as we are part of the international community, maybe somewhere in the international arena some of these things were raised, and therefore maybe the attention of Ghanaian researchers was drawn to these international requirements. So, I'll say it's a new thing. We are still learning in the learning process. **[AREC 3, Administrator 3]**	*Lack of legislation, reliance on international collaboration, need for an animal governing body in Ghana*	1:80 ¶ 248
Q1 C	Assessing how the ethical use of animals in scientific studies is currently governed in institutions	Mm, I am sure that in KNUST, I can speak for KNUST because I was with the animal house. So, I know there are some policies relating to the animal house community. Yes, I know there are some policies relating to the use of animals in research, but the details of them I am not quite familiar with because, er, I am not quite familiar with them. but I believe that a section of the review committee is in charge of dealing with the experiments or protocols that involve animal work. I am aware there are some guidelines they are using because they wouldn't approve a protocol without following such guidelines. **[AREC 3, Researcher 5]**	*Availability of institutional use of animal ethics policies, use of AREC, review protocols, approve protocols, organizational policies, organizational guidelines being used by the AREC*	1:22 ¶ 65
		I am also aware of some guidelines when it comes to animal house husbandry, especially with the faculty of pharmacy's animal house. They have some documents I have seen that talk about how the animals are supposed to be kept. And mostly, they are rodents. We are talking about mice, rats, and guinea pigs, so I know there is a document relating to that, but I don't know if those documents can be classified as laws or regulations, or I don't know how they will term it. And then I am very sure that Noguchi (Noguchi Memorial Institute for Medical Research) will also have some guidelines in place because the animal houses are also certified. So, without those kinds of policies and regulations, you won't get those international certifications. **[AREC 3, Researcher 5]**	*Availability of guidelines, animal welfare, need to convert guidelines into laws and regulations*	1:23 ¶ 67

OBJECTIVE 1: To explore and describe Researchers, AREC Members, and AREC Administrators' understanding of the concept 'animal research ethics governance'. **AREC 3**				
NUMBER	**INTERVIEW QUESTION GUIDE**	**KEY QUOTATIONS CREATED FROM THE PARTICIPANTS' NARRATIVES**	**KEY CODES CREATED FROM THE NARRATIVES**	**TRANSCRIPT REFERENCE FROM ATLAS**
		My institution has an animal ethics committee. So, in my opinion, the [redacted] is one of the institutions that has tried to do it in a more organized manner. So, there is a research policy, a research ethics policy, and then there are research ethics committees that have been approved by the university. And then these are chaired by people who are appointed by the Office of Research Innovations and Development, so it seems a bit more structured institutionally. KNUST is also doing something similar, but mainly at the departmental level.**[AREC 3, Member 5]**	*Availability of animal ethics committee, research policy, research animal policy, institutional structure, university policy*	1:54 ¶ 165
		The mere fact that in my institution, even though they (the ethics committees) may be there, they were not properly regulated because I don't have much information on what was being done in the past, so for the academic board or for the university in 2020 to come up with a policy to say that this is the direction we are going suggests that it's a new thing. I mean, at least for the past three years or so, it wasn't like that. That is why I say that it's a new thing, and we are still learning. Having been in this business for the past three years, you could see that sometimes some people even do not know about the existence of the committee. **[AREC 3, Administrator 3]**	*Availability of animal ethics committee, improper regulation, currently in the learning process, lack of awareness, lack of information, new policy*	1:82 ¶ 252

Appendix 6.1: The Thematic Analysis Findings on the Existing Research Ethics Governance Systems that Promote the Ethical use of Animals in Scientific Studies in Ghana from Case 1

OBJECTIVE 2: To explore and describe the experiences of Researchers, AREC members, and administrators of existing research ethics governance systems that promote the ethical use of animals in scientific studies in Ghana **AREC 1**

Objective	Main Themes	Sub-Themes	Codes	Participants Labels				
				#R1	#R2	#M1	#M2	#A1
The governance systems that promote the ethical use of animals in scientific studies	Use of ARECs system and reliance on international ethical standards	Use of ARECs and SOP to govern the ethical use of animal	*Use of an animal ethics committee (AARECs)*	x	x	x		x
			Use of institutional SOP to govern the ethical use of animal					x
		Benchmarking and reliance on international ethical standards	*Benchmarking international ethical standards (European and USA standards)*	x			x	
			Reliance on existing world bodies					x
			Being compliant with CIOM's guidelines for animal use				x	
			International collaboration					x
		Use of institutional animal research units	*Use of Animal experimentation facility*					x
			Use of an excellent library system					x
			Use animal research unit					x
	An application of ineffective governance systems	Inefficient existing animal ethics committees	*lack of collaboration among existing animal ethics committees*		x			
			lack of clarity about the relationship between existing ethics committees		x			
		International donors demand evidence of ethical use of animal compliance	*International grants bodies require ethical compliance*	x				x
			Expectations of funding agencies	x				
		Lack of awareness about governance systems that promote the ethical use of animals for research	*Self-doubt*	x				
			Lack of knowledge	x				
			Uncertainty	x	x			
			Lack of awareness of existing governance systems		x			

OBJECTIVE 2: To explore and describe the experiences of Researchers, AREC members, and administrators of existing research ethics governance systems that promote the ethical use of animals in scientific studies in Ghana AREC 1								
Objective	**Main Themes**	**Sub-Themes**	**Codes**	**Participants Labels**				
				#R1	**#R2**	**#M1**	**#M2**	**#A1**
The experiences with animal research ethics governance systems in Ghana	**Positive experience with the animal research ethics governance systems**	**Appreciation of institutional systems for animal research**	*Positive evaluation*	x				
			Satisfactory remarks	x				
			Positive view of animal research	x				x
			Good feedback	x				
		Use of ethics committee to oversee animal research	*The ethics committee composed of experienced people with animal research*					x
			An ethics committee using a multidisciplinary expert to ensure animal welfare					x
			Responsiveness of AREC					x
			Ensure efficient communication	x				
			Good working relations	x				
			The provision of useful information online	x				
			Service/administrative charges by ARECs		x			
		Use of institutional principles for animal research	*Application of the CIOMS principle by the AREC as a behind-the-scenes guideline*				x	
			Inexplicit indication of the CIOMS principle in the AREC document				x	
			A robust SOP and use of regulations					x
			Use of institutional principles to ensure animal welfare				x	x
			Use of guidelines for animal use					x
		Use of good facilities for animal research	*Use of robust lab systems*					x
			Use of a well-equipped lab					x
	Negative experience with the animal	**There are inefficiencies in animal research ethics governance systems**	*There is suspicion of inefficiency in ethics committee activities*		x			
			Financial constraints for inspection/monitoring by the ethical committees after ethical approval			x		

OBJECTIVE 2: To explore and describe the experiences of Researchers, AREC members, and administrators of existing research ethics governance systems that promote the ethical use of animals in scientific studies in Ghana **AREC 1**

Objective	Main Themes	Sub-Themes	Codes	Participants Labels				
				#R1	#R2	#M1	#M2	#A1
	research ethics governance systems		*Lack of knowledge/awareness on seeking ethical clearance and approval for animal research*					x
			Use of animals for research without ethical approval and compliance					x
			Need for animal use awareness creation					x
			Use of animals for research in unapproved animal facilities					x
	Desire for improvement in animal research ethics governance systems and oversight of animal research	Need for national governance framework for animal research	*Desire for improvement and oversight*					x
			Need for uniformity across institutions		x			
			Need for regulatory authority to oversee the activities of the ethics bodies		x			x
			Need for harmonization of SOPs		x			
			Need for well-structured ethics governance systems for animal research					x

Appendix 6.2: The Thematic Analysis Findings on the Existing Research Ethics Governance Systems that Promote the Ethical use of Animals in Scientific Studies in Ghana from Case 2

OBJECTIVE 2: To explore and describe the experiences of Researchers, AREC members, and administrators of existing research ethics governance systems that promote the ethical use of animals in scientific studies in Ghana **AREC 2**

Objective	Main Themes	Sub-Themes	Codes	Participants Labels				
				#R3	#R4	#M3	#M4	#A2
The governance systems that promote the ethical use of animals in scientific studies	Use of ARECs system and reliance on international ethical standards	Use of ARECs to govern the ethical use of animal	*Use of the AREC to oversee animal welfare*	x			x	
			Use of a national biosafety committee					x
			Use of ethics committee for protocol review and approval	x				
		Use of institutional animal research units	*Use of institutional review boards*	x				x
			Institutional collaboration for decision-making on ethical use of animals					x
	An application of ineffective governance systems	Existence of ineffective governance systems	*Inadequate systems in place*			x		
			Non-existent structures to ensure ethical conduct of research using animals			x		
			Weak or non-existent ethics approval requirements for research using animals			x		
			Lack of laboratory science			x		
			Inadequate regulatory systems			x		
		Lack of strict adherence and punitive measures for non-compliance	*Seeking ethical approval depends on researchers discretion*	x				
			Seeking ethical clearance motivated by journal publication requirements	x				
			Lack of strict adherence to ethical use of animals	x		x		
			Use of animals for research without ethical approval and compliance	x		x		
			Lack of punitive measures for non-compliance	x				
			Lack of strict regulations for compliance	x				
		Lack of awareness about governance systems	*Lack of awareness of the governing body*	x	x			
			Uncertainty about existence of by-laws or regulations for animal research	x				
			Lack of knowledge		x			
			Lack of monitoring of research using animals			x		

OBJECTIVE 2: To explore and describe the experiences of Researchers, AREC members, and administrators of existing research ethics governance systems that promote the ethical use of animals in scientific studies in Ghana **AREC 2**

Objective	Main Themes	Sub-Themes	Codes	Participants Labels				
				#R3	#R4	#M3	#M4	#A2
		Need for proper animal governance system, awareness creation, and regulatory body	*The need for animal use awareness creation*	x				
			Need for a proper animal governance system to oversee animal research			x		
			Need for regulatory body to police the activities of the institutional ethics committee			x		
The experiences with animal research ethics governance systems in Ghana	Positive experience with the animal research ethics governance systems	Use of ethics committee to oversee animal research	*Use of AREC for animal research*				X	X
			IRB and AREC work together with studies involving humans and animals					x
			Institutional research and innovation unit governing ethical research and providing oversight of the ethics committees				X	
	Negative experience with the animal research ethics governance systems	Challenging experience with the use of AREC for animal research	*Inadequate capacity of AREC members*					X
			Inadequate funding for capacity building in animal research ethics compared to human subject research					X
			Lack of regulations to fall on					X
			International regulations not easily accessible					X
		Lack of strict adherence and punitive measures for non-compliance	*Lack of strict adherence to ethical use of animals*	x				x
			Use of animals for research without ethical approval, and compliance	x				x
			Premium not placed on ethical use of animals as human subject research					x
			Seeking ethical clearance motivated by grant/funding conditions	x				
			No respect for animals					X
		Lack of national governing body with the oversight for animal research	*Institutional Senior officer and administrators oversee research using animals*				X	
			One committee review both animal and human subject studies					X
			No institutional requirement for ethical clearance before commencing studies using animals	x				
			No accountability required from researchers	x				
			Low awareness of the need for ethical clearance before using animals for research					x

OBJECTIVE 2: To explore and describe the experiences of Researchers, AREC members, and administrators of existing research ethics governance systems that promote the ethical use of animals in scientific studies in Ghana AREC 2									
Objective	**Main Themes**	**Sub-Themes**	**Codes**	**Participants Labels**					
				#R3	**#R4**	**#M3**	**#M4**	**#A2**
		Lack of awareness about governance systems	*Lack of knowledge about ethical use of animals for research*					x
			Creation of confusion in ethical approval for human and animal research					X
	Desire for improvement in animal research ethics governance systems and oversight of animal research	**Need for national governance framework for animal research**	*Need for a law to govern animal use for research*			X		
			Need for a regulatory body to police the activities of the institutional ethics committee			X		
			Need for a proper animal governance system to oversee animal research			X		X
			Need for an animal rights advocacy group			X		
		Need for awareness creation and sensitisation for animal research	*Need for training and capacity building*					X
			Need for animal use awareness creation					X
			Sensitization of researchers not yielded desired results					X
			Challenge of compliance by researchers					x

Appendix 6.3: The Thematic Analysis Findings on the Existing Research Ethics Governance Systems that Promote the Ethical use of Animals in Scientific Studies in Ghana from Case 3

OBJECTIVE 2: To explore and describe the experiences of Researchers, AREC members, and administrators of existing research ethics governance systems that promote the ethical use of animals in scientific studies in Ghana **AREC 3**

Objective	Main Themes	Sub-Themes	Codes	Participants Labels		
				#R3	#M5	#A3
The governance systems that promote the ethical use of animals in scientific studies	Use of ARECs system and reliance on international ethical standards	Use of ARECs to govern the ethical use of animal	*Use of ethical committees*		x	
			Ethics committee established to attract funding (meet funding requirement)		x	
		Use of institutional animal research units	*Existence of institutional ethical review board*	x	x	
			Ethical review board ensures animal welfare	x		
			Institutional governance systems exist		x	
		Benchmarking and reliance on international ethical standards	*Based on best practices from local and international institutions*		x	
			Use of funding agency's guidelines for animal use	x	x	
			International research community recognition requires ethical compliance with animal use			x
	An application of ineffective governance systems	Existence of ineffective governance systems	*Lack of national policies*	x		
			Holistic national governance system non-existent		x	
			Lack of legislation in Ghana		x	
		Academic progression and publication require research compliant with animal use	*Academic progression requires research compliant with animal use*			x
			The demand for an ethical clearance certificate serves as a governance system for animal welfare			x
			Ethical approval requirement for publication			x
		International donors demand evidence of	*International research community recognition requires ethical clearance certificate for animal use*			x

OBJECTIVE 2: To explore and describe the experiences of Researchers, AREC members, and administrators of existing research ethics governance systems that promote the ethical use of animals in scientific studies in Ghana **AREC 3**

Objective	Main Themes	Sub-Themes	Codes	Participants Labels		
				#R3	#M5	#A3
		ethical use of animal compliance	*Requirements of Grant funding agencies for ethical compliance*	x		
			Ethical use of animals a condition for research funding by doners	x		
		Lack of awareness about governance systems	*Lack of awareness of any other animal ethical governing body*	x		
			No awareness of policies	x		
The experiences with animal research ethics governance systems in Ghana	Positive experience with the animal research ethics governance systems	Use of ethics committee to oversee animal research	*Obtain ethical clearance*	x		
			Institutional differences regarding requirements	x		
			Requirements for completing ethics application form		x	
			Obtaining people's commitment to ethical standards			x
			Educating them on the preservation of life			x
			Training requirement prior to using animals for research		x	
		Reliance on funding agencies and international ethical standards	*Perspective shift and international comparative perspective*		x	
			Funding agency reporting requirements	x		
			Funding agencies have oversight on animal use	x		
	Negative experience with the animal research ethics governance systems	Challenging experience with the use of AREC for animal research	*Completion of long forms*		x	
			Understanding long ethics application forms		x	
			Requirement of a license prior to using animals for research		x	
			No animal conditions report requires by others	x		
		Lack of strict adherence and punitive measures for non-compliance	*Use of animals for research without ethical approval and compliance*		x	
			Lack of stringent measures and compliance		x	
			Lack of strict adherence to ethical use of animals		x	
			Lack of awareness		x	

OBJECTIVE 2: To explore and describe the experiences of Researchers, AREC members, and administrators of existing research ethics governance systems that promote the ethical use of animals in scientific studies in Ghana **AREC 3**

Objective	Main Themes	Sub-Themes	Codes	Participants Labels		
				#R3	#M5	#A3
		Lack of awareness about governance systems	*Lack of knowledge about ethical use of animals making it difficult to complete forms*		x	
	Desire for improvement in animal research ethics governance systems and oversight of animal research	Need for awareness creation and sensitisation for animal research	*Need for ethical considerations*		x	
			Training people about animal welfare and use for research			x
			Need for awareness on animal welfare	x	x	
			Need for intensive education about existence of ethical review board	x		
			Need for intensive education about animal research	x	x	

Appendix 6.4: Comprehensive Findings with Respect to the Key Quotes and Key Codes from the Participants in Objective 2 from AREC 1 to AREC 3

OBJECTIVE 2: To explore and describe the experiences of Researchers, AREC members, and administrators of existing research ethics governance systems that promote the ethical use of animals in scientific studies in Ghana. **AREC 1**

NUMBER	INTERVIEW QUESTION GUIDE	KEY QUOTATIONS CREATED FROM THE PARTICIPANTS' NARRATIVES	KEY CODES CREATED FROM THE NARRATIVES	TRANSCRIPT REFERENCE FROM ATLAS
Q2 A	Assessing the governance systems that promote the ethical use of animals in scientific studies	Well, governance systems—I'm not really sure if I can talk to that because, on the governance side, I am more on the end-user side. So, I just assume that the IACUC is for the [redacted] because you have some of these international bodies that have grants, and they would expect that for animal research, they would naturally expect that whatever ethical approval I get is meeting international standards. When it comes to the governance system, I'm not sure I can talk about that because I am not well versed in that space. **[AREC 1, Researcher 1]**	*Self-doubt, lack of knowledge, uncertainty, obtaining ethical approval from the AREC, international bodies' grants require ethical compliance, meeting international ethical standards, expectations of funding agencies.*	2:2 ¶ 9
		From my perspective, I don't see any such systems around as of now. If I look at even the existing animal ethics committees, I am wondering whether there is any crosstalk between them. Whether, for example, they were set up independently or one was set up and helped the other, I'm not sure what relationship exists between and across them. So, I am not aware of any kind of system that is in place for the ethical use of animals in research. **[AREC 1, Researcher 2]**	*Lack of existing system, existence of ARECs, Lack of awareness of existing governance systems, uncertainty, lack of collaboration among existing animal ethics committees, lack of clarity about the relationship between existing ethics committees*	2:13 ¶ 48
		The only system I can mention is the IACUCs, the ethics committees. **[AREC 1, Member 1]**	*Existence of ARECs*	2:17 ¶ 59
		Yes, I mentioned the US Animal Care and Use Guide. Then there is some other document, the Animal Welfare Act, which we base on, but most importantly, there is this guideline that is used now, the CIOMS guidelines. It gives you clear principles that you have to abide by if you want to use animals in research. That is the major guideline, though our documents are based on it. **[AREC 1, Member 2]**	*Benchmarking the US Animal Care and Use Guide, following guidelines in the Animal Welfare Act, being compliant with CIOM's guidelines for animal use*	2:29 ¶ 106

OBJECTIVE 2: To explore and describe the experiences of Researchers, AREC members, and administrators of existing research ethics governance systems that promote the ethical use of animals in scientific studies in Ghana. **AREC 1**

NUMBER	INTERVIEW QUESTION GUIDE	KEY QUOTATIONS CREATED FROM THE PARTICIPANTS' NARRATIVES	KEY CODES CREATED FROM THE NARRATIVES	TRANSCRIPT REFERENCE FROM ATLAS
		So, for instance, at my institution, we have one of the best animal labs in the country. The Noguchi animal experimentation unit is one of the labs that anyone can conduct his or her animal research in. So, we have a very good lab; aside from the lab, we also have a very good library and an intensive SOP that governs how research can be conducted. **[AREC 1, Administrator 1]**	*Use of the world-class lab facility (animal experimentation facility use of an excellent library system, and use of standard operating procedures for ethical animal use*	2:36 ¶ 131
		In the country, individual SOPs (standard operating procedures) govern how the individual institution should carry out animal research across the board. **[AREC 1, Administrator 1]**	*Use of institutional SOP to govern the ethical use of animal, individual institutional SOPs*	2:35 ¶ 126
		Yes, for my institution, we have a whole unit for research and an office for research that also oversees its work, which is also being done at this animal facility within the animal ethics committee. **[AREC 1, Administrator 1]**	*Use of an animal ethics committee, animal research unit, existence of an institutional Research Office that oversees the work of the AREC and animal facility*	2:37 ¶ 133
		We follow international animal governance systems based on both US, European, and UK standards. So, the SOPs were not just put together for putting together sake, but they were put together following other existing governance structures and bodies in conformity with the US, Europe, and the UK. So, whatever structures exist there and whatever SOPs they are using to guide their animal research are what we have also put together to guide us. So, we don't work in a vacuum; we rely on these existing world bodies of animal research organizations. **[AREC 1, Administrator 1]**	*Benchmarking international animal government systems, US standards, UK standards, European standards, use of institutional standard operating procedures to govern ethical use of animals, international collaboration, reliance on existing world bodies*	2:38 ¶ 135 i
Q2 B	Assessing the experiences with the existing animal research ethics	My experience with them, well, I think generally, has been fine because, in my case, I submitted to the IACUC, and they got back to me. They asked for further clarifications, and I responded. There is a form I had to fill out, and then they get back to you via email, and the administrator is quite responsive, which is quite a good thing. What is most important is that people are	*Positive experience with AREC, responsiveness of AREC, ensure efficient communication, good working relations, the provision of useful information online.*	2:3 ¶ 12

OBJECTIVE 2: To explore and describe the experiences of Researchers, AREC members, and administrators of existing research ethics governance systems that promote the ethical use of animals in scientific studies in Ghana. **AREC 1**

NUMBER	INTERVIEW QUESTION GUIDE	KEY QUOTATIONS CREATED FROM THE PARTICIPANTS' NARRATIVES	KEY CODES CREATED FROM THE NARRATIVES	TRANSCRIPT REFERENCE FROM ATLAS
	governance systems that promote the ethical use of animals in scientific studies	responsive whenever there are follow-ups and clarifications that need to be addressed. So, I think the system they have is okay. When it comes to timelines, I think they have their timelines online so all prospective applicants can have a fair idea of the timelines, which I think is quite good. **[AREC 1, Researcher 1]**		
		I think, just like I explained, even for the human ethics bodies, it will be good to have some regulatory authority that also looks at what ethics bodies are doing. There needs to be uniformity across. **[AREC 1, Researcher 2]**	*Need for uniformity across, need for regulatory authority to oversee the activities of the ethics bodies*	2:14 ¶ 50
		So there needs to be some sort of overarching body that will also look out for what is happening on the ground and move to harmonise things; otherwise, we would find ourselves in a situation where everybody wants to rush to a particular ethics committee either because they will get their feedback quickly or because it is less expensive. **[AREC 1, Researcher 2]**	*Need for regulatory authority to oversee the activities of the ethics bodies, there is suspicion of inefficiency in ethics committee activities, need for harmonization of SOPs and service/administrative charges by ARECs*	2:15 ¶ 52
		As of now, finances are even more of a problem. There are people who may want to do research, let's say in Cape Coast, and you find out there is no money to go there to inspect the facility. Because once you grant the ethics approval, the approval comes with a responsibility. And the university says we don't have money. What are you going to do? Do you see where we are? **[AREC 1, Member 1]**	*Financial constraints for inspection/monitoring by the ethical committees after ethical approval*	2:18 ¶ 69
		It is part of what we do. We apply it in our operations, but if you go into our documents, I mean the IACUC document, we don't mention the CIOMS principle directly, but in our operations here as a facility, and then it is also part of the behind-the-scenes guidelines that we apply, but we don't state it in our document, but we use it in our application here. **[AREC 1, Member 2]**	*Application of the CIOMS principle by the AREC as a behind-the-scenes guideline, inexplicit indication of the CIOMS principle in the AREC document*	2:25 ¶ 70

OBJECTIVE 2: To explore and describe the experiences of Researchers, AREC members, and administrators of existing research ethics governance systems that promote the ethical use of animals in scientific studies in Ghana. **AREC 1**

NUMBER	INTERVIEW QUESTION GUIDE	KEY QUOTATIONS CREATED FROM THE PARTICIPANTS' NARRATIVES	KEY CODES CREATED FROM THE NARRATIVES	TRANSCRIPT REFERENCE FROM ATLAS
		So, they came up with some of these principles that need to guide us on how we use the animals, the processes we put the animals through, and how they are housed. **[AREC 1, Member 2]**	*Use of institutional principles to ensure animal welfare*	2:29 ¶ 71
		Yeah, I think it's good to have very well structured, organized systems that govern the use of animals because it's not every research project that we can conduct directly on humans; we have to begin most of this research, especially when it comes to some discoveries, on animals. So, having a robust system that will enhance smooth research regarding animals is a very good thing, and I think my institution, the [redacted], has such a robust system in terms of lab, in terms of committee to oversee that, in terms of rigor, how serious we take the welfare and wellbeing of the animal research is top-notch, and for me, that is a very good thing. And we hope to keep that and improve and also ensure that we move steps ahead so we can have a nationwide board that will oversee whatever research that we do. **[AREC 1, Administrator 1]**	*Need for well-structured ethics governance systems for animal research, appreciation of institutional systems for animal research, positive view of animal research, desire for improvement and oversight, use of robust lab systems at UG, use of an ethics committee to oversee animal welfare*	2:39 ¶ 137
		So, the work of the animal ethics committee is just one of the committees under the overall ethics committee. So, as a university, we have a whole unit dedicated to research ethics. And because of respect and because of how seriously we take animals like this as an important arm or umbrella of our research spectrum, a whole committee has been dedicated purely and mainly to animal research. Err, not just that, within a setup committee, we have varying expertise, people with different animal ethics backgrounds, and even people without animal research backgrounds on the committee, so that they can look at the animal research not just purely from the scientific point of view but also from a sociological, communal point of view. So, the committee is quite robust, and even a legal person is on board that also ensures that whatever we do, she looks	*Use of ethics committee to oversee animal research, the ethics committee composed of experienced people with animal research, an ethics committee using a multidisciplinary expert to ensure animal welfare*	2:40 ¶ 139

OBJECTIVE 2: To explore and describe the experiences of Researchers, AREC members, and administrators of existing research ethics governance systems that promote the ethical use of animals in scientific studies in Ghana. **AREC 1**

NUMBER	INTERVIEW QUESTION GUIDE	KEY QUOTATIONS CREATED FROM THE PARTICIPANTS' NARRATIVES	KEY CODES CREATED FROM THE NARRATIVES	TRANSCRIPT REFERENCE FROM ATLAS
		at the legal aspect that talks about animal protection or animal welfare. So, I think I'm glad to be working on this for quite some time now, and so far, so good. **[AREC 1, Administrator 1]**		
		There is more room for improvement because, as far as our part of the world is concerned, we are still not there yet, we still have a long way to go, and we still have to improve on animal research. So, a lot of people are not even aware that they need to seek clearance or ethical clearance of animals before they can use them. There are people keeping rats privately and secretly in their own facilities and using them for research. So, with time, we need more awareness to let people know that, hey, you just can't use animals anyhow as far as research is concerned. You would have to submit it through the ethical clearance system. **[AREC 1, Administrator 1]**	*Desire for improvement and oversight of animal research, lack of knowledge/awareness on seeking ethical clearance and approval for animal research, use of animals for research without ethical approval and compliance, need for animal use awareness creation, use of animals for research in unapproved animal facilities*	2:41 ¶ 144
		The current governance systems, per my experience, I think are so far so good. Like I said, we have a robust SOP, a well-equipped lab, the first-class in the country for animal research, and it is situated on this campus. We also have regulations and guidelines as to how even the lab could be used and how these animals are utilized and processed for research. So, there are strict guidelines involved. I think so far so good. **[AREC 1, Administrator 1]** `	*Efficient existing governance system for animal research, positive evaluation, good feedback, satisfactory remarks, use of a well-equipped lab, a robust SOP, use of regulations, use of guidelines for animal use*	2:42 ¶ 146

OBJECTIVE 2: To explore and describe the experiences of Researchers, AREC members, and administrators of existing research ethics governance systems that promote the ethical use of animals in scientific studies in Ghana. **AREC 2**

NUMBER	INTERVIEW QUESTION GUIDE	KEY QUOTATIONS CREATED FROM THE PARTICIPANTS' NARRATIVES	KEY CODES CREATED FROM THE NARRATIVES	TRANSCRIPT REFERENCE FROM ATLAS
Q2 A	Assessing the governance systems that promote the ethical use of animals in scientific studies	Apart from the bodies that have been set, the ethics committee, or institutional review boards, I don't know about any other thing, that is, an institution, or whether we even have by-laws or regulations that are used to control the use of animals in research. **[AREC 2, Researcher 3]**	*Lack of awareness of the governing body, uncertainty about existence of by-laws or regulations for animal research, use of an ethics committee, use of institutional review boards*	2:4 ¶ 19
		So, every institute in [redacted] is supposed to be submitting their protocols to the ethics committee, and all that, but truth be told, if we are going to publish in some journals, we will not ask for ethics. I am sure there are a lot of protocols that will never go to the ethics board. There is no rule that will insist that you submit to the ethics committee for approval. **[AREC 2, Researcher 3]**	*Use of ethics committee for protocol review and approval, use of animals for research without ethical approval and compliance, lack of strict regulations for compliance; lack of strict adherence to ethics, lack of punitive measures for non-compliance, seeking ethical clearance motivated by journal publication requirements*	2:5 ¶ 21
		So, it is all dependent on the PI or the research team to decide if they feel they should go for ethics or not. For example, recently I went for ethics, and my work was just a questionnaire survey. But I did that because of the little knowledge that I got from studying abroad. Research like that, even a survey going out to interview people in the social sciences, even if it is the social sciences, you need ethics approval, and I had some colleagues who were asking, ahh, like this one too, did you go for it (ethics)? **[AREC 2, Researcher 3]**	*Seeking ethical approval depends on researchers' discretion, the need for animal use awareness creation.*	2:6 ¶ 23
		As I said, at the moment, I don't see much. You see, in laboratory science, the reason behind this is that laboratory science is very weak here. That is the first thing. And because laboratory science is weak, it has not necessitated a lot of strict adherences to ethics. Of course, field work using animals is also there, and so a lot of the procedures that we do—in fact, when I was working in New Zealand, we did procedures like fistulation, even esophageal fistulation—were based on the things we took the animals through. Over there, we sought ethical clearance to be able to fistulate the animals. Here, no one would've gone through ethics;	*Inadequate systems in place, Lack of strict adherence to ethical use of animals, use of animals for research without ethical approval and compliance, Western world requires ethical clearance on animal research, lack of laboratory science, inadequate regulatory systems*	2:19 ¶ 76

OBJECTIVE 2: To explore and describe the experiences of Researchers, AREC members, and administrators of existing research ethics governance systems that promote the ethical use of animals in scientific studies in Ghana. **AREC 2**

NUMBER	INTERVIEW QUESTION GUIDE	KEY QUOTATIONS CREATED FROM THE PARTICIPANTS' NARRATIVES	KEY CODES CREATED FROM THE NARRATIVES	TRANSCRIPT REFERENCE FROM ATLAS
		we did, and we tried some here as well. **[AREC 2, Member 3]**		
		We did ruminant fistulation, and nobody required us to come for ethical clearance. You see, so if you ask what sort of systems exist, I will say that no, I don't see systems existing here. We may need to put systems in place. We may need to say that for every institution that uses animals, you have to have an IACUC in place, you have to submit to ABCD procedures before you are allowed to use your animal, and there should be a body policing, whatever we have said we would be putting in place. If we do not have those structures, then it will be the same business as usual. **[AREC 2, Member 3]**	*Need for a proper animal governance system to oversee animal research, need for regulatory body to police the activities of the institutional ethics committee, lack of monitoring of research using animals, weak or non-existent ethics approval requirements for research using animals, non-existent structures to ensure ethical conduct of research using animals.*	2:20 ¶ 81
		I think the ethical clearance board should have been the best people to answer these questions. Then you should have different questions for us because these questions are not for us. I don't have any idea. **[AREC 2, Researcher 4]**	*Lack of awareness, trust in authority, lack of knowledge*	2:16 ¶ 57
		The governance systems that are in place have to do with the IACUC, which oversees and ensures that people do the right thing when it comes to research in the interest of animals used for research. **[AREC 2, Member 4]**	*Use of the AREC to oversee animal welfare*	2:32 ¶ 115
		Okay, we have the ethics board; that is one. We have the Biosafety Committee, which is not under [redacted]ut is a national body. From time to time, they also depend on our approval to be able to take decisions at their level. So, I will say the ethics board and the biosafety committee. It is a national body with people from different institutions serving on its board as committee members. **[AREC 2, Administrator 2]**	*Use of the ethics board, use of a national biosafety committee, institutional collaboration for decision-making on ethical use of animals*	2:43 ¶ 148
		Oh, for now, I think those are the two I can think of. In cases where it involves a clinical trial, then that is	*Use of the Food and Drug Authority for clinical trials*	2:44 ¶ 157

OBJECTIVE 2: To explore and describe the experiences of Researchers, AREC members, and administrators of existing research ethics governance systems that promote the ethical use of animals in scientific studies in Ghana. **AREC 2**

NUMBER	INTERVIEW QUESTION GUIDE	KEY QUOTATIONS CREATED FROM THE PARTICIPANTS' NARRATIVES	KEY CODES CREATED FROM THE NARRATIVES	TRANSCRIPT REFERENCE FROM ATLAS
		where the FDA (Food and Drug Administration) comes in. So, maybe I can say that for now, these are the three main bodies. **[AREC 2, Administrator 2]**		
Q2 B	Assessing the experiences with the existing animal research ethics governance systems that promote the ethical use of animals in scientific studies	So nobody will ask, 'did you get ethics approval for it?' or when you are not doing an experiment where you are going to keep animals, a lot of people will not do it (that is, go for ethics approval). Even for just going around to collect samples from animals and things, no one will ask you anything. And also, erm, journals request some proposals because we use grants. So, some of the grants will require it, when you are filling out the form or when you are applying, they require that you attain ethics clearance, or you have to indicate whether you will obtain ethics clearance. **[AREC 2, Researcher 3]**	*Grant funding research requires ethical compliance, lack of strict adherence to ethical use of animals, use of animals for research without ethical approval, and compliance, no institutional requirement for ethical clearance before commencing studies using animals, no accountability required from researchers, seeking ethical clearance motivated by grant/funding conditions*	2:7 ¶ 25
		I think that there should be a law; you know, there should be a law that requires us to do that. Without these laws, what are we working up to? So, and the body to do that will be parliament. Parliament should put the legislation in place. **[AREC 2, Member 3]**	*Need for a law to govern animal use for research*	2:21 ¶ 83
		You know, so you should have animal rights people here; they should have legislation, and they should have the institutional committees overseeing all these. If not, things will be as usual. **[AREC 2, Member 3]**	*Need for a law to govern animal use for research, a need for an animal rights advocacy group, need for a regulatory body to police the activities of the institutional ethics committee, need for institutional ethics committees to oversee research using animals.*	2:22 ¶ 85
		In this place, we already have a responsible senior officer and the administrators that are there. And then we have the IACUC, where we meet regularly and discuss issues. In the University, we have a whole research office. So, the IACUC reports to research and innovation, and they will take it up there. If there are issues, which we have found in a lot of them, we will report through them that we are not meeting our responsibilities because of this, that, and that. Then they will try to see how best they can resolve that issue. And the members are given that appointment for a period of time. **[AREC 2, Member 4]**	*Use of AREC for animal research, institutional research and innovation unit governing ethical research and providing oversight of the ethics committees, Institutional Senior officer and administrators oversee research using animals*	2:33 ¶ 117

OBJECTIVE 2: To explore and describe the experiences of Researchers, AREC members, and administrators of existing research ethics governance systems that promote the ethical use of animals in scientific studies in Ghana. **AREC 2**

NUMBER	INTERVIEW QUESTION GUIDE	KEY QUOTATIONS CREATED FROM THE PARTICIPANTS' NARRATIVES	KEY CODES CREATED FROM THE NARRATIVES	TRANSCRIPT REFERENCE FROM ATLAS
		My experience with them has been a bit challenging in terms of awareness. The awareness level is very low in Ghana at the moment. As I said earlier, a lot of people don't know about it, and those who do know are refusing to make use of the animal ethics committee. They feel like the ethics committee is for the human side. Why should I? Maybe I'm dealing with animals; why should I come to you (AREC)? They feel animals don't have feelings and all that. So why are you concerned about the ethical aspect of animal research? So, the awareness is very low; just as a premium has been placed on the human aspect, I would wish they placed the same premium on the animal aspect too. So that the work can flow, and the work of the ethics committee becomes a bit easier for them. **[AREC 2, Administrator 2]**	*Low awareness of the need for ethical clearance before using animals for research, lack of strict adherence to ethical use of animals, use of animals for research without ethical approval, and compliance, challenging experience, lack of knowledge about ethical use of animals for research, premium not placed on ethical use of animals as human subject research, no respect for animals*	2:45 ¶ 159
		Another challenge has to do with those who combine human research with animal research. In that kind of research, they are doing the animal research, but they need to interview one or two people in addition. So, it becomes a challenge. Where does the work fall? Does it go to the IRB, or does it come to the IACUC? So, what we have done in the past is take the component that deals with humans to the IRB to look at. Then there are the components that deal with the animal, and then the IACUC handles it as well. As in, we kind of separate the two so that it wouldn't look like... for some of them, we've had one challenge: the initial stages. It was just the IRB and the IACUC working together. **[AREC 2, Administrator 2]**	*Confusion regarding studies using both animals and humans regarding which committee to review/approve, Lack of clarity for studies involving animals and humans, IRB and AREC work together with studies involving humans and animals*	2:46 ¶ 163
		Kind of the same board members because they had expertise to conduct the two reviews. So, when approval is given and the IRB chairperson signs, people start raising issues: why should the IRB person be signing for the IACUC? So, it came to a point where we had to separate the two boards and have different chairpersons for each. **[AREC 2, Administrator 2]**	*One committee review both animal and human subject studies, Creation of confusion in ethical approval for human and animal research, carried out organisational change, use of IRB for human research, use of IACUC for animal research*	2:47 ¶ 163

OBJECTIVE 2: To explore and describe the experiences of Researchers, AREC members, and administrators of existing research ethics governance systems that promote the ethical use of animals in scientific studies in Ghana. **AREC 2**				
NUMBER	**INTERVIEW QUESTION GUIDE**	**KEY QUOTATIONS CREATED FROM THE PARTICIPANTS' NARRATIVES**	**KEY CODES CREATED FROM THE NARRATIVES**	**TRANSCRIPT REFERENCE FROM ATLAS**
		So, these are some of the few challenges, and the fact that we don't have regulations to easily fall on, just like the human aspect or national regulations and international ones too, are not readily available on the internet to use. So, these are some of the challenges, and I think training is necessary. We have more funding for capacity building in the human aspect than in the animal aspect. So, training or capacity building of the board members is also another challenge that we have. **[AREC 2, Administrator 2]**	*Lack of regulations to fall on, need for training and capacity building, and need for a proper animal governance system to oversee animal research, international regulations not easily accessible, inadequate funding for capacity building in animal research ethics compared to human subject research, inadequate capacity of AREC members*	2:48 ¶ 165
		So, at the inception stage, we had to go around and do sensitization. Even so, we still faced challenges with people accepting the whole concept and complying with it. So, implementation is a challenge. **[AREC 2, Administrator 2]**	*Need for animal use awareness creation, challenge of compliance by researchers, sensitization of researchers not yielded desired results*	2:49 ¶ 167

OBJECTIVE 2: To explore and describe the experiences of Researchers, AREC members, and administrators of existing research ethics governance systems that promote the ethical use of animals in scientific studies in Ghana. **AREC 3**

NUMBER	INTERVIEW QUESTION GUIDE	KEY QUOTATIONS CREATED FROM THE PARTICIPANTS' NARRATIVES	KEY CODES CREATED FROM THE NARRATIVES	TRANSCRIPT REFERENCE FROM ATLAS
Q2 A	Assessing the governance systems that promote the ethical use of animals in scientific studies	For now, I can only talk about the ethical review board as something that is in place to ensure ethical use of animals in research because some of the comments that come after you submit your protocol deal with how the animal is being catered for, the kind of pain you are coming to induce on the animal, and what your approaches are to minimizing it. So, I can only speak for the ethical review board because, like I said, I have not come across any policy documents, but from the work that I have seen from the ethical review board at both KNUST and UHAS, I can say that is a sort of system to ensure that there is ethical use of animals. Ethical approach when it deals with animal research. **[AREC 3, Researcher 5]**	*Existence of institutional ethical review board, ethical review board ensures animal welfare, lack of awareness of any other animal ethical governing body, no awareness of policies,*	2:9 ¶ 32
		Yes, another thing has to do with funding agencies. Some of the funding agencies that I submitted some proposals to are always asking for documents indicating that you are only going to deal with the animals in your study. And I think without that particular document or file attached to the application, you are right away rejected. So, funding agencies are also ensuring, from my experience, that there is ethical use of animals. So, that is another system. So, I think for the ethical review board, I will say that is coming from the institutions and funding agencies that are also putting in. But in terms of national policies, I have not come across any. **[AREC 3, Researcher 5]**	*Requirements of Grant funding agencies for ethical compliance, ethical use of animals a condition for research funding by doners, funding agencies ensuring ethical use of animals, lack of national policies*	2:10 ¶ 34
		Ok, so in Ghana, the holistic approach, as I said, is not available because of a lack of legislation in that particular frame, and so wherever it is existing, the institutions are doing it based on probably best practices from other universities outside of Ghana and then adopting such practices, and so in Ghana as a whole, there is no legislation available to ensure ethical use of animals for research. **[AREC 3, Member 5]**	*Holistic national governance system non-existent, Lack of regulations, need for a proper animal governance system to oversee animal research, institutional governance systems exist, based on best practices from local and international institutions*	2:23 ¶ 87

OBJECTIVE 2: To explore and describe the experiences of Researchers, AREC members, and administrators of existing research ethics governance systems that promote the ethical use of animals in scientific studies in Ghana. **AREC 3**

NUMBER	INTERVIEW QUESTION GUIDE	KEY QUOTATIONS CREATED FROM THE PARTICIPANTS' NARRATIVES	KEY CODES CREATED FROM THE NARRATIVES	TRANSCRIPT REFERENCE FROM ATLAS
		But if you want to look at it from an institutional point of view, there are instances where, for example, NIH has some specific guidelines or some things that they require in terms of animal ethics, and so if applicants are coming from certain institutions, they will have to show that they have such an ethics committee available. In fact, that was one of the reasons for setting up the Noguchi IACUC. It came out of that need. So usually, they will do it in a way to satisfy that particular agency and their guidelines. So, it's the same thing that has been readopted into the current structure that we have. **[AREC 3, Member 5]**	*Use of funding agency's guidelines for animal use, lack of legislation in Ghana, use of ethical committees, requirements of funding agencies like NIH ensure ethical use of animals, ethics committee established to attract funding (meet funding requirement)*	2:24 ¶ 93
		In the research activity, as a university system, there are three major functions of the university. Teaching, research, and community service. Research is one of the key activities of the university; therefore, if one wants to progress in the academic or professional ladder as a researcher to be recognized in the international community, then you cannot run away from some of these things. Because at any point in time, your research activity will be probed to see whether you meet that particular requirement, and I think it has started. **[AREC 3, Administrator 3]**	*International research community recognition requires ethical compliance with animal use, academic progression requires research compliant with animal use*	2:51 ¶ 174
		Now, for publication, if you publish an article that requires animal ethics, they require the submission of a certificate, a clearance certificate, to indicate that you have fulfilled the requirements of that particular research. So, the international community demanding a certificate of ethical clearance is a way of promoting ethical practice in the research environment. So, demanding an ethical clearance certificate is one of the governance systems that are in place or should be in place to be able to govern the ethical use of animals. **[AREC 3, Administrator 3]**	*International research community recognition requires ethical clearance certificate for animal use, the demand for an ethical clearance certificate serves as a governance system for animal welfare, ethical approval requirement for publication*	2:52 ¶ 178

OBJECTIVE 2: To explore and describe the experiences of Researchers, AREC members, and administrators of existing research ethics governance systems that promote the ethical use of animals in scientific studies in Ghana. **AREC 3**

NUMBER	INTERVIEW QUESTION GUIDE	KEY QUOTATIONS CREATED FROM THE PARTICIPANTS' NARRATIVES	KEY CODES CREATED FROM THE NARRATIVES	TRANSCRIPT REFERENCE FROM ATLAS
Q2 B	Assessing the experiences with the existing animal research ethics governance systems that promote the ethical use of animals in scientific studies	For now, in some cases, they have guidelines written to fulfill all righteousness, and in other cases, I think there are periodic reports you must submit. For Welcome Trust, I know every six months they require a report as to what you are doing with the animals. And even in UHAS here, after I obtained my ethical clearance, I am required to submit reports six months apart as to how the conditions of the animals I am using are. So, I think in KNUST, nothing like that came. As long as you have approval, you can do anything. There is no oversight, but with UHAS, there is an oversight because there is some sort of report. For funding agencies, there is an oversight because they require those reports to be submitted. **[AREC 3, Researcher 5]**	*Institutional differences regarding requirements, six monthly animal conditions report required by some, obtain ethical clearance, no animal conditions report require by others, Funding agencies have oversight on animal use, funding agency reporting requirements*	2:11 ¶ 39
		But I believe that the various institutions need to educate their researchers and staff on ethical review boards on the ethical use of animals. It is something that we need to be educated on because, actually, no one tells you. No one tells you; you are not educated on all those things; you are just, it happens to you, then you learn from it.**[AREC 3, Researcher 5]**	*Need for animal use awareness creation, need for intensive education about existence of ethical review board, need for education on ethical use of animals*	2:12 ¶ 41
		It is my experience with animal ethics in other jurisdictions or in other institutions. It is more robust even there than it is here, and to the point that you would not just have to get ethical approval for the use of animals; you would need to be licensed even before you can work with them and even attempt to apply for an approval. So it was that experience and understanding that made me realize that we are trying our best, which is good, but we shouldn't complain because even ours is not as good as we think it is. So even though initially I would look at it as that, now I will appreciate every form when I'm completing it because I understand that it is needed and that it is important to be done. Even though we are not doing it	*International comparative perspective, perspective shift, lack of strict adherence to ethical use of animals, use of animals for research without ethical approval and compliance, requirement of a license prior to using animals for research, training requirement prior to using animals for research, completion of long forms, understanding long ethics application forms, lack of stringent measures and compliance*	2:25 ¶ 95

OBJECTIVE 2: To explore and describe the experiences of Researchers, AREC members, and administrators of existing research ethics governance systems that promote the ethical use of animals in scientific studies in Ghana. **AREC 3**

NUMBER	INTERVIEW QUESTION GUIDE	KEY QUOTATIONS CREATED FROM THE PARTICIPANTS' NARRATIVES	KEY CODES CREATED FROM THE NARRATIVES	TRANSCRIPT REFERENCE FROM ATLAS
		as stringently as other institutions are, it is better than having nothing anyway. **[AREC 3, Member 5]**		
		As a reviewer, I think most people don't know the extent to which animal ethics are required until they start to complete the form of this nature. So, a lot is being asked, and they probably have no idea how to manage that, and they probably are not thinking deeply about how they would do it when it happens. So, I think that there will be a need for a lot of education. **[AREC 3, Member 5]**	*Lack of awareness, need for intensive education about animal research, requirements for completing ethics application form, lack of knowledge about ethical use of animals making it difficult to complete forms*	2:26 ¶ 97
		For people to understand what it entails to use animals and then why you cannot just stand one day and decide that you want to do research so the animal must suffer for it. **[AREC 3, Member 5]**	*Need for awareness on animal welfare, need for ethical considerations*	2:27 ¶ 102
		Now people have embraced it. For the committee, we have been inspecting the facilities, all the animal facilities on campus. We have organized programs and capacity-building programs for animal keepers to ensure that they perform their duties within ethical standards. That is why I'm saying that awareness has been created and everybody is becoming aware that if I want to do this, this is required of me. And I think, in my view, it's a good development to preserve life. So, like during our early days when you saw young people just killing animals anyhow, even when they were playing, we have now seen the light, and as I think we are now learning, it may come to a time that even this particular education will go down to the primary school. Every life matter, including animals. **[AREC 3, Administrator 3]**	*Training people about animal welfare and use for research, obtaining people's commitment to ethical standards, educating them on the preservation of life*	2:53 ¶ 179

Appendix 7.1: The Thematic Analysis Findings on the Existing Research Ethics Practices that Promote the Ethical use of Animals in Scientific Studies in Ghana from Case 1

OBJECTIVE 3: To explore and describe the experiences of Researchers, AREC members, and AREC administrators of existing research ethics practices that promote the ethical use of animals in scientific studies in Ghana **AREC 1**

Questions	Main Themes	Subtheme (Category)	Codes	Participants Labels				
				#R1	#R2	#M1	#M2	#A1
According to you, which research ethics governance practices promote the ethical use of animals in scientific studies?	Obtaining ethics clearance certificates	Ethics application process	*Animal ethics committee responsiveness*	x				
			Seeking ethical animal committee review of protocols				x	x
			Thorough review of protocols focused on animal research pain assessment				x	x
		Protocols approval process	*Advice and guidance by the animal ethics committee*				x	
			Revision of protocol to ensure animal welfare					x
			Approval of research protocols					x
			Issuance of ethics certificates				x	
	An application of ineffective governance practices	Administrative inefficiencies in the protocol's application and approval process	*Lack of requisite training among animal ethics board members*		x			
			Unnecessary delaying of requests		x			
			Delays in ethics review process		x			
			Complicated ethics application forms	x				
			Forms difficult to complete	x				
			Time-consuming process	x				
			Untimely feedback	x				
			Bureaucracy	x				
			Laxity	x				
		Need for ethics committee members and researchers' refresher training	*Conducting training programs and awareness among researchers*					x
			Need of refresher training among animal ethics committee members	x	x			x
			Need of training for ethics committee members	x				
		Need to ensure animal welfare and use paramount	*Strict adherence to guidelines*				x	
			Ensuring animal welfare				x	
			Making animal welfare and use paramount				x	
			Institutional improvement and social justice	x				x

OBJECTIVE 3: To explore and describe the experiences of Researchers, AREC members, and AREC administrators of existing research ethics practices that promote the ethical use of animals in scientific studies in Ghana				AREC 1				
Questions	**Main Themes**	**Subtheme (Category)**	**Codes**	**Participants Labels**				
				#R1	**#R2**	**#M1**	**#M2**	**#A1**
		Need for administrative processes improvement	*Need for process improvement*	x				
			Keeping abreast of the current state of knowledge		x			
What has been your experience with the existing research ethics governance practices in place in your institution to promote the ethical use of animals in scientific studies?	**Positive experiences with research ethics governance practices at the institutions**	**Ethical clearance application process**	*Ensuring efficient process for applying the ethical use of animals*	x				
			AREC ensuring quality assurance				x	
			Review of animal research protocols				x	
			Provision of justification for using animals in research				x	
			Approval of protocols				x	
		Ethical use of animals' awareness creation	*Creating awareness about animal use for research*	x				
			Institution made some progress with animal ethics					x
			Minimal progress in ethics awareness					x
			Upholding animal welfare	x				
		Ethical use of animals monitoring and supervisory practices	*There is a regulated environment*	x				
			Monitoring and supervising the animal research (AREC)			x	x	
			Supervising agency (e.g., In-house veterinarians)	x				
			Monitoring systems (Ensuring checks and balances)	x				
		Adherence to ethical use of animals	*Ensuring compliance with ethical approval conditions*	x			x	
			Minimal compliance with ethical clearance procedures					
			Ensuring strict adherence to the ethical use of animals	x				
			Accountability	x				
	Negative experience with research ethics governance practices at the institutions	**Unsatisfactory experiences with current research ethics governance practices in place in the institution**	*Negative experiences*			x		
			Social injustice			x		
			Discrimination and racism			x		
			Frustration		x			
		Lack of in-depth understanding and a supportive practice	*Lack of a supportive system for animal use in Ghana*			x		
			Lack of in-depth veterinarian understanding of animal research					
			Lack of appreciation of animal research among the supervisors					

OBJECTIVE 3: To explore and describe the experiences of Researchers, AREC members, and AREC administrators of existing research ethics practices that promote the ethical use of animals in scientific studies in Ghana **AREC 1**

Questions	Main Themes	Subtheme (Category)	Codes	Participants Labels				
				#R1	#R2	#M1	#M2	#A1
			Lack of information about the Animal Ethics Committee processes and guidelines		x			
			Lack of or inaccessible AREC SOPs		x			
		Inefficiency in ethics application process	*Inefficiency in the current ethical application process*	x	x			
			The existence of procrastination among ethical review board members		x			
			High turnaround time for ethical review		x			
			No sense of urgency for review by AREC members		x			
		Unnecessary delay in review and approval process	*Delays making the institution less competitive globally*		x			
			Delays affecting project implementation timelines		x			
			Delays affecting impact of publications					
			Delay in giving feedback		x			
	Need for improvement in research ethics governance practices at the institutions	**Need for improvement in the application process and acquire robust monitoring system**	*Need for improvement in the application and review process*		x			
			Need for improvement in the administrative process		x	x		
			Need for institutional improvement		x	x		x
			Need for robust monitoring system in place			x		
		Need for collaboration and efficiency in the AREC's activities	*Need for collaboration between researcher and veterinarian*			x		
			Need for efficiency by the AREC to become more globally competitive		x			

Appendix 7.2: The Thematic Analysis Findings on the Existing Research Ethics Practices that Promote the Ethical use of Animals in Scientific Studies in Ghana from Case 2

OBJECTIVE 3: To explore and describe the experiences of Researchers, AREC members, and AREC administrators of existing research ethics practices that promote the ethical use of animals in scientific studies in Ghana				AREC 2				
Questions	**Main Themes**	**Subtheme (Category)**	**Codes**	**Participants Labels**				
				#R3	**#R4**	**#M3**	**#M4**	**#A2**
According to you, which research ethics governance practices promote the ethical use of animals in scientific studies?	**Obtaining ethics clearance certificates**	**Protocols application process**	*Sensitization on the ethical review application process and requirements*				x	x
			Assessing animal welfare for research				x	
			Ensuring qualified team of researchers to conduct study using animals				x	
		Protocols approval process	*Offering pieces of advice*				x	
			Ensuring ethical considerations				x	
			Institute certification for students before they use animals for research			x		
	An application of ineffective governance systems	**Lack of legislation, enforcement and adherence to ethical animal standards**	*Lack of regulatory systems*			x		
			Lacking strict adherence to the animal research process	x				
			Researchers exercise their discretion on animal use compliance	x				
			Seeking ethical clearance not compulsory	x				
			Study team decides whether or not to seek ethical clearance	x				
			Non-adherence to standards			x		
			Lack of compliance			x		
		Lack of concern and care about animal use	*Lack of animal welfare*			x		
			Lack of concern and care about animal use			x		
			Lack of awareness of the need for ethical review	x				
			A huge gap between Ghana and developed countries in ensuring ethical use of animals			x		
			Lack of information		x			
			Doubt		x			
		Poor animal research facilities	*Poor animal research practices*			x		
			Existence of a poor laboratory system			x		

OBJECTIVE 3: To explore and describe the experiences of Researchers, AREC members, and AREC administrators of existing research ethics practices that promote the ethical use of animals in scientific studies in Ghana				AREC 2				
Questions	**Main Themes**	**Subtheme (Category)**	**Codes**	**Participants Labels**				
				#R3	**#R4**	**#M3**	**#M4**	**#A2**
			Poor conduct of lab animal research			x		
		Need for ethical use of animal awareness creation	*Need for awareness raising on animal use*			x		x
			Need for animal research training and awareness creation	x		x		x
			Need to train undergraduate and postgraduate on ethical use of animal for research			x		
			Continuous training and education on ethical use of animal			x		x
		Need for legislation and advocacy for ethical use of animal for research	*Need for animal welfare outreach*			x		
			Advocacy for ethical use of animal for research			x		
			Need for animal welfare advocacy groups			x		
			Need for animal rights			x		
			Social activism			x		
			Need for legislation			x		
		Need for well-structured facilities	*Need for institutional improvement with systems for ethical use of animals in research*			x		
			Need for a well-structured lab to promote animal research			x		
			Need for resources to enhance ethical research			x		
What has been your experience with the existing research ethics governance practices in place in your institution to	**Positive experiences with research ethics governance practices at the institutions**	**Ethical use of animals' application process**	*Submit animal research applications to AREC*				x	
			AREC review of protocol				x	
			One on one assistance/support by the AREC to researchers				x	x
			Provide approval for research protocols				x	x
			AREC advice to researchers				x	
		Ethical use of animals monitoring and supervising system	*AREC conducts evaluations*				x	
			Provide feedback				x	
			Make corrections if required				x	
			Monitor and supervise the animal research environment				x	
			Provide post approval support for animal use for research					x

OBJECTIVE 3: To explore and describe the experiences of Researchers, AREC members, and AREC administrators of existing research ethics practices that promote the ethical use of animals in scientific studies in Ghana				AREC 2				
Questions	**Main Themes**	**Subtheme (Category)**	**Codes**	**Participants Labels**				
				#R3	**#R4**	**#M3**	**#M4**	**#A2**
promote the ethical use of animals in scientific studies?			*Inspection of animal houses and research sites*				x	
		Adherence to the ethical use of animals	*Ensure ethical use of animals for research*				x	
			Use 3Rs principles				x	
			Provide training and recommendations about the ethical use of animals for research					x
	Negative experience with research ethics governance practices at the institutions	**Lack of animal welfare focus**	*Subjecting animals to suffering*			x		
			Inhumane use of animals and			x		
			Animal cruelty			x		
		Lack of strict adherence to the ethical use of animals	*Researchers seek academic publication interest*			x		
			Submission of protocols for approval is motivated by research publication interest			x		
			Publication bias			x		
		Poor animal research facilities	*The existence of animal college that is not well resourced and equipped*			x		
			Inadequate well equipped and resourced animal houses for research in Ghana			x	x	

Appendix 7.3: The Thematic Analysis Findings on the Existing Research Ethics Practices that Promote the Ethical use of Animals in Scientific Studies in Ghana from Case 3 (AREC 3)

OBJECTIVE 3: To explore and describe the experiences of Researchers, AREC members, and AREC administrators of existing research ethics practices that promote the ethical use of animals in scientific studies in Ghana				AREC 3		
Questions	**Main Themes**	**Subtheme (Category)**	**Codes**	**Participants Labels**		
				#R3	**#M5**	**#A3**
According to you, which research ethics governance practices promote the ethical use of animals in scientific studies?	**Processes for obtaining ethical clearance certificates**	**Protocols application process**	*Institutional responsibility for animal use*	x	x	
			Fill out the application form			x
			Submit the application			x
		Protocols approval process	*Review application based on its relevance*	x		x
			Ensuring adherence to rules and regulations for ethical use of animals	x		
			Assessing alternatives to animal testing	x		
			Ensuring animal welfare	x	x	
			Regular visits to animal facilities and research environments	x		
	An application of ineffective ethics governance practices	**Lack of enforcement and adherence to ethical animal standards**	*Lack of animal welfare compliance in research*		x	
			The need to ensure periodic report submission	x		
			Lack of monitoring and supervision	x		
			Lack of enforcement		x	
		Need to sensitise institutional staff and AREC members on ethical use of animals	*Need for AREC to perform due diligence in reviewing and approving protocols*	x		
			AREC members not well versed in animal studies	x		
			Some AREC members don't understand protocols	x		
			AREC should be guided by the 3Rs in their review	x		
		Need for well-structured facilities	*Lack of animal house facilities for experimentation by students*		x	
			Need for a well-structured lab to promote animal research		x	
			Lack of adequate resources for conduct of research involving animals		x	
		Ethics application process	*Procedures for research using animals questionable*	x		

OBJECTIVE 3: To explore and describe the experiences of Researchers, AREC members, and AREC administrators of existing research ethics practices that promote the ethical use of animals in scientific studies in Ghana						AREC 3
Questions	**Main Themes**	**Subtheme (Category)**	**Codes**	**Participants Labels**		
				#R3	**#M5**	**#A3**
What has been your experience with the existing research ethics governance practices in place in your institution to promote the ethical use of animals in scientific studies?	**Positive experiences with research ethics governance practices at the institutions**		*Availability of research guidelines*	x		
			Understanding the ethics application forms	x		
			Research application process	x		
			Submit an animal research application form			x
		Ethical use of animals monitoring and supervising practices	*Conduct evaluation*			x
			The AREC reviews application			x
			Provide feedback			x
			Make corrections if required			x
			Offer approval			x
			Submit the report either annually, biannually, or quarterly			x
			Site visit to the research environment			x
		Adherence to the ethical use of animals	*Ensure animal welfare*	x		
			Sensitisation on ethical use of animals for research		x	
			Training on ethical use of animals		x	
			Usage of whistle-blowers for non-compliance			x
	Negative experience with research ethics governance practices at the institutions	**Lack of strict adherence to the ethical use of animals**	*Inadequate animal care compliance*	x		
			Lack of adherence to international animal research standards	x		
			Need for adherence to existing guidelines for animal use	x		
			Need for an ethical review board to ensure strict compliance with animal research	x		
		Cumbersome ethics application process	*Existence of cumbersome animal research application processes*		x	
			Bureaucracy		x	
			Inability to complete ethics application forms well		x	

OBJECTIVE 3: To explore and describe the experiences of Researchers, AREC members, and AREC administrators of existing research ethics practices that promote the ethical use of animals in scientific studies in Ghana				AREC 3		
Questions	**Main Themes**	**Subtheme (Category)**	**Codes**	**Participants Labels**		
				#R3	**#M5**	**#A3**
		Poor animal research facilities	*Lack of animal research resources*	x		
			Lack of animal house facilities for experimentation	x		
			Need for a well-structured lab to promote animal research	x		
			Inadequate and poor housing conditions	x		
		Need to simplify ethical use of animals' application process	*Need for user-friendly processes*		x	
			Need for institutional improvement		x	
			Need for simplification of animal research process		x	
		Lack of animal use for research awareness	*Lack of animal use for research awareness*		x	
			Need for continuous training and education on the ethical use of animals		x	
			Inadequate training for staff and students	x		

Appendix 7.4: Comprehensive Findings with Respect to the Key Quotes and Key Codes from the Participants in Objective 3 from AREC 1 to AREC 3

OBJECTIVE 3: To explore and describe the experiences of Researchers, AREC members, and AREC administrators of existing research ethics practices that promote the ethical use of animals in scientific studies in Ghana. **AREC 1**

NUMBER	INTERVIEW QUESTION GUIDE	KEY QUOTATIONS	KEY CODES DERIVED FROM THE PARTICIPANTS	TRANSCRIPT REFERENCE FROM ATLAS
Q3 A	Assessing the research ethics governance practices that promote the ethical use of animals in scientific studies	So, when it comes to that, let me think. So far, if I compare the feedback, I get from an animal ethics committee with what I get from the human ethics committee, it is much faster for the human ethics committee. Like I said, even the forms to fill out—the one that I am familiar with—are very complicated, and when it comes to the review time, it is also very long. I have stayed in one for almost 6 to 8 months before we could begin work, so I think there is a bit of laxity in terms of how they approach doing that kind of business. The other thing is that people on such boards will need frequent training. **[AREC 1, Researcher 1]**	*Animal ethics committee responsiveness, untimely feedback, need of training for ethics committee members, need for process improvement, administrative inefficiency, time-consuming process, institutional improvement, bureaucracy, laxity, complicated ethics application forms, forms difficult to complete*	3:4 ¶ 17
		I am wondering, for those who are on the animal ethics board now, whether one or all of them have the requisite training to be qualified enough to be there, and whether even those who were there from the beginning have had any refreshers over the period, because without that, many things are changing globally, and if you don't constantly refresh your knowledge, you get stuck in the old ways of doing things. Probably there is refinement that will make things move faster or happen better, but you are not aware, and you keep delaying what needs to be done. So, I think training our ethics committee members is very important. Of course, that will facilitate and help turn around time for all of these things. **[AREC 1, Researcher 2]**	*Lack of requisite training among animal ethics board members, need for refresher training among animal ethics committee members, keeping abreast of the current state of knowledge, unnecessary delaying of requests, importance of training, social justice, delays in ethics review process*	3:5 ¶ 18
		Once your protocol is approved and you are given certification, you provide study-specific protocols that guide us in our work. So, you see, even if you are doing something that requires a certain level of pain, the committee will advise you on how it	*Review and approval of protocols, issuance of ethics certificates, advice and guidance by the animal ethics committee, making animal welfare and use paramount*	3:23 ¶ 77

OBJECTIVE 3: To explore and describe the experiences of Researchers, AREC members, and AREC administrators of existing research ethics practices that promote the ethical use of animals in scientific studies in Ghana. **AREC 1**

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		should be done. So, practically, we make sure that it's mainly the welfare of the animal. Its paramount. **[AREC 1, Member 2]**		
		So, for example, if you want to do some work and then we notice that when you give the injection, the animals will be in pain, we will advise that you take a second look at it. There are various ways to access pain. So, we have some guidelines we use to access pain. So, if you see that it is beyond the pain level, based on what you indicated in your proposal, we ask that you hold on and then revise. So, we have put in place checks and balances so that the welfare of the animal will be paramount. **[AREC 1, Member 2]**	*Animal research pain assessment, ensuring animal welfare, revision of protocol to ensure animal welfare, strict adherence to guidelines, making animal welfare and use paramount*	3:24 ¶ 79
		So, the things we've been doing are to ensure that every research project that goes on is subjected to a committee and a thorough review of those protocols. These are some of the daily things we do. We conduct a lot of training and raise awareness among faculty members and researchers. This is what we've been doing for some time now, and I think it's yielding a lot of fruit. **[AREC 1, Administrator 1]**	*Seeking ethical animal committee review of protocols, approval of research protocols, creating awareness among researchers, conducting training programs, ensuring institutional improvement, and witnessing fruitful results, thorough review of protocols,*	3:42 ¶ 134
Q3 B	Assessing the experience with the existing research ethics governance practices in place in the institution that promote the ethical	Generally, once there is a supervising agency, there are supervisors—the people who actually verify that whatever people say they are doing is done. In some jurisdictions, for example, if I use my US experience, if you have a well-constructed animal laboratory, they are in a regulated environment, and so on, you also have in-house veterinarians who monitor the behavior of animals and give advice on what to do with the animals. **[AREC 1, Researcher 1]**	*Supervising agency, accountability, in-house veterinarians for monitoring, upholding animal welfare, there is a regulated environment*	3:2 ¶ 8

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	use of animals in scientific studies	In some instances, they either euthanize or recommend that the researcher euthanize the animals, and if you don't do it, you can be questioned for not doing it. So, with some of these measures put in place, it is difficult for anyone not to adhere to the ethical use of animals. If there is no monitoring, I can choose to do anything I want. Monitoring is important. Whatever system there is, we have to make sure that there is monitoring and checks and balances that make sure that once people know that they are being observed or monitored, they will conduct the research ethically. With the form that I filled out, it's a very good form, and on the form, there are times when I think they have to come around and monitor what you are doing, but this doesn't happen. **[AREC 1, Researcher 1]**	*Ensuring strict adherence to the ethical use of animals, monitoring systems, ensuring checks and balances, creating awareness about animal use for research, and an efficient process for applying the ethical use of animals, ensuring compliance*	3:3 ¶ 12
		I think that is one of the major challenges that we have in our system. When someone is supposed to review something and send it to the next level, they will leave it down for so long that you'd have to follow up and follow up, and they don't realize that they are delaying. They become sort of an assembly line, where there are many people waiting to act based on what you have done. **[AREC 1, Researcher 2]**	*Need for improvement in the application and review process, inefficiency in the current ethical application process, the existence of procrastination among ethical review board members, high turnaround time for ethical review, no sense or urgency for review by AREC members*	3:6 ¶ 20
		So if you delay, you are delaying every other process that must happen downstream, and I think some of those things need to be sort of checked; otherwise, we are becoming so much less competitive globally because, as I said, if I had to wait almost 6 to 8 months to get approval to do some work, someone in another place could get that in 1 month. By the time I start, they are already publishing. So that is a big challenge, and we need our administrators to understand that when I am pushing you to get something done, it is not	*Unnecessary delay in review and approval, delays making the institution less competitive globally, delays affecting project implementation timelines, delays affecting impact of publications, need for institutional improvement, need for efficiency by the AREC to become more globally competitive, need for improvement in the administrative process,*	3:7 ¶ 26

OBJECTIVE 3: To explore and describe the experiences of Researchers, AREC members, and AREC administrators of existing research ethics practices that promote the ethical use of animals in scientific studies in Ghana. **AREC 1**

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		because I'm pushing. It's because I'm looking at so many things, including competitiveness. Otherwise, we will just be wasting our time, and by the time you get any data out, it will become dead news. **[AREC 1, Researcher 2]**		
		Especially when it comes to the animal bit. But I'm just looking at our animal ethics committee; I'm not even sure how often they are supposed to meet or what their SOPs are. I've not seen it. I won't say they don't have it because I have not looked for it. Probably they might have it, and I haven't seen it, but ideally, looking at how long it takes to get feedback from them, there are some bottlenecks that, with my understanding of what needs to happen on that job, will work better. **[AREC 1, Researcher 2]**	*Frustration, desire for improvement in processes, lack of information about the Animal Ethics Committee processes and guidelines, delay in giving feedback, lack of or inaccessible AREC SOPs, ethical review bottlenecks*	3:8 ¶ 28
		Ok, I've had positive and negative experiences. I've had positive experiences because some ethics committees understand and appreciate where the researcher is coming from, and they would want to apply the 3Rs principle. **[AREC 1, Member 1]**	*Positive experiences, social justice, ethics committee with a deep understanding and appreciation of animal use*	3:19 ¶ 68
		I've also had negative experiences where some committees don't understand, and they would want to throw the baby, the bucket, and the water out. And I've had apartheid experiences; it was in South Africa, where it was because of my color that my work was being done; they were overcritically looking at my work because of my color. **[AREC 1, Member 1]**	*Negative experiences, discrimination, social injustice, racism, lack of understanding*	3:20 ¶ 70
		I've had pleasant experiences in China, where they were quite supportive of the work; they understood it, and I saw their practices as also very interesting. There were things I learned from them. Sometimes people do not follow humane procedures. But the good thing, and perhaps our system has to be strengthened, is that, in China, where the animals	*Lack of a supportive system for animal use in Ghana, need for institutional improvement, need for monitoring system in place*	3:21 ¶ 72

OBJECTIVE 3: To explore and describe the experiences of Researchers, AREC members, and AREC administrators of existing research ethics practices that promote the ethical use of animals in scientific studies in Ghana. **AREC 1**

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		are kept, in theater rooms, etc., they are all mounted with camara. So, they can monitor whatever you are doing. That is not available at my institution, so we need to do that. **[AREC 1, Member 1]**		
		And also, some of the negative experience I'll say is understanding between the veterinarians who oversee it, because every work must finally end up in a veterinarian's hands who will oversee the in-depth welfare of the animal, so some of them overreact, so the researcher is looking for something. I was looking for something pertaining to cancer, and the longer the animal stays in the work, the better for me because cancer does not develop overnight. I was going 36 months, and you have an animal that has gone 20 months, and you can see that in a few more months, I'll get good results, and there may just be a sore on the tail of the animal, and the veterinarian says no, sacrifice the animal. And that becomes very hard for the researcher. So those are some of the experiences I've had. There must be a good understanding of the work by the veterinarian and an appreciation of the work. **[AREC 1, Member 1]**	*Lack of in-depth veterinarian understanding of animal research, lack of appreciation of animal research among the supervisors, need for collaboration between researcher and veterinarian*	3:24 ¶ 73
		After the committee has done that, we in practice ensure that whatever has been recommended in your protocol and was approved by the committee is what you do. **[AREC 1, Member 2]**	*AREC ensuring quality assurance, ensuring compliance with ethical approval conditions*	3:25 ¶ 83
		You must provide justification for the use of the animal and the number of animals you are going to use. The type of animal you want to use and why you want to use that type of animal. If it is mice, why mice? If it is rats, why rats? If it is grasscutters or anything, So, once that approval is given, the way you do the work, the committee will have to look at all that. When they approve it, then we make sure that we also have a system in place that	*Provision of justification for using animals in research, review of animal research protocols, approval of protocols, monitoring and supervising the animal research (AREC)*	3:26 ¶ 87

OBJECTIVE 3: To explore and describe the experiences of Researchers, AREC members, and AREC administrators of existing research ethics practices that promote the ethical use of animals in scientific studies in Ghana. **AREC 1**

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		checks the work that you are doing and how you are going about it. **[AREC 1, Member 2]**		
		I think so far so good. We still have a long way to go, but my institution has made a long stride. We've really, really improved because before, things were not like that. People were just conducting their own research anyway. But people are now aware that they have to submit their work through ethical clearance procedures. **[AREC 1, Administrator 1]**	*Institution made some progress with animal ethics, minimal progress in ethics awareness, minimal compliance with ethical clearance procedures, need for institutional improvement*	3:43 ¶ 137

OBJECTIVE 3: To explore and describe the experiences of Researchers, AREC members, and AREC administrators of existing research ethics practices that promote the ethical use of animals in scientific studies in Ghana. **AREC 2**

NUMBER	INTERVIEW QUESTION GUIDE	KEY QUOTATIONS	KEY CODES DERIVED FROM THE PARTICIPANTS	TRANSCRIPT REFERENCE FROM ATLAS
Q3 A	Assessing the research ethics governance practices that promote the ethical use of animals in scientific studies	I think it still comes down to the same thing; it is very subjective, depending on the research team. Or whatever requirements are there. So, if you are knowledgeable or think you know about it and you know you must go for it, you will apply for the ethics; you do it. Otherwise, you may finish your work and not have ethics approval. So, in practice, it depends on the research team. Sometimes, it depends on the requirements. **[AREC 2, Researcher 3]**	*Lacking strict adherence to the animal research process, researchers exercise their discretion on animal use compliance, seeking ethical clearance not compulsory, study team decides whether or not to seek ethical clearance*	3:10 ¶ 36
		So, if the team knows that they must get ethics approval, they may go for it. But there are research teams that don't know; they don't think they need ethical approval for whatever work they are doing. **[AREC 2, Researcher 3]**	*Lack of awareness of the need for ethical review, need for animal research training*	3:11 ¶ 38
		I think the ethical clearance board should have been the best people to answer these questions. I don't have any idea. **[AREC 2, Researcher 4]**	*Doubt, lack of information*	3:13 ¶ 45
		We haven't started at all. If I look at my experience in the US in handling labs, as I said, laboratory work here is poor. It is very poor. I mean, if you want to look at laboratory mice, breeds, or species you want, erm, where do you go? Who are the breeders? They are not there. So, you do whatever you think is right. You know, maybe if you went to Mampong or Noguchi (Noguchi Memorial Institute for Medical Research). Noguchi has a well-structured lab. P3 lab over there, and with all those animals over there. Maybe they have certain practices that may help. Of course, I've been to their lab before. **[AREC 2, Member 3]**	*Existence of a poor laboratory system, referencing the Noguchi Memorial Institute for Medical Research as a well-structured lab, the need for a well-structured lab to promote animal research, a huge gap between Ghana and developed countries in ensuring ethical use of animals, Poor conduct of lab animal research, lack of regulatory systems, lack of compliance, poor animal research practices, non-adherence to standards*	3:28 ¶ 93
		What we have to do is try to reach out to institutions and create awareness. I am aware of some awareness-creation seminar that was organized some time ago. The frequency is another thing because of the resources. **[AREC 2, Member 3]**	*Need for awareness creation, need for resources to enhance ethical research, need for animal welfare outreach*	3:29 ¶ 95

OBJECTIVE 3: To explore and describe the experiences of Researchers, AREC members, and AREC administrators of existing research ethics practices that promote the ethical use of animals in scientific studies in Ghana. **AREC 2**

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		I think one thing that can also be done, not just raise awareness, is to help the institutions put in place these measures. Identify the areas where animals are used. And especially with the students. First-year students, if for nothing at all, should be brought on board right from the beginning, and postgraduate students, before they touch animals, must go through ethical use training. They should have a course. You should have passed your certification before you started your work. **[AREC 2, Member 3]**	*Need to train undergraduate and postgraduate on ethical use of animal for research, need for institutional improvement with systems for ethical use of animals in research, institute certification for students before they use animals for research*	3:30 ¶ 97
		You see, the whole thing must start with the law. The legislation. When there is legislation, everybody will be forced to work to meet the requirements of the legislation. Then the other thing is the pressure group. If the animal rights people come in, yes, they may keep raising awareness. The way we like killing all kinds of animals, we are killing animals everywhere. You see, so we have to understand animals. All they do and what they don't do are important to us. We don't seem to care. Even animals on the IUCN (International Union for Conservation of Nature) red list are killed, and nobody cares. They kill them and display them by the roadside. Everybody is passing, and the police are passing, and the game and wildlife people are passing, and they are even selling those animals to them. **[AREC 2, Member 3]**	*Need for legislation, need for animal welfare advocacy groups, need for awareness raising on animal use, lack of animal welfare, lack of concern and care about animal use, lack of enforcement*	3:31 ¶ 99
		So, nobody is looking at animal use for laboratory work at all. Maybe your work should bring about that kind of awareness. Whether you can get it or not, rally people around. **[AREC 2, Member 3]**	*Advocacy for ethical use of animal for research, animal research awareness, need for animal rights, social activism*	3:32 ¶ 101
		One critical issue you can easily see through the application is that if you are going to have an invasive intervention with the animal, and when you bring your list of investigators, straight away, we will see that there is something wrong. So, we try to encourage people to have a vet on the study who will	*Assessing animal welfare for research, ensuring ethical considerations, offering pieces of advice, ensuring qualified team of researchers to conduct study using animals*	3:36 ¶ 113

OBJECTIVE 3: To explore and describe the experiences of Researchers, AREC members, and AREC administrators of existing research ethics practices that promote the ethical use of animals in scientific studies in Ghana. **AREC 2**

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		give emergency attention to the animal in case there is anything. Or we even advise that the animal is not meeting its welfare. Yeah, so some of these things we look at deeply, and we will advise you. **[AREC 2, Member 4]**		
		On a day-to-day basis, I will say continuous education for anybody that we come into contact with. So, anybody who expresses interest in submitting for ethical clearance, we seize the opportunity to provide some kind of education and a basic explanation of what is expected of you as a researcher and what is expected of us as a board. **[AREC 2, Administrator 2]**	*Continuous training and education on ethical use of animal, sensitisation on ethical use of animals for research, sensitization on the ethical review application process and requirements*	3:45 ¶ 144
Q3 B	Assessing the experience with the existing research ethics governance practices in place in the institution that promote the ethical use of animals in scientific studies	My experience in Ghana has been that people submit their protocols for review not because of their interest in the animal but because of the requirements for publications. There are differences here, so we have to make people aware that I am doing it because of the animal. Not because of publication. **[AREC 2, Member 3]**	*Researchers seek academic publication interest, submission of protocols for approval is motivated by research publication interest, publication bias, lack of animal welfare focus*	3:33 ¶ 105
		Look at the animal college; that is the worst form of mistreatment of animals here, not even for the lab work. Animal College in Ghana is horrible. It is horrible. You see, I worked with animals in New Zealand, the college facilities, and all those things. My goodness, it's tops. Here, no, animal college is one of the poorest that you have. The animals are suffering, even to the point of slaughter. Nobody cares. **[AREC 2, Member 3]**	*Inhumane use of animals, the existence of animal college that is not well resourced and equipped, subjecting animals to suffering, animal cruelty*	3:34 ¶ 107
		Applications are taken and then sent to members for review. And then, recommendations are discussed. And the recommendation given to scientists is what they are supposed to do or what the gaps are. Then they will be able to either do that or have it rejected or accepted with corrections to what they are doing. So, if you are going to do work on animals, we look at the animal you are going to use. Is it sufficient, or	*Submit animal research applications to AREC, AREC review of protocol, AREC conducts evaluations, provide feedback, make corrections if required*	3:37 ¶ 117

OBJECTIVE 3: To explore and describe the experiences of Researchers, AREC members, and AREC administrators of existing research ethics practices that promote the ethical use of animals in scientific studies in Ghana. **AREC 2**

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		is it more than necessary? So, if it is more than necessary because we are dealing with animal welfare, then we will recommend that you reduce the numbers. If it is possible you could do with its cells, why do you have to use lifeless animals because they will be suffering? **[AREC 2, Member 4]**		
		So, we look at those 3 Rs. And then the last R is welfare, concerning the welfare of the animal. Unfortunately, there are very few places where animals can be kept for research. So, what we do is, if somebody is not going to do it at a recognized place, then we try to inspect the environment in which he is going to do the research. And when we inspect, we certify that the environment is okay, and then we give the go-ahead. So, these are some of the things we look at, and we try to advise researchers. **[AREC 2, Member 4]**	*Use 3Rs principles, ensure ethical use of animals for research, monitor and supervise the animal research environment, inadequate well equipped and resourced animal houses for research in Ghana, inspection of animal houses and research sites, AREC advice to researchers*	3:38 ¶ 123
		After the approval, if you still need any help, we will still provide that support system for anybody who needs it. If maybe somebody is not too familiar with the guidelines and needs further explanation, or if there is a recommendation from the board that someone is not too clear about, we can assign you a board member who will walk you through the process and make sure that you get the needed understanding. **[AREC 2, Administrator 2]**	*Provide approval for research protocols, provide post approval support for animal use for research, provide training and recommendations about the ethical use of animals for research, one on one assistance/support by the AREC to researchers*	3:46 ¶ 146

OBJECTIVE 3: To explore and describe the experiences of Researchers, AREC members, and AREC administrators of existing research ethics practices that promote the ethical use of animals in scientific studies in Ghana. **AREC 3**

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Q3 A	Assessing the research ethics governance practices that promote the ethical use of animals in scientific studies	Like I said, erm, education. We need to let our staff know about the use of animals, and we also need to enforce the use of the rules and regulations because if the animal houses or animal house facilities exist, regular visits to those places need to be conducted for us to indeed see that the animals are kept in the humane condition that we have written down on paper. We need to really scrutinize the protocols that we will review and ask questions about; can we not replace this *in-vivo* study with *in-vitro* approaches? Is this the only way? So, we need to consider replacement if need be; we need to consider refinements if need be and then those are the three Rs, and we need to reduce the number of animals we use. So, we need to do that, and most importantly, the various individuals on the ethical review board who are supposed to review protocols for animal studies need to be well-versed. They need to be well equipped to understand so that they can really make input and be sure there is ethical use of animals. **[AREC 3, Researcher 5]**	*Need to sensitise staff on ethical use of animals, ensuring adherence to rules and regulations for ethical use of animals, regular visits to animal facilities and research environments, need for AREC to perform due diligence in reviewing and approving protocols, assessing alternatives to animal testing, AREC should be guided by the 3Rs in their review, AREC members' not well versed in animal studies, AREC members don't understand protocols*	3:14 ¶ 50
		Researchers are making sure the animals are well catered for and well cared for. So, if the institution does not have people who come around to check periodically, if reports are not submitted periodically, we will never know how the animals are cared for, especially how animals are disposed off, and that is one of my biggest worries. **[AREC 3, Researcher 5]**	*Institutional responsibility for animal use, ensuring animal welfare, the need to ensure periodic report submission, lack of monitoring and supervision*	3:15 ¶ 51
		Institutions also need to have it at the back of their minds to build and resource the animal house. If a number of their research staffs are doing studies in that kind of area, then that institution must have a place to keep their animals. Because right now, not to snitch on my school, we are doing a lot of research involving animals, but we don't have an animal house facility, and the animals are kept in the lab	*Institutional responsibility for animal use, need for an animal house for research involving animals, lack of adequate resources for conduct of research involving animals, lack of animal house facilities for experimentation by students, need for a well-structured lab to promote animal research, lack of animal welfare compliance in research, lack of enforcement*	3:16 ¶ 53

OBJECTIVE 3: To explore and describe the experiences of Researchers, AREC members, and AREC administrators of existing research ethics practices that promote the ethical use of animals in scientific studies in Ghana. **AREC 3**

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		where students are carrying out various experiments. So, you can already tell that animal welfare is not being taken care of; the institution is not enforcing those things. **[AREC 3, Member 5]**		
		So, the practice will be to complete a form, which will basically look at the source and the relevance of the work that is being done. **[AREC 3, Administrator 3]**	*Fill out the application form, submit the application, review application based on its relevance*	3:47 ¶ 151
Q3 B	Assessing the experience with the existing research ethics governance practices in place in the institution that promote the ethical use of animals in scientific studies	The major issue, I would say, is maybe a lack of resources because the housing condition of the animals is not so good. You are keeping about 10 to 15 animals in a cage, which is supposed to have a maximum of 6. So it is quite questionable: the feed, you give them any kind of food, which is not ideal, and how the animals are handled is also a problem because the people handling the animals are not trained; they don't have the expertise in dealing with the animals, and the technicians who are working in the school of pharmacy teaching students on various animal models don't have any training on animal care. So those are my experiences—the things that we need to address immediately. So, along with coming in with a governance framework, it also comes with resources. **[AREC 3, Researcher 5]**	*Lack of animal research resources, Lack of animal house facilities for experimentation, need for a well-structured lab to promote animal research, inadequate animal care compliance, inadequate and poor housing conditions, inadequate training for staff and students, lack of adherence to international animal research standards, procedures for research using animals questionable*	3:17 ¶ 57
		Because there are guidelines, if we cannot go by those guidelines, why don't we make sure we have everything in place before we conduct research? We cannot house them. There are portions that deal with animal husbandry, and there are portions that deal with animal experimentation. There is a way of keeping animals in a well-humane environment that is in line with the guidelines. If you don't have such facilities, it is questionable. But the ethical review board must also consider that they are in; that is why I said they play a major role, so they must know what	*Availability of research guidelines, need for adherence to existing guidelines for animal use, ensure animal welfare, need for an ethical review board to ensure strict compliance with animal research, understanding the ethics application forms*	3:18 ¶ 59

OBJECTIVE 3: To explore and describe the experiences of Researchers, AREC members, and AREC administrators of existing research ethics practices that promote the ethical use of animals in scientific studies in Ghana. **AREC 3**

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		is available in an institution and then how to go about it. **[AREC 3, Researcher 5]**		
		So, my personal experience will come in two parts. One, as a reviewer, and then two, as a researcher. As a researcher, not until now, the processes have been very cumbersome. Because if you want to submit an application, you have to provide very detailed information. It used to be a very bulky document to complete, but recently we have been trying to modify it and make it a bit simpler and more user-friendly for those who would like to apply for an ethics review. **[AREC 3, Member 5]**	*Existence of cumbersome animal research application processes, need for user-friendly processes, need for institutional improvement, bureaucracy, simplification of animal research process*	3:39 ¶ 124
		But then, as a reviewer, I think most people don't know the extent to which animal ethics are required until they start to complete the form of this nature. So, a lot is being asked, and they probably have no idea how to manage that, and they probably are not thinking deeply about how they would do it when it happens. So, I think that there will be a lot of education for people to understand what it entails to use animals and why you cannot just stand one day and decide that you want to do research so the animal must suffer for it. **[AREC 3, Member 5]**	*Lack of animal use for research awareness, need for continuous training and education on ethical use of animals, sensitisation on ethical use of animals for research*	3:40 ¶ 126
		I think a lot of education is required. Even the form, most people don't fill it well and most of the time when they fill it, they leave some portions out without completing them and so normally we take it back to them for them to work on it. And I'm sure with that they would probably be learning and in the future they would do well when they apply. **[AREC 3, Member 5]**	*Need for continuous training and education on the ethical use of animals, training on animals, research application process, inability to complete ethics application forms well,*	3:41 ¶ 128

OBJECTIVE 3: To explore and describe the experiences of Researchers, AREC members, and AREC administrators of existing research ethics practices that promote the ethical use of animals in scientific studies in Ghana. **AREC 3**

NUMBER	INTERVIEW QUESTION GUIDE	KEY QUOTATIONS	KEY CODES DERIVED FROM THE PARTICIPANTS	TRANSCRIPT REFERENCE FROM ATLAS
		So, when the applicant submits the form, the committee will look at it and then check if all the answers given are satisfactory. Once the committee thinks that it is satisfactory, it will give its approval. Once the approval is given, either annually, biannually, or quarterly, there will also be instances of the report from the applicant. I mean, if they are successful. They will have to provide reports of what has been done, and if the person needs a renewal, another application can be made. **[AREC 3, Administrator 3]**	*Submit an animal research application form, the AREC reviews application, conduct evaluation, provide feedback, make corrections if required, offer approval, submit the report either annually, biannually, or quarterly*	3:48 ¶ 152
		Sometimes, site visits can be done to ensure that the person is complying with what has been approved. And there are instances where we are anticipating that people can even be whistleblowers. If there is something that is going on that is against ethics, we can get information and then go in right away to stop the process. So, these are some of the structures and procedures that govern the use of animals for research. **[AREC 3, Administrator 3]**	*Site visit to the research environment, usage of whistleblowers for non-compliance*	3:49 ¶ 155

Appendix 8.1: The Thematic Analysis Findings on the Key Stakeholders' (researchers, AREC members, AREC administrator) Suggestions to Promote the Ethical use of Animals in Scientific Studies in Ghana from Case 1

OBJECTIVE 4: To explore and describe Researchers, AREC members, and AREC Administrators' suggestions to promote the ethical use of animals in scientific studies in Ghana **AREC 1**

Objective	Main Themes	Sub-Themes	Codes	Participants Labels				
				#R1	#R2	#M1	#M2	#A1
The ways ethical use of animals in scientific studies can be promoted in Ghana	Need for research ethics governance framework	Need for a national governance body for animal research	*Need for an overarching body to govern animal use for research*		x		x	x
			Build and overarching body now to set up the systems		x			x
			Establish national body to provide guidance		x		x	
			National body to provide advisory services for ARECs				x	
			Need for national governance body for animal research				x	x
			Need for government oversight				x	
			A national body to monitor ethical use of animals for research					x
			Advocacy for the National Biosafety Authority			x		
		Need for development of regulations, standards (SOPs) and guidelines	*Institute government regulation*		x			
			National guideline development		x	x		
			Policy development			x		
			Adopt existing best practices to be used by all		x			
			Establish national standards					
			Standardisation of animal research best practices		x			
		Need for upholding animal welfare	*Ensuring animal welfare*	x	x		x	x
			Safeguard overuse of 3Rs principles		x			
			Applying the 3Rs principles		x			
			Ensure humane care and use of animals for reliable study outcomes	x				
			Proper animal housing conditions					x
			Ensure unification		x			
		Need for efficiency in administrative processes	*Ensure efficiency in administrative processes*		x			
			Ensure collaboration among existing ARECs		x			

OBJECTIVE 4: To explore and describe Researchers, AREC members, and AREC Administrators' suggestions to promote the ethical use of animals in scientific studies in Ghana AREC 1									
Objective	**Main Themes**	**Sub-Themes**	**Codes**	**Participants Labels**				
				#R1	**#R2**	**#M1**	**#M2**	**#A1**
			Need for ethics committee		x	x		x
			Use a top-down approach		x			
	Need for intensive education and sensitisation on animal research	**Need to educate and sensitise researchers on animal research**	*Embark on intensive education of researchers who use animals in animal research*	x				
			Sensitization on the importance of animal hygiene	x				
			Awareness creation	x				x
			Provide clarity of guidelines for animal research					
		Need for a hygienic animal research environment	*Need for a hygienic animal research environment*	x				
			Appropriate research methods	x				
			Ensure ethical conduct of animal research	x	x			x
			Obtain an ethics certificate prior to animal research		x			
			Need for animal research outcome reliability	x				
The ways ethical use of animals in scientific studies can be promoted in the institutions	**Need to establish robust ARECs and a regulatory authority to oversee their activities at the institutional level**	**Need to establish robust AREC in every institution and equip them with adequate resources**	*Establish AREC within the institution*	x			x	
			ARECs should be accountable to a higher body			x		
			Equip AREC to monitor research sites	x		x		
			Ensure regular site visits			x		
			The ethical committee should be equipped with adequate resources			x		
			Equip ARECs with all resources needed to oversee animal research	x		x		
		Need to simplify the ethical application process	*Simplify the application form*		x			
			Streamline ethics approval process		x			
			Improve efficiency in the ethics application process		x			
			Improve efficiency to reduce turnaround time		x			
			Ensure high-quality research outputs	x				
		Need to create awareness about roles and responsibilities of AREC	*Create awareness about the roles and responsibilities of ethical committees*				x	
			Create awareness about the AREC				x	x
			Provide sensitization on the work of the AREC				x	

OBJECTIVE 4: To explore and describe Researchers, AREC members, and AREC Administrators' suggestions to promote the ethical use of animals in scientific studies in Ghana AREC 1									
Objective	**Main Themes**	**Sub-Themes**	**Codes**	**Participants Labels**				
				#R1	**#R2**	**#M1**	**#M2**	**#A1**
		Need for regulatory authority to oversee the activities of AREC at the institutional level	*Need for a national government body for animal research*					
			Need for regulatory authority to oversee the activities of the ethics bodies at the institutional level			x		
			Adherence to existing standards	x				
			Establish institutional standards for animal use	x				
			Ensure accountability			x	x	
			Ensure animal welfare					x
	Need to educate staff and create awareness among the general public about ethical use of animals for research	**Need to educate departmental heads and researchers on ethical use of animals for research**	*Train all heads of departments about animal use*				x	
			Provide training to researchers		x			
			Provide education on existing standards	x				
		Need to create awareness about animal research facilities	*Create awareness about animal research facilities within the institution*					x
			Create awareness about ethical use of animals	x				x
			Create awareness about animal research	x				x
The suggested elements to be included in the animal research ethics governance framework	**Inclusion of laws, policies, and government oversight**	**Inclusion of rules and regulation**	*Ensure clarity in rules and regulation*	x	x			
			Inclusion of transparency		x	x		
			Leave room for interpretation		x			
		Benchmark and adapt western practices	*Benchmark western practices*		x			
			Adaptability and customization		x			
			Cultural considerations		x			
			Contextualise it in Ghana		x			
		Define animal welfare policy	*Define research ethics*				x	
			Define a well-efficient structure		x		x	
			Define clear terms and guidelines				x	x
		Government oversight	*Advocacy for ethical bodies for accountability*		x	x		
			Need for overarching body to govern animal use for research		x	x		x

OBJECTIVE 4: To explore and describe Researchers, AREC members, and AREC Administrators' suggestions to promote the ethical use of animals in scientific studies in Ghana AREC 1									
Objective	**Main Themes**	**Sub-Themes**	**Codes**	**Participants Labels**					
				#R1	**#R2**	**#M1**	**#M2**	**#A1**
			Enforcement by government					x
	Inclusion of well-defined roles and responsibilities for all stakeholders involved in animal research	**Stakeholders' inclusion**	*Internal/institutional stakeholders*					x
			Include external stakeholders			x		x
			Include experts (i.e., clinical pathologists, legal experts, toxicologists, pharmacists)		x	x		x
		Inclusion of AREC composition	*Operations of ARECs*	x	x	x		
			SOPs of ARECs		x			
			Animal transportation conditions				x	
		Define clear roles and responsibilities	*Responsibilities of researchers*					x
			Responsibilities of government					x
			Institutional responsibilities			x		x

Appendix 8.2: The Thematic Analysis Findings on the Key Stakeholders' (researchers, AREC members, AREC administrator) Suggestions to Promote the Ethical Use of Animals in Scientific Studies in Ghana from Case 2

OBJECTIVE 4: To explore and describe Researchers, AREC members, and AREC Administrators' suggestions to promote the ethical use of animals in scientific studies in Ghana **AREC 2**

Objective	Main Themes	Sub-Themes	Codes	Participants Labels				
				#R3	#R4	#M3	#M4	#A2
The ways ethical use of animals in scientific studies can be promoted in Ghana	Need for research ethics governance framework	Need for a national governance body for animal research	*Need for regulatory authority to oversee the activities of various institutions*	x		x	x	
			National body to control institutional ARECs	x		x	x	
			Need for regulatory authority to oversee the ARECs of various institutions	x		x	x	
			Need for animal ethical leadership					
		Need for development of regulations, standards (SOPs) and guidelines	*Need for national legislation*			x		
			Need for animal research legislation in Ghana	x		x	x	
			Punitive measures	x				
			Standardisation of animal ethical practices	x				
			Ethical organizational structure				x	
			Benchmark international standards					x
			Develop national guidelines					x
		Establish additional ARECs and resource them	*Need for an ethical committee in the various institutions*		x	x		
			Need to increase number of AREC				x	
			Need to resource ARECs to enable them monitor				x	
		Need for upholding animal welfare	*Need for animal right activism*			x		
			Ensuring humane use of animals					
			Advocate animal ethics under veterinary services directorates	x		x		
			Make animal ethics as important at human ethics					
			Emphasising the importance of research ethics		x	x	x	x

OBJECTIVE 4: To explore and describe Researchers, AREC members, and AREC Administrators' suggestions to promote the ethical use of animals in scientific studies in Ghana AREC 2

Objective	Main Themes	Sub-Themes	Codes	Participants Labels				
				#R3	#R4	#M3	#M4	#A2
		Need for efficiency in administrative processes	*Reduce delays in monitoring studies to ensure compliance*				x	
			Ensuring collaboration and support					x
			Standardising research protocols					x
			Ensure access to resources				x	
	Need for intensive education and sensitisation on animal research	Need to educate institutions and their students on animal research	*Capacity building and training*					x
			Students at bachelors and master's level should be trained on ethics		x	x	x	x
			Need for sensitising institutions and individuals about animal welfare		x	x		x
		Need for create awareness among the community members	*Need to create awareness about the animal research process among students*			x	x	x
			Create awareness about the animal research application process		x	x		x
			Animosity and threats to ensure animal welfare			x		
			Receipt of insults in the quest to ensure animal welfare			x		
			Create awareness about animal research ethics		x	x		x
The ways ethical use of animals in scientific studies can be promoted in the institutions	Need to establish robust ARECs and a regulatory authority to oversee their activities at the institutional level	Need to establish robust AREC in every institution and equip them with adequate resources	*Establishment of ARECs in the various institutions*			x		
			Strong institutional policies to back ARECs					x
			Put systems in place to make ARECs more relevant to researchers					x
			Ethics committee should educate and train applicants on ethical use of animals	x		x		
		Need for regulatory authority to oversee the activities of AREC at the institutional level	*Need for Institutional Internal Review Board*	x				
			Compliance with animal ethics principles					x
			Enforcement of ethical use of animals	x				x
			Need for institutional policy					x
			Promote ethical considerations	x				

OBJECTIVE 4: To explore and describe Researchers, AREC members, and AREC Administrators' suggestions to promote the ethical use of animals in scientific studies in Ghana AREC 2

Objective	Main Themes	Sub-Themes	Codes	Participants Labels				
				#R3	#R4	#M3	#M4	#A2
			Bottom up approach (from institutions to national)			x		
The suggested elements to be included in the animal research ethics governance framework	Inclusion of policies, rules and regulations	Inclusion of rules and regulations	*Inclusion of legislation*	x				
			Ethical use of animal modalities					x
			Define guidelines for monitoring animal research	x			x	x
			Develop institutional frameworks			x		x
			Ethical use of animal monitoring system				x	x
		Adapting to international standards	*Adapt international standards*	x				
			Define contextual principles for ethical use of animals in research				x	x
			Cultural relativism and ethnocentrism				x	
			National identity in the framework					x
		Define animal welfare policy	*Ensure cultural diversity in policy development*					x
			Standardization of animal welfare practices across various institutions	x				x
			Focus on national level to institutional level (top-down approach)	x				
			Include standard operating procedures (SOPs)			x		
	Inclusion of capacity-building plan and sensitization system	Inclusion of capacity-building plan and sensitization system	*Animal research ethics curriculum development*					x
			Need for ethical clearance for animal research				x	
			Include capacity-building plan			x		x
			Include a sensitization system	x		x		
		Define clear roles and responsibilities	*Define roles and responsibilities of AREC members*			x		x
			Pursue institutional acceptance of the framework			x		x

Appendix 8.3: The Thematic Analysis Findings on the Key Stakeholders' (researchers, AREC members, AREC administrator) Suggestions to Promote the Ethical use of Animals in Scientific Studies in Ghana from Case 3

OBJECTIVE 4: To explore and describe Researchers, AREC members, and AREC Administrators' suggestions to promote the ethical use of animals in scientific studies in Ghana **AREC 3**

Objective	Main Themes	Sub-Themes	Codes	Participants Labels		
				#R3	#M5	#A3
The ways ethical use of animals in scientific studies can be promoted in Ghana	Need for research ethics governance framework	Need for a national governance body for animal research	*Adhere to regulations*		x	
			Ensure compliance		x	
			Ensure accountability		x	
		Need for development of regulations, standards (SOPs) and guidelines	*Laws to protect indigenous animals*	x		
			Need national legislation on animal use		x	
			Need for laws and regulations	x	x	
			Institutional guidelines from national law	x	x	
			Need for a national framework		x	
		Need for efficiency in administrative processes	*Top-down approach with national legislation applied in each institution*	x	x	
			Ensure documentation		x	
			Ensure standardization for practices		x	
			Ensure diversity	x		
	Need for intensive education and sensitisation on animal research	Need to educate and sensitise society and students on animal research	*Create awareness of animal welfare*	x		x
			Incorporate into basic school curriculum			x
			Educate society about animal handling against threat			x
			Educate students about the importance of nature			x
The ways ethical use of animals in scientific studies can be promoted in the institutions	Need to establish robust ARECs and a regulatory authority to oversee their	Need to establish robust AREC in every institution and equip them with adequate resources	*Ensure establishment of AREC*		x	
			Harmonise ethics standards and practices		x	
			Document to focus on the scientific use of animals	x		
			Value of mentorship			

OBJECTIVE 4: To explore and describe Researchers, AREC members, and AREC Administrators' suggestions to promote the ethical use of animals in scientific studies in Ghana AREC 3

Objective	Main Themes	Sub-Themes	Codes	Participants Labels		
				#R3	#M5	#A3
	activities at the institutional level	Need to ensure research integrity	*Requirement for certification before ethical approval*	x		
			Inspect ethical certificate prior to animal research	x		
			Ensure ethical conduct of research	x		
		Need for robust institutional specific guidelines and structure	*Need for institutional guidelines*	x		
			Ensure ethical structure		x	
			Enforcement of rules/guidelines		x	
		Need for regulatory authority to oversee the activities of AREC at the institutional level	*Need to curb the conduct of animal research without ethical considerations*		x	
			Need to issue licenses for animal research institutes		x	
			Ensure oversight and monitoring	x		
	Need to train university communities and educate the general public about animal research	Need to train university communities on animal research	*Need to educate university communities on the ethical use of animals*		x	
			Ensure institutions are aware of ethical concerns		x	
			Train researchers on the ethical use of animals	x	x	
			Train animal house/care staff	x		
			Ensure environmental awareness			x
		Need to create awareness and ensure humane use of animals for research	*The importance of practical experience*	x		
			Use experience-based learning method	x		
			Recognition of certificates	x		
			Ensure animal care	x		x
			Preservation of wildlife and ecosystems			x
The suggested elements to be included in the animal research ethics	Inclusion of policies, rules and regulations	Inclusion of international guidelines and best practices on animal use	*Adapt international guidelines and frameworks*	x		
			Adapt international best practices on animal use	x		
			Inclusive of structure and procedure		x	
			Monitoring and Evaluation process		x	

OBJECTIVE 4: To explore and describe Researchers, AREC members, and AREC Administrators' suggestions to promote the ethical use of animals in scientific studies in Ghana AREC 3						
Objective	**Main Themes**	**Sub-Themes**	**Codes**	**Participants Labels**		
				#R3	**#M5**	**#A3**
governance framework		**Inclusion of AREC composition and responsibilities**	*Responsibilities of the committee members*	x	x	
			Committee composition		x	
	Inclusion of capacity-building plan and sensitization system	**Inclusion of training and sensitization system**	*Education and training about the framework*			x
			Sensitization at all levels including communities			x
			Internal and external stakeholders sensitisation			x
			Environmental awareness			x
			Ensuring societal mind change about animal use			x

Appendix 8.4: Comprehensive Findings with Respect to the Key Quotes and Key Codes from the Participants in Objective 4 from AREC 1 to AREC 3

OBJECTIVE 4: To explore and describe Researchers, AREC members, and AREC Administrators' suggestions to promote the ethical use of animals in scientific studies in Ghana **AREC 1**

NUMBER	INTERVIEW QUESTION GUIDE	KEY QUOTATIONS CREATED FROM THE PARTICIPANTS' NARRATIVES	KEY CODES CREATED FROM THE NARRATIVES	TRANSCRIPT REFERENCE FROM ATLAS
Q4 A	Assessing how ethical use of animals in scientific studies can be promoted in Ghana	Well, obviously, that goes to the users of these animals, people like me who use animals for research. I think there should be education that animal research goes beyond just the idea that I need animals, and I get the animals and use them for my research. **[AREC 1, Researcher 1]**	*Embark on intensive education of researchers who use animals in animal research*	4:1 ¶ 2
		What people should not lose sight of is that if the animals are not in a good state, let's say either the environment they are in is not hygienic, people sometimes conduct animal-based research in very unhygienic places, and what they don't recognize is that because of the poor hygiene, the microorganisms and various problems in that environment will be inducing some changes in that environment, and therefore the outcome of the study may not be reliable. Once people understand that these are some of the important features that we pay attention to with animal research, we can be sure that the results we are having are indeed the results we should be having. **[AREC 1, Researcher 1]**	*Need for a hygienic animal research environment, sensitization on the importance of animal hygiene, need for animal research outcome reliability, ensure humane care and use of animals for reliable study outcomes*	4:2 ¶ 8
		So, for ethical use of animals in research to be promoted in Ghana, one is to educate the researchers; two is to look at the conditions in which animals are kept, the housing and all that; and three is how the research is conducted. Certain types of research on certain types of animals depending on the time, physiology, etc. should be looked at. **[AREC 1, Researcher 1]**	*Uphold animal welfare, educate researchers on animal research, proper animal housing conditions, ensure ethical conduct of animal research, appropriate research methods*	4:3 ¶ 10

OBJECTIVE 4: To explore and describe Researchers, AREC members, and AREC Administrators' suggestions to promote the ethical use of animals in scientific studies in Ghana **AREC 1**				
NUMBER	**INTERVIEW QUESTION GUIDE**	**KEY QUOTATIONS CREATED FROM THE PARTICIPANTS' NARRATIVES**	**KEY CODES CREATED FROM THE NARRATIVES**	**TRANSCRIPT REFERENCE FROM ATLAS**
		I think animal research is very important everywhere you go around the globe. There are people who have tried to apply, if I remember correctly, what they call the 3Rs. It's very important, but we also need to be cautious not to overuse it because then it's not really serving any purpose. **[AREC 1, Researcher 2]**	*Ethics in animal research, applying the 3Rs principles, safeguard overuse of 3Rs principles*	4:9 ¶ 25
		So, I think countrywide, if we are to do anything, maybe if I come to the human situation, we've had a lot of these ethics bodies springing up, so it's almost like building from the bottom up. I don't know if for animal research, with the few that are existing now, maybe starting from the top would be better so that any other one that is set up will make it easier for them to operate because there will already be defined standards that spell out what they need to do if that overarching body can be set up. Work with the three existing ones now, set up a system that unifies them, and then any other one that comes will already have quite a good base to operate on. **[AREC 1, Researcher 2]**	*Need for an overarching body to govern animal use for research, ensure unification, institute government regulation, standardization/harmonization of animal research practice, establish national standards, top-down approach.*	4:10 ¶ 27
		I think that will be easier to do than the bottom-up approach, where each one is setting up their own system and doing things their own way; later, it becomes difficult to conform. I think now that there aren't that many of them, there is a good opportunity to build that overarching body to define certain things. We can even look at the processes the three are using; we take the best practices and just unify them, and that just becomes the guiding principles for us as a country, so any other one that needs to come up, and if there are any places where work is going on and they do not have these structures in place,	*Use a top-down approach, standardisation of animal research best practices, build and overarching body now to set up the systems, adopt existing best practices to be used by all,*	4:7 ¶ 17

OBJECTIVE 4: To explore and describe Researchers, AREC members, and AREC Administrators' suggestions to promote the ethical use of animals in scientific studies in Ghana **AREC 1**

NUMBER	INTERVIEW QUESTION GUIDE	KEY QUOTATIONS CREATED FROM THE PARTICIPANTS' NARRATIVES	KEY CODES CREATED FROM THE NARRATIVES	TRANSCRIPT REFERENCE FROM ATLAS
		then they will more or less be forced into a corner to get this done. **[AREC 1, Researcher 2]**		
		We are now in an era where, even when you want to publish, you would need to provide details about these ethics certificates. **[AREC 1, Researcher 2]**	*Obtain an ethics certificate prior to animal research*	4:11 ¶ 27
		So once such a body is formed, it will also make it easier for others who do not have the IACUCs to either quickly align with the existing one or, if there is a need to create a few more, do so more easily and swiftly. **[AREC 1, Researcher 2]**	*Ensure efficiency in administrative processes, ensure collaboration among existing ARECs*	4:12 ¶ 29
		I will advocate for the formation of a committee to develop the necessary national guidelines for animal research ethics. Once there is a committee in place, I don't know which ministry because, erm, there is this, they have what, there is an accreditation board, they have, erm, I think there is a national biosafety authority. I think that that committee and authority must begin to think about national policy and ethics. **[AREC 1, Member 1]**	*Committee formation, national guideline development, policy development, advocacy for the National Biosafety Authority*	4:38 ¶ 107
		So, as a nation, once we have a national body in place that oversees and then provides some guidance, yeah, that is the first step. And then they will now become like an advisory or guide that will be making sure that the research, the university's research institution, also has their systems in place. Systems of governance in place. So that we will promote the welfare of the animals. **[AREC 1, Member 2]**	*Need for a national government body for animal research, need for a system of governance, upholding animal welfare, establish national body to provide guidance, national body to provide advisory services for ARECs*	4:45 ¶ 123

OBJECTIVE 4: To explore and describe Researchers, AREC members, and AREC Administrators' suggestions to promote the ethical use of animals in scientific studies in Ghana **AREC 1**

NUMBER	INTERVIEW QUESTION GUIDE	KEY QUOTATIONS CREATED FROM THE PARTICIPANTS' NARRATIVES	KEY CODES CREATED FROM THE NARRATIVES	TRANSCRIPT REFERENCE FROM ATLAS
		Through awareness, we create, and then we need an overall body. Just like human ethics, we also need a body that regulates how animals should be used. Animals should not be handled anyhow, as far as research is concerned. An individual unit that conducts research on animals should have some sort of committee that regulates what these animals are subjected to prior to, during, and even after the research is conducted. So, there must be clear guidelines as to how these animals can be handled. **[AREC 1, Administrator 1]**	*Need for national governance body for animal research, awareness creation, need for ethics committee, clarity of guidelines for animal research, ensuring animal welfare*	4:75 ¶ 198
		The government must also ensure that it has a body that once in a while checks on the type of research that goes on in terms of how animals are handled or taken care of. **[AREC 1, Administrator 1]**	*Need for a national governing body for animal research, ensuring animal welfare, need for government oversight, a national body to monitor ethical use of animals for research*	4:76 ¶ 200

CON'T: OBJECTIVE 4: To explore and describe Researchers, AREC members, and AREC Administrators' suggestions to promote the ethical use of animals in scientific studies in Ghana **AREC 1**

NUMBER	INTERVIEW QUESTION GUIDE	KEY QUOTATIONS CREATED FROM THE PARTICIPANTS' NARRATIVES	KEY CODES CREATED FROM THE NARRATIVES	TRANSCRIPT REFERENCE FROM ATLAS
Q4 B	Assessing how the ethical use of animals in scientific studies can be promoted in the institutions	Let's also add that there are already existing standards about the use of animals in research. A number of these are considered quite universal, and people should know them and adhere to them. The institutions must have additional measures in place to ensure the ethical use of animals for research within the institutions. Each institution should put certain standards in place to ensure high-quality outputs and standards with regards to the use of animals.**[AREC 1, Researcher 1]**	*Establish institutional standards for animal use, ensure high-quality research outputs, education on existing standards, adherence to existing standards*	4:5 ¶ 13
		Well, maybe the only thing that I will suggest or recommend is that every institution in which they have staff using animals for research should do their best to establish this IACUC because once they have it, it is a professional body or committee that would be equipped with all the resources to manage animal research in those institutions. That, I think, will be one of the best ways to go. **[AREC 1, Researcher 1]**	*Establish AREC in the institutions, equip ARECs with all resources needed to oversee animal research,*	4:6 ¶ 15
		At the institutional level, I think training is key, but I also think we need to streamline the process because the ethics application form is quite a long one; I can't even remember it being over 20 pages of questions, some of them with terminology you don't even understand. Some of the animal ethics forms are so complicated that I always have to get someone from our animal experimentation unit to help me complete them, and all that takes away from you. **[AREC 1, Researcher 2]**	*Improve efficiency in the ethics application process, simplify the application form, training of researchers, streamline ethics approval process*	4:13 ¶ 32
		Simplifying the process is very key; of course, streamlining things so that you can have a very good turnaround time is also very important because, like I said, without that, it makes us uncompetitive. **[AREC 1, Researcher 2]**	*Simplify the ethical application process, improve efficiency to reduce turnaround time,*	4:14 ¶ 34

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		The structure must be equipped logistically to be able to fulfill its mandate to the fullest. Animals cannot talk. A human being can talk, leave the place, and report. Animals cannot talk, which means that the committee should be tooled to be able to make onsite visits to evaluate ongoing research. Then they will report to a higher body. **[AREC 1, Member 1]**	*The ethical committee should be equipped with adequate resources, ensure regular site visits, equip AREC to monitor research sites, ARECs should be accountable to a higher body*	4:40 ¶ 110
		So, putting the committee there is good. Getting the personnel there is good. But the next tier above them that should have that oversight responsibility should also be held accountable. **[AREC 1, Member 1]**	*Need for regulatory authority to oversee the activities of the ethics bodies at the institutional level*	4:41 ¶ 112
		Within the institutions, we should establish bodies (IACUCs), and we need to make the group more visible. Yes, more visible. It is there, but it is not being enforced fully in all departments. All heads of departments must be made aware that any student work that involves an animal must go through the IACUC. **[AREC 1, Member 2]**	*Establish AREC within the institution, train all heads of departments about animal use, ensure accountability, sensitization on the work of the AREC*	4:47 ¶ 126
		What I am saying is that the unit in charge of ethics must work harder to make their presence known to the university community. Their activity, the role, and all that in the committee so that everybody is aware. **[AREC 1, Member 2]**	*Create awareness about the roles and responsibilities of ethical committees*	4:48 ¶ 128
		Within my institution, we have the systems in place now, and we are doing everything to create more awareness so people will be more aware of the facilities that we have and the fact that you can't just conduct animal research anyhow and you would have to subject them through the ethics committee. **[AREC 1, Administrator 1]**	*Create awareness about animal research facilities within the institution, create awareness about the AREC, create awareness about ethical use of animals*	4:78 ¶ 204
		So, awareness, so we have started, last semester, we went to unit by unit that conduct research on animals to let them know that your unit is likely to conduct research on animals and that anytime	*Create awareness about animal research, ensure animal welfare*	4:79 ¶ 206

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		you are thinking of research involving animals, you need to speak to us first. While you have the concept and a proposal at hand, you can talk to us, and we will be able to guide you on how to proceed so that your research can be smooth and then you will also not cause any harm to any animal that you will be using in your research. **[AREC 1, Administrator 1]**		
Q4 C	Assessing what the animal research ethics governance framework should include to promote the ethical use of animals	Well, I think the establishment of laws and the composition of the IACUC are important to be captured in the framework. **[AREC 1, Researcher 1]**	*Inclusion of AREC composition, inclusion of laws*	4:8 ¶ 19
		I think you need to probably capture some history and some information on what already exists on the ground, which you are doing. I know you need to define a structure that will work efficiently for our part of the world. I know that between us and the west, normally you would have even cultural practices that would sometimes make something that is probably standard in the west does not work here, so we need to have a structure that is customized to our setting. Contextualised. Yes, that is very important. **[AREC 1, Researcher 2]**	*Define a well-efficient structure, benchmark western practices, contextualise it in Ghana, cultural considerations, adaptability, customization*	4:16 ¶ 38
		I think it needs to have clearly defined terms and guidelines because when people are working with guidelines that are clear, the room for everyone is reduced, but when they are very generalised, then you create room for people to sort of do things and still justify it because of the lack of clarity. **[AREC 1, Researcher 2]**	*Define clear terms and guidelines, leave room for interpretation, ensure clarity in rules and regulations*	4:17 ¶ 40
		I think a document like that should have general things, but it should drill down to some specific areas that we expect to see in ethical bodies. So how are ethical bodies supposed to run, even with reporting lines, because who is watching the	*Advocacy for ethical bodies for accountability, definition of guidelines, inclusion of transparency, operations of ARECs, SOPs of ARECs, clear guidelines,*	4:18 ¶ 42

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		watchman? If they are supposed to guide how things are done, but who is watching how they are doing what they are doing? All of that needs to be detailed so that there is no ambiguity in terms of the rules and guidelines, which probably you are looking at as a law to guide that. They should be very clear so that there is no ambiguity and room for people to go around issues and do things. **[AREC 1, Researcher 2]**		
		You need a pharmacist because drugs will be administered. You need a toxicologist. He is specializing in drugs that are not too good and will harm the animal. You also need a clinical pathologist. A clinical pathologist has expertise in chemical pathology, hematology, etc. because there are a lot of these experiments that people would want to do. If they want to take blood, it will be for some of these things. Then you also need a vet. In fact, for vets, you need about 2 or 3 because that is their area. Vets understand animals better than we do. They have handled almost all animals. Then you will also need a legal person, which is common for all the committees. A legal person who looks at it from the point of view of a layman with legality and compassion. Then you have your reverend minister, who is also there to look at the morals. I think these are the main professional groups that are needed on the IACUC. **[AREC 1, Member 1]**	*Inclusion of AREC composition, include experts such as clinical pathologists, legal experts, pharmacists, toxicologists, veterinarian, define research ethics*	4:44 ¶ 117
		What I will say is that the composition of the animal ethics committee is very important. Then, the overhead body should also take keen interest in that committee. So far as you have a chairman, the chairman cannot do everything. What if the chairman is compromising on the wrong things	*Composition of the animal ethics committee, need for regulatory authority to oversee the activities of the ethics bodies, accountability, animal welfare, importance of committee composition, research ethics*	4:43 ¶ 115

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		against the welfare of the animals? **[AREC 1, Member 1]**		
		I think we should look at the same guidelines as well as the Animal Welfare Act document that should guide us. Most countries—a lot of countries—have some of these policy documents already. **[AREC 1, Member 2]**	*Define guidelines, animal welfare policy, research ethics, guided by the animal welfare act*	4:50 ¶ 131
		Animals are animals, which is why we have IACUC documents, which are kind of universal. With reference to those documents, we can work out something that will suit our context but does not take away the welfare of the animals. In fact, the way animals are transported is a whole issue. **[AREC 1, Member 2]**	*Animal welfare, animal transportation conditions, research ethics,*	4:51 ¶ 133
		I think the framework should include all stakeholders within institutions that conduct research on animal-related work. **[AREC 1, Administrator 1]**	*Stakeholders inclusion, , internal/institutional stakeholders*	4:81 ¶ 210
		We should also ensure that this framework has external stakeholders, i.e., something that the government can look into, and create an overarching body that will oversee animal research in the country. So, the framework should look at something like that. You target individual researchers that have animal research ethics requirements. At the same time, we look at how we can get the government to ensure that people are doing the right thing in the various institutions where animal research is conducted. It shouldn't be just the responsibility of the institutions. The researchers are also to be responsible, though the government must also ensure that it has a body that once in a while checks on the type of research that goes on in terms of how animals are	*Include external stakeholders, Need for overarching body to govern animal use for research, , government oversight, , responsibilities of researchers, responsibilities of government, enforcement by government*	4:82 ¶ 212

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		handled or taken care of. **[AREC 1, Administrator 1]**		
		The framework should have in it various levels and responsibilities. So, for instance, what the government has to do nationally to ensure ethical use, what researchers must do, and what institutions must do. **[AREC 1, Administrator 1]**	*Define roles and responsibilities, government responsibilities, researcher responsibilities, institutional responsibilities*	4:83 ¶ 214

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Q4 A	Assessing how ethical use of animals in scientific studies can be promoted in Ghana	Then maybe we should also have a national body that controls what happens in the various institutions and makes sure that there's uniformity. So, for instance, whatever is done at Noguchi is similar to CSIR, similar to UHAS, and all that. And if there is no legislation backing what they do, there should be legislation so that if there are punitive measures, people will take them seriously and will like to follow the rules. I think that's about it. **[AREC 2, Researcher 3]**	*Need for regulatory authority to oversee the activities of various institutions, need for animal research legislation in Ghana, standardisation of animal ethical practices, punitive measures, national body to control institutional ARECs*	4:19 ¶ 50
		We have the Ghana Standard Authority that defines the standard, and we have the Foods and Drug Authority under the Ministry of Health. So, maybe animal ethics can be under the veterinary services directorates. And then, maybe they can have a board with members from various institutions that gives ethics approval. Yeah, so that they come together and come up with similar guidelines that will be regulated. **[AREC 2, Researcher 3]**	*Advocate animal ethics under veterinary services directorates, need for regulatory authority to oversee the activities of various institutions*	4:20 ¶ 52
		The promotion should be like, maybe most organizations should have a committee for ethical clearance. So, like yesterday, a student from the [redacted] contacted me to ask if we could do ethical clearance at our place. I'm sure he also doesn't know that the school gives ethical clearance. So maybe there should be more education on it and where to access such things. So that it will be easier even at the master's level or first-degree level, people can apply for this clearance easily for their research work. If I had used it in my first or second degree, I could have answered maybe the questions you asked earlier. So, I think awareness is important. It's creating awareness for researchers in the animal sector. **[AREC 2, Researcher 4]**	*Need for an ethical committee in the various institutions, create awareness about the animal research application process, access to resources, students at bachelors and master's level should be trained on ethics, create awareness about animal research ethics*	4:27 ¶ 75

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		Well, the first thing is awareness. We need a lot of awareness creation. If we get a lot more people raising awareness that animals also have self-right, then people's attention will be drawn towards it. **[AREC 2, Member 3]**	*Animal rights awareness*	4:52 ¶ 139
		You're going to have a daunting task. You know, when I was the director of the animal research institute, there were encroachers on our land, and I was trying to stop them. Someone held my neck and said, "Wo, w3 gyimi paaa, wo kor suku nu, mboa sem nkoaa na wo sua ye. Wo kor suku nu mboa nsem nkoa na ewor wu trimu, na mboa asem na do di no, wa gyimii (when you went to school, all your studies were about animals, and that is all you have in your head. You are behaving like an animal. You are a fool." When we are thinking about human beings, we are thinking of animals and where they will sleep. What sort of person are you? What sort of person are you, Err? So, you went to school all this time to try and throw people out of their homes because of animals? Right. So, that is the reality. That is the reality. And we are here, hitting and killing animals. **[AREC 2, Member 3]**	*Need for awareness among the community members, receipt of insults, animosity, and threats to ensure animal welfare*	4:53 ¶ 141
		The sensitization should start with institutions and individuals within the institution. Now that we have had fortunately for us three IACUCs, somebody should rally them around and let them understand that it goes beyond the committee, it goes beyond seeking publication to the extent of making sure that the animals are not mistreated, not necessarily in the use for research because researchers can be horrible. And I've cut animals several times, sutured them several times, and pushed things into them several times without ethical clearance. Right from sixth grade, from	*Need for sensitising institutions and individuals about animal welfare, ensuring humane use of animals*	4:54 ¶ 143

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		school, I'll buy my own guinea pigs and open them up for all kinds of things without any guidance. I try to do all kinds of things with the animal. Look at that, and how many people are like me doing all kinds of things? Nobody told me those days about ethical or humane use. **[AREC 2, Member 3]**		
		I have told you about the legislation. We need national legislation to guide everyone. And then try to get the animal ethics and animal rights people. **[AREC 2, Member 3]**	*Ensuring animal rights, need for national legislation, need for animal right activism, need for a national ethics committee/board*	4:55 ¶ 147
		I think they should expand the IACUC centers. That will promote it. They should be resourceful. Because sometimes we feel like going out to monitor what we have approved that should be done, but the resources are not there. It takes a long time before they will give us the opportunity to go out. **[AREC 2, Member 4]**	*Need to increase number of AREC, need to resource ARECs to enable them monitor, reduce delays in monitoring studies to ensure compliance*	4:61 ¶ 163
		And the people need to be educated too. Nobody knows unless you are a researcher. Yeah, the students come; they don't know what is ethical. They write a proposal, and you say, okay, how are you going to obtain your ethics? Then it is now that they realize that they have to obtain ethics permission before they come, or they have to change the whole subject. Yeah, so I think some of these things will really promote the regulation of research in this country. **[AREC 2, Member 4]**	*Lack of awareness, need to create awareness about the animal research process among students, need to educate students*	4:62 ¶ 165
		If there is no head, then all that everybody is doing is on their own. You don't know whether what someone is doing somewhere is right or wrong. So, I think the number one is to decide that this is where our head is. And then, who falls under that? Yeah, I think that is very important. Errh, in a country if there are no leaders, nothing	*Need for ethical leadership, ethical organizational structure, advocate CSIR as animal ethical leadership, need for regulatory authority to oversee the ARECs of various institutions, need for national board overseeing/leading all ARECs in the country*	4:63 ¶ 167

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		will go on. So, I think they should just recognize CSIR, and then they will take it up from there and do other necessary restructuring or structuring. **[AREC 2, Member 4]**		
		Okay, first of all, I will say that the work of the IACUC is very important, and there should be some premium placed on it, just as with human subject research. So, what I will want to say is that a national guideline should be developed, which will make the work easier for local IACUCs to know what exactly is expected of them nationally and internationally as well. So, that is one of the things. We should have expertise in the system to be able to provide training or capacity-building for both the IACUC board members and the researchers as well. And anybody who will need any form of support. I will want to say that such systems put in place locally or nationally should be put in place. Then the awareness should also increase. **[AREC 2, Administrator 2]**	*Capacity building and training, emphasising the importance of research ethics, ensuring collaboration and support, standardising research protocols, benchmark international standards, make animal ethics as important at human ethics, develop national guidelines, awareness*	4:84 ¶ 219
Q4	Assessing how the ethical use of animals in scientific studies can be promoted in the institutions	The way universities demand that student proposals be submitted for ethical approval and all that, maybe institutions can also do that. Even institutions can have their own internal review boards, not specifically ethics, and when people's proposals are brought in, they are recommended for approval, then they go to the ethics committee for your approval. **[AREC 2, Researcher 3]**	*Need for Institutional Internal Review Board, suggestions for improvement*	4:22 ¶ 57
B		Then, I think, like they were doing in Australia, the ethics committees shouldn't just be giving approvals; they should train applicants. Train and educate applicants about the ethical use of animals because they can make a recommendation, and you are somewhere else. You don't know whether the person is really	*Ethics committee should educate and train applicants on ethical use of animals, promote ethical considerations*	4:23 ¶ 59

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		practicing it or not. But you need to be educated. And then, if the person is educated, then the information goes on, and they will also let their colleagues know about it. Charging fees for ethics applications, in my view, can be one of the deterrent factors that doesn't make people go for it. Because if you don't have a grant that will take care of the fees, etc., people may not want to use their money to go and apply for ethics. **[AREC 2, Researcher 3]**		
		The institutional level on the microscale, sensitization, and making sure that the IACUCs are established at the institutional level. It becomes critical here that if the institutions are doing it themselves, then it will go up to the national level. **[AREC 2, Member 3]**	*Establishment of ARECs in the various institutions, sensitization and awareness creation, bottom-up approach (from institutions to national)*	4:57 ¶ 151
		Within my institution, I will say we need an institutional policy as well. The experience gathered over the years is that it is not enough to set up the committee and just expect people to patronize it. We need an institutional policy, a strong one to back it, that will compel your institutional members to be the first to comply with what you have put or set in place for them. So, these institutional policies are very important. Don't just set it up and think everybody knows about it, and they will work by maybe some default or kind of patronize it. No, it's not enough. You need to back it up with some policies. Some enforcement will push them to actually take it seriously. **[AREC 2, Administrator 2]**	*Compliance with animal ethics principles, enforcement of ethical use of animals, need for institutional policy, strong institutional policies to back ARECs, put systems in place to make ARECs more relevant to researchers*	4:86 ¶ 223
Q4 **C**	Assessing what the animal research ethics governance framework	So, it should have the organizations starting from the national level, then you come to the various institutions. Errmm, it should have something like the standards for the use of animals, because I don't think it's just for the research institutions or	*Focus on national level to institutional level (top-down approach), standard for animal use, inclusion of legislation, standardization of animal welfare practices across various institutions*	4:25 ¶ 65

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	should include to promote the ethical use of animals	the universities. Pharmaceutical companies, etc., if we are doing serious research, all use animals, so there should be guidelines and standards for institutions that use animals. There should be legislation because having papers that are not backed by any legislation doesn't give them weight. And it should include things like training; fees, you know, should be standardized across the board. Yeah, in detail, different animals, and then, er, the various standards that go with animals. **[AREC 2, Researcher 3]**		
		Oh, I think we can adopt. We always adopt, and then we can tailor it to our environment because not everything that is done there can be applied to the latter here. But if there is, let's say, an international code or something that everybody has subscribed to, then it means that everyone is supposed to follow it. Then we cannot change it to suit us. Yeah, but if there is nothing like that in their guidelines, then we can tailor the guidelines to our environment. **[AREC 2, Researcher 3]**	*Define guidelines, adapt international standards*	4:26 ¶ 69
		For the time being, maybe you have to get these policy frameworks set up within the institutions, and you have to sensitize them more to do this kind of thing; you have to look at SOPs; you have to look at; is there even the possibility of getting the vice chancellors committee? We don't have private laboratories here. So, when they are doing that, then the vice chancellors committee will begin to accept that these things must be set up within our institutions; maybe we may be getting something. **[AREC 2, Member 3]**	*Include a sensitization system, develop institutional frameworks, include standard operating procedures (SOPs)*	4:59 ¶ 155
		When it starts within the university, it is the start. When you get them to accept it, you can easily move on to others like the [redacted], Ghana Health	*Goal setting, pursue institutional acceptance of the framework*	4:60 ¶ 157

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		Service Research Institutes, and other research institutions. **[AREC 2, Member 3]**		
		I think the key element should be what the principles are that we are standing on to develop such a framework. So, if I talk about principles, we need to look at what our voice is as Ghanaians. How do we see animals? What value or premium do we put on these animals? Is it maybe respect? Do we need to respect autonomy? Like, what is the baseline for what we are doing? We need to agree on that and establish that fact. Then, going forward, we also need to look at the other element that has to do with which animals or the various categories of animals that we are focusing on. We need to be clear on that. So, group of animals, if they are vertebrate or invertebrate, we need to put these categories clear for people to know that if my research involves this, I need to seek ethical clearance. If it involves this, I'm exempt from ethical clearance. We need to be clear on that. **[AREC 2, Member 4]**	*Define the principles for the framework, research ethics, research guidelines, need for ethical clearance for animal research, must have the Ghanaian perspective (contextual), define contextual principle for ethical use of animals in research*	4:87 ¶ 225
		Then, we also need to put some modalities in place. What will compel someone to submit for ethics clearance? We need to be clear on those ones as well. Then, monitoring guidelines were also. Yes, we have the framework in place. How do we monitor to ensure that people are actually complying with what we have set? Is it enough to just give them ethical clearance and allow them to go? We need to monitor that as well to know what they are doing on the field; if it syncs with what we have put down on paper, we need to find out. If it doesn't, where can we improve upon it? **[AREC 2, Administrator 2]**	*Ethical use of animal modalities/guidelines, ethical use of animal monitoring system, guidelines for monitoring animal research,*	4:88 ¶ 226

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		Then, there should be some capacity-building. Because it's not very new, we will say it's new. So, capacity building. Do we need to set up some curriculum? Some basic curricula that maybe researchers can go and take that will provide maybe basic ethics principles and guidelines and training for a researcher to know what is expected of them as researchers? What is expected of me as an IACUC board member? We need to develop something. Something has to be there. So, all those things have to come into the framework. That is what I am expecting to see in the framework. **[AREC 2, Administrator 2]**	*Include capacity-building plan, animal research ethics curriculum development, ethics education, research guidelines, roles, and responsibilities of AREC members*	4:89 ¶ 226
		I think it should be contextualized. Because every culture has its own uniqueness. I want to believe that Ghana might have a unique culture, beliefs, or moral beliefs. That may be slightly different from somebody in a developing country in terms of how we appreciate animals, how we treat animals, how we value animals, and all that. I'm sure there will be something. We should look out for that uniqueness and capitalize on it for Ghana. We shouldn't pick from outside and dump on our people. What if it's not applicable to us? **[AREC 2, Administrator 2]**	*Ensure cultural diversity in policy development, cultural relativism, ethnocentrism, national identity in the framework, contextualized,*	4:90 ¶ 228

OBJECTIVE 4: To explore and describe Researchers, AREC members, and AREC Administrators' suggestions to promote the ethical use of animals in scientific studies in Ghana **AREC 3**

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Q4 A	Assessing how ethical use of animals in scientific studies can be promoted in Ghana	In Ghana, we need some regulations on that to protect the animals and the indigenous animals in Ghana. I said indigenous because we want to promote diversity. I said that because how animals behave out there and how they behave over here are totally different. So, we want to have a national law that protects the use of animals. Their use domestically—you know what we have—as well as in scientific studies. Then, from there, various institutions must come up with their own guidelines and then work with them. **[AREC 3, Researcher 5]**	*Ensure animal welfare, ensure diversity, ensure the need for laws and regulations, ensure institutional-specific guidelines, laws to protect indigenous animals, institutional guidelines from national law*	4:28 ¶ 81
		So, I think that as a country, we should have some legislation. I would want to see that. I give the example of the Ghana Procurement Act, which is binding on all public institutions, state institutions, or public institutions, so you cannot procure just like that because you are bound by that law. If we have national legislation spelling out clearly that we cannot use animals the way we want and that there are rules and regulations surrounding the ethical use of them, then that will be binding on all research institutions, and so every research institution would have to apply itself to that rule and probably would have to develop their own structures based on that legislation. So I think that it should be a top-down approach. And even though we can talk to these institutions that do not have any of these structures to start with, err, they would do it at will if it were, or they would do it as they wanted to because they are not bound by anything. **[AREC 3, Member 5]**	*Need for national legislations on animal use, ensure institutional-specific guidelines from national legislation, top-down approach*	4:64 ¶ 175
		I will give you an example of another jurisdiction, like the United Kingdom, for example; these are enshrined in their rules and regulations, so when	*Ensure accountability, ensure compliance, adhere to regulations, benchmark*	4:65 ¶ 175

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		you go to an institution and they are telling you to fill out some forms or there are some mandatory things that would have to be done in terms of animal work, they always quote the home office, which is like their central government, and that the central government would be coming to check, so they need to be sure that after every animal is born, they should be able to account for its life until it passes away. **[AREC 3, Member 5]**		
		So, documentation is very key. You document when it is born, when it is dead, and why it died, you know. And so, because of that, they operate within that framework, but if we don't have anything like that in Ghana, it will be as and when anyone decides to do something. There will be so many variations depending on where their source of funding is coming from. Even though there may be some similar things, there may be variations depending on where they are picking their example from. But if we have a national one that determines what everyone should do, then it will be the same for every institution, wherever you go. **[AREC 3, Member 5]**	*Ensure standardization for practices, ensure documentation, need for a national framework, need national legislation on animal use*	4:66 ¶ 177
		I'm not talking about central. Centrality comes from the government, and everything goes to the government. No. What I'm saying is that there should be legislation that is applicable to every institution. They pick it, and then they operate it in their own institutions, but then there will be some commonalities because it comes from the same legislation. **[AREC 3, Member 5]**	*Need for national legislation on animal use, ensure standardisation of practices, top-down approach with national legislation applied in each institution*	4:67 ¶ 179

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		We need to go down to every day's development. The primary schools and other things to educate them about the importance of nature, including animals, so that we start from there, and once they are acceptable down there, it becomes easier for us when you come to the higher educational institutions, and when you are practicing, we should get there. As well as everybody else, everybody must acknowledge the importance of life, especially when it comes to dealing with animals, so that we minimize the harm and suffering that they normally go through. **[AREC 3, Administrator 3]**	*Create awareness of animal welfare, educate students about the importance of nature, educate society about animal handling against threat, incorporate into basic school curriculum*	4:91 ¶ 234
Q4 B	Assessing how the ethical use of animals in scientific studies can be promoted in the institutions	The local governance must come from the various institutions when the institution's guidelines are available. **[AREC 3, Researcher 5]**	*Need for institutional guidelines*	4:30 ¶ 84
		It's not like it is going to be different from what is there nationally, but the institutional one is going to be like a second check, a second oversight, and because they are there with the researcher in the same institution, you are able to periodically monitor whether the study is in line with the guidelines that have been given. **[AREC 3, Researcher 5]**	*Need for institutional guidelines, ensure monitoring, ensure oversight, ensure ethical conduct of research*	4:31 ¶ 86
		There should be a subsection under animal welfare where you focus entirely on scientific use. It is very important. **[AREC 3, Researcher 5]**	*Document to focus on the scientific use of animals*	4:32 ¶ 88
		Workshops can be conducted to teach or train. You must always ensure that the people who are going to handle animals are experts in doing that. You need to train people to do those kinds of things, care for the animals, and conduct the various experiments that they do. So, as part of the ethical review process, you can ask if the researcher or any member of the team has had	*Train researchers on the ethical use of animals, ensure animal care, inspect ethical certificates prior to animal research, train animal house/care staff, requirement for certification before ethical approval*	4:33 ¶ 90

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		any training in that area, and the person can show the certificate. **[AREC 3, Researcher 5]**		
		The ethics board must insist or should ensure that whoever submits protocols has some certification regarding the use of animals. **[AREC 3, Researcher 5]**	*Inspect ethical certificate prior to animal research, requirement for certification before ethical approval*	4:34 ¶ 92
		From my experience, most of the skills we acquired were acquired through experience. We hardly attend conferences and workshops where they are giving us certificates, but through mentorship from your supervisor, you learn, so if there is a track record, that is fine. But if there isn't a track record but the person has some certificate to show, that one is acceptable. **[AREC 3, Researcher 5]**	*The importance of practical experience, use experience-based learning method, value of mentorship, recognition of certificates, requirement for certification before ethical approval*	4:35 ¶ 94
		The institutions should be aware of concerns regarding ethics, and that is important. Bad ethics is bad science, and so if you don't have any ethics review, any ethics committee, or any ethics structures, then whatever they are doing there is not helping anyone, so I think it is best for institutions to realize this. **[AREC 3, Member 5]**	*Ensure institutions are aware of ethical concerns, ensure ethical structure, ensure ethical guidelines, ensure establishment of AREC*	4:69 ¶ 183
		At least when we have it in these institutions, then the institutions can come together and say, Let's harmonise what we are doing and then try to push the government to make it into an act that will help all of us. **[AREC 3, Member 5]**	*Advocate for national ethics regulation, harmonise ethics standards and practices*	4:70 ¶ 185
		What we are doing is just scratching at the surface and comparing that to what is happening in other countries, in the west, for example, there is so much to be done. Licensing: we are not licensing anybody yet. We are not licensing anyone. Anybody, it is like, as if, even though it is mandatory, it is not compulsory. People are doing their work without ethics, and they are	*Need to issue licenses for animal research, the conduct of animal research without ethical considerations, need for ARECs, benchmarking, enforcement of rules/guidelines,*	4:71 ¶ 187

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		getting away with it. And the other thing is, when it comes to ethics, we are trying to separate them. So, there are protocol review committees, scientific and protocol review committees, but they have added ethics to it, and they are doing everything, not specifically animals. So, they receive for animals, but then the truth is that they may not have all that is required in terms of membership, and so if they have a committee that does the universal approval, it is not the best, so even though animal research ethics is in existence, we are not getting as many protocols as we should because the other committees are receiving them. But gradually, we are telling them that when they see the animal component, they should revert to us and tell the applicant to submit to our committee for ethics as well. **[AREC 3, Member 5]**		
		There is a need to educate the university community. It should be done. We are doing it, but it is still not yielding results. It's more like a gradual thing. It's gradually yielding, though, but we need to do more. **[AREC 3, Member 5]**	*Need to educate university communities on the ethical use of animals*	4:72 ¶ 189
		I think it should not be limited to research. In our daily lives, we should acknowledge the importance of life. The preservation of wildlife is the preservation of our ecosystem. It should be part of us, not only for research purposes. **[AREC 3, Administrator 3]**	*Ensure environmental awareness, preservation of wildlife, preservation of ecosystems, must apply to the entire society*	4:93 ¶ 241
Q4 C	Assessing what the animal research ethics governance framework should include to	I think we should look at the NC3Rs document and see how best we can adopt it. Adopting that one, yeah. Not entirely everything, because some of the things over there are crazy. We should tailor it to what our conditions are. And I think it would help because Welcome Trust is based in the UK, and one of the things they will ask is that	*Adapting to international best practices on animal use, adapt international guidelines and frameworks, must be contextual*	4:37 ¶ 99

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	promote the ethical use of animals	you confirm that the protocols that you will use with the animals you are going to work with and how you are going to handle them are in line with UK laws. Because we don't have, yeah, so we need to have something that we can also put there so that whatever we are doing is in line with our laws. **[AREC 3, Researcher 5]**		
		In your framework, I think there should be structures. There should be an idea about the memberships, procedures, and responsibilities of the committee members, and it should also contain monitoring and evaluation. So, I think these should be essential. **[AREC 3, Member 5]**	*Inclusive of structure, committee composition, procedures, responsibilities of the committee members, monitoring and evaluation process*	4:74 ¶ 192
		I will say education should be a major thing as far as the framework is concerned. Education, sensitisation at all levels of our society, and then the churches, the chiefs, and all other things must acknowledge some of these things. And then once we are also educating, though when we are dealing with animals, the vegetation is a key environment for them. **[AREC 3, Administrator 3]**	*Environmental awareness, education, and training about the framework, ensuring societal mind change about animal use, sensitization at all levels including communities, internal and external stakeholders sensitisation*	4:95 ¶ 244

Appendix 9: Editing Certificate

Between the lines editing

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To whom it may concern:

I hereby confirm that I edited the thesis titled: "ETHICAL USE OF ANIMALS IN SCIENTIFIC STUDIES IN GHANA: PROPOSING A RESEARCH ETHICS GOVERNANCE FRAMEWORK". Any amendments introduced by the author hereafter are not covered by this certificate. Participants' verbatim quotes were not edited to maintain their authenticity. The author ultimately decided whether to accept or decline any recommendations I made, and it remains the author's responsibility at all times to confirm the accuracy and originality of the completed work. The author is responsible for ensuring the accuracy of the references and its consistency based on the department's style guidelines.



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