

## Reflective Report: Research Project

### 'Education for Sustainable Development: Scoping Animal Welfare Policy and Legislation Across Africa'

Working with research animals is a privilege and not a right. However, ethical review processes and ethical committees governing the humane use of animals in research are often in their infancy, or are simply non-existent in many parts of the world. My research project aimed to scope the prevalence of animal welfare policies, laws, and ethical review processes in each of the fifty-four countries in Africa. This research is centred around promoting global ethical standards, providing quality education, and promoting innovation, sustainable practices, and responsible consumption - as in-line with the United Nation's 'Sustainable Development Goals'. By establishing an understanding of the prevalence of animal welfare policies governing African scientific studies, this project aims to provide a knowledge base that can be used to refine professional education courses and support African researchers in undertaking high-quality research.

#### Research Conducted

Secondary data was extracted into Excel following an extensive systematic literature review of animal research publications, in the publications database PubMed, for each country in Africa. Searches were filtered in a step-wise manner using Boolean operators and filters. Results for each search were recorded in Excel, as seen in Figure 1. Publications that met these search criteria were uploaded into a bibliography in EndNote. This method was repeated for each country.

ID	Search Query	Results
1	animal*	7,841,933
2	(((ethic* OR (AEC)) OR (IACUC)) OR (law)) OR (regulation*) OR (review*)	6,912,714
3	1 and 2	1,719,419
4	Egypt	155,629
5	3 and 4	5,658
6	Limit 5 to yr="2022-2024"	1,566
7	Filter 5 and 6 by text availability - 'Free Full Text'	875

*Figure 1. Stepwise search query table.* The search strategy and results of reviewing PubMed using Boolean operators and filters. This strategy was used and recorded for each country. If results were limited, 6 would be altered to "Limit 5 to yr="2019-2024".

Exclusion criteria included: reviews and systematic reviews, research conducted for agricultural practices, papers unavailable to the University of Leeds, and papers published before 2022. However, if search results were limited, papers published after 2019 were included - countries where this was necessary have been marked with an asterisk in the ethical approval prevalence data extraction spreadsheet (Figure 3).

Following search filtering in PubMed, all relevant publications were systematically reviewed to determine whether or not animal welfare guidelines had been followed, and if an ethical review process had been carried out. This information was extracted into spreadsheets by detailing key details such as the author(s), the study title, the animal species, the study type, any relevant guidelines followed, whether or not an ethical review had been conducted, and if so, the approving body, and the approval number, as seen in Figure 2. This method was repeated for each country. It is important to note that there are gaps in the documentation of this information, due to a lack of available information - noted as “not found”. This highlights a key area of focus for future studies.

Egypt										
PubMed Search Terms										Results:
((animal*) AND (((((ethic*) OR (AEC)) OR (IACUC)) OR (law)) OR (regulation*)) AND Egypt) AND ("2022"[Date - Publication] : "2024"[Date - Publication]))										875
ID	Author(s)	Paper	Link to Paper	Animal Species	Study Type	Guidelines Followed:	Specific Law/Guideline:	Ethical Review	Approved By:	Ethics Approval No.
1	Zoheir et al.	New Approach about the Signaling Crosstalk between IQGAPs/NF-κB/IL-8 and PDGCS/p53/TPAIL Pathways that Modulate Malignant Transformation in Hepatocellular Carcinoma	<a href="https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3238653/">https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3238653/</a>	Balb/c Mice	Microbiology	Animals were kept in compliance with the National Institutes of Health (NIH) Guide for the Care and Use of Laboratory Animals, Medical Research Ethics Committee approved this study	NIH Guide of the Care and Use of Laboratory Animals	Yes	Medical Research Ethics Committee approved this study, the Animal Care and Use Committee of National Research Centre, Egypt.	Project number: 12060168, (NRC-12060168)
2	Yousef et al.	Assessment of the potential cerebellar toxicity of gold nanoparticles on the structure and function of adult male albino rats	<a href="https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4947208/">https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4947208/</a>	Albino Rats	Microbiology	Not found	Not found	Yes	the Research Ethics Committee of the Faculty of Medicine, Suez Canal University	(No: 4865#)
3	Younis et al.	Luteolin Mitigates D-Galactose-Induced Brain Ageing in Rats: SIRT1-Mediated Neuroprotection	<a href="https://www.ncbi.nlm.nih.gov/pmc/articles/PMC11365848/">https://www.ncbi.nlm.nih.gov/pmc/articles/PMC11365848/</a>	Rats	Neuroscience	the Institutional Animal Research Ethical Committee, Faculty of Medicine, Tanta University, Egypt	Not found	Yes	The Local Committee of Research and Medical Ethics of the Faculty of Medicine, Tanta University	Permit code: 36284PR344/9/23
4	Sherif et al.	Synergistic impact of Chlorella vulgaris, zinc oxide- and/or selenium nanoparticles dietary supplementation on broiler's growth performance, antioxidant and blood biochemistry	<a href="https://www.ncbi.nlm.nih.gov/pmc/articles/PMC11364751/">https://www.ncbi.nlm.nih.gov/pmc/articles/PMC11364751/</a>	Broiler Chickens	Nutrition	the regulations of the animal care and ethics committee at Kafrelsheikh University, Egypt	Not found	Yes	The ethics committee at Kafrelsheikh University, Egypt	(KFS-IACUC/124/2023)
5	Shanab et al.	Modulatory mechanisms of copper-albumin complex toward N-nitrosodiethylamine-induced neurotoxicity in mice via regulating oxidative damage, inflammatory, and apoptotic signaling pathways	<a href="https://www.science-direct.com/science/article/pii/S01478513230134537?via=ihIpub">https://www.science-direct.com/science/article/pii/S01478513230134537?via=ihIpub</a>	Mice	Microbiology	Not found	Not found	Yes	the Ethics Committee for the Control and Prevention of Cruelty to Experimental Animals of the Faculty of Veterinary Medicine at South Valley University	(Approval no. 32)
6	Shaban et al.	Mammary fat globules as a source of mRNA to model alterations in the expression of some milk component genes during lactation in bovines	<a href="https://www.ncbi.nlm.nih.gov/pmc/articles/PMC11220968/">https://www.ncbi.nlm.nih.gov/pmc/articles/PMC11220968/</a>	Cattle	Genetics	all protocols were carried out in accordance with the Universal Directive on the Protection of Animals Used for Scientific Purposes, as well as the ethical guidelines of the Scientific Research Committee at Suez Canal University in Ismailia, Egypt	ARRIVE guidelines	Yes	The animal protocols of Ethics Committee of the Faculty of Veterinary Medicine at Suez Canal University, Egypt	approval number: 2023027

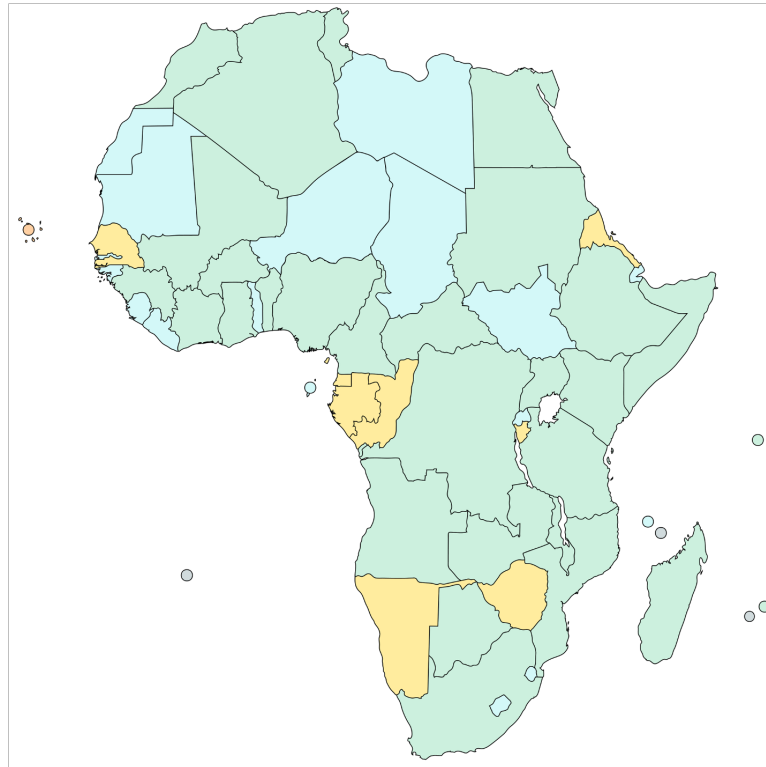
Figure 2. Data collection spreadsheet section. Data for each country in Africa was compiled into individual spreadsheets detailing the search terms, total relevant results, key research paper details and key ethical approval details including guidelines followed and the approval-granting body. Ethical review prevalence is colour-coded.

Key information from each country's data collection spreadsheet was then compiled into a data extraction table, as seen in Figure 3. This table details the number of papers with or without ethical approval (and whether this was due to ethical approval not being required, or just not found), the total relevant results, the total search results, and the total papers excluded. The reason for paper exclusion and relevant data was also recorded.

Country	Ethical Approval?				Total Excluded	Total Results	Overall	Excluded Papers				Colour Code
	Yes	N/A	No	Total				Sys.	Review	N/A	Total	
1 Algeria	2	0	0	2	56	58	4	20	32	56	Evidence of Ethical Approval	
2 Angola	1	1	0	2	20	22	2	3	15	20	Ethical Approval not Applicable	
3 Benin	4	2	1	7	38	45	7	7	24	38	No Evidence of Ethical Approval	
4 Botswana	2	0	0	2	22	24	1	3	18	22	No Supporting Data	
5 Burkina Faso	2	1	0	3	41	44	4	12	25	41	*	
6 Burundi	0	1	0	1	4	5	1	1	2	4	*	
7 Cabo Verde	0	0	1	1	6	7	1	2	3	6	*	
8 Cameroon	3	7	1	11	85	96	15	10	60	85	*	
9 Central African Republic (CAR)	1	2	0	3	31	34	1	3	27	31	*	
10 Chad	0	0	0	0	38	38	2	6	30	38	*	
11 Comoros	0	0	0	0	4	4	0	1	3	4	*	

Figure 3. Ethical approval prevalence data extraction table section. Key data detailing the number of papers with/without ethical approval, total relevant papers, total search results, and total excluded papers and for what reason. Data extracted following completion of literature reviews for each country. Results are colour-coded.

29 of 54 countries showed evidence of following an ethical review process - 54%. Eight countries did not require ethical approval for the studies conducted. This was due to various reasons - such as the extent of legislation protecting the species involved at the time of research, or the methods of sampling used in the study, e.g. sampling by observation and/or other non-invasive methods. One country - Cabo Verde - had no evidence of an ethical review process despite having relevant papers. Sixteen countries did not have any supporting data. Across the continent, of 198 relevant papers, 156 had evidence of an ethical review process - 79%.



*Figure 4. Map of ethical approval prevalence in African countries. Colour coded to distinguish which countries had evidence of ethical approval (green), did not require ethical approval (yellow), or did not have evidence of ethical approval (red). Countries without supporting data are highlighted in blue.*

It is important to note that there are still gaps in our knowledge after completing this research. Most notably, this research has been limited due to the constraints of publishing in PubMed. The cost of publishing in international journals poses a barrier to many individuals and organisations across the continent - who will instead publish in local or institutional journals. As well as this, Francophone countries may not publish in mainstream English language journals. Of the 25 countries in Africa without evidence of ethical review processes - whether they were not applicable, not found, or without supporting data - 19 have a language other than English as their official language. It is because of issues such as these that further research is required in order to provide a well-rounded picture of the extent of animal welfare policy and legislation across Africa. The research I have conducted provides an excellent base of understanding that can be further built upon by undertaking systematic literature reviews of different databases that are more accessible such as GoogleScholar or AfricaBib.

## The Importance of My Research

One of the greatest threats to research involving animals is a lack of reproducibility and reliability. As discussed by my research supervisor, Professor Dave Lewis, in “The 3Rs of Animal Research & Beyond”<sup>1</sup> up to 95% of studies involving animals are neither - massively limiting the advancement of scientific knowledge. High-quality, humane animal welfare is critical for reliable and reproducible research involving animals, which in turn requires robust legislation and ethical review processes. The extent of legislation governing the use of animals in scientific research in each African country is unknown. This research project aimed to address this issue through the undertaking of an extensive literature review to establish the scope of animal welfare policies across the continent. This is a crucial step in the promotion of global ethical standards and sustainable research.

Adherence to animal welfare standards is crucial to the undertaking of reliable and reproducible research - ultimately facilitating international collaboration and enhancing the global impact of research undertaken in Africa. Through the refinement of professional education courses for the care and use of research animals, the development of solutions to complex problems facing the continent will be supported - advancing the development of novel medicines, sustainable agricultural practices, and animal conservation efforts.

I have created a robust research approach which can be used in other emerging regions - such as South and Central America and the Gulf States - to similarly scope the prevalence of, and support the continuing development of, humane animal research. The findings of my research can also be used by individual governments, as well as the African Union, in the development of animal welfare legislation across the continent. Through the improvement of legislation, a culture of care is promoted, and reproducibility is increased - this is crucial to the advancement of scientific knowledge.

## Personal Impact

One of the main aspirations I had when applying for the Laidlaw Scholarship was to broaden my horizons and understanding of issues beyond my discipline in order to become a better global citizen and multifaceted individual. However, this research project has allowed me to go so far beyond this. Conducting this research has aided in the development of my cultural capital and provided me with the opportunity to lead in making change across the globe. Through the scoping of animal welfare legislation across Africa, not only have I expanded my interdisciplinary knowledge through the studying of laws, regulations and policies, I have been able to collaborate on political and societal issues, and develop my abilities in investigative study and analysis. Through this, I have been able to take on a leading role in the promotion of sustainable research and global ethical standards, and hopefully support the advancement of scientific knowledge.

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<sup>1</sup> Lewis, D. (2024, June 30). The 3Rs of Animal Research & Beyond [Video file]. In *The Biomedical & Life Sciences Collection, Henry Stewart Talks*. Retrieved January 10, 2025, from <https://doi.org/10.69645/HWNN8984>.

This research project was a massive undertaking, and I was not expected to complete it within the research period. Not only did I undertake it alone, but I was given the freedom to entirely self-lead my work. This was a very daunting prospect, however, it has been fundamental in the development of my organisational skills and personal discipline - particularly as I undertook this research alongside working part-time. Not only this, but this project has tested my resilience. After completing my research my laptop crashed and wiped about a months worth of work - which also happened to be the month where I conducted most of my research. This was both incredibly frustrating and upsetting. I had intended to complete my project before the start of my second year at university, and I became increasingly concerned about having to balance the completion of my project alongside my studies. However, I was determined not to be defeated by this set-back, and ended up repeating my research to replace my lost data. Upon returning to this research, I found that I was far more efficient in reviewing papers and was able to complete my project in far less time than I had anticipated. I believe that this reflects my determination and commitment to my goals.

I am constantly looking to improve my skills and push myself out of my comfort zone to advance my abilities. Working alongside high-performing academics and receiving one-to-one mentoring from my research supervisor has given me the opportunity to actively learn and develop my skills. Upon the completion of my project (for the second time), I was given the opportunity to present my final research outcomes to module managers within the Faculty of Biological Sciences. This was the first time I had presented at university outside of a group setting, and was fundamental in developing my confidence, as well as my communication and presentation skills. This experience has helped prepare me for my future endeavours - such as presenting at research conferences.

Alongside my research, I am so incredibly grateful the opportunity the Laidlaw Scholarship has given me to build my social and intercultural understanding, and most primarily, make friends,. Through my engagement with the Leeds Scholar cohort, as well as the vast global network of scholars, I have been supported in my academic development, my understanding of the modern world from a socio-economic and political view alongside my degree has been furthered, and I my personal growth as a passionate and ethical citizen of the world has been advanced.

I started this project wanting to aid in the enactment of change, become a better global citizen, and engage in wider issues beyond my degree. The opportunity that this research project has provided me with to deepen my understanding of the issues facing the humane use of animals in research has been a key component in achieving my aspirations. This project has allowed me to re-invest my skills, knowledge, and experiences in a field I am incredibly passionate about to aid in the development of others. I am so grateful to have had the opportunity to conduct research that is crucial to the promotion of sustainable research and the enhancement of animal welfare. The experiences and skills I have developed throughout my research are invaluable to setting myself up to become a better global citizen and strong next generation leader.

## Looking Ahead

I am pursuing an Integrated Masters degree at the University of Leeds, and am incredibly keen to further explore the interplay between my knowledge base in Biomedical Sciences and its application to animal conservation. The advancement of my skills in investigative analysis, personal resilience, and organisation throughout this research project and scholarship programme have been critical to the achievement of my ambitions.

I am currently exploring volunteering opportunities to aid in the improvement of animal conservation efforts across Africa for my 'Leadership in Action' placement. I want to invest the skills I have developed and collaborate on political and societal issues to further my understanding of global viewpoints and become a multifaceted individual, while enriching my knowledge and understanding of the world. I am particularly interested in the promotion of co-existence between communities and predatory species, and believe that the reduction of conflict between predatory animals and local communities through the promotion of healthy co-existence is crucial to effective conservation. I want to experience new cultures, and gain new perspectives, and am incredibly excited at the prospect of undertaking hands-on work in the field in partnership with like-minded individuals.

I am currently in the process of applying to present my findings at various conferences both within the United Kingdom, and internationally, and am incredibly excited to begin sharing my research with a wider audience.