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Animals in Science: Ethical Justifications, Regulatory Frameworks, and Political Recommendations in the Canadian Context

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By

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ABSTRACT

Global estimates suggest that more than 100 million non-human animals are used for scientific purposes each year. The nature of the research, teaching, and testing conducted on these animals can be very invasive, painful, and fatal. Should we care? To discontinue these practices in some cases may result in human suffering. Should any human benefits of research, teaching, and testing outweigh the resultant animal suffering? This paper begins with an analysis of some of the most popular theories on the moral status of animals. From this analysis it is argued that mere species membership is not a morally relevant characteristic, and that non-human animals can have moral status and moral rights. A deontological approach to adjudicating moral claims across species is presented to overcome some of the challenges typical of utilitarian and rights-based approaches. This approach is used to sketch a general framework for evaluating which types of scientific animal use ought to be permitted. It is argued further that, while some forms of scientific animal use may be permitted at present, we ought to strive for the elimination of the practice. The focus will then shift to an analysis of Canada's regulatory system for the scientific use of animals, identifying shortcomings of this system. The Canadian approach to regulation in this area will be compared against approaches that are taken in the UK and the Netherlands which are more closely aligned with the moral arguments made in the first section. There are opportunities for Canada to learn from these countries, and remarks will be made on how and why Canada should improve the regulation of animals in research, teaching, and testing. Such changes have the potential to improve the wellbeing not only of the animals used in science, but for humans as well. Finally, expected costs and benefits that would accompany the implementation of the recommendations are considered with comments on how costs can be alleviated and why they should be incurred.

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CHAPTER 1

MORALITY AND THE SCIENTIFIC ANIMAL USE INDUSTRY

Introduction

Non-human animal use in science constitutes a large industry. More than four and a half million animals were used for scientific purposes in Canada in 2019, and global estimates suggest more than 100 million animals are used annually.[1] Considering the size of the industry and the generally invasive nature of scientific animal procedures, scientific inquiry can be expected to generate a great deal of pain and distress in non-human animals making it an area of great moral concern. The role of policy in providing protection for animals in science is crucial to uphold ethical standards, but these efforts often encounter significant barriers. Political action is increasingly important as evidence continually suggests scientific, economic, and environmental benefits are associated with transitioning to non-animal methods in science. To meet our moral obligations to animals used in science, improve the quality of scientific inquiry, better utilize scientific resources, and reduce environmentally harmful practices, Canada should seek to eliminate the use of animals in science.

To begin this analysis of the scientific animal use industry, the moral status of non-human animals will be evaluated. I will then discuss how we ought to determine our moral duties to other animals in light of their moral status, with a specific focus on animals used in science. A case-by-case approach for evaluating scientific animal use will be proposed arguing for the immediate abolishment of some practices and a gradual transition away from others. Next, an

1. Canadian Council on Animal Care (CCAC), *CCAC Animal Data Report 2019,* 4; Katy Taylor et al., "Estimates for Worldwide Laboratory Animal Use in 2005," *ATLA* 36, no. 2 (July 2007): 328-36; Andrew Knight, "127 Million Non-human Vertebrates Used Worldwide for Scientific Purposes in 2005," *ATLA* 36, no. 5 (July 2008): 494-5.

overview of the scientific animal use industry in Canada will be provided along with an analysis of the regulations that surround this industry and how they are enforced. The Canadian regulatory system will then be compared with other countries that enforce stronger regulations on scientific animal use, specifically The UK and The Netherlands. Recommendations will be made for how Canada should learn from these countries to develop stronger, more effective regulations. Finally, economic impacts that would be expected to follow the adoption of these recommendations will be analyzed, along with considerations of environmental impacts that would accompany changing practices in the scientific animal use industry.

Morality & Non-Human Animals

Scientific procedures conducted on non-human animals in Canada are classified based on the degree of pain and distress that they inflict. Procedures range from involving little or no pain or distress, to inflicting severe or intolerable pain on conscious, unanesthetized animals.[2] Considering the use of millions of non-human animals in these procedures each year in Canada and the substantial size of the global scientific animal use industry, scientific animal procedures constitute a substantial source of pain and suffering and generate significant ethical concern. In order to properly determine the ethical implications of scientific animal procedures and the moral obligations that humans have to the animals used in these procedures, it must first be determined to what extent non-human animals are deserving of moral consideration. To do this, some of the most prominent positions on the moral status of non-human animals will be considered.[3]

2. CCAC, *CCAC Animal Data Report 2019*, 6.

3. Unless otherwise stated, the discussion of non-human animals will generally refer to animals as defined by the scientific animal use industry. It is not accepted that this definition is appropriately broad – indeed I will argue that the definition should be expanded – but the scope of the term will be limited herein to avoid metaphysical complications regarding what is an animal.

i. Speciesism

In her article, *The Moral Status of Animals*, Lori Gruen presents an in-depth discussion of the moral considerability of non-human animals.[4] The first position that she analyzes is "speciesism" – the idea that humans are the only morally considerable beings or that their interests are of higher importance than those of other species based merely on species membership.[5] Peter Singer has compared this position to racism. A speciesist human views the interests of humans as more important than the interests of other species based merely on species membership, similar to how a racist person might view the interests of his own race as more important than the interests of another race based merely on race membership.[6] Gruen rightly holds that the species to which one belongs is a characteristic that is not, in itself, morally relevant. Thus, species membership is not a suitable basis for determining the moral considerability of entities.[7] Mary Anne Warren comes to a similar conclusion in her article, *Moral Status*, claiming that we do not have good reason to believe that non-human animals are incapable of being morally considerable based on their species, while overlooking any cognitive capacities they possess.[8]

ii. Human Exceptionalism

The next position that Gruen discusses is that of "human exceptionalism," explained as the view that there are capacities possessed exclusively by humans which serve as the basis for

4. Lori Gruen, "The Moral Status of Animals," *The Stanford Encyclopedia of Philosophy* (Fall 2017).

5. Interests, in this section and throughout the paper, are defined as the needs and desires of living, sensible creatures which, when satisfied, contribute to the flourishing of that being and, when frustrated, make that being worse off. Interests are not restricted to the reflective activity of taking an interest in something. For Gruen's discussion of speciesism, see: Gruen, "The Moral Status of Animals," 1.1.

6. Peter Singer, "All Animals are Equal," *Philosophic Exchange* 5, no. 1 (1974): 108.

7. Gruen, "The Moral Status of Animals," 1.1.

8. Mary Anne Warren, "Moral Status," in *A Companion to Applied Ethics*, eds. R.G. Frey, C.H. Wellman (Wiley-Blackwell, 2003), 441.

affording moral status to humans and not to other animals.[9] This position goes a step beyond speciesism by suggesting that it is not species membership in itself that sets us apart from the other animals, morally speaking, but that there is some uniquely human characteristic(s) that serve as the basis for having moral status. A challenge with this approach is to identify the capacities that afford moral considerability to all humans, but not to any other beings. Various capacities that have been suggested, Gruen explains, have all failed to be exclusive to humans. The cognition and behaviour of humans are said to share "deep roots" with those of other animals.[10] Due to a lack of capacities that have successfully been identified as uniquely human, and the cognitive and behavioural similarities between humans and other animals, Gruen claims that the attempt to identify capacities that are uniquely human is not a strong approach for determining the moral considerability of animals.[11]

Rationality has been suggested as a capacity that sets humans apart from other animals. Gruen provides an example of this in her writing when she considers "personhood," understood in the Kantian sense that the criteria for being a person is to be a rational, self-reflective being.[12] This concept has been further developed by Christine Korsgaard who has suggested that the "beliefs" of non-human animals are simply their perceptions, and their "wills" are simply their desires. "Conscious activities" occur in non-human animals, but they are not "conscious *of* them."[13] Alternatively, Korsgaard holds, humans are conscious *of* and think *about* their perceptions and desires. This level of consciousness, Korsgaard explains, allows humans to

9. Gruen, "The Moral Status of Animals," 1.2.
10. Ibid.
11. Ibid.
12. Ibid., 1.3; Immanuel Kant, *Groundwork of the Metaphysics of Morals*, eds. Mary Gregor, Jens Timmermann (New York: Cambridge University Press, 2011), 428; Immanuel Kant, *Anthropology from a Pragmatic Point of View*, eds. R.B Louden, Manfred Kuehn (New York: Cambridge University Press, 2006), 15.
13. Christine M. Korsgaard, *The Sources of Normativity* (New York: Cambridge University Press, 1996), 93.

question whether certain perceptions constitute a *reason* to hold a belief, and whether certain desires constitute a *reason* to act. She argues that the "reflective mind" requires a reason; perception and desire are not enough. This "problem of the normative," as Korsgaard refers to it, is considered unique to humans, separating them from the other animals.[14]

Gruen identifies an important problem that results from Korsgaard's line of reasoning: Some humans do not fit within the category of persons. There are humans, such as infants and people with severe cognitive impairments, who do not possess the capacities for rationality and self-reflection that constitute this understanding of personhood.[15] Korsgaard addresses this problem by suggesting that, even though there is a significant difference between rational, self-reflective beings and those that lack these capacities, both are deserving of moral consideration, including non-human animals.[16] She dissents from Kant's view that moral demands can only be made by moral beings, arguing instead that non-moral beings can make moral demands against moral beings. She claims that there are many morally considerable "natural concerns," such as the desire to be free of pain, that do not arise from our rational capacities but from our "animal nature."[17] To exemplify this, Korsgaard states that we already believe it is wrong to make an animal suffer if we recognize our own suffering, which arises from our animal nature, as morally objectionable. While our rational capacities allow us to value ourselves as ends in ourselves, our animal nature is included in what we value and, so, should also be valued in other animals.[18] This

14. Ibid.

15. Gruen, "The Moral Status of Animals," 1.3.1.

16. Mary Anne Warren has further supported this idea, arguing that suffering is intrinsically evil whether it is a human or a non-human animal that suffers. She claims that if we are unable to recognize this, then we will be unable to properly understand why certain ways of acting toward other humans are morally reprehensible. See: Mary Anne Warren, "The Rights of the Nonhuman World," in *Environmental Philosophy: A Collection of Readings*, eds. Robert Elliott, Arran Gare (Milton Keynes: Open University Press, 1983), 114; Christine M. Korsgaard, "Facing the Animal you See in the Mirror," *The Harvard Review of Philosophy* 16, no. 1 (2009): 7.

17. Korsgaard, "Facing the Animal you See in the Mirror," 7.

18. Korsgaard, "Facing the Animal you See in the Mirror," 7-8.

position overcomes the implausible claim that rationality and self-reflection are the *only* morally significant capacities by viewing them, rather, as members of a larger class of morally significant capacities. In line with this assertion, Gruen concludes that the needs and desires that are valued by rational, self-reflective agents should also be valued when non-rational beings experience those needs and desires similarly.[19] This, in essence, is the principle of equal consideration of like interests which I will discuss shortly.

iii. Sentience

The final basis for determining moral status that Gruen discusses is sentience. She acknowledges in this section that the lives of sentient beings, human and non-human, can be made better or worse.[20] The position maintained by utilitarians is that the issue of real importance to beings is whether their interests are satisfied or frustrated. Contemporary utilitarians, Gruen explains, argue that the capacity of a being to suffer is sufficient for that being to be deserving of moral consideration. Any being that possesses an interest in avoiding suffering is deserving of that interest being considered. A being, human or non-human, that acts in a way to avoid pain can be viewed as having the interest of avoiding suffering. Gruen concludes that beings capable of suffering are deserving of moral consideration and can make moral claims.[21]

19. Gruen suggests that rational, self-reflective agents have interests that are not a matter of their rational, self-reflective capacities, but of their existence as living, sensible creatures. Thus, these types of interests should be valued the same way in all living, sensible creatures that have the capacity to experience those same interests. (It should be further noted that this is not a comprehensive way of identifying the interests of non-human animals, as these animals may have interests that rational, self-reflective agents do not.) See: Gruen, "The Moral Status of Animals," 1.3.1.

20. Ibid., 1.4.

21. Gruen suggests that non-human animals make moral claims on us when we recognize that they are in pain. (This should be extended to recognize the ability of rational agents to make moral claims on behalf of non-rational beings, as there may be cases of suffering in non-rational beings that are not evident to rational agents. In these cases, rational agents can make claims on behalf of the non-rational beings.) See: Gruen, "The Moral Status of Animals," 1.4.

The view above understands suffering as having moral significance, which raises an interesting question regarding when suffering is moral suffering. Under some views, suffering by itself is not morally significant but must be instituted as such by an observer who pities the sufferer. In this way, attributing moral status is a characteristic of moral agents. However, this characteristic does not license moral agents to rank themselves higher than other beings in terms of moral significance. Just as moral agents are entitled to grant their own moral status by way of their desire to avoid suffering, so must they grant moral status to other beings who have a desire to avoid suffering.

Other views may understand suffering as intrinsically bad and would regard all cases of suffering as moral suffering. For example, Jeff McMahan has discussed the idea that there are at least two bases for a being's moral status – the being matters *in itself*, or it provides a physical location where intrinsically bad states, such as suffering, can occur.[22] Under this type of view, a being's suffering has moral status regardless of whether a moral agent is present to observe and pity the suffering. Additionally, the intrinsic badness of suffering would suggest that suffering *in itself* has the same moral status (varying as a matter of degree) regardless of the species of being in which it occurs.

To illustrate an interesting difference between the two types of views just discussed, consider the following example. There are two planets, Acheron and Elysium, both of which are inhabited by a rich population of sentient beings, though none of them are moral agents nor are any moral agents aware of the existence of these planets. Life on Acheron is characterized by a fierce competition of interests and a great deal of suffering. Life on Elysium, however, is

22. Jeff McMahan, "Suffering and Moral Status," forthcoming in *Rethinking Moral Status,* ed. Stephen Clarke and Julian Savulescu (Oxford: Oxford University Press), 2-4.

characterized by complete harmony of interests and very little suffering. According to the first type of view discussed – that suffering is only moral suffering if it is instituted as such by an observer who can conceive of morality and pity the sufferer – life on Acheron might be more painful than life on Elysium, but it would not be worse, morally speaking. The second type of view, which recognizes suffering as having moral status in itself, would suggest that life on Elysium is, indeed, better than life on Acheron. Another way of thinking about this difference is that the first view would suggest that a world with less suffering can be better than a world with more suffering only if there is a moral agent present to perceive and pity the suffering. The second view grants that a world with less suffering is always better than a world with more suffering, other things equal. The fundamental question is whether morality is a construct of moral agents, or if it exists independently and is merely discovered by moral agents. While these views are interesting and relevant to the discussion of moral suffering, I cannot offer a resolution to their opposition, nor is such a resolution required to continue with the aim of this paper.

Regardless of the differences between the two views discussed above, each holds that suffering is morally significant in the eyes of a moral agent. They also do not justify hierarchies of ethical importance on the basis of species membership – either all beings capable of suffering can make moral claims against moral agents based on their suffering, or none can. The reasoning in this subsection is consistent with the idea in the previous subsection that the possession of rational capacities is not a necessary condition for having morally considerable interests. For example, it seems highly plausible to say that the pain inflicted through torturing an infant would be sufficient to make the act morally reprehensible, despite the infant's lack of rationality. There is no good reason to deny similar moral considerability to non-human animals that are also capable of suffering. Thus, the capacity of a sentient being to suffer, regardless of rational

capacity or species membership, is sufficient for a moral agent to afford moral consideration to that being.

iv. Utilitarianism and Rights-Based Theories

Following her analysis of the moral considerability of non-human animals, Gruen explains that identifying non-human animals as morally considerable does not indicate how to assess their moral claims or how to adjudicate a conflict of claims. She discusses two different approaches that aim to provide guidance for navigating these issues. One of these positions is a utilitarian position. According to this position, the significance of an animal's moral claim depends on the existence of competing moral claims. The harms and benefits associated with each claim are evaluated and the proper course of action is the one that maximizes utility by minimizing overall harms and maximizing overall benefits. Following from the arguments above on species membership and moral status, species membership is not a morally relevant capacity that alters the weight of a being's moral claim, and so a harm or benefit that is experienced similarly in both a human and another animal is not stronger in the human on the basis of species membership. Singer has addressed this in his discussion of the principle of equal consideration of like interests. Under this principle, any roughly similar cases of suffering must be weighed equally regardless of the species to which the suffering beings belong.[23] To provide an example under the utilitarian position, if the life of a morally considerable being is threatened and the only way to save its life is to harm another morally considerable being without killing it, then it may be viewed as morally permissible to inflict such harm.[24]

23. Peter Singer, "Equality for Animals?" in *Practical Ethics,* by Peter Singer (New York: Cambridge University Press, 1993), 57.

24. Gruen, "The Moral Status of Animals," 2.

Gruen suggests the adoption of a "multi-factor perspective" to reconcile some of the objections to the utilitarian position, such as that egregious harms could potentially be permitted if they were accompanied by a large enough amount of relatively trivial benefits, even if these benefits are spread across a large group such that no one individual receives any substantial benefit. The multi-factor perspective involves consideration for the types of interests a being is capable of possessing, the relative weight of interests, and the context of the interests and the beings who hold them. Gruen presents the idea of interests existing on a scale, being either crucial, important, replaceable, or trivial. In a conflict of interests, more important interests override less important ones.[25] Despite the attempt to overcome objections by adopting these approaches, the utilitarian perspective still faces challenges. For example, it seems that a singular crucial interest would override any number of important interests, but it is not clear that important interests should not be able to weigh against crucial ones to some degree. Perhaps a considerable number of important interests within one individual should aggregate to constitute consideration in the crucial category, and what if there is a tremendous amount of important interests spread across a large group? Further challenges arise with the categories. It is not clear which types of interests belong in each category and where the lines are drawn between them. If there are conflicting interests within the same category of importance, then the view may depend on the simple balance of harms and benefits again. Even under the multi-factor perspective, utilitarianism seems to commit us to do wrong under some circumstances. Consider a popular thought experiment originally presented by Judith Jarvis Thomson.[26] You are a surgeon with five patients who will all die if they do not receive organ transplants today. Another patient in your clinic happens to have the right blood-type and all of the healthy organs needed such that

25. Ibid.
26. Judith Jarvis Thomson, "The Trolley Problem," *The Yale Law Journal* 94, no.6 (May 1985): 1396.

harvesting his organs would allow you to complete all five of the organ transplants, and you know all of the transplants will be successful. Are you permitted to harvest the one patient's organs against his will in order to save the lives of the other five patients? While it seems morally intuitive that you are not permitted to kill the innocent patient to save the other five, the utilitarian position would suggest you ought to do this.

The other position Gruen discusses is the animal rights approach. There are variations of this approach, some stronger than others. Consider Tom Regan's rights approach first as an example of a strong animal rights approach, followed by Warren's weak animal rights approach. According to Regan, any being, human or otherwise, that experiences pleasure and pain, joy and suffering, satisfaction and frustration – any being whose quality of life, as experienced by them, is made different by these – is a "subject-of-a-life" with inherent value and moral rights.[27] Any violation of those rights, such as performing experiments on animals, is morally reprehensible regardless of the needs of humans or other animals.[28] He makes an exception to this by claiming that we can override the rights of others only if they are violating our rights, suggesting we could seriously harm or kill a terrorist if doing so is a justifiable means of preventing the rights violation they will perform.[29] Regan defines a subject-of-a-life as "a conscious creature having an individual welfare that has importance to [itself] whatever [its] usefulness to others."[30] In determining which non-human animals fit within this category he focuses on their subjective experience, a capacity which he associates with the central nervous system in humans. Due to the similarities between the human central nervous system and those of other mammals, Regan

27. Tom Regan, "The Case for Animal Rights," in *In Defence of Animals*, ed. Peter Singer (New York: Basil Blackwell, 1985), 24.

28. Gruen, "The Moral Status of Animals," 2.

29. Tom Regan, "Empty Cages: Animal Rights and Vivisection," in *Animal Ethics: Past and Present Perspectives*, ed. Evangelos D. Protopapadakis (Berlin: Logos Verlag Berlin GmbH, 2012), 183.

30. Regan, "The Case for Animal Rights," 22.

suggests that humans and non-human mammals are equally subjects-of-a-life. As such, he claims that these beings hold certain moral rights equally, specifically focusing on rights to life and bodily integrity, and violating the rights of such beings cannot be morally justified.[31]

Warren has concerns with Regan's position. Perhaps the most critical issue she raises is the existence of a "sharp line" – an all-or-nothing divide between those beings who matter morally and those who do not based on whether they are the subject-of-a-life. According to Regan's theory this sharp line must exist somewhere, while Warren argues that it is more likely for subjective experience to vary as a matter of degree. She discusses such animals as fish, amphibians, reptiles, and invertebrates as examples where the all-or-nothing approach seems poorly suited – even if these animals are not considered subjects-of-a-life, perhaps they still have some level of subjectivity that is morally significant.[32] Warren presents an alternative to Regan's position that she identifies as the weak animal rights theory. This theory suggests that beings should be free to pursue their natural interests free from the infliction of unnecessary harms, but that the strength of their moral rights may vary based on probable degrees of sentience and mental capacities.[33] She suggests that the latter is relevant to the strength of moral rights as beings with greater mental capacities are likely to have a greater capacity for suffering.[34] Warren also claims that humans have stronger rights than other animals due to human rationality permitting cooperation and problem solving, which she suggests may require complex language like that of human language.[35]

31. Tom Regan, "Empty Cages: Animal Rights and Vivisection," 183.
32. Mary Anne Warren, "Difficulties with the Strong Animal Rights Position," *Between the Species* 2, no.4 (1986): 165-6.
33. Warren, "Difficulties with the Strong Animal Rights Position," 172.
34. Warren, "Difficulties with the Strong Animal Rights Position," 166.
35. Warren, "Difficulties with the Strong Animal Rights Position," 169.

Warren draws attention to a crucial problem in Regan's theory – the all-or-nothing divide. Another challenge with his position lies in the suffering that it ignores. Under Regan's position, morality demands that all testing and experimentation that violates the rights of any subject-of-a-life must be stopped immediately. This would result in the end of many, if not all, uses of animals in tests and experiments. Considering the use of animals in medical studies and safety testing,[36] the immediate abolishment of these studies could result in a significant amount of suffering and death among beings that rely on medications required to undergo animal safety testing, and many areas of medical research would be slowed or stopped until non-animal methods could be developed. However, under Regan's view, the suffering of those with medical conditions and those who are reliant on medication do not constitute a moral justification for continuing to violate the rights of non-human animals through testing and experimentation. It is not clear that we should accept Regan's claim that the suffering of others should not be considered as a potential justification for overriding the rights of an individual. Perhaps, at least in some cases, there could be enough suffering at stake to justify some overriding of rights.

Warren's weak animal rights theory effectively responds to the challenges in Regan's theory. She eliminates the all-or-nothing moral divide, allowing more non-human animals to receive moral consideration without requiring that their rights be equal in strength with the rights of all other morally considerable beings. Her claim that rights can vary in strength presents the possibility for rights to be weighed against one another which is more informative for evaluating conflicting moral claims than is Regan's view of rights as being inviolable. Warren's claim that human rights are stronger than the rights of other animals on the basis of rationality, however,

36. More than 1.4 million animals were documented as being used in medical studies, and over 200,000 in regulatory testing in Canada in 2019. CCAC, *CCAC Animal Data Report 2019*, 5.

seems problematic. This claim is subject to the same challenges raised previously in the section on human exceptionalism. Primarily, it does not seem that the rational human ability to cooperate and resolve conflicts should increase the relative weight of all of our rights, even those that are grounded in non-rational capacities. Additionally, her claim that cooperation and conflict resolution may require something like human language seems troublingly anthropocentric – perhaps other animals can achieve cooperation and conflict resolution with language that is considerably different from human language. The elements of Warren's weak animal rights theory are strong, though her claim about human rights being categorically stronger than those of other animals is weak.[37]

v. Adjudicating Competing Moral Claims: Moderate Deontology

The bases for determining the moral status of non-human animals that were considered at the beginning of this section – speciesism, human exceptionalism, and sentience – fail to provide any satisfactory arguments that justify granting hierarchies of ethical importance on the basis of species membership. Suffering of a certain degree ought to make the same moral claim against a moral agent regardless of the type of being that experiences the suffering. Additionally, beings capable of experiencing the same degree of suffering have the same moral rights to avoid that suffering. Moral rights are not understood here in the sense of absolute or inviolable rights, as in Regan's rights position. Rather, to say that a being has a moral right is to recognize that they ought to be treated a certain way. For example, to say that humans have a moral right to life is to say that we ought not to kill them – doing so would be morally impermissible. However, there

37. Utilitarian and rights-based approaches to adjudicating moral claims have been contrasted here to emphasize the differences in how they generally proceed and common issues that they encounter. There are variations to the approaches taken in each category such that the two categories and their relation to one another are more nuanced than what is presented herein.

could be competing considerations that, if considerable enough, could justify overriding a person's right to life – this will be discussed later. Based on what has been established, it would be inconsistent to suggest that moral rights apply to all and only humans – at least some morally considerable interests in humans, such as the interest to avoid suffering, that are at the foundation of certain moral rights apply similarly to at least some non-human animals. In cases where non-human animals have morally considerable interests, we must also recognize what this tells us about how they ought to be treated – we must recognize their moral rights. Utilitarianism and rights-based theories face substantial challenges in their attempts to adjudicate competing moral claims. Here, I will present a deontological framework to account for how the interests and moral rights of non-human animals ought to be weighed against the interests and moral rights of humans.

Deontological theories are concerned with duties and adhering to the Right, rather than the focus on maximizing the Good that is characteristic of consequentialist theories like utilitarianism.[38] While rights have a role in moderate deontological theories, they are not the central focus and they are not absolute. Moderate deontological theories consider our duties, how they weigh against one another, and how they inform what are to be our moral obligations. They include constraints against certain actions which can make an act wrong even if it produces the most good, but the constraints are not absolute such that they can be lifted if there is enough at stake. One such deontology has been developed by W.D. Ross. In establishing his position, Ross contrasts it with utilitarianism. He discusses an example in which you have made a promise to a friend to meet them for a trivial engagement, though you find yourself in a position where you

38. Larry Alexander and Michael Moore, "Deontological Ethics," *The Stanford Encyclopedia of Philosophy* (October 2020): section 2.

can provide relief to the victims of a serious accident. Ross argues that it is justifiable to provide aid to the victims of the accident, thus breaking the promise made to your friend, not because it will bring about greater good as utilitarians would argue, but because the duty to help the victims is stronger than the duty to keep your promise. To support his position, Ross considers an instance of this scenario in which the good brought about by either option – keeping your promise to your friend or providing relief to the accident victims – will be equal. While classical utilitarianism would suggest you may flip a coin as either option is equally permissible, Ross' position holds that we ought to provide relief to the accident victims on the basis of the relative strength of our duties in this scenario.[39]

The example discussed above illustrates Ross' ideas of *prima facie* duties and duty proper. He does not use "*prima facie*" to refer to a potentially illusory appearance at first sight, rather he speaks of *prima facie* duties as those which would constitute our duty proper in the absence of other *prima facie* duties.[40] Our duty proper is our duty all things considered – that which outweighs any conflicting duties and which we ought to uphold.[41] In the example above, your duty to keep your promise and your duty of benevolence to provide relief to the accident victims are *prima facie* duties – either one would be your duty proper in the absence of other such duties. Taking both into consideration, the duty of benevolence is stronger than the duty to keep your promise and so becomes your duty proper. Thomas Hurka and Esther Shubert have provided an analogy with opposing physical forces that helps to illuminate this idea of weighing *prima facie* duties to determine our duty proper. When opposing forces act upon the same object

39. W.D. Ross, "What Makes Right Acts Right?" in *The Right and the Good*, ed. Philip Stratton-Lake (Oxford: Oxford University Press, 2002), 18.

40 Ross, "What Makes Right Acts Right?" 19-20.

41 Ross, "What Makes Right Acts Right?" 19-20.

it is the stronger force that determines the direction in which the object is moved. Similarly, when we have opposing *prima facie* duties it is the stronger duty that determines the proper direction of our actions and our duty proper.[42]

While Ross' deontology emphasizes weighing *prima facie* duties against one another to determine our duty proper, his position does little to enlighten how it is that we ought to conduct this weighing. Philippa Foot has discussed a distinction that helps to illuminate how we ought to weigh the *prima facie* duty to provide aid against the *prima facie* duty not to cause harm. The distinction she discusses is that between doing and allowing. Foot asserts that it is morally worse to actively do harm to another than to allow them to be harmed. She argues this point on the basis that actively doing harm involves setting a new chain of events in motion that will bring about harm whereas allowing harm to occur involves permitting a chain of events to continue when it is already in motion or will soon be in motion.[43] Relating this to the organ transplant example discussed previously, the surgeon's duty not to cause harm to the one healthy patient is stronger than her duty to provide aid to those who need organ transplants. While her duty not to cause harm applies only to one person and her duty to provide aid applies to five, this is not enough to justify the infliction of harm on the healthy patient. Foot's position suggests this is because actively inflicting harm is more severely wrong than allowing harm to occur such that the *prima facie* duty not to cause harm to one outweighs the *prima facie* duty to provide aid to five, making the surgeon's duty proper to refrain from killing the healthy patient. An interesting question arises from this weighing of *prima facie* duties – might there be a number of patients

42 Thomas Hurka and Esther Shubert, "Permissions To Do Less Than the Best: A Moving Band," in *Oxford Studies in Normative Ethics*, ed. Mark Timmons (New York: Oxford University Press, 2012), 7.

43 Philippa Foot, "Morality, Action, and Outcome," in *Moral Dilemmas and Other Topics in Moral Philosophy* (Oxford: Clarendon Press, 2002), 89-90.

who could be saved that is large enough such that the duty to provide aid outweighs the duty not to cause harm, granting the surgeon a permission or even an obligation to kill the one healthy patient? Moderate deontology suggests there could be enough at stake in some scenarios to lift the constraint against killing the healthy patient. How many people must stand to be saved – would saving 100 lives be enough to justify killing one person, or would it need to be a thousand or even a million? Samantha Brennan has explored this topic with her discussion of thresholds for rights.

Brennan's thresholds approach is quasi-consequentialist. It shares some elements of consequentialist theories like utilitarianism – specifically, Brennan's approach looks at the overall good produced or harm prevented in consideration of whether a course of action is morally permissible. However, her approach has important variations from consequentialist theories such that it is not based on a simple one-to-one weighing of harms and benefits. There are three central elements to Brennan's approach which distinguish it from other consequentialist theories. The first element is what she calls the *total requirement*. This is the amount that must be at stake in order to justify the infringing of another's right.[44] If it is not permissible to kill one person to save five, as is suggested in the organ transplant example, then saving five lives is not enough to satisfy the total requirement to justify killing a person. If it is, however, permissible to kill one person to save 100, then the total requirement would be met, and we would know that the threshold to justify killing someone exists somewhere between saving five lives and saving 100 lives.

44. Samantha Brennan, "Thresholds for Rights," in *The Southern Journal of Philosophy* 33, no.2 (Summer 1995): 147.

A challenge with the total requirement arises when we raise the question of where, specifically, the threshold for this requirement exists. In the organ transplant example just discussed, moral intuition provides a general sense of where the threshold exists within a substantial range, though it is not very informative for cases that occur somewhere in the middle of that range. Perhaps it would still seem rather clear that we should not kill one person to save six, or that we would be permitted to kill one person to save ninety-nine, but what should we do if there are thirty lives at stake? If that does not seem like enough to justify killing a person, maybe forty would do it, or perhaps we need fifty lives at stake. Moral intuition is not a precise tool for identifying where this threshold exists, and unless a precise tool could be developed for weighing lives against one another in cases like this, the exact location of the threshold will remain difficult to identify, if at all possible. With this limitation on identifying the specific location of the threshold for the total requirement, perhaps the threshold may, at best, be identified as existing somewhere within a general range. Moral considerations would be clear for cases that occur outside of this range, but cases that operate within the range would likely be highly controversial with difficulties in identifying what morality permits or demands. In this way, there are limitations on how informative the total requirement is in Brennan's approach.

The second element Brennan discusses is the *universal constraint*. This element suggests that what is at stake must satisfy a minimum level of severity to be counted against the harm that will be inflicted. To illustrate this, she suggests that no number of minor headaches could justify the killing of a person to prevent those headaches.[45] The universal constraint, she suggests, is relative to the harm that will be inflicted. While no number of minor headaches could justify killing a person, she does view minor headaches as being severe enough to be factored into the

45. Brennan, "Thresholds for Rights," 149.

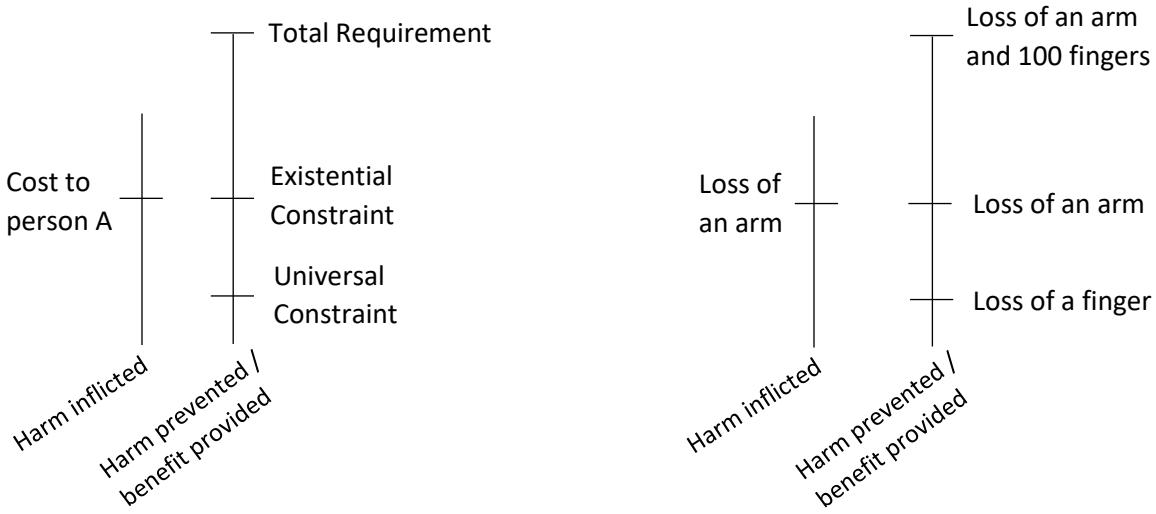
consideration of whether it is permissible to punch a person in the nose.[46] While Brennan does not have a clear guideline on where this constraint ought to be placed in relation to the harm that will be inflicted – making this threshold susceptible to the same type of challenge with precision as the total requirement, – the idea is that it rules out the possibility that a great deal of minor considerations could achieve the total requirement and justify inflicting a major harm. Some concerns arise with this constraint. Brennan suggests that numerous minor considerations in one person at different times ought to be considered independently rather than aggregately. For example, she says that one person experiencing two headaches at two different times should be viewed the same as two different people each experiencing one headache.[47] What if a person experiences a headache every day for the rest of their life, should we view this as no different than thousands of different people each experiencing one headache? It seems that having a headache every day for the remainder of your life is a more severe type of harm.

The final element Brennan discusses is the *existential constraint*. This element requires that at least one beneficiary of the harm that will be inflicted has at least as much at stake as the person who stands to be harmed.[48] This element is perhaps the most questionable. Brennan gives an example of inflicting the harm of losing an arm to prevent others from losing their fingers. She suggests that, no matter how many people stand to lose their fingers, it would not be justifiable to cause the person to lose an arm unless there is also a beneficiary who stands to suffer a harm that is as bad or worse than losing an arm.[49] From her previous comments viewing two headaches occurring in one person the same as two people each experiencing one headache,

46. Brennan, "Thresholds for Rights," 152.
47. Brennan, "Thresholds for Rights," 152.
48. Brennan, "Thresholds for Rights," 153.
49. Brennan, "Thresholds for Rights," 153.

it seems she would not view one person losing ten fingers as worse than ten people each losing one finger. As such, to lose ten fingers would still be a less severe harm than losing an arm. Already this seems questionable, and it becomes even more so when we consider that, according to this view, we would not be permitted to cause a person to lose an arm if doing so would prevent everyone in the world from losing all of their fingers.

Consider the following diagrams, the one on the left providing a general visualization of Brennan's thresholds approach and the one on the right providing an example of how it might look when weighing the loss of fingers and arms.



While there are some concerns with Brennan's thresholds approach, particularly with precision and with the suitability of the existential constraint, it sketches a general framework that is valuable for thinking about how to weigh our duties against one another to determine our permissions and obligations. This framework, I argue, can incorporate our duties to non-human animals who can make moral claims on us, and these can be weighed against the duties we have to humans. Based on the arguments raised throughout, there are no fundamental differences between our duties to humans and our duties to other animals that would preclude the latter from

being captured within this framework. Rather, any differences in the duties that we have to different beings would be captured by placing them at different points on the scales in the diagrams above. While the information we can expect to receive from engaging in this practice of weighing our duties to humans and to other animals will not be precise – due to issues with identifying exact locations of thresholds, – incorporating our duties to non-human animals within Brennan's thresholds approach is proposed as a framework for getting a general sense of how we can weigh these duties against one another in a way that overcomes some of the challenges with other utilitarian and rights-based theories.

vi. Thresholds and Scientific Animal Use

In moral considerations it seems that harms are more significant than benefits.[50] If giving candy to a person brings about a benefit that is equal in magnitude to the harm brought about by giving a person a minor headache, it does not seem that we should flip a coin to decide between giving someone a piece of candy or preventing a minor headache. Rather, the harm seems to have more significance and we should choose to prevent the minor headache. Consider the following table, presented to me by Thomas Hurka, and the subsequent explanation.[51]

	In order to prevent harm to others	**In order to give benefits to others**
Causing harm to someone	5	6
Failing to prevent a harm	3	4
Failing to give a benefit	1	2

50. Jeff McMahan has discussed the idea that the ability of a good to weigh against a harm depends on whether the good is in the form of preventing a harm or providing an enhancement, suggesting the latter would have less weight. See: Jeff McMahan, "Proportionate Defence," in *Weighing Lives in War*, ed. Jens David Ohlin, Larry May, and Claire Finkelstein (Oxford: Oxford University Press, 2017), 152.

51. Thomas Hurka presented this table in an Ethics lecture on January 13, 2020, at the University of Toronto.

The scenarios depicted in this table are increasingly difficult to justify, number one being the least difficult to justify and number six being the most difficult. There may be some dispute with the rankings, particularly in the middle – perhaps four is actually more difficult to justify than five. The rankings would also likely fluctuate based on the types of harms and benefits involved in different scenarios. Generally speaking, if we keep the harms and benefits in question the same for each scenario, the difficulty of justifying the scenarios follows this kind of trend (you might insert a harm and benefit to help illuminate this, perhaps using the benefit of receiving candy and the harm of a minor headache mentioned above). The reason for this trend can be explained with the doing versus allowing distinction discussed by Foot, and the greater moral significance of harms over benefits. In the column at the left of the table, the top entry – causing harm to others – is a case of actively inflicting harm. The next entry below is a case of allowing a harm to occur – according to the doing versus allowing distinction, this latter case would be less severely wrong. Finally, the bottom entry in the leftmost column involves allowing a benefit not to be received which is even less severely wrong than the previous entry, morally speaking, due to the lesser significance of benefits compared to harms. The actions are more severely wrong as they move up the table making them more difficult to justify. Looking at the row across the top of the table, the first entry involves prevention of harms whereas the next entry to the right involves giving benefits. Again, based on the greater moral significance of harms over benefits, an act is more difficult to justify if it produces benefits rather than preventing harms, making the scenarios more difficult to justify as they move to the right of the table.

Another distinction that has been proposed as a factor in how difficult it is to justify inflicting a harm is the distinction between *eliminative* and *opportunistic* harm. Jonathan Quong has identified eliminative harms as those inflicted on another person in an act that could have

been achieved without the other person being present, whereas opportunistic harms are those inflicted on another person through an act that could not have been achieved without the other person being present. Quong argues that opportunistic harming is considerably worse than eliminative harming.[52] This distinction seems to draw on relations to a chain of events, similar to Foot's distinction between doing harm and allowing harm to occur. Consider the organ transplant example discussed previously. To kill the healthy patient in order to save the five other patients would be a case of opportunistic harming – the act of saving five lives could not be achieved if the healthy patient were not present. In this case, you are bringing the healthy patient into a chain of events to which they are not intimately connected. Now, consider a variation of the organ transplant example. Your five patients need organ transplants immediately – thankfully, the organs will be arriving any minute by helicopter. As the helicopter approaches, the pilot notices there is a person trapped on the landing pad who can be moved, but it will take some time to get them free. The pilot has no place else to land and will certainly kill the trapped person if they land on the pad. The time required to free the person from the landing pad is so long that waiting means the five patients will die before they can receive their new organs. If the pilot lands on the trapped person and kills them, this is a case of eliminative harming – the person is already intimately connected to the chain of events that will result in their death. The pilot does not require that the person is on the landing pad – and she would likely prefer if they were not involved in the chain of events in this way – but she cannot avoid this. While it may not be clear whether it is permissible for the pilot to land, killing the trapped person, it certainly seems that, if it is wrong, it would be less severely wrong than killing the healthy patient in the original

52. Jonathan Quong, "Killing in Self-Defense," *Ethics* 119, no.3 (April 2009): 530.

example. In other words, when the same amount is at stake, opportunistic harming is more severely wrong and, thus, more difficult to justify than eliminative harming.

Cases of scientific animal use are mostly, if not entirely, cases of scenarios five and six from the table above making them perhaps the most difficult to justify from these possible scenarios. Taking the distinction of eliminative and opportunistic harm into consideration makes cases of scientific animal use even more difficult to justify as such cases usually, if not always, involve opportunistic harming. It is not as if the procedures being conducted could have taken place if the animal subjects were absent – rather, these practices depend on the presence of the animals, bringing them into a chain of events which they would not otherwise be involved in and which causes them harm. Further harms associated with scientific animal use can be identified when looking at the lack of suitability for human applications and the comparable benefits of non-animal technologies.[53] The substantial thresholds for justifying the infliction of these considerable harms must be recognized.

When looking at Brennan's thresholds approach, increasing the difficulty of justification would raise the total requirement of impartial good that is necessary to lift constraints and permit one to incur the associated cost. However, as the costs in these scenarios would be imposed on non-human animals, we are faced with the question of how to weigh those costs against the corresponding human harms and benefits. The principle of equal consideration of like interests suggests we ought to treat roughly equal cases similarly – the harm of losing a leg might be viewed as roughly equal in a human and a dog in terms of the physical pain that is suffered. However, there are also elements in this example that seem relevantly dissimilar – the loss of a

53. This topic is discussed in more detail in the final section of chapter 2 and the first section of chapter 3.

leg may be much more physically (and, perhaps, mentally) debilitating for the human than the dog. In another example, Singer has suggested that cancer may be a greater harm in humans than in mice due to the evidence that humans have a higher degree of awareness about what it means for them to have cancer.[54] Warren and Martha Nussbaum have made arguments that relate to this topic as well. Warren has suggested that higher mental capacity generates a higher capacity to suffer.[55] Nussbaum has argued that the same condition across two species may not constitute the same level of harm in each – she gives an example of a human and a chimpanzee each having a level of cognitive capacity equal to the average level for a chimpanzee. While the human may experience social and political barriers that make it difficult to achieve full and equal participation in their society, the chimpanzee would not experience any such harms.[56] We might also consider, however, that humans tend to have greater resources to alleviate the harms they experience. From prosthetics to painkillers and psychological supports, humans tend to have more aide available to address the harms we experience than other animals. Could these factors offset some relevant differences between humans and other animals, or even make the harms of non-human animals more substantial in some cases due to a lack of therapeutic options?

The weighing of harms between humans and non-human animals is a complex and imperfect procedure, even without mentioning the harm of death which further complicates the matter. However, for the sake of the argument to follow, a precise weighing of such harms will not be necessary. The general framework provided by Brennan, when applied to certain cases of scientific animal use, is quite informative. For example, the use of nonhuman animals for testing

54. Singer, "Equality for Animals?" 58-9.

55. Warren, "Difficulties with the Strong Animal Rights Position," 166.

56. Martha C. Nussbaum, "The Moral Status of Animals," *The Chronicles of Higher Education* 52, no. 22 (February 2006).

of cosmetics and household products is clearly unjustifiable. These practices are instances of case six from the table above which sets the highest threshold for justifying the imposed harms. There is not enough at stake for humans such that the existential constraint would be met, and, more importantly, the benefits afforded to humans would not satisfy the universal constraint. In other words, what is at stake for humans in these contexts is not severe enough to count toward justifying the harms inflicted on non-human animals. Moreover, there are many cosmetics and household products available that do not employ animal testing such that any loss of benefits to humans if testing in these areas were eliminated would be minimal, if even existent. In these cases, and any similar ones, the use of animals ought to be eliminated immediately.

Other cases are far more complex, particularly when the scientific use of animals aims to prevent substantial harms such as in cases of research on life-threatening disease. Weighing of harms in these cases would be challenging even with access to information about the procedures and conditions that non-human animals are exposed to, though the public does not have access to such information in Canada. My intuition is that, even in cases where considerable human harms stand to be prevented, the infliction of harms on non-human animals in scientific procedures would not be permissible in most cases. This seems particularly plausible if we consider the low likelihood that successful findings in animal trials will translate to success in human trials, which will be discussed later. However, I will not provide an argument about moral permissibility in such instances. Rather, for these complex cases my position is that we ought to phase out the use of animals in science where harms are inflicted whether their use is deemed permissible or not. For any cases where scientific animal use is morally impermissible, we would have an obligation to eliminate their use. If there are cases of scientific animal use where it is determined that the total prevention of harm expected to result from a course of action outweighs the infliction of

harms on non-human animals such that it is deemed morally permissible, we should still aim to phase out the use of animals. While moderate deontology does not require this systematically, my reasoning rests on two points. First is the commonly held principle that a world with less suffering is better than a world with more suffering. Developing alternative technologies that replace scientific use of animals would alleviate a great deal of suffering without prolonging or incurring greater harms to humans. The second point relates to Ross' discussion of compunction. If we are permitted or obligated not to fulfill a *prima facie* duty in order to fulfill our duty proper, Ross argues that our unfulfilled *prima facie* duties still exist. While our leaving them unfulfilled is justified, he says we ought to feel a sense of compunction and that we have a duty to try to make up for this.[57] In all cases of scientific animal use, even if they are justified, our duty not to cause harm is unfulfilled. Rather than accepting an institution that systematically overrides the rights of other beings not to be harmed, we would be better to transition to an approach that achieves the same ends without requiring that we leave our duty not to cause harm unfulfilled.

There are some cases where the value of scientific animal use is clearly not enough to justify overriding the rights of other beings not to be harmed. These cases, such as testing of cosmetics and household products, ought to be eliminated immediately. There are many cases that have far more crucial aims to prevent human harms and it is often unclear whether there is enough at stake to justify the scientific use of animals. Even if my intuition is correct and many of these cases are morally impermissible, their complexity makes it difficult to definitively establish such a normative claim. Further, establishing a convincing argument for the moral impermissibility of such practices may be unlikely to influence the operations of the industry – we might view factory farming as an example of this as a practice that is responsible for far more

57. Ross, "What Makes Right Acts Right?" 28.

animal suffering and environmental degradation than scientific animal use, though the institution seems largely unaffected by ethical argumentation. Rather than trying to establish an argument about the moral permissibility of complex, high-stakes cases of scientific animal use, my focus is on promoting the phasing out of scientific animal use altogether to eliminate a practice that is responsible for a great deal of suffering and that systematically requires us to leave unfulfilled our duty not to cause harm.

The Argument for a Gradual Transition

Why should a gradual transition away from scientific animal use be permitted? First, it is not suggested that all uses of animals in science should be phased out gradually. A case-by-case approach should be taken to determine which procedures are clearly unjustifiable and should be eliminated immediately, and which are more complex and should be phased out gradually. Practices such as cosmetic testing and dissections in secondary school should be eliminated immediately due to being of trivial value that cannot justify the associated uses of animals. However, there are potential cases where the immediate abolishment of animal procedures may cause substantially more suffering than would occur if they are allowed to be phased out. Such cases may include safety testing of medical products and pharmaceuticals that many people depend on to avoid suffering or death and for which non-animal methods to perform the required safety tests are not available.

Second, and unfortunately, moral arguments are not always sufficient for producing social and political change. In the case of slavery, campaigning for abolition was important for denouncing the practice and influencing moral attitudes, but it is largely accepted that abolition

also depended on slavery becoming less economically efficient.[58] Advocating for abolition of scientific animal procedures will similarly continue to have an important role in changing moral attitudes, but there is also a need to develop systemic changes that make the practice less economically favourable and that make elimination of the practice more politically viable. The political and economic barriers to immediately abolishing the practice make this approach unlikely to be adopted, and, in some cases, morality might suggest that immediate abolishment would be suboptimal or even impermissible. Thus, it is believed that permitting a gradual approach in certain areas of the industry, in combination with continually advocating for elimination of the practice, will contribute to a faster progression toward a complete and morally justified abolishment of the practice.

The Animals in Scientific Animal Use

The discussion thus far has largely focused on the moral considerability of animal suffering and how to weigh harms and duties. With increasing numbers of animals used to achieve a goal and increasing severity of harms imposed on them it becomes more difficult to justify the goals of scientific animal use. This section will provide some information on the number of animals used for scientific purposes in Canada and the severity of harms to which they are exposed.

First, refer to table 1 below for a depiction of the types of animals used in Canadian studies in 2019.[59]

58. In making a comparison between slavery and scientific animal use, there is an important distinction I ought to make: In the case of scientific animal use I have suggested there may be some instances where the practice is justified. However, in the case of slavery, I am not suggesting that the practice has had potentially justifiable instances. See; Sue Donaldson and Will Kymlicka, *Zoopolis* (New York: Oxford University Press, 2011): 253.

59. CCAC, *CCAC Animal Data Report 2019*, 4.

Animal Type	Number of Animals
Mice	1,391,398
Birds	1,194,320
Fish	905,822
Cattle	632,060
Rats	176,024
Amphibians	115,093
Other Animals	44,610
Pigs	33,072
Guinea Pigs	20,426
Other Rodents	13,609
Dogs	12,195
Reptiles	7,925
Cats	5,894
Rabbits	5,269
Nonhuman primates	4,805
Total	**4,562,522**

Table 1: Animals Used for scientific purposes in Canada in 2019.

Although there is some vagueness in this list, we can see that most of the animals listed are vertebrates. Warren draws attention to the high probability that vertebrate animals have the capacity to experience mental states such as pain and pleasure based on their behaviour, neuroanatomy, and sensory organs.[60] Additionally, the National Research Council (US) Committee on Recognition and Alleviation of Pain in Laboratory Animals has concluded that all vertebrate animals should be considered to have the capacity to experience pain.[61] Under the

60. Warren, "Moral Status," 442.

61. This position is based on two points: (i) there is believed to be a strong likelihood that it is correct, and (ii) the consequences of wrongly assuming that a vertebrate cannot experience pain has "serious ethical implications." See: National Research Council (US) Committee on Recognition and Alleviation of Pain in Laboratory Animals, *Recognition and Alleviation of Pain in Laboratory Animals* (Washington: National Academies Press, 2009): 23.

definition of animal used by the Canadian Council on Animal Care (CCAC), it is known that any invertebrate animals recorded in table 1 are cephalopods.[62] Mather and Anderson provide evidence that these types of animals exhibit physiological and behavioural responses that are consistent with the human experience of pain.[63] Thus, there is good reason to believe that all of the types of animals listed in table 1 have an interest in avoiding pain and can suffer.

Second, consider the following categories of invasiveness for animal studies as set out by the CCAC, and the number of animals involved in each category as shown in table 2 below.[64]

Category B: Experiments which cause little or no discomfort or stress.

Category C: Experiments which cause minor stress or pain of short duration.

Category D: Experiments which cause moderate to severe distress or discomfort.

Category E: Procedures which cause severe pain near, at, or above the pain tolerance threshold of unanesthetized conscious animals.

Category of Invasiveness	Number of Animals
B	2,134,957
C	1,207,785
D	1,249,683
E	152,892
Total	**4,745,317**

Table 2: Animals Used in Each Category of Invasiveness in 2019.[65]

62. "Animals" are defined as "vertebrates and cephalopods." See CCAC, "What Types of Animals Are Studied in Canadian Science?" www.ccac.ca.

63. They also discuss the importance of cephalopods having an environment that allows them to exercise their natural behaviours, referring to the negative impacts of frustrating these behaviours that have resulted from confinement in aquaria. See: Jennifer A. Mather and Roland C. Anderson, "Ethics and invertebrates: a cephalopod perspective," *Diseases of Aquatic Organisms* 75, no. 2 (May 2007): 121-5.

64. CCAC, *CCAC Animal Data Report 2019*, 6.

65. The total number in this table exceeds the total number of animals reported in table 1 due to some individual animals being used in multiple procedures. See: CCAC, *CCAC Animal Data Report 2019*, 7.

Categories C, D, and E, by definition, involve inflicting harms upon non-human animals. There is a possibility that some experiments in category B could be conducted without inflicting harm.

In addition to the experiments conducted on non-human animals, the conditions in which they are confined must be considered. Rachels has outlined various ways that confinement has been harmful to captive animals, concluding that an animal's environment must be sufficient for that animal to engage in its natural behaviours if its interests are not to be harmed.[66] Additionally, there is strong evidence to support that at least some animals, including rats, fish, and primates, have social interests that impact their welfare.[67] Thus, failure to provide the animals with adequate environments to accommodate their natural behaviours and satisfy their social interests could constitute harm as well.

Alternatives Options: Invertebrates, Live Isolates, Computer Models, and Others

Alternatives to scientific animal use will be important to phase out, and ultimately eliminate, the use of animals in science. This section aims to provide information on the types, applications, and availability of such alternatives.

Invertebrate organisms are used in a wide variety of laboratory applications, including medical studies on Parkinson's disease, diabetes, and drug development.[68] The extent to which invertebrates are used in animal research in Canada is difficult to approximate, as invertebrates

66. James Rachels, "Do Animals Have Rights?" in *Can Ethics Provide Answers?* (Lanham: Rowman & Littlefield, 1997), 85-8.

67. Tanja K. Kleinhappel et al., "Animal welfare: a social networks perspective," *Science Progress* 99, no. 1 (2016): 68-82; Oliver Burman et al., "Removing individual rats affects indicators of welfare in the remaining group members," *Physiology & Behaviour* 93, no. 1 (2007): 89-96; Ana I. Faustino et al., "Mechanisms of social buffering of fear in zebrafish," *Scientific Reports* 7, no. 1 (March 2007): 1-10; Brenda McCowan et al., "Connections Matter: Social Networks and Lifespan Health in Primate Translational Models," *Frontiers in Psychology* 7 (April 2016): 1-11.

68. Sonali K. Doke and Shashikant C. Dhawale, "Alternatives to animal testing: A review," *Saudi Pharmaceutical Journal* 23, no. 3 (July 2015): 226-7; Susan E. Wilson-Sanders, "Invertebrate Models for Biomedical Research, Testing, and Education," *ILAR* 52, no. 2 (January 2011): 127-8.

only fit within the CCAC definition of an "animal" if they are cephalopods. Scientific procedures involving non-cephalopod invertebrates fall under a distinct category of invasiveness, "Category A: Experiments on most invertebrates or on live isolates."[69] Since they are not regarded as animals by the CCAC, the scientific uses of non-cephalopod invertebrates are not monitored and no animals are reported in this category.[70]

Invertebrates are commonly regarded as having a reduced capacity or inability to suffer, generally due to their simple physiology relative to "higher" animals.[71] However, there is evidence that various invertebrates exhibit physiological and behavioural responses to noxious mechanical, thermal, and chemical stimuli.[72] It is possible that invertebrates have less capacity to suffer than do vertebrate animals, but it is not clear that they are incapable of suffering. If the assumption is wrong, serious ethical implications arise from acting under the assumption that invertebrates cannot suffer. Unless it can be definitively shown that invertebrates are incapable of suffering, we should assume that they can suffer and treat them accordingly. In her article investigating the capacity of invertebrates to experience pain, Jane Smith makes a suggestion that should serve as a guide for the use of invertebrate animals in scientific procedures. That is, the conditions of invertebrate research should seek to reduce any pain and stress that the animals could potentially experience, any killing should follow humane procedures, and the animals' living conditions should be the most appropriate for their kind.[73] Invertebrates should be

69. CCAC, *CCAC Animal Data Report 2017*, 6.

70. CCAC, *CCAC Animal Data Report 2017*, 6-7.

71. C.M. Sherwin, "Can Invertebrates Suffer? Or, How Robust is Argument-by-Analogy?" *Animal Welfare* 10, no. 1 (February 2001): 103.

72. Jane A. Smith, "A Question of Pain in Invertebrates," *ILAR* 33, no. 1-2 (January 1991): 26-28; Paul L.R. Andrews, "Laboratory Invertebrates: Only Spineless, or Spineless and Painless?" *ILAR* 52, no. 2 (January 2011): 121-4; Mather and Anderson, "Ethics and invertebrates: a cephalopod perspective," 121.

73. Smith, "A Question of Pain in Invertebrates," 30.

included in the classification of "animals," regulated more closely, and ultimately replaced in research by non-animal alternatives.

The use of *in vitro* methods involving live isolates, such as cell and tissue cultures, may be a promising alternative to animal studies. *In vitro* methods have been utilized to study areas such as safety pharmacology, genotoxicity, eye and skin irritation, and dermal absorption.[74] These methods have the potential to reduce or replace some forms of animal testing, possibly providing faster and higher quality data.[75] One challenge with *in vitro* methods is that they sometimes involve collecting cells and tissues from animals through invasive procedures that may inflict harm.[76] *In vitro* studies can reduce the number of animals needed for research as cell and tissue cultures can be used for various purposes over an extended period, making it an improvement over conducting research directly on animal subjects, but there should also be development to eliminate the need for invasive collection methods.[77] *In vitro* methods also include the use of cells and tissues from human sources allowing the collection process to involve consent, and providing better models in research that is conducted for human applications.[78]

Computer models have been developed to simulate human physiology to aid in the development of new medicines, predict various potential toxic and biological effects of

74. Jen-Yin Goh et al., "Development and use of *in vitro* alternatives to animal testing by the pharmaceutical industry 1980 – 2013," *Toxicology Research* 4, no. 5 (August 2015): 1301.

75. Ibid., 1297; R.M. Pearson, "In-vitro techniques: can they replace animal testing?" *Human Reproduction* 1, no. 8 (December 1986): 559.

76. PREDICT One Health Consortium, *PREDICT Operating Procedures: Rodent Sampling Methods* (2017), 6-16; PREDICT One Health Consortium, *PREDICT Operating Procedures: Livestock Sampling Methods* (2016), 5-11; Karolinska Institutet, "On tissue collection from mice and rats" (December 2014), www.ki.se.

77. Doke and Dhawale, "Alternatives to animal testing: A review," 226.

78. Jan Barfoot et al., *Stem Cell Research: Trends and Perspectives on the Evolving International Landscape* (Elsevier, 2013), 25; Wyss Institute, "Human Organs-on-Chips," wyss.harvard.edu.

substances such as chemicals or new drugs being developed, and contribute to the understanding of human biology.[79] Using computer models can accelerate processes in medical research, such as the development of new drugs, compared to the conventional animal methods.[80] Beyond their value in medical research, computer models have applications in educational settings along with other types of models and virtual learning tools. There are extensive non-animal resources that seek to educate at all levels of schooling without the use of animals.[81] The use of these educational tools as alternatives to animal methods has been associated with an equal or higher level of academic performance, faster learning, and better understanding among students compared to others who engaged in animal methods.[82] There may be areas of professional training in which the current non-animal alternative methods are not able to provide the same level of preparation as conventional animal methods, requiring further innovation to make transition away from animal methods possible.[83] However, in many educational settings, and particularly in the case of dissections, there is good reason to believe that computer models and other non-animal educational resources provide equal or higher quality of education than conventional animal methods. These latter methods should be replaced by the former

79. Baltazar D. Aguda et al., "An *In Silico* Modeling Approach to Understanding the Dynamics of Sarcoidosis," *PLOS One* 6, no. 5 (May 2011): 1-9; Ted Martonen et al., "*In silico* modeling of asthma," *Advanced Drug Delivery Reviews* 55, no. 7 (July 2003): 829-49; Doke and Dhawale, "Alternatives to animal testing: A review," 225.

80. National Institute of Biomedical Imaging and Bioengineering, "Computational modeling" (2016), www.nibib.nih.gov.

81. The Science Bank offers computer models and other tools that can replace the use of animals in educational settings from the earliest years of primary school to medical and veterinary school. See: The Science Bank, "Innovative Teaching Tools for Today's Science Class," www.thesciencebank.org.

82. D.G. Dewhurst et al., "Comparison of a computer simulation program and a traditional practical laboratory class for teaching the principles of intestinal absorption," *Advances in Physiology Education* 267, no. 6 (December 1994): S103; Dinesh K. Badyal et al., "Computer simulation models are implementable as replacements for animal experiments," *ATLA* 37, no. 2 (April 2009): 192; Jonathan Balcombe, "Dissection: The Scientific Case for Alternatives," *Journal of Applied Animal Welfare Science* 4, no. 2 (2001): 120; National Anti-Vivisection Society, "Animals Used in Education," www.navs.org.

83. Netherlands National Committee for the protection of animals used for scientific purposes (NCad), *Transition to non-animal research* (2016): 4.

accordingly.[84] The continued development and implementation of computer models will help to replace animal procedures and can improve the quality and efficiency of medical research and education.

CHAPTER 2

COMPARATIVE POLITICS OF SCIENTIFIC ANIMAL USE POLICY

Canadian Regulations on Scientific Animal Use

Various non-animal methods are already viable to replace uses of animals in science in such areas as cosmetics testing and dissections, and there are promising progressions with *in vitro* and computer models that seek to replace the use of animals in more crucial areas. However, there will undoubtedly be some areas of animal studies, the benefits of which are deemed crucial, that will not have any viable non-animal alternatives readily available. In the cases where the use of animals in science will continue until they can be replaced by non-animal alternatives, it is important to minimize the harm inflicted on animals by improving the quality of conditions that the animals are exposed to and the care that they receive. This section will look at the systems in Canada that seek to regulate scientific animal use and how they relate to the moral considerations discussed above.

Who has regulatory power over the conditions and levels of care to which animals in science are subjected? Animal welfare was not included in the *Constitution Act, 1867*, and neither were medical or scientific research. Considering the status of non-human animals as

84. In various countries, including The Netherlands, Switzerland, and Argentina, dissections are no longer carried out in primary or secondary schools, and the quality of scientific education has not suffered. (The same approach should be adopted in Canada immediately.) See: Balcombe, "Dissection: The Scientific Case for Alternatives," 124.

property under Canadian law, the power over animal welfare has fallen under the provincial power of Property and Civil Rights.[85] Research institutes typically fall under the provincial power of Local Works and Undertakings.[86] Thus, regulatory power over the use of animals in science largely belongs to the provinces. The degree of regulation on scientific uses of animals within provinces is minimal, if there is any regulation at all.[87] However, the federal government has also been able to exercise some authority over animal welfare through Criminal Law power. Further influence has involved the use of federal "spending power" to fund the Canadian Council on Animal Care (CCAC), mandating compliance with the standards of this organization as a requirement for receiving federal research grants.

i. The Canadian Council on Animal Care

The CCAC is a Canadian body that regulates the use of animals in science at the national level. The organization was developed in 1968, following a decade of growth in biomedical research and changing attitudes on the ethics of scientific animal use.[88] Though not a government institution, they are funded by two agencies of the federal government.[89] In 2017 and 2018 the CCAC received approximately two-thirds of its funding from the Canadian Institutes of Health Research (CIHR) and Natural Sciences and Engineering Research Council (NSERC).[90] The CCAC has developed extensive general guidelines for the care of animals focusing on areas such

85. *The Constitution Act, 1867*, 30 & 31 Vict, c 3, s. 92(13); Elaine L. Hughes, "Scientific Experiments on Animals and Constitutional Principle," *Constitutional Forum* 12, no. 1-3 (July 2011): 71.

86. *The Constitution Act, 1867*, s. 92(10); Elaine L. Hughes, "Scientific Experiments on Animals and Constitutional Principle," *Constitutional Forum* 12, no. 1-3 (July 2011): 71.

87. Hughes, "Scientific Experiments on Animals and Constitutional Principle," 72-3.

88. CCAC, "When – A Timeline of Animal Ethics and Care in Canadian Science," www.ccac.ca.

89. Charlotte Montgomery, *Blood Relations: Animals, Humans, and Politics* (Toronto: Between the Lines, 2000), 96.

90. The total combined amount granted from these two agencies was 1.75 million dollars each year. See: CCAC, *Financial Report 2017-2018*, 2. www.ccac.ca.

as environment, nutrition, social and behavioural requirements, surgery, anesthesia, and euthanasia.[91] They have also developed guidelines specific to different types of animals to provide protections that are better tailored to the animals' needs.[92] Laboratory inspections are conducted to assess whether facilities adhere to the guidelines of the CCAC.

How well does the CCAC regulate scientific animal use to be aligned with the moral considerations discussed above? At first glance, the oversight from the CCAC seems to be an effective way to monitor the use of animals in science and ensure that appropriate measures are taken to minimize harm. However, under this regulatory system there exists no harm-benefit analysis of any kind that would employ the types of weighing discussed in Brennan's threshold approach. The CCAC also does not recognize a need to phase out the use of animals in science, rather defending the continuation of the practice. Further, the organization faces numerous barriers (discussed below) that significantly constrain the abilities of the CCAC to enforce regulations and reduce harm inflicted upon animals used in science.

First, participation in the CCAC program is not mandatory. Participation is required in order to receive public funding, thus requiring the participation of government institutions and other facilities that depend on public funding. However, any private facilities, such as companies in pharmaceuticals or biotechnology, can conduct animal procedures with no obligation to participate in the CCAC program. As universities have been collaborating more with private corporations on research in recent years, their need for public funding has diminished and, subsequently, so has oversight from the CCAC.[93] Dave Neil, a past veterinarian at the University of Alberta, has suggested that the voluntary structure of the CCAC has led to systems in most

91. CCAC, "General Guidelines," www.ccac.ca.
92. CCAC, "Types of Animals," www.ccac.ca.
93. Lesli Bisgould, *Animals and the Law* (Toronto: Irwin Law, 2011), 210.

provinces under which private institutions can conduct animal studies with a complete absence of oversight and limitations so long as they are not blatantly and criminally cruel.[94]

Second, the members of the CCAC do not constitute a well-rounded representation of competing interests in the area of animal use in science. There are twenty-two member organizations, most of which have an interest in encouraging or conducting animal procedures. Humane Canada is the only member with a clear interest in animal welfare.[95] The distribution of interests among the Board of Directors also underrepresents the interests of non-human animals. There are currently twelve directors, three of whom have legal, business, or accounting backgrounds. Of the other nine directors, six are directly involved in medical or academic research and two others have backgrounds as veterinarians in animal research contexts. There is only one director who has a clear background in advocating for animal welfare.[96]

Third, inspections conducted at CCAC-certified facilities do not effectively enforce CCAC guidelines. Inspections are conducted once every three-to-five years and the facilities receive significant notice, allowing them to prepare for the inspection.[97] During inspections, members of the inspection panel – made up of scientists, a minimum of one veterinarian, and one community member nominated by Humane Canada – receive information about the procedures being conducted at the facility. This includes information on how many animals are being used, the types of animals being used, and the conditions to which they are being subjected.[98] Inspection panels do not typically get to observe experiments in-progress.[99] After the inspection,

94. Montgomery, *Blood Relations*, 103.
95. CCAC, "Member Organizations and Funders," www.ccac.ca; Bisgould, *Animals and the Law*, 209.
96. CCAC, "Board of Directors," www.ccac.ca.
97. Bisgould, *Animals and the Law*, 211; Montgomery, *Blood Relations*, 96.
98. Ibid., 97.
99. Bisgould, *Animals and the Law*, 211.

the panel produces a written report and submits this to the facility within ten weeks. The facility is expected to respond to the concerns outlined in this report by proposing a plan for making changes that will address the concerns. The facility has three to six months to produce this plan, depending on the significance of the concerns. After receiving this proposed plan, the CCAC will find the facility to be in a state of compliance, conditional compliance, probation, or non-compliance with the standards of the CCAC. If a facility is found to be in a state of non-compliance, this can be reported to government and other funding agencies. To reach this point in the process can take up to a year, during which the facility could continue to operate without resolving any of the concerns.[100]

If a CCAC-certified facility is found to be in a state of non-compliance, the CIHR and NSERC can stop funding research in that facility. However, by the year 2000, even though facilities had been found to be in non-compliance, funding from federal agencies had never been stopped or reduced in response.[101] In 2003, the executive director of the CCAC stated that the program had not stopped even one experiment since it was established in 1968.[102] In the past eighteen years since this statement was made, the evidence, or lack thereof, suggests that the power to revoke or reduce federal funding to facilities that are found to be in non-compliance with the CCAC standards remains unexercised. The CCAC does not make this information available.

Fourth, the availability of information through the CCAC is substantially restricted. No information about facility assessments are released, members of the assessment panel must agree to confidentiality, and there is no requirement for the facilities to release any information on

100. Montgomery, *Blood Relations*, 97.
101. Ibid.
102. John Sorenson, *About Canada: Animal Rights* (Black Point: Fernwood Publishing, 2010), 137.

CCAC findings. Further, there are no details released about the conditions and procedures to which the animals are subjected, nor are there any details released about standards violations that are discovered, and information about which facilities are subject to assessment is not available.[103] Since the CCAC is not a federal agency, it is not included under the *Access to Information Act* and has no obligation to release any of this information.[104] The information that the CCAC does release is limited to the total amount of animals that are used in CCAC-certified facilities, the types of animals used, and how many animals are used in each general category of invasiveness and purpose of use.[105] The CCAC holds the view that this level of confidentiality is needed to promote discussion among scientific communities, and it seems also to aim at protecting institutions from acts of protest against their methods of animal use.[106] However, as will be discussed later, other systems of regulation have been developed that involve a higher degree of transparency while promoting learning between scientific communities and protecting the identities of institutions.

The information that is released by the CCAC is further restricted in the sense that it does not capture the full scope of scientific animal use in Canada. Since private facilities in many provinces can operate with little or no oversight and no requirement to report data on their operations, it is nearly impossible to accurately determine how many animals are used in science in Canada, the specific purposes for which they are used, and the procedures to which they are subjected. Additionally, there are some animals used in science that are simply not recorded. These include non-cephalopodic invertebrates and animals that are dead prior to their scientific

103. Bisgould, *Animals and the Law*, 212-13.
104. Montgomery, *Blood Relations*, 100; *Access to Information Act*, RSC 1985, c A-1.
105. Bisgould, *Animals and the Law*, 213.
106. Ibid., 212.

use, such as those killed for dissection and those that die as a result of genetic modification processes.[107]

Fifth, a core element of the CCAC program is that every certified animal use facility must have their own Animal Care Committee (ACC). The ACCs are supposed to ensure adherence with CCAC guidelines, review proposed procedures, and ensure that an effort has been made to seek non-animal methods. There is, however, no requirement for ACCs to contribute to the development of non-animal methods, and it is not made clear to what extent an ACC must seek such methods. Thus, it is very difficult to enforce this requirement of seeking alternatives; the ACCs own assurance that there are no viable non-animal methods may be sufficient.[108]

The CCAC does not set requirements around the types of members that make up the ACCs, but suggest that they should include scientists or teachers that have worked with animals, a member of the institution who does not conduct work with animals, at least one veterinarian, and at least one community member.[109] Generally these committees consist mostly of individuals who have shared interests with the institution, and who hope to have their own proposals approved by the ACC which creates an incentive for the committee members to approve the proposals of the other members.[110] The community members are from outside of the institution, but depend on an invitation from the ACC to be on the committee and to remain on it.[111] Further, rejection by a community member may not have much impact on the outcome for a proposal. Stephanie Brown, a former president of multiple humane societies, spent some time as a member of an ACC at a hospital in Toronto. Brown rejected the proposed renewal of an experiment

107. Montgomery, *Blood Relations*, 101.
108. Bisgould, *Animals and the Law*, 211-12.
109. CCAC, "Oversight System," www.ccac.ca.
110. Bisgould, *Animals and the Law*, 212.
111. Montgomery, *Blood Relations*, 101.

involving the insertion of metal bars into the backs of cats causing them to be immobilized. The committee required a single vote of rejection in order to veto a proposal. Rather than accepting Brown's rejection of the proposal – being the only one – the committee decided to change the requirement to two votes of rejection in order to veto a proposal.[112]

Finally, approximately one-third of the CCAC's funding comes from fees paid by the institutions that participate in the CCAC program.[113] This creates a disincentive for the CCAC to revoke an institution's CCAC-certification, as doing so would result in a loss of financial support for the organization. CCAC-certified institutions have been found to be in non-compliance with CCAC guidelines, but there is no record of the CCAC ever revoking an institution's certification, nor any record of federal funding having been reduced or revoked, even though these are the proposed repercussions for an institution that is found to be in non-compliance.

The CCAC has not had any role in criticizing scientific uses of animals and has not effectively supported the need to replace these uses. Rather, it has a history of defending the interests of the animal research industry and supporting the use of animals in science as a necessary practice.[114] David Sztybel, in an evaluation of the CCAC's code of ethics, has criticized the institution as being potentially more harmful to animals used in science than if the program did not exist at all. The CCAC creates the idea that animals in science are protected in Canada while effectively fostering the continued suffering of these animals.[115] Legislative action

112. Montgomery, *Blood Relations*, 103.
113. CCAC, *CCAC Facts & Figures*, (2018), www.ccac.ca.
114. Bisgould, *Animals and the Law*, 209-10.
115. David Sztybel, "The Canadian Council on Animal Care's Code of Ethics: A Critical Evaluation," *Medical Research Modernization Committee*. www.mrmcmed.org.

is urgently needed to develop a better regulatory system for the scientific uses of animals in Canada.

ii. Criminal Law

The federal government has not enacted any legislation directly relating to the use of animals in science. This area falls under sections 444 – 447 of the *Criminal Code* which protect against cruelty to animals.[116] Some shortcomings, however, include a lack of definition for the term "animal," and the classification of animals as property. Viewing non-human animals as property in the legal system enforces the idea that animals should be valued merely on the basis of the utility they offer to humans. Further, these sections of the *Criminal Code* provide minimal protection to animals used in science. The anti-cruelty laws have a particular focus on violent abuse, such as forcing animals to fight one another, and interference with animals while they are aiding in law enforcement, military operations, or other services to humans. However, the infliction of pain and suffering on non-human animals is generally deemed legally permissible if it serves a lawful purpose, such as in the case of scientific procedures.[117] Criminal power in Canada has been exercised over the use of an animal in research only once in response to a study that involved a baboon being constantly restrained in a chair for a matter of months, alone, in a windowless room. The study had been approved by the CCAC.[118]

iii. Provincial Law

Animal welfare is a matter that falls under provincial power. Provincial legislation on animal welfare typically proscribes the infliction of distress upon non-human animals. However,

116. *Criminal Code*, RSC 1985, c C-46.
117. Sorenson, *About Canada: Animal Rights*, 157.
118. Montgomery, *Blood Relations*, 62; Tim Beardsley, "Canada Baboon Cruelty Trial," *Nature* 313, no. 6002 (February 1985): 421.

if the practices that inflict distress upon animals are generally accepted – such as research, testing, and teaching – they tend not to constitute an offence. Provincial animal welfare legislation largely protects the use of animals in science in this way, while providing little legislative protections for the animal subjects, if there are any protections at all.

Legislation protecting non-human animals in British Columbia is unique, being the only provincial legislation that does not make any reference to the use of animals in science.[119] Excluding Ontario, which will be discussed separately, the other eight provinces recognize the uses of animals in science as accepted practices. The laws protecting animals in all eight of these provinces do not apply to the accepted practices of research, testing, and teaching, so long as these practices operate according to generally recognized guidelines, many referring specifically to CCAC guidelines.[120] However, none of the provinces require institutions that conduct animal studies to actually participate in the CCAC program. The power to inspect these institutions is generally delegated to certain agents within each province, typically officers from animal protection or law enforcement agencies. These agents have the power to conduct inspections of facilities where animals are held or where there is reason to believe that animals are in distress. However, legislation in many of the provinces state that the use of animals in accepted practices does not constitute distress. Hence, the use of animals in science is typically not, in itself, a reason to believe that animals are in distress - there must be reason to believe that the procedures

119. *Prevention of Cruelty to Animals Act*, RSBC 1996, c 372.

120. **NL**: *Animal Protection Standards Regulations*, NLR 36/12, s.10. **AB**: *Animal Protection Act*, RSA 2000, c A-41, s.2(2); *Animal Protection Regulation*, Alta Reg 203/2005, s.2. **MB**: *The Animal Care Act*, CCSM c A84, s.3(2), 4, 6(2); *Animal Care Regulation*, Man Reg 126/98, s.4(4)-4(5). **PEI**: *Animal Welfare Act*, RSPEI 1988, c A-11.2, s.7(1)-7(2). **NB**: *Society for the Prevention of Cruelty to Animals Act*, RSNB 1973, c S-12, s.18(1); *General Regulation*, NB Reg 2000-4, Schedule A.

being conducted violate the guidelines that are referenced in the respective legislation. It is rare for the distress caused through an accepted practice to constitute an offence.[121]

Ontario, like most of the other provinces, has general policies surrounding animal cruelty which do not apply to the use of animals in science that adhere to generally accepted guidelines.[122] However, Ontario differs from the other provinces in having legislation that applies directly to the use of animals in science. The *Animals for Research Act* requires that all facilities using animals for research purposes must be registered as approved by the director of the act who is appointed by the Minister of Agriculture, Food and Rural Affairs.[123] The director makes decisions about whether to approve an application for registration based on reports submitted by the research facilities.[124] The act also requires animal research facilities to develop an animal care committee similar in function to those required by the CCAC.[125] An inspector is empowered under the act to monitor all registered facilities, and any other facility that is reasonably expected to be using or intending to use animals for research purposes.[126] Unlike in the case of the CCAC where advanced notice is provided to facilities before an inspection occurs, the inspector under the *Animals for Research Act* can arrive at facilities unannounced to conduct an inspection. Facilities found to be in violation of the regulations can be ordered to cease their operations, and violators may be subject to fines or imprisonment.[127]

The regulatory system of animal research facilities in Ontario seems to be more effective than the CCAC system, but it is not without shortcomings. The animal care committees required

121. Bisgould, *Animals and the Law*, 222.
122. *Ontario Society for the Prevention of Cruelty to Animals Act*, RSO 1990, c O.36, s.11.1(2).
123. *Animals for Research Act*, RSO 1990, c A.22, s.1(1), 5(1).
124. Bisgould, *Animals and the Law*, 217.
125. Ibid., 218.
126. *Animals for Research Act*, RSO 1990, s.18(3).
127. Ibid., s.21(1); Montgomery, *Blood Relations*, 104.

under Ontario's provincial legislation do not require any members from outside of the facility, creating the opportunity for these committees to consist entirely of individuals who share the interests of the facility and the other committee members.[128] In the case of the inspector, the Minister has the power to appoint additional inspectors as they believe to be necessary.[129] Yet, for many years there has been only a single inspector tasked with monitoring over 120 facilities.[130] Thus, the inspector monitors facilities by selectively investigating works in progress, rather than being able to extensively review the full operations of facilities. Further, the inspector is not empowered by the act to investigate the purposes that are served by animal use procedures, whether there are non-animal alternative methods available, or whether a procedure involves excessive or redundant use of animals. The reports from facility inspections under Ontario law also remain unavailable to the public. A previous inspector, Dr. Bill Holley, claimed that in eighteen years of service there was only one occurrence of a facility being ordered to cease operations while a hearing was conducted. He had never seen the imposition of a fine or penalty in a case where provincial legislation had been violated. Holley has suggested that, in order for Ontario's regulations on animal research to be more effective, "unnecessary pain" should be better defined, animal care committees should require scientific experts from outside of the facility, and inspectors should be empowered to investigate the purposes of animal procedures.[131] The lack of these elements may suggest an underlying attitude that facilities having the freedom to carry out their procedures as they see fit is more important than protecting animal welfare.

128. Bisgould, *Animals and the Law*, 218.
129. *Animals for Research Act*, RSO 1990, s.18(1).
130. Bisgould, *Animals and the Law*, 218.
131. Montgomery, *Blood Relations*, 104-05.

Though having serious shortcomings, the Ontario system for regulating the use of animals in science has strengths over the other provinces and the CCAC system. Overall, the provincial legislation across Canada does not overcome the shortcomings of the limited regulations set out by the CCAC and the federal government.[132] Canada's legislation on the use of animals in science needs to be improved.

Stronger Regulations: The UK

The United Kingdom is known for having some of the strictest policies on the use of animals in science. Scientific uses of animals are regulated under the *Animals (Scientific Procedures) Act, 1986* (ASPA).[133] Two simple, but important, strengths of UK legislation which are absent in Canadian legislation are a clear definition of which animals are protected under the legislation, and the protection of animals outside of the classification of property.[134] The animal science industry is regulated by the Home Office,[135] with licensing, monitoring, and ethical considerations being conducted at the national level.[136] The strengths of this regulatory system will be discussed below along with how they relate to the moral considerations discussed previously, and comments will be made on how Canada can learn from the UK to become better aligned with those moral considerations.

i. Licensing

132. The International Fund for Animal Welfare (IFAW), in an analysis of animal cruelty legislation across fourteen countries, has commented on Canada's legislation as being substantially behind the legislation of the other countries. See: IFAW, *Falling Behind: An International Comparison of Canada's Animal Cruelty Legislation* (Ottawa: IFAW, 2008): 18.

133. *Animals (Scientific Procedures) Act, 1986*, c. 14.

134. In the legislation, "a protected animal" is defined as "any living vertebrate other than man and any living cephalopod." See: *Animals (Scientific Procedures) Act, 1986*, preliminary.

135. A department of the central government of the UK which has a particular focus on security and crime.

136. Derek Fry, "How Different Countries Control Animal Experiments Outside Recognized Establishments," *ALTEX* (January 2012): 311.

In the UK, unlicensed use of animals for scientific purposes is not permitted.[137] There are three different licenses that are required for animal procedures to be conducted lawfully. *Personal licenses* require that those who will be conducting the procedures have been suitably educated and trained, and that they continue to display competency in their ability to abide by the licensing conditions and provide proper care to the animals. If no infractions occur, a review is required to occur at least once every five years.[138] *Project licenses* are granted or denied following a review of the project proposal. Such proposals are submitted to the Home Office for consideration of the project's purpose and conditions to ensure that the number of animals and their suffering is minimized. A "harm-benefit analysis" is also conducted to determine if the benefits of the project are significant enough to justify the procedures.[139] While it is not clear how these analyses proceed and how closely they agree with Brennan's thresholds approach discussed above opposed to a more utilitarian analysis, this kind of structure is an important tool for implementing the types of moral considerations discussed earlier. Finally, to acquire an *establishment licence*, a facility must be reviewed and found capable of providing appropriate care to animals."[140]

The power to grant the above licenses belongs to the Secretary of State who receives assistance from medical and veterinary experts who they appoint to act as inspectors.[141] Under the ASPA, the Secretary of State is not only empowered, but *required* to ensure that no animals are used in scientific procedures if there are "scientifically satisfactory" methods suitable for a project that do not involve the use of animals.[142] In the event of a violation of the ASPA or of

137. *Animals (Scientific Procedures) Act, 1986*, s.2B.
138. Ibid., s.4(4A), 4(5).
139. Ibid., s.5, 5A, 5B.
140. Ibid., s.6.
141. Ibid., s.18(1).
142. Ibid., s.2A(2)(a), 5B(3)(b).

any license conditions, the Secretary of State can immediately suspend or revoke a license, or a period of time to correct the violations may be granted.[143]

ii. Inspections

In the UK, the potential risks of each licensed facility are evaluated to determine a minimum number of inspections that must take place. Evaluated risk factors include; how many projects are underway, what types of procedures are involved, how many animals are involved, what types of animals are involved, and previous trends of compliance.[144] In 2018 there were 157 licensed facilities, and 653 inspections were conducted – an average of more than four inspections per facility within that year.[145] These inspections can be conducted without providing any notice to the facilities or the associated personnel.[146] Sixty-three per cent of the inspections conducted in 2018 were unannounced inspections.[147] Having an effective framework for inspections, such as this, is an important element for ensuring that the moral principles guiding scientific animal use are upheld in practice.

iii. Transparency

All scientific projects that involve the use of animals are made public. Summaries of every animal project that gets approved is published on the UK government's website, and these summaries are required to be free of technical terminology to make them more accessible to the public.[148] For any and all cases where personnel, projects, or facilities are found to be in non-

143. Ibid., s.11.

144. Animals in Science Regulation Unit (ASRU), *Annual Report 2018* (Home Office, 2020), 18.

145. Some facilities would have received more inspections than this average, and others less, based on the evaluated risk factors for each facility. Ibid; Home Office, "Annual Statistics of Scientific Procedures on Living Animals, Great Britain 2018," 22.

146. *Animals (Scientific Procedures) Act, 1986*, s.18(2B).

147. ASRU, *Annual Report 2018,* 18.

148. Home Office, "Non-technical summaries," www.uk.gov.

compliance, descriptions of these occurrences and their outcomes are made publicly available in annual reports released by the Home Office. In cases where more substantial investigations occur, detailed reports are typically published to the government website. A decision to withhold the publication of such a report is not prohibited, but would be an uncommon exception.[149] These publications function, in part, to continually educate members of the scientific community on how to uphold the requirements of the ASPA by providing examples of violations.[150] All of the information made publicly available is disconnected from the associated facilities and personnel, allowing for transparency about the operations of the industry while protecting industry members from targeted protest.

Canada and the UK: A Comparative Analysis

Protections for animals in science in the UK are stronger than in Canada. A key difference is the harm-benefit analysis in the UK which sets a foundation for a Brennan-type weighing of duties to determine what is permissible in the field of scientific animal use. Additionally, scientific animal procedures can only be conducted by licensed personnel who are working on licensed projects in a licensed facility in the UK, while the Canadian system is susceptible to having facilities, projects, and personnel that are completely unregulated. It is an offence in the UK to conduct procedures on animals where non-animal alternatives are available, and the availability of alternatives is subject to review. In Canada, the requirements for using non-animal methods under the CCAC system lack a meaningful review process. Inspections in the UK are largely unannounced and occur very frequently relative to the inspections occurring every three to five years in Canada which involve advanced notice. Finally, the conditions

149. ASRU, *Annual Report 2016,* 32, 36-48; Home Office, "Animal testing: compliance investigations by the Animals in Science Regulation Unit," www.gov.uk.

150. ASRU, *Annual Report 2016,* 36.

imposed on the animal subjects and any violations of standards are made publicly available in the UK, while the Canadian system remains clouded by secrecy with nearly no information being available to the public. These strengths of the UK system not only create a foundation for conducting a Brennan-type weighing of duties, they also provide a structure for more effectively upholding the moral demands that are identified. Nonetheless, the public opinion on matters of animal studies seem to be similar between the two countries.[151] If public attitudes are similar, what explains the significant regulatory differences? A common approach to analyzing policy development involves considering the political influence of institutions, ideas, and interests. Investigating these elements will help to explain the regulatory differences between Canada and the UK.

i. Institutions

The legislative institutions of Canada and the UK are rather similar, both being parliamentary democracies consisting of two houses. The lower house, the House of Commons, operates similarly in both systems. The upper houses, the Senate in Canada and the House of Lords in the UK, are more divergent in that the Senate has become largely ineffective in Canada while the House of Lords has a more active role in the legislative processes of the UK. Thus, passing bills is likely to be more difficult in the UK, having an upper house that engages more strongly in considering and challenging proposed bills than is the case in the Canadian system.

151. Survey data suggest that the use of animals in medical research is supported by 64% cent of the Canadian public and 65% of the UK public. Views that the value of scientific inquiry is more important than animal suffering in *all* cases of animal studies are supported by only 30% of the Canadian public and 39% of the UK public. See: Department for Business, Energy & Industrial Strategy, *Public attitudes to animal research in 2016* (Ipsos MORI, 2016), 4; CCAC, *National Nanos survey 2013*, 4-5.

One of the strengths of the UK regulatory system, the high degree of transparency, is relatively new. A directive imposed by the European Union (EU) in 2010, Directive 2010/63/EU, required EU Member States to publish project summaries for all approved projects involving the use of animals for scientific purposes.[152] When the directive was implemented, the UK's regulations on scientific uses of animals were already stronger than those required by the directive in many ways. However, the UK had not previously released summaries of the approved projects, which has contributed an important element of transparency to the UK system.[153] Directive 2010/63/EU was implemented following a proposal that was devised in collaboration with a wide range of societal members to gauge attitudes and perceived priorities regarding scientific animal use.[154] There has been no Canadian collaboration of this magnitude conducted to comprehensively determine Canadian attitudes and perceived priorities regarding how animals are used in science.

Another important institution, the European Centre for the Validation of Alternative Methods (ECVAM), was created in 1991.[155] The first such system in Canada was established in 2017 – the Canadian Centre for Alternatives to Animal Methods (CCAAM) and its subsidiary, the Canadian Centre for the Validation of Alternative Methods (CaCVAM).[156] Having an organization to promote the benefits and viability of non-animal methods of scientific inquiry in

152. Directive 2010/63/EU of the European Parliament and of the Council of 22 September 2010 on the protection of animals used for scientific purposes, *Official Journal of the European Union* (2010), article 43.

153. It will be interesting to see if there are any changes to scientific animal use following the UK's separation from the European Union (EU). As regulations in the UK were typically ahead of and stronger than requirements enforced by the EU, it is not expected that UK practices and regulations will undergo any substantial change.

154. Collaboration involved scientists, academics, industry members, EU Member States, non-governmental organizations, scientific committees on animal health and welfare, committees on health and environmental risks, the Animal Health and Welfare Panel, further expert groups, and the public. See: Thomas Hartung, "Comparative Analysis of the Revised Directive 2010/63/EU for the Protection of Laboratory Animals with its Predecessor 86/609/EEC – a t^4 Report," *ALTEX* 27 (April 2010): 286.

155. Ibid., 285.

156. University of Windsor, "Welcome to CCAAM / CaCVAM," www.uwindsor.ca.

Europe has likely influenced public attitudes on the value of these methods and has surely contributed to their implementation. The development of an institution of this kind in Canada is an important step in transitioning away from using animals in science and will likely contribute to changing views on the perceived necessity of animal use in scientific fields.

ii. Ideas

There has been a relation between changing attitudes in times of influential academic publications and changing regulations in Canada and the UK. In their 1959 publication, *The Principles of Humane Experimental Technique*, W.M.S. Russell and R.L. Burch introduced an idea that has come to be known as the Three Rs in the field of animal studies.[157] The Three Rs refer to replacement, reduction, and refinement.[158] This idea has been influential, becoming incorporated into many regulatory systems governing the scientific use of animals, including those of Canada and the UK.[159] The Three Rs seem to have been particularly influential in Canada. In an account of their history, the CCAC refers to the 1950s and 1960s as a period of changing opinions on animal ethics. Four years after the publication by Russell and Burch, the National Research Council of Canada initiated an investigation of the conditions of care for animals in science. In 1966, a recommendation was made for the development of a voluntary oversight system, leading to the establishment of the CCAC in 1968.[160] The regulations of the

157. W.M.S. Russell and R.L. Burch, *The Principles of Humane Experimental Technique* (London: Methuen, 1959).

158. The essential idea of the Three Rs is that alternatives to animal use should be utilized whenever possible, the number of animals used should be minimized, and the care provided to the animals should be optimized to protect their well-being. See: National Centre for the Replacement, Refinement & Reduction of Animals in Research (NC3Rs), "The 3Rs," www.nc3rs.org.uk.

159. CCAC, "Three Rs," 3rs.ccac.ca; *Animals (Scientific Procedures) Act, 1986*, s.2A.

160. CCAC, "History," www.ccac.ca.

UK were not impacted during this time, perhaps due to having an already established system for regulating the use of animals in science, whereas no such system existed in Canada prior to 1968.

Despite comparatively little influence in the UK during the 1950s and 1960s, the changes made to the UK legislation in 1986 with the introduction of the ASPA were accompanied by further academic publications and changing attitudes. The publications of *Animal Liberation* from Peter Singer in 1975, and *The Case for Animal Rights* from Tom Regan in 1983 are considered to have had a significant impact on the development of animal ethics as topics in philosophy and bioethics.[161] There was some legislative action in Canada around this time as well with the implementation of the *Animals for Research Act* in Ontario in 1990. Academic publications and changing opinions seem to be important for bringing attention to the regulations around animal use, but these factors do not provide an explanation of why the systems developed in considerably different ways.

The transparency of scientific animal use industries seems to be connected to the type of regulatory system that is pursued when changing attitudes bring about a perceived need for regulatory change. These industries have largely operated very privately, keeping the public and government officials largely unaware of their operations. However, this has not been so much the case in the UK with the early development of legislation during a time of greater transparency around the use of animals in science.[162] In the eighteenth and nineteenth centuries, leading up to the implementation of *The Cruelty to Animals Act, 1876*, Great Britain experienced shifting attitudes toward the use of animals in science. There was very little secrecy around the practice,

161. Nuno Henrique Franco, "Animal Experiments in Biomedical Research: A Historical Perspective," *Animals* 3, no. 1 (March 2013): 257-59. See also: Peter Singer, *Animal Liberation* (New York: Avon Books, 1975); Tom Regan, *The Case for Animal Rights* (Berkeley: University of California Press, 1983).

162. Lori Gruen, *Ethics and Animals: An Introduction* (New York: Cambridge University Press, 2011), 111.

with procedures being performed for the public. Richard Ryder provides a thorough account of the types of demonstrations practiced during this period, such as public vivisection performed on unanesthetized dogs who were nailed to boards.[163] This period was largely associated with the denouncement of animal experiments and led to the organization of animal advocacy organizations, animal welfare legislation throughout the nineteenth century, and the UK's first national legislation on animal research in 1876.[164] In more recent years, prior to the implementation of the ASPA in 1986, there was less systemic transparency, but various incidents came to the public's attention. In 1975 photos emerged of a study that involved forcing dogs to smoke tobacco, resulting in widespread protest to the study.[165] In 1985, the Royal College of Surgeons was charged with cruelty, found guilty, and fined due to their treatment of monkeys that were being used in experimentation.[166]

In other countries, such as Canada, where there are high levels of secrecy and a lack of long-standing legislation on animal research, there has been a particular trend for regulations to emerge after events that make the public more aware of the operations of the industry.[167] As previously discussed, charges of cruelty were laid against researchers at the University of Western Ontario in 1985 for confining a baboon to a chair for a matter of consecutive months. Within five years, the *Animals for Research Act* was implemented in Ontario. However, when

163. Richard Ryder, *Animal Revolution: Changing Attitudes towards Speciesism* (Oxford: Basil Blackwell, 1989), 59-124.

164. Ibid., 64-86.

165. Ibid., 245-46.

166. Ibid., 250.

167. For example: in the US there are two pieces of national legislation that regulate the use of animals in science. The *Animal Welfare Act* was implemented in 1966. It was extended from a bill that was introduced as a direct response to a scandal involving the theft of peoples' pets from their yards to be used for animal research. The *Health Research Extension Act* was implemented in 1985. This act was closely preceded by two scandals. The first, in 1981, involved undercover footage of a research facility working with monkeys that led to the first charges of cruelty in the US. In 1984, involved the transplant of a baboon's heart into a human baby. Images of the infant's incision circulated, and the child died at three weeks of age. See: Gruen, *Ethics and Animals*, 111-13.

the Canadian government saw a need to develop a regulatory system in the 1960s to keep up with changing ethical attitudes, the public remained largely unaware of the scientific uses of animals due to a high degree of secrecy and a lack of controversial procedures becoming apparent to the public. The structure of the resulting system, the CCAC, is considerably non-strict compared to the UK regulatory system. It seems, then, that when changing attitudes lead to a perceived need to update regulations on the use of animals in science, public awareness of controversial procedures tends to apply pressure for stronger regulatory responses.

iii. Interests

Interests of the public are not the only politically significant interests. In 1998, following the emergence of the field of animal ethics and changing attitudes on the ethics of using animals in science, the Canadian government found it necessary to update the anti-cruelty laws in the *Criminal Code* which were most recently revised in the mid-1970s.[168] The Canadian Department of Justice published a consultation paper in 1998 to gather input from the public regarding the types of change that should be made.[169] Over the following ten years, thirteen different amendments were proposed with only the thirteenth being passed. The earlier bills involved substantial amendments, such as removing animals from the classification of property. These bills were met with strong support from organizations of veterinarians, animal rights advocates, humane societies, and the public. However, there was strong opposition from industries involved in animal use, including agricultural, hunting, fur, and research industries. The bill that succeeded, Bill S-203, was implemented in 2008. This bill raised the penalties associated with the existing cruelty provisions while not making any substantial amendments to the provisions

168. Elaine L. Hughes and Christiane Meyer, "Animal Welfare Law in Canada and Europe," *Animal Law* 6 (2000): 40-1.

169. Bisgould, *Animals and the Law*, 87, note 113.

themselves. While widely opposed by the organizations of veterinarians, animal rights advocates, humane societies, and the public, the bill received support from an array of industries involved in the use of animals.[170] It seems that economic actors have had more significant influence on Canadian anti-cruelty legislation than public attitudes. A strength of the legislative efforts in the UK has been that they apply specifically to the use of animals in science, and not to animals in general. This approach restricts the legislative impact to members of scientific industries involved in animal use, reducing the likelihood of such widespread opposition that Canada has received during efforts to amend anti-cruelty laws.

iv. Key Points from this Comparative Analysis

The regulations set out by UK legislation and those of the CCAC have many similarities, in theory, promoting adherence to the principles of replacement, reduction, and refinement. In practice, the regulatory systems function very differently. The level of transparency in the UK is substantial compared to the secrecy of the Canadian system. This transparency largely stems from a comprehensive review of the regulations on scientific uses of animals in collaboration with industry, government, animal welfare experts, and the public in Europe. No review of this magnitude has been conducted in Canada.

It seems that academic publications and changing attitudes have been important mechanisms for bringing the status of regulations on animal use to be reviewed. The degree of public awareness and opposition to scientific animal procedures tend to be correlated with the strength of regulatory responses. The introduction of legislation in 1876 and 1986 in the UK were characterized by times when controversial uses of animals were apparent to the public and

170. Ibid., 89-96.

generated strong opposition. In Canada, the only piece of legislation that sets out a specific regulatory system for overseeing the use of animals in science was introduced in Ontario shortly after there were charges of cruelty against researchers at an Ontario university for conducting a controversial baboon study. The first regulatory system for scientific animal use established in Canada, however, was characterized by a time of strong secrecy in the industry and a lack of controversial procedures coming to public attention. The resulting regulatory system, the CCAC, has a structure that is considerably less strict than the structure of the UK regulatory system.

Attempts have been made to amend the anti-cruelty provisions of Canadian criminal law, but these have largely failed. An important element of this trend is that one of the most important proposed amendments – changing the classification of animals from being property – has an impact on *all* animal use industries, not just the scientific industry. Thus, these attempts have been met with opposition from many economic actors. In the UK, however, legislative efforts have been coordinated with a specific focus on scientific uses of animals, reducing the amount of economic actors affected by the legislation.

The UK system of regulation promotes transparency, accountability, and protection of animals in science in ways that are more aligned with the moral considerations discussed above, and that the Canadian system needs to adopt. However, the UK system also elicits some concerns. The current UK bans on using animals in science are limited, and it is not clear whether the harm-benefit analysis is conducted as a simple utilitarian calculus or if it is more aligned with the deontological approach discussed herein. The system also does not necessarily work toward eliminating scientific animal use. In the Netherlands, another approach has been developed that aims to overcome such problems.

The Netherlands

The Netherlands National Committee for the protection of animals used for scientific purposes (NCad) has been appointed to protect animals that are used in scientific and educational contexts. A previous State Secretary for Economic Affairs in the Netherlands, Martijn van Dam, developed a goal for the country to become an international leader in laboratory innovation without the use of animals by the year 2025. In 2016, he requested that the NCad develop a transition plan for the replacement of scientific uses of animals. The NCad has developed a plan, outlining the objectives, strategy, and management of the transition.[171] This approach has a clear alignment with the importance of eliminating scientific animal use mentioned previously and it will be reviewed below as it provides additional support for eliminating scientific animal use, and because it can serve as a guide for Canada to become more aligned with the moral considerations discussed earlier.

i. Objectives

The transition plan presents objectives that are "both ambitious and realistically achievable," acknowledging that animal research cannot be eliminated in all fields by 2025.[172] Five main goals are set forth pertaining to different areas of focus. The first refers to the practice of performing regulatory tests on animals to determine the safety of chemicals, food ingredients, pesticides, and veterinary medicines. Referring to the availability of innovative, non-animal procedures to analyze the safety of these types of products, the opinion of the NCad is that all animal testing under these categories can be completely replaced by non-animal methods by

171. NCad, *Transition to non-animal research*, 2-3.
172. Ibid., 17.

2025. Moreover, they strongly expect that this transition would improve the reliability of safety testing.[173]

The second area of focus involves regulatory testing in the case of vaccines and other biological products. Similarly, the position on this topic is that the use of animals can be eliminated by 2025 due to the availability of alternative testing methods. Additionally, it is held that in cases where products are developed under consistent production methods and have previously been tested and approved for use, there should be no requirement to conduct animal testing on subsequent productions.[174]

Third is the area of fundamental scientific research. Being a more complicated area for replacing the use of animals, the view is that it is not realistically possible to phase out all uses of animals in this area by 2025. Due to the breadth of this category, a case-by-case approach is presented for the development of specific goals over a ten-year period. This approach involves the various scientific disciplines, individually or in clusters, constructing transition plans that are tailored to their fields. In addition to researchers and innovators from the appropriate fields, these plans are to be constructed in collaboration with organizations involved in patient and animal welfare. The result should be a transition plan that outlines clear objectives, how knowledge will be developed and shared, the potential for non-animal innovations to apply to their field, and how these innovations will be incorporated.[175]

The fourth objective is for the Netherlands to be an international leader in the development of innovations that replace the use of animals in science. This objective identifies

173. Ibid., 17, notes 12-13.
174. Ibid., 18, note 15.
175. Ibid., 18-9

that the progression of such alternatives should be occurring more rapidly. A recommendation is made for a more significant focus on the development of alternative methods, particularly on the process of ideas being implemented as accepted practices. Emphasis is placed on the importance of collaboration between disciplines and sectors.[176]

The final objective refers to education and training in biomedical research and veterinary medicine. The position is that the use of animals can be significantly reduced by 2025. Although it is expected that training in the final levels of veterinary medicine will continue to require the use of animals beyond 2025, the plentiful non-animal teaching methods available suggest that lower levels of veterinary training and other fields of biomedical education can operate without the use of animals.[177]

ii. Strategy

This section of the transition plan outlines how to expedite the transition away from animal methods in science. A particularly important aspect of this effort is to facilitate the development of non-animal innovations from conception to implementation through investment in the validation process. An approach suggested in the strategy is to develop a graduated funding process that splits funding between early development stages and validation stages. In the latter context, priority should be given to innovations that show a higher degree of promise in being readily applicable.[178]

The strategy also recognizes importance in promoting the validity of non-animal methods at the level of international risk assessment requirements. A variety of products are legally

176. Ibid., 19.
177. Ibid., 19-20.
178. Ibid., 21-2.

required at an international level to be tested on animals to determine their safety. With the development of non-animal innovations in recent years there has been an international movement to adjust these regulations in order for the implementation of new technologies that can provide improved risk assessment. The NCad suggests starting this transition by advocating for the implementation of new technologies alongside conventional animal methods, expecting that this approach will lead to animal methods being deemed less reliable and ultimately unnecessary. The importance of international collaboration is stressed.[179]

The strategy recognizes the value of human applications. Considering the optimal value of conducting studies for human benefit on human models rather than other animal models, the NCad proposes that results of research conducted on humans should be better utilized. Although virtual human models have current applications and very promising future applications, there is value in developing more research with human subjects than is currently pursued. Investigation into possible advancements in human research methods that provide meaningful results without being unethically invasive is advised.[180]

The final element of the strategy involves transparency in the process. Oversight and assessment of the progress made under the transition plan is important for optimizing the continued application of efforts to the objectives. It is proposed that data be collected on all uses of animals in science and the progress made in developing non-animal innovations, and that this information be made publicly available.[181]

iii. Management

179. Ibid., 20-1, note 24.
180. Ibid., 20, 23.
181. Ibid., 24, note 26.

The NCad holds that the transition away from using animals in science must be managed, as it will not occur on its own. It is recognized that there are many stakeholders involved in the transition away from animal methods. There is a need for the efforts of the involved parties to be coordinated to facilitate the transition. The NCad suggests that the central government institution that oversees the industry of scientific animal use is the only institution capable of taking on the role of managing the coordination between the involved parties.[182]

Another level of management is suggested through the development of an institution that manages collaboration between departments. The collaboration fostered through this institution aims to link developing policies on the use of animals to policies in areas of medicine, science, and the environment. The intended effect is to stimulate policy change in other areas, such as social responsibility of corporations, in ways that may facilitate the transition plan.[183]

In order to hold the involved parties accountable to the transition plan, the NCad suggests developing a further agenda within the plan. This agenda would consist of the objectives of the transition plan and, as underlined in the third objective, the individualized transition plans developed for each specific field of research. The agenda is then to contain an agreement where any industries, organizations, or other institutions involved in policy domains relating to the use of animals in science are to agree to the objectives set forth in the agenda.[184]

Finally, the management institutions are to have an international function. The NCad suggests that the Netherlands use their institutions and progress to promote their efforts across

182. Ibid., 25.
183. Ibid., 25-6.
184. Ibid., 27.

the globe. A list of recommendations for specific forms of influence and collaboration are provided.[185]

iv. Comparing the Netherlands and Canada

Similar to Canada, protections for animals afforded by the central government originated under criminal law in the Netherlands. Introduced in 1886, the protections were minimal and based on the repercussions that humans experienced from harm inflicted on animals.[186] In 1977, with changing attitudes toward the needs for protecting the health of animals, the *Experiments on Animals Act* was introduced in the Netherlands. Four years later, in response to strong opposition from animal advocacy groups, the Dutch government enacted a declaration recognizing animals as having intrinsic value.[187] The system for regulating the use of animals in science today is still grounded in the *Experiments on Animals Act* and involves a central agency that is responsible for the licensing and oversight of animal procedures.[188]

An important difference between the history of animal protections in Canada and the Netherlands is the latter having success in classifying animals as having intrinsic value. This classification recognizes animals as mattering for their own sake – having interests that matter to themselves. The Canadian system lacks this classification and views animals as objects, suggesting that they matter only as far as they matter to humans – their value is derived from the utility they offer. A possible explanation for why the Netherlands found success in this case is due to their political system promoting engagement and discussion between stakeholders,

185. Ibid., 27-9.

186. Eugénie C. de Bordes, "Animal protection legislation in the Netherlands: past and present," in *The Human-animal Relationship: Forever and a Day,* eds. Francien Henriëtte de Jonge and Ruud van den Bos (Assen: Royal Van Gorcum BV, 2005), 201.

187. Ibid., 206.

188. NCad, *Transition to non-animal research*, 8.

whereas the Canadian attempts to reclassify animals have been characterized by strong competition of interests.[189] More recently, the development of the central licensing agency in the Netherlands resulted from European Union Directive 2010/63/EU, as did the development of the NCad from whom the transition plan was produced.[190] Thus, these organizations have resulted from a strong international pressure that is not present in Canada. The influence of changing attitudes in times of academic publications on animal ethics seems to remain present in the history of the Netherlands animal protection legislation.[191] The development of the transition report has been similarly influenced, with Martijn van Dam directly citing a think tank in his reasoning for requesting the NCad to develop the plan.[192] There are differences between the Netherlands and Canada, such as the collaborative nature between stakeholders in the Netherlands, that may require Canada to approach phasing out animal use in science differently than proposed in the NCad transition plan which involves close collaboration across industries and other interest groups. However, the transition plan retains value as a guiding framework for how Canada can approach the phasing out of animal use in science, including the need for coordinated international efforts to which Canada should contribute.

What Canada Can Learn from the UK and the Netherlands

The UK system of regulation constitutes an effective framework for applying a strong harm reduction approach to regulating the use of animals in science while such practices continue, and includes a harm-benefit analysis that sets a foundation for employing a Brennan-

189. Ibid., 27.

190. Biomedical Primate Research Centre, "Dutch Experiments on Animals Act," www.bprc.nl.

191. The implementation of the *Experiments on Animals Act* and the declaration of animals as having inherent value were influenced by advocate groups when animal ethics was developing as a distinct field, shortly following Peter Singer's publication of *Animal Liberation.*

192. NCad, *Transition to non-animal research*, 11.

type weighing of duties to determine our proper duties to the animals used in science. The transition plan developed in the Netherlands provides a guide for utilizing this framework to better restrict animal procedures in the short term, while developing a system that will phase out most, if not all, animal testing over a longer period. If applied effectively, these systems taken together have the potential to form a system for regulating the use of animals in science that reduces suffering and works toward fulfilling our duties to these animals.

i. Establish a Federal Regulatory System

A core element of the UK and Netherlands systems involve mandatory licensing for all scientific procedures involving animals with licensing, monitoring, and enforcement controlled by the central government in a transparent system. This approach promotes transparency and accountability by requiring that all scientific uses of animals are recorded and made publicly available. The current Canadian regulatory system, the CCAC, does not support having a higher degree of transparency.[193] Further, considering the members who compose the animal care committees under the CCAC system, the members who form the CCAC itself, and the financial dependency of the CCAC on the continued operation of the facilities that they oversee, a transition of regulatory power to a federal agency would present an opportunity to shift the ethical evaluation of projects and the enforcement of regulations to a less biased system.

Another essential feature of the regulatory systems in the Netherlands and the UK is their grounding in legislation. The limited effectiveness of the CCAC to enforce regulations is not only due to their systemic bias, but also due to the absence of any legislative power to respond to violations. Grounding a federal regulatory system in legislation is an important element to make

193. Bisgould, *Animals and the Law*, 212.

the system binding on the facilities that it oversees. The Canadian federal government can establish this legislative grounding through the criminal law power by developing a section in the *Criminal Code* that pertains specifically to the use of animals for scientific purposes. By proposing the development of a section that pertains specifically to the use of animals in science, opposition from other animal use industries may be minimized. Such a section should be modeled after the UK legislation, including a classification of "animal" that affords protection to non-human animals for their own sake.[194] Moreover, this regulatory system should employ a harm-benefit analysis that weighs our duties to humans against our duties to other animals in the context of scientific animal use according to the Brennan-type framework set out above in order to meet, or at least to better uphold, our moral duties to non-human animals.

ii. Develop a Transition Plan

After successfully developing a regulatory system that is grounded in legislation and enforced by the federal government, an important next step for the Canadian regulatory system would be to develop a transition plan for phasing out the use of animals in science. Modeled after that of the Netherlands, a Canadian transition plan should outline clear objectives for phasing out all possible uses of animals in a clearly defined period while developing a framework that will continue to promote the elimination of all uses of animals in science beyond this period. The approach, like that of the Netherlands, should include contributing to international efforts to promote the acceptance of non-animal methods under international testing regulations.[195] Such a

194. This would not solve the issue of animals being classified as property in areas outside of scientific procedures, but changing the classification exclusively in this proposed new section of criminal law aims to make the approach more practical, recognizing the widespread opposition from economic actors in past attempts to reclassify animals in a general sense.

195. Institutions such as the CCAAM and its subsidiary, the CaCVAM, with their goals of expediting the replacement of animal methods through development and validation of non-animal innovations, should have an essential role in the development and implementation of such a plan.

system would make Canada an international leader in the realm of animal ethics by creating regulatory institutions that work at the national and international levels to fulfill our duties to non-human animals.

Why Should Canada Act?

The primary motivation for Canada to develop a better system for regulating the use of animals in science should be to fulfill our duties to animals that are used in scientific procedures. However, the inability of non-human animals to engage in our political structures results in an underrepresentation of our moral obligations to them in the political realm.[196] Even though the political operations of Canadian society are largely anthropocentric, this does not mean the efforts to improve moral attitudes toward non-human animals are hopeless. It has been seen that humans have recognized a need to update how the moral status of non-human animals is represented in legal structures, and we have applied political pressure for this purpose with some success.[197] Further, there are anthropocentric motivations that promote a need to restructure the regulatory system of scientific animal procedures in Canada in a way that is consistent with fulfilling our moral obligations to animals.

Transparency and accountability are important values in a democratic society. Regardless of the implications for animals used in science, the processes of the scientific animal use industry should be apparent to the public and effectively held accountable to the regulations set in place. This is especially important in Canada considering the role of public funding in the form of

196. The exploitation of non-human animals for human benefit has been a part of Canadian culture for generations. The interests of economic actors expressed within polity have been largely successful in impeding political progress for the moral status of animals, maintaining their exploitation for, often trivial, human benefit. See: Donaldson and Kymlicka, *Zoopolis*, 2-5.

197. Ibid., 1-2.

research grants for many animal procedures, and the wide-reaching consumption of products tested on animals, such as cosmetics, household products, and medicines, by the public. Members of Canadian society should be able to clearly know what is involved in the production of the products that they consume, and they should be confident that producers are effectively held accountable to the regulations of the industry. This is not the case under the current CCAC system of regulation.

Another anthropocentric motivation to expedite the elimination of animal use in science, a key element of the Netherlands transition plan, is to improve the quality and efficiency of scientific inquiry.[198] Animal trials for medicine development are unreliable; Ninety-five per cent of drugs that are deemed suitable to proceed from animal trials to clinical trials in humans are unsuccessful at the latter stage.[199] There are also potential occurrences of treatments that are successful in humans being overlooked due to failure in inaccurate animal models.[200] Safety testing procedures conducted on animals also largely fail, lacking reliability in their predictiveness of the human and environmental impacts of chemicals.[201] The continued acceptance and utilization of animal methods in science seems to be based on convention more than scientific validation.[202] Non-animal methods work to provide relatively fast, inexpensive,

198. The US Food and Drug Administration (FDA) has previously announced a need to replace conventional animal methods due to their general unreliability: Food and Drug Administration, *Challenge and Opportunity on the Critical Path to New Medical Products* (March 2004), 20. See also: NCad, *Transition to non-animal research*, 23.

199. John Arrowsmith, "A Decade of Change," *Nature Reviews Drug Discovery* 11, no. 1 (January 2012): 17. See also: University of Windsor, "Welcome to CCAAM / CaCVAM," www.uwindsor.ca.

200. It is not clear how common this occurrence is, as failures in animal models typically do not proceed to human trials. See: Sorenson, *About Canada: Animal Rights*, 145; American Anti-Vivisection Society, "Scientific Problems," www.aavs.org.

201. University of Windsor, "Welcome to CCAAM / CaCVAM," www.uwindsor.ca.

202. Thomas Hartung, "Food for Thought… On Animals Tests," *ALTEX* 25 (January 2008): 7.

and reliable approaches to scientific inquiry and should replace animal methods as quickly as possible to improve the quality and efficiency of scientific inquiry.[203]

CHAPTER 3

COSTS AND BENEFITS OF ELIMINATING SCIENTIFIC ANIMAL USE

Costs & Benefits of the Transition

The changes proposed herein would have significant impacts on the Canadian scientific animal use industry. The impacts of the resultant changes to industrial practices would have financial, welfare, and environmental dimensions. This section explores the costs and benefits to be expected under the proposed transition, how they support or challenge the transition, and how any challenges can be alleviated to aide in successfully implementing the transition.

i. The With and Without Principle

A common approach to cost-benefit analysis involves considering the costs and benefits that are expected to occur with the implementation of a certain set of conditions, and those that are expected to occur without implementing those conditions.[204] Various costs and benefits that would be expected to be present with and without the elimination of scientific animal procedures will be considered below.

a. Financial costs

203. The use of human models supports faster development of medicines under more reliable testing, increased safety levels, and improvements in the identification of drugs that are successful in humans despite beings harmful to certain other animals. See: Sorenson, *About Canada: Animal Rights*, 145-6; NCad, *Transition to non-animal research*, 36.

204. Ronald C. Griffin, "The Fundamental Principles of Cost-Benefit Analysis," *Water Resources Research* 34, no. 8 (August 1998): 2065.

Scientific animal procedures tend to be more expensive than non-animal alternatives. The use of animals in scientific facilities generates numerous distinct costs as housing animals requires considerable amounts of space, cages and enclosures, bedding, food, cleaning, and waste disposal.[205] The total cost of maintaining animals for scientific purposes is the combined costs of purchasing the animals and maintaining them. These costs include animal acquisition, which can be very inexpensive for some animal types or thousands of dollars per animal for others, and the cost of labour and supplies needed to tend to the animals and the facilities.[206] An analysis of procedural costs for toxicological testing developed by the Humane Society International, shown in table 3, outlines the cost differences between animal methods and non-animal alternatives. The non-animal methods range from being hundreds of dollars less expensive, to hundreds of thousands of dollars less expensive.

Type of Toxicity	Type of Test	Study Cost (USD)
Genetic Toxicity		
Chromosome aberration	animal test	$30,000
	in vitro test	$20,000
Sister chromatid exchange	animal test	$22,000
	in vitro test	$8,000
Unscheduled DNA synthesis	animal test	$32,000
	in vitro test	$11,000
Eye Irritatation/Corrosion		
Draize rabbit eye test	animal test	$1,800
BCOP test	*in vitro* test	$1,400
Skin Corrosion		
Draize rabbit skin test	animal test	$1,800

205. National Institutes of Health (NIH), *Cost Analysis and Rate Setting Manual for Animal Research Facilities* (May 2000), 18; A.I.T. Walker and D.E. Stevenson, "The Cost of Building and Running Laboratory Animal Units," *Laboratory Animals* 1 (1967): 105-9.

206. U.S. Congress, Office of Technology Assessment, *Alternatives to Animal Use in Research, Testing, and Education* (Washington: U.S. Government Printing Office, 1986), 243.

EpiDerm™ human skin model	*in vitro* test	$850
CORROSITEX® membrane barrier	*in vitro* test	$500
Skin Sensitisation		
Guinea pig maximisation test	animal test	$6,000
Local lymph node assay (LLNA)	reduction alt.	$3,000
Phototoxicity		
Rat phototoxicity test	animal test	$11,500
3T3 neutral red uptake test	*in vitro* test	$1,300
Embryotoxicity		
Rat developmental toxicity test	animal test	$50,000
Rat limb bud test	*in vitro* test	$15,000
Non-genotoxic Cancer Risk		
Rat 24-month cancer bioassay	animal test	$700,000
SHE cell transformation test	*in vitro* test	$22,000
Pyrogenicity		
Rabbit pyrogen test	animal test	$475-$990
LAL / Endosafe-IPT	*in vitro* test	$83-$160
Estrogen Hormone Interactions		
Rat uterotrophic assay (OVX)	animal test	$29,600
Subcellular receptor-binding assay	*in vitro* test	$7,200
Androgen Hormone Interactions		
Rat Hershberger assay	animal test	$37,000
Subcellular receptor-binding assay	*in vitro* test	$7,300

Table 3: Costs of Animal and *In Vitro* Toxicity Tests.[207]

Further costs of scientific animal procedures are incurred due to inconsistencies between animal models and humans resulting in significant investments into research that ultimately has

207. These figures were collected in 2012, so the costs may be different today. However, there is no data on the costs of animal methods and non-animal alternatives available that is more current. See: Humane Society International, "Costs of Animal and Non-Animal Testing," www.hsi.org.

no successful human applications.[208] For example, clinical trials for an HIV vaccine were conducted for over twenty years without success before the non-human primate models were questioned. Similarly, thirty years were invested in studying diabetes under a rodent model before it was realized that this model was not properly applicable to humans.[209] Improved accuracy under non-animal models can further reduce costs by reducing the likelihood of investing in unsuccessful research. In recent years, a growing number of pharmaceutical companies have chosen to pursue non-animal methods to make their operations more efficient.[210]

b. Health Impacts

The time required for many animal methods can lead to chemicals being used in marketed products before appropriate safety testing has been completed.[211] The longer it takes to conduct safety testing on manufacturing chemicals, the more consumers are at risk. Vioxx, a painkiller for arthritis produced by Merck, is an example of this. Five years after Vioxx had been available on the market, it was discontinued after studies revealed cardiovascular risks associated with the drug. Within the period that it was on the market, the use of Vioxx led to many fatal heart attacks and strokes in patients. Thousands of legal cases were brought against Merck, costing the company billions of dollars in legal settlements.[212] Untested chemicals used for market production result in significant health risks for consumers and financial risks for

208. Frank Sams-Dodd, "Strategies to optimize the validity of disease models in the drug discovery process," *Drug Discovery Today* 11, no. 7 (April 2006): 355.

209. Aysha Akhtar, *Animals and Public Health: Why Treating Animals Better is Critical to Human Welfare* (New York: Palgrave Macmillan, 2012), 154-5.

210. Lucy Meigs et al., "Animal Testing and its Alternatives – the Most Important Omics is Economics," *ALTEX* 35, no. 3 (July 2018): 302.

211. Charlie Schmidt, "Researchers exploring faster alternatives to 2-year test for carcinogenicity," *Journal of the National Cancer Institute* 98, no. 4 (February 2006): 228.

212. Reuters, "Merck agrees to pay $830 million to settle Vioxx securities lawsuit," www.reuters.com.

producers. Non-animal methods can complete toxicological testing more rapidly than animal tests, helping to reduce these risks.[213]

Animal methods can increase risks for consumers further by incorrectly identifying chemicals as being safe in animals, despite being dangerous to humans.[214] Alternatively, benefits to humans can be missed if potentially beneficial products are deemed dangerous in the animals on which they are tested. Aspirin and acetaminophen, for example, show dangerous effects in animal trials but have proven safe and valuable in humans.[215] Cyclosporine had highly variable effects across different animals, providing little insight for human application and delaying its acceptance.[216] FK506 was almost unsuccessful due to findings of high toxicity in animal tests.[217] However, these latter two products are now successfully used in organ transplants and to treat autoimmune disease.[218] More reliable methods will improve public health by better protecting against harmful products, and better identifying beneficial ones. The complete replacement of animal methods by non-animal innovations in toxicology has been proposed as optimal.[219]

Scientific animal procedures can present harms to the people who conduct them. The use of anesthetics in confined facilities can have negative impacts on the health of lab personnel. Regular exposure to low levels of anesthetic gases, which can be present during animal procedures even with the proper mitigating equipment, have been associated with an increase in

213. Helena Kandárová and Silvia Letašiová, "Alternative methods in toxicology: pre-validated and validated methods," *Interdisciplinary Toxicology* 4, no. 3 (September 2011): 112.

214. Fanny K. Ennever and Lester B. Lave, "Implications of the lack of accuracy of the lifetime rodent bioassay for predicting human carcinogenicity," *Regulatory Toxicology and Pharmacology* 38, no. 1 (August 2003): 52.

215. Thomas Hartung, "Per aspirin ad astra…," *ATLA* 37, no. 2 (December 2009): 45-6.

216. David J. Cohen et al., "Cyclosporine: A New Immunosuppressive Agent for Organ Transplantation," *Annals of Internal Medicine* 101, no. 5 (Novemer 1984): 669-70.

217. R.Y. Calne et al., "Rapamycin for immunosuppression in organ allografting," *The Lancet* 2, no. 8656 (July 1989): 227.

218. Akhtar, *Animals and Public Health*, 155.

219. National Research Council, *Toxicity Testing in the 21st Century*, 60.

neurological and reproductive damage, toxicity of the liver and kidneys, and abnormal tissue growth.[220] Lab personnel are also at risk of developing infections from animals that are carrying disease.[221] Infections can be acquired by coming into contact with infected animals or contaminated equipment, or through airborne transmission of the virus or bacteria.[222] Infections of this type occur at a rate of 0.45 per cent, and can be fatal.[223] The increased risks of negative health impacts under scientific animal procedures can place costs on the healthcare industry. These risks and the associated costs can be reduced under non-animal scientific procedures.

c. Demand Impacts

The lack of transparency and government monitoring in the Canadian scientific animal use industry results in an absence of data on the size and value of the associated sectors, making analysis of these sectors considerably speculative. Though the value is unclear for Canadian industries involved in breeding, veterinary care, and production of food, housing, and equipment for scientific animal procedures, demand would be lost in these markets with the phasing out of scientific animal procedures. However, the replacement of scientific animal procedures with non-animal alternative methods would contribute to growth in other markets occurring simultaneously with losses in demand in markets that depend on the use of animals in science. The growing use of non-animal methods would generate a potential for growth in the technology industries responsible for producing non-animal alternative technologies.

220. Jennifer C. Smith and Brad Bolon, "Atmospheric Waste Isoflurane Concentrations Using Conventional Equipment and Rat Anesthesia Protocols," *Contemporary Topics in Laboratory Animal Science* 41, no. 2 (March 2002): 10.

221. Katherine Groff et al., "Review of Evidence of Environmental Impacts of Animal Research and Testing," *Environments* 1, no. 1(June 2014): 22.

222. James G. Fox et al., *Laboratory Animal Medicine: 2nd Edition* (Waltham: Academic Press, 2002), 1060.

223. Determined in a study of US facilities. Benjamin J. Weigler et al., "A national survey of laboratory animal workers concerning occupational risks for zoonotic diseases," *Comparative Medicine* 55, no. 2 (April 2005): 183.

d. Social Costs

Knowledge of the suffering experienced by animals used in science constitutes a cost borne by members of society. Consumers who have an interest in animal welfare are made worse-off if they are aware that the products they consume involve invasive use of animals. As attitudes change and interests in animal welfare become stronger, this social cost becomes higher making scientific animal procedures more costly to a society. The extent of this social cost can be approximated by measuring consumers' willingness to pay for products that do not involve animal use.[224] Limited research has been conducted on Canadians' willingness to pay for goods that do not involve animal use. One survey found that, on average, Canadians are willing to pay an additional $13.49 per $100 on products that are guaranteed to be ethically produced. However, the definition of ethically produced did not only include being free of harm to animals, but also being free of sweatshop and child labour.[225] Despite a lack of clear information on the preferences of Canadians to avoid products that involve animal use, it can be expected that animal use in science generates a social cost that can be eliminated with the transition to non-animal procedures.

e. Animal suffering

The greatest cost of scientific animal use is borne by the animals themselves. It is very difficult to attribute a value to the cost of suffering experienced by animals in science for various reasons. Namely, the nature and extent of suffering varies widely across different procedures,

224. Willingness to pay is a concept used in economics suggesting that a society's value for a good can be measured as the aggregate amount that members of a society are willing to pay for that good. See: Jennifer Fearing and Gaverick Matheny, "The Role of Economics in Achieving Welfare Gains for Animals," in *The State of Animals IV: 2007*, eds. Deborah J. Salem and Andrew N. Rowan (Washington: Humane Society Press, 2007), 165.

225. This cannot be taken as an accurate representation of the willingness to pay for avoiding harm to animals due to the conflicting variables of sweatshop and child labour. See: Abacus Data, *Ethical Consumerism and Canadians*, 8. www.abacusdata.ca.

and non-human animals cannot directly communicate to humans their preferences for avoiding being used in scientific procedures. Nonetheless, the aversion of animals to painful stimuli and the negative psychological impacts from the conditions to which the animals are exposed are often clear indicators of the high cost borne by these animals. The preferences of non-human animals to avoid being used in scientific procedures are not captured by our economic structures due to their inability to participate in these structures.[226] However, the cost of animal suffering cannot be overlooked, and should be recognized as the highest cost of scientific animal use.

f. Summary of Costs and Benefits

The opportunity cost of continuing to use animal methods in science is very high. Scientific animal procedures tend to be more expensive than non-animal alternatives. The continued use of animal methods would be associated with higher procedural costs for firms than the use of non-animal methods. In the case of health impacts, the relatively long time required by animal procedures generates a health risk for humans due to the delay of proper safety testing of marketed substances. Non-animal methods can conduct safety testing more quickly, and would improve the accuracy of developing new medicines by providing more suitable models for human application than can be provided by animals. The improved medical knowledge associated with non-animal alternatives would help to alleviate costs borne by producers, the public, and the healthcare system by improving product safety and better identifying new medicines. Social costs borne by consumers with an interest in animal welfare who are aware of invasive animal procedures would be eliminated if those animal procedures are replaced. Finally, the cost of suffering borne by animals, though not captured in our economic structures, is the

226. Fearing and Matheny, "The Role of Economics in Achieving Welfare Gains for Animals," 162.

highest cost involved and can be eliminated if scientific animal procedures are replaced by non-animal alternatives. Continued support for animal procedures will slow the advancement of non-animal innovations that are relatively fast, inexpensive, safe, and make humans and other animals better off.[227]

ii. The Problem of Externalities

Externalities are costs or benefits that are not contained to those who produce them but affect a wider class of people.[228] Of the costs and benefits discussed above, various are externalities generated by the scientific animal use industry. The negative health impacts borne by the public and the healthcare system are largely externalities, though the cost of these impacts can sometimes be shifted back to firms in the animal use industry through legal action, such as in the case of Vioxx discussed previously. The social cost borne by consumers as a result of scientific animal procedures is not captured by firms in the animal use industry, nor is the cost of suffering borne by non-human animals. Thus, alleviating these costs through improving animal welfare will provide little or no motivation for firms to eliminate scientific animal procedures. The major source of consideration for firms will be the financial costs of operating with and without animal methods.

Excluding the other considerations and looking solely at financial costs of operating with and without animal procedures, it seems that firms in the scientific animal use industry would ultimately benefit from eliminating animal methods due to the lower procedural costs of non-animal alternatives. However, the consideration is not this simple. The transition cost associated

227. National Research Council, *Animal Biotechnology: Science-Based Concerns* (Washington: The National Academies Press, 2002), 300; Aysha Akhtar, "The flaws and human harms of animal experimentation," *Cambridge Quarterly of Healthcare Ethics* 24, no. 4 (October 2015): 415.

228. Fearing and Matheny, "The Role of Economics in Achieving Welfare Gains for Animals," 162.

with replacing animal procedures with non-animal alternatives must be considered. To transition to non-animal methods, firms must purchase the equipment necessary to conduct these types of procedures. These firms also have sunken costs in the equipment for animal procedures that they would have to forfeit, as much of the equipment likely could not be sold or repurposed. When factoring in these considerations, the annual operating costs may be lower for conducting non-animal procedures, but firms would have to make significant short-term investments for the transition. Further, costs and benefits that occur in the future tend to be discounted – that is, costs and benefits occurring today are weighted more heavily than costs and benefits that will occur later in time.[229] Thus, the short-term transition costs are likely to be considered more strongly by firms than the annually recurring benefits that would result from switching to non-animal procedures. From the perspective of the firms, it may seem better to continue using the equipment for animal procedures that they can conduct without making further investments, rather than abandoning this equipment and investing in all new equipment. It may be possible, however, to alleviate the transition cost for firms.

iii. Facilitating the Transition

Government support can help to alleviate the costs of implementing non-animal scientific procedures.[230] Why should this be done? After all, with the development of policy that mandates the transition from animal methods to non-animal alternatives, the cost-benefit analysis of animal use facilities would not matter – their transition to non-animal methods would be legally required. However, lowering the cost of this transition for firms would help to reduce opposition from economic actors in the scientific animal use industry, reducing the barriers to successfully

229. David J. Torgerson and James Raftery, "Discounting," *BMJ* 319, no. 7214 (October 1999): 914.
230. Steven McMullen, *Animals and the Economy* (Palgrave Macmillan, 2016), 137.

implementing new policy. A possible approach for facilitating the transition to non-animal methods would involve the use of accelerated depreciation. This approach involves shifting the depreciation of new assets to occur more rapidly in the near future, which reduces a firm's taxable income in the short-term.[231] Allowing accelerated depreciation could help to offset the financial burden of acquiring the equipment necessary for scientific facilities to conduct non-animal procedures, lowering the short-term transition cost and reducing political opposition from the scientific animal use industry.

iv. Licensing and Research & Development for Continued Animal Procedures

Regulation of scientific animal use will continue to be necessary until all scientific animal procedures are eliminated. Currently, the Canadian federal government spends $1.75 million each year in funding the CCAC. This amount constitutes approximately two-thirds of the organizations funding, while approximately one-third of their funding comes from participation fees paid by CCAC-certified facilities.[232] In the UK, the regulatory system operates under a full cost recovery program where license fees paid by individuals and establishments involved in scientific animal procedures cover the entire operating cost of the regulatory body.[233] To achieve this in the UK, licensing fees in the 2019/2020 year were £275 for personal licenses and £826 for establishment licenses, or approximately $470 CAD and $1400 CAD, respectively.[234] Personal license fees would be a new element in the Canadian regulatory system, but the establishment license fee of $1,400 is relatively small compared to the current institution fees under the CCAC

231. Robert Eisner, "Accelerated Depreciation: Some Further Thoughts," *The Quarterly Journal of Economics* 69, no. 2 (May 1955): 285-6.

232. CCAC, *Financial Report 2017-2018*, 2. www.ccac.ca.

233. ASRU, *Annual Report 2016,* 33.

234. These Canadian dollar amounts were calculated using the 2019 average conversion rate of 1.6947 GBP to 1 CAD. ASRU, *Annual Report 2018,* 29; Open Financial Exchange (OFX), "Yearly Average Rates," www.ofx.com.

system, varying from $2,200 – $28,600 based on the size and type of facility.[235] Converting to a cost recovery program under a federal regulatory body in Canada that is similar in structure to the UK regulatory system would shift the cost of regulatory funding to be entirely borne by members of the scientific animal use industry, rather than the majority of funding coming from taxpayer dollars as is currently the case.

Research and development in the area of non-animal innovations in science is crucial for the elimination of all scientific animal procedures. In the UK, the Home Office has provided funding to a national institution that engages in research and development of non-animal innovations, the National Centre for the Replacement, Refinement, and Reduction of Animals in Research (NC3Rs). Annual reports from 2014-2016 report payments of £250,000 per year being made to this organization.[236] While there is no evidence of such payments being made in the 2017 and 2018 annual reports, the Home Office still emphasized a collaborative professional relationship with NC3Rs during these years.[237] Under the Canadian system, there is no incentive to support this kind of research and development.[238] Government investment in this area of research and development is an important element to support the elimination of scientific animal use. Further, there are opportunities for the federal regulatory system to be structured in a way that promotes scientific animal use facilities to invest in research and development of non-animal methods.

235. CCAC, "Program Fees," www.ccac.ca.

[236] ASRU, Annual Report 2016, 35; ASRU, Annual Report 2015, 37; ASRU, Annual Report 2014, 37.

[237] ASRU, Annual Report 2018, 6, 14; ASRU, Annual Report 2017, 15.

238. Montgomery, *Blood Relations*, 81-2.

Potential for cost reduction through the development of new technologies creates incentive for firms to invest in research and development.[239] Increasing costs of scientific animal procedures relative to non-animal alternatives increases the potential savings that can be attained through development of non-animal scientific procedures. Strategically implementing license fees in Canada to be tailored to the type and extent of animal use in science can be used to increase the economic incentive of eliminating scientific animal procedures. Establishment license fees can be structured in a way that the annual fees reflect the amount of animal procedures conducted in a facility each year. In this way the development and implementation of non-animal procedures would result in reduced licensing costs for facilities. Project license fees could be introduced as well. These fees could be based on the amount of animals used in a study and the level of invasiveness, such that projects involving animal use are increasingly expensive with increasing numbers of animals used and levels of invasiveness. In this case, licensing fees could further be reduced through the development of non-animal procedures, while they could also be reduced by finding ways to lower the amount of animals used and lessen the invasiveness of procedures that continue while non-animal alternatives are not available.

Internalizing the external costs of scientific animal use to the facilities conducting the procedures presents another opportunity for making animal procedures more expensive to firms relative to non-animal alternatives. Internalizing external costs involves measuring the value of costs that are not borne by those that produce them, and imposing that value on the producers who are responsible for bringing about those costs.[240] This approach helps to make the cost of

239. Charles Hill et al., *Strategic Management Theory: An Integrated Approach* (Stamford: Cengage Learning, 2013), 129.

240. Neva Goodwin, "Internalizing Externalities: Making Markets and Societies Work Better," *Opinion Sur,* no. 52 (December 2007): 3.

production that is borne by a firm more accurately reflect the overall cost of production that is borne by society. One cost that could be internalized is the social cost discussed above – the cost borne by consumers with an interest in animal welfare who are worse-off for knowing that the products they consume involve scientific animal use. The value of this cost can be approximately determined through measuring consumer willingness to pay for certain products that do not involve animal use in their production.[241] After identifying the social cost of scientific animal procedures, it could then be internalized to animal use facilities in the form of a tax. Another external cost discussed above is the cost of animal suffering. This cost would be far more difficult to internalize to scientific animal use facilities. The lack of ability for non-human animals to communicate with humans or to participate in our economic structures makes it difficult to measure the cost of their suffering. Further, any cost that could be practically applied to capture the cost of animal suffering would surely fail to properly represent the value of their suffering.

Environmental Impacts

The use of animals in science involves practices with environmentally harmful dimensions. It is important to note, however, that in the overall matter of environmental degradation, the use of animals in science constitutes a relatively minor impact. Other areas, such as factory farming and transportation, contribute to environmental degradation far more significantly than the use of animals in science, and areas such as these remain the most

241. Research on consumer willingness to pay for products that do not involve animal use in this case could be conducted via survey. Since there would be no alternative products on the market that do not involve animal use in cases where non-animal procedures are not available, analyzing market behaviour would not be viable as a research approach. Consumers in these cases do not have options to express their preference for products that do not involve animal use through their consumption behaviour. Rather, consumers would only have the option to consume products involving animal use or to not participate in the market. See: Fearing and Matheny, "The Role of Economics in Achieving Welfare Gains for Animals," 165.

important issues to address for environmental protection. Nonetheless, reducing environmentally harmful practices remains an important factor associated with eliminating the use of animals in science, regardless of the magnitude in comparison with other practices.

i. Energy Intensity

A major environmental consideration of animal labs is their consumption of energy. Animal labs consume energy at rates up to ten times greater than other offices, per square meter of space.[242] High ventilation levels are largely responsible for energy consumption with fans comprising 40%-50% of energy consumed. The ventilation levels, measured in air changes per hour (ACH), are up to 20 ACH in animal facilities, while reaching up to 12 ACH in non-animal laboratories.[243] An additional 10%-30% of energy use is attributed to temperature control of the environment and equipment.[244] Other sources of energy consumption relate to protection against outside pathogens entering the facility, and the space requirements for animal housing.[245]

ii. Hazardous Waste, Pollution & Contamination

Chemicals are used for a wide variety of operations in animal laboratories, such as sanitation, providing treatment to animals, and conducting studies.[246] Laboratory procedures in general involve using chemicals that may be irritant, corrosive, asphyxiant, neurotoxic, reproductively toxic, developmentally toxic, or carcinogenic.[247] However, chemicals tend to be

242. Steven Cubitt and Gordon Sharp, "Maintaining quality and reducing energy in research animal facilities," *Animal Technology and Welfare* (August 2011): 92.

243. Ibid., 94.

244. Ibid., 92.

245. Scott D. Reynolds and Eric D. Joesten, "Green and lean: Methods of improving lab animal room ventilation," *ALN* 31 (December 2018).

246. Groff et al., "Review of Evidence of Environmental Impacts of Animal Research and Testing," 17.

247. National Research Council, *Prudent Practices in the Laboratory: Handling and Management of Chemical Hazards* (Washington: The National Academies Press, 2011), 60-4.

used in particularly high doses when administered to animals in toxicology tests.[248] The harmful chemicals ingested by animals can become present in their waste, bedding, and feed.[249]

Scientific animal facilities produce a lot of waste.[250] Included in this waste are animal carcasses that may host harmful chemicals, viruses, or bacteria, depending on the conditions they were exposed to as study subjects. Included are also animal excreta, bedding, and feed as previously mentioned, as well as other laboratory equipment that is contaminated from contact with hazardous materials or contaminated animals.[251] Incineration is a preferred method for disposing of contaminated carcasses, bedding, and feed.[252] Incineration, in general, has been identified as harmful to the environment and human health due to emitting harmful pollutants, including carbon monoxide and carbon dioxide, heavy metals, dioxins and furans, nitrogen oxides, and sulphur dioxide.[253] The incineration of animal carcasses has been associated with higher metal emissions than incineration of other medical waste.[254] Another study on polycyclic aromatic hydrocarbons (PAHs), a class of particles that can have toxic or carcinogenic effects, found these particles to be more concentrated in emissions from animal carcass incineration than other medical waste incineration, varying from 1.4 – 7.6 times more concentrated in animal

248. National Research Council, *Toxicity Testing in the 21st Century*, 40.

249. Office of Laboratory Animal Welfare (OLAW), *Institutional Animal Care and Use Committee Guidebook* (Bethesda: National Institutes of Health, 2002), 141.

250. Ibid., 48.

251. Groff et al., "Review of Evidence of Environmental Impacts of Animal Research and Testing," 18.

252. National Research Council, *Prudent Practices in the Laboratory*, 207; OLAW, *Institutional Animal Care and Use Committee Guidebook*, 141.

253. Canadian Council of Ministers of the Environment, *Canada-Wide Standards for Dioxins and Furans* (Winnipeg, 2001), 6; Michelle Allsopp et al., *Incineration and human health* (Exeter: Greenpeace Research Laboratories, 2001), 42; Michela Franchini et al., "Health effects of exposure to waste incinerator emissions: a review of epidemiological studies," *Annali dell'Istituto Superiore di Sanità* 40, no. 1 (2004): 102; Environmental Protection Agency (EPA), *Commercial and Industrial Solid Waste Incineration (CISWI) Emission Limit Calculations for Existing and New Sources for Reconsideration Proposal* (Eastern Research Group, 2011), 1.

254. Shui-Jen Chen et al., "Emissions of heavy metals from animal carcass incinerators in Taiwan," *Chemosphere* 55, no. 9 (2004): 1197.

carcass emissions.[255] A main form of exposure of humans to PAHs is through food, due to the settling of these particles on crops.[256]

The dioxins and heavy metals produced from incineration of scientific animal waste contribute to soil and vegetation contamination. Dioxins in plants and soil vary based on their proximity to incineration sites with higher concentrations of dioxins occurring closer to those sites. Similarly, atmospheric heavy metals from incineration can be deposited in soil and can build up in plants, creating risks for other animals.[257] Water contamination can result as well, with heavy metals settling in water sources from atmospheric concentrations or from wastewater produced by cleaning incinerator equipment.[258] Additionally, runoff from contaminated animal waste can contaminate surface water and groundwater.[259] This presents a risk for the chemicals used in animal labs to enter drinking water, due to the limitations of water treatment plants to completely remove chemicals from drinking water sources.[260]

iii. Biodiversity

Capturing animals from the wild for use in animal research can present threats to biodiversity. In 2008, Ardith Eudey acknowledged that long-tailed macaque populations were rapidly declining in the wild, citing the international trade of these primates for use in science as

255. World Health Organization (WHO), *Air Quality Guidelines for Europe, 2nd Edition* (Copenhagen: WHO Regional Publications, 2000), 92; Shui-Jen Chen et al., "Emission of polycyclic aromatic hydrocarbons from animal carcass incinerators," *Science of the Total Environment* 313, no. 1 (2003): 61.

256. WHO, *Air Quality Guidelines for Europe*, 92.

257. Allsopp et al., *Incineration and human health*, 38-9.

258. Ibid., 39, 52.

259. OLAW, *Institutional Animal Care and Use Committee Guidebook*, 20.

260. Paul E. Stackelberg et al., "Persistence of pharmaceutical compounds and other organic wastewater contaminants in a conventional drinking-water-treatment plant," *Science of the Total Environment* 329 (March 2004): 99-100.

a source of the issue.[261] In 2013, over 91% of the primates imported to the US were of this species. As a percentage of all primates imported to the US that year, less than 3% were reported as being captured from the wild.[262] However, it seems that the supply of primates at licensed breeding facilities have been supplemented with illegally caught primates from the wild, so this proportion may be understated.[263] The data on imported primates in Canada is not as detailed, but 4,805 nonhuman primates were reported as being used in science by the CCAC in 2019, and 3,122 primates were imported to Canada in the same year.[264]

A further potential risk to biodiversity is presented by the use of genetically modified animals in science. Concerns have been raised about the possibility of a genetically modified animal escaping from a facility and breeding with populations in the wild, possibly causing harmful disruption to the ecosystem to which that population belongs.[265] Specific strategies for containment have been presented to minimize such risk.[266]

Conclusion

Humans have an obligation to eliminate scientific animal procedures where the inflicted harms are not justifiable. If there are cases where the infliction of harms on animals used for scientific purposes are permissible, we should aim to replace such practices to reduce suffering and fulfill our duties to those animals. Canada's current regulatory system for the use of animals in science fails to meet our moral duties. To improve, Canada should develop a federal

261. Ardith A. Eudey, "The Crab-Eating Macaque (Macaca fascicularis): Widespread and rapidly declining," *Primate Conservation* 23, no. 1 (2008): 129.

262. International Primate Protection League (IPPL), "U.S. primate import statistics for 2013," (January 2014), www.ippl.org.

263. Eudey, "The Crab-Eating Macaque," 130.

264. CCAC, *CCAC Animal Data Report 2019*, 4; Statistics Canada, "Imports – Live Animals," www.statcan.gc.ca.

265. Melvin B. Dennis, "Welfare issues of genetically modified animals," *ILAR* 43, no. 2 (January 2002): 106.

266. National Research Council, *Animal Biotechnology: Science-Based Concerns*, 115.

regulatory system for the use of animals in science – modeled after the UK system – that promotes research and development of non-animal scientific innovations and mandates the replacement of animal methods when such innovations are developed and validated. Additionally, the regulatory system should employ a harm-benefit analysis that operates according to the Brennan-type framework for weighing our duties to humans against our duties to other animals. The federal regulatory body should also set out a transition plan – modeled after that of the Netherlands – to guide the short-term phasing out of all replaceable and non-essential uses of animals in science, while also developing a scientific framework that works toward complete elimination of animals in science in the long-term. The regulatory system should be grounded in legislation to allow the regulatory body to effectively enforce standards, and these standards should ensure that the only scientific animal procedures that continue do not have available non-animal alternative options, are of crucial importance, and minimize the amount of animal suffering. To reduce opposition toward a new regulatory system from economic actors, the Government of Canada should seek to facilitate the development of non-animal scientific facilities, such as through the use of accelerated depreciation. Eliminating the use of animals in science through stronger regulation will promote non-animal alternative practices that are less costly, more reliable, and less environmentally harmful within a more transparent and accountable scientific animal use industry. Further, such a system would support the ability of the Canadian scientific industry to meet our moral obligations and fulfill our duties to non-human animals, making Canada an international leader in ethical scientific animal use.

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