# THE ETHICS OF PAIN: MORAL STATUS, EMOTION, COGNITION, AND THE LAW OF LABORATORY ANIMALS IN PAIN RESEARCH

BY

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THE ETHICS OF PAIN: MORAL STATUS, EMOTION, COGNITION, AND THE LAW OF LABORATORY ANIMALS IN PAIN RESEARCH

Thesis under the direction of Nancy M.P. King, JD, Professor, Public Health Sciences-Social Sciences, Maya Angelou Center for Health Equity, Institute for Regenerative Medicine.

Pain research is often conducted on neurologically developed animals in order to develop treatments for human pain. The experience of pain involves the physical perception of pain, along with the mental states of emotion and cognition. Pain research is an ethically significant issue as it can cause animals to suffer greatly. One justification for the use of animal models is that unlike humans, animals lack moral status and are not entitled to moral consideration; as such, humans are permitted to use them in pain research. However, evidence suggests that both humans and animals can experience morally significant emotions, including suffering, and both have varying levels of cognitive capacities. Emotion and cognition are significant properties in granting humans moral status. Based on their capacities for emotion and cognition, neurologically developed animals also have moral status and deserve moral consideration. This moral consideration necessarily requires comparable protections and limits in pain research. Even though animals may be used in pain research, due to poor translation, the justification for the continued use of animal pain models is lacking.

# INTRODUCTION

"The fact that man knows right from wrong proves his intellectual superiority to the other creatures; but the fact that he can do wrong proves his moral inferiority to any creatures that cannot."
-Mark Twain

According to the International Association for the Study of Pain, pain is defined as "an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage." (IASP, 2012). Pain is a complex physical experience that involves the activation of nerve fibers and nerve endings called nociceptors in response to harmful thermal, chemical, and mechanical stimuli. (Orlans, 1993, p. 129). Besides humans, these nociceptors can be found in other vertebrates and are activated by the same harmful stimuli. (Rowan, 1984, p.77). The experience of pain is also multidimensional in that along with the physical perception of harmful stimuli, it also involves the mental components of cognition and emotion. (Id.) Suffering, a mental component of pain, is commonly defined as a negative emotional state that stems from physical or psychological stimuli. (Bekoff, 2009, p. 418). Organisms that are capable of suffering are said to be sentient. (DeGrazia, 1996, p. 99). While no one would doubt that pain is indeed a well-known human experience, the case for the experience of pain in neurologically developed nonhuman animals is more contentious. This contention is particularly relevant to the ethical issue of using neurologically developed animals, such as mammals, in pain research. The pain research at issue involves the intentional infliction of pain on these animals with the primary goal of human-only benefits.

Many animals react in the same way as most humans do to painful stimuli by, for example, withdrawing the affected body part, crying, moaning, or screaming out, writhing, attempting to run away, limiting the use of the affected body part, or by

displaying facial grimacing. (Masson & McCarthy, 1995, p. 29). Evidence that these reactions are the result of actual pain and are not simply automatic reactions to a given stimulus, come from studies on adaptation, behavior modification, learning, anesthesia, and analgesia. (DeGrazia, 1996, p. 108-09). Pain can serve as a survival mechanism by enabling animals to avoid harmful stimuli. (Singer, 2009, p. 11). Despite their marked response similarities to humans, neurologically developed animals are still routinely used in biomedical research, including pain research. Each year, at least twenty-five million animals including primates, dogs, cats, birds, fish, rabbits, guinea pigs, rats, and mice, are used in all forms of research in the United States, though the exact number used in pain research, specifically, has not been quantified. (Id. at 220).

A belief among some researchers is that the experience of pain in animals is simply a mechanical process lacking any subjective or moral significance. (Rollin, 1989, p. 63). Accordingly, it is often argued that if animals cannot feel pain or suffer, then they have no interest in avoiding pain and suffering in the research setting. (Singer, 2009, p. 9). However, such a rationalization does not seem to adequately take into account evidence that many animals are emotional, cognitively advanced, and can suffer; such physical and mental states may be on par with or even greater than those states experienced by humans, due to the acute senses of some animals, as well as their inability to understand the source of research pain, or the reasons for being inflicted with pain. (Rollin, 1989, p. 61). Additionally, pain behavior in animals can be uniquely expressed and therefore seemingly unidentifiable to researchers. (Id. at 62). Whereas humans are typically able to verbally articulate their pain sensations, pain in animals is assessed not by words but by displays of aversive behavior, temperament changes, sounds,

movements, as well as clinical changes in breathing, heart rate, nervous system, and musculoskeletal functioning. (Orlans, 1993, p. 134). Even with these observable changes, the quality of the pain experienced by animals can only be inferred. (Walker et al., 1999, p. 319). Though pain can appear differently or not be easily identified in animals, it does not necessarily imply that its existence in neurologically developed animals can be denied. Pain is still pain and the fact that these animals may feel pain to any degree, even if such pain is subjective and can only be inferred from behavior, lends support to the idea that they are worthy of moral consideration, and are equally worthy of certain protections and limits in pain research. Ideally, the protections and limits granted to neurologically developed animals should mirror the protections and limits granted to human research subjects, specifically, to children research subjects.

Animals possess anatomical, hormonal, neurochemical, and pain inhibiting systems that are similar to those found in humans, which make them practical models for studying acute and chronic human pain disorders. (Rollin, 1989, p. 63-64). Both humans and animals have well developed diencephalon, which is the part of the brain that processes emotions and feelings, such as pain. (Singer, 2009, p. 11). Additionally, the pain-detection threshold is similar in both humans and many vertebrates. (Orlans, 1993, p. 133). The results from research using animal models are supposed to be translated to humans with the goal of future application in clinical settings. Thus, while the subjective experience of animal pain tends to be overlooked, minimized, or delegitimized, in order to continue to support the utility of animal pain models, it must be assumed by researchers that animals experience at least some level of pain that is similar to that experienced by humans. (Rollin, 1989, p. 63). Otherwise, the research would have little

to no applicability to humans. (Singer, 2009, p. 40). Essentially, if humans and animals are anatomically similar and have similar nervous systems, it is possible that animals experience pain the same way humans do. (Id. at 10-11).

The stimuli that animals are exposed to in pain research are the very same stimuli that would be likely to evoke pain responses in humans. However, subjective animal pain has been deemed in some cases to be nonexistent or negligible. Partially based on this belief, animals serve as research subjects oftentimes when testing on humans would be considered unethical. Yet, to subject animals but not humans to certain types of pain research has an air of moral unjustifiability. In effect, because animal pain has seemingly low moral significance compared to other kinds of human-centered considerations, like human moral status, animals serve as a mere means in reaching the ends of human pain knowledge and treatment. (Cavalieri, 2001, p. 38).

Current animal models of pain focus on understanding the biological processes of pain, the transmission of painful signals, as well as determining the efficacy of pharmacological treatments and anesthetics. (Langley et al., 2008, p. 469). To accomplish such aims, pain studies involve the stimulation of nociceptors by injecting chemicals, cutting, crushing, freezing, or burning various parts of animals, for example. (Short, 1998, p. 126).

According to the USDA, a painful procedure is defined as "any procedure that would reasonably be expected to cause more than slight or momentary pain or distress in a human being to which that procedure was applied." (USDA.gov, *Painful and Distressful Procedures*, 2012). Depending on the study, animal subjects may be conscious and restrained during painful procedures. (Rowan, 1984, p. 79). Furthermore,

while general anesthesia can be used for certain surgical procedures, it may or may not be used in other pain studies if the anesthesia will interfere with the responses of the nervous system, and in turn, potentially skew the research results. (Id.)

Pain research on animals can test reflexive behaviors, unlearned behaviors, learned behaviors, and chronic nociceptive responses. (Stanley & Paice, 1997, p. 5). To test reflexive responses, the tail flick test may be utilized which involves applying radiant heat to a portion of an animal's tail, which in turn, elicits a reflexive flicking of the tail. To test unlearned and voluntary behaviors, hot plates are often utilized. Animals are placed on hot plates that gradually increase in temperature. Researchers then determine at what temperature and time the animals begin to withdraw and lick their paws. To test learned behaviors, animals are often subjected to painful stimuli, such as electrical shocks, and must learn to tailor their behavior in order to avoid the painful stimuli. To test chronic pain, animals may be subjected to hot or cold stimuli, or be injected with various substances and chemicals that cause symptoms similar to those associated with human diseases. Additionally, to test neuropathic pain, animals may have their spinal cords or sciatic nerves either constricted or surgically cut. (Id. at 5-6). Cancer pain models often utilize animals. (Ma, 2007, p. 127). Animals are implanted with tumor cells in their bones or around their nerves, which in turn, mimic cancer pain in humans as the tumor cells grow. (Id.) Then, potentially painful chemotherapeutic chemicals are injected into the animals in order to test the efficacy of the chemical agents. (Id.) In essence, in the various forms of pain research, neurologically developed animals can be burned, crushed, shocked, injected with painful substances and tumor cells, surgically cut, or paralyzed in order to further the knowledge and treatment of human pain.

The major ethical issues with pain research on neurologically developed animals tend to center mostly on the considerable levels of pain and suffering that the animal subjects experience. Additionally, there is the added significant issue that while animal models can potentially provide some insight into the chemical and physiological aspects of pain, they are not ideal models for pain in humans. (Langley et al., 2008, p. 468). The key point is that translation from animal models to humans can be difficult since different animal species tend to indicate only a few characteristics of pain, whereas pain in humans can be more diffuse and complex. (Id. at 469). Furthermore, whereas some stimuli in research may or may not subjectively cause pain in humans, the same stimuli could very well cause different species of animals to feel pain. (Allen, 2004, p. 618-19). Thus, if the animal data cannot be translated to humans, animals end up suffering in pain research unnecessarily.

It is true that not all biomedical research causes extreme suffering in animals. It is also true that proposals for alternative models may not be completely feasible at this time for all types of animal research. That is, there are some types of research where a critical human purpose necessitates the use of animal subjects; pain research, however, is seemingly neither critical nor dependent on the use of animals. Despite difficulties in tackling the larger issue of animal research, generally, the time is ripe to handle the slightly narrower, yet no less ethically charged issue of pain research.

Pain research is an ethically significant issue as it causes severe discomfort, stress, the deprivation of needs, and even the death of innocent animals. There is a natural weighing that occurs between the potential benefits of pain research for humans and the harm that it possibly causes animals; unfortunately, animals tend to be on the losing end

of the weighing process. Alternative models are presently achievable in pain research and with enough effort and legislative push, applying such alternatives can become a requirement for pain researchers who currently utilize animal models.

In distinguishing humans from other animals, the argument is often made that humans and not animals have moral status. As such, since animals lack moral status, they are not entitled to moral consideration, and humans are permitted to use them basically unhindered in pain research. However, this argument seems flawed. While there are distinct differences between humans and animals, evidence suggests that they both share the ability to experience morally significant emotions, including suffering, and both have varying levels of cognitive capacities. Based on these emotional and cognitive capacities, animals have moral status, and therefore, deserve moral consideration.

Today, neurologically developed animals are used as subjects in pain research when it would be considered unethical to perform such research on humans. However, in precisely those circumstances, it is also unethical to use neurologically developed animals for the following reasons: (1) Animals suffer in pain research; (2) there are no current regulatory limits on their suffering if it is deemed necessary to the research; (3) the research at issue is solely for the benefit of humans; (4) animals are not free to refuse or withdraw from participation to avoid pain and suffering; and (5) animals are not good enough models for human pain to justify using them when using humans would be unethical. Therefore, pain research using neurologically developed animals as models for human pain can only be justified if and when the harm to animal subjects is minimized and defensible in light of the knowledge to be gained. Based on this narrow justification, as well as the reality of poor translation of animal models, all or nearly all current and

future pain research using neurologically developed animals would essentially be invalidated.

Both emotion and cognition are morally significant properties in granting moral status to humans and animals. If, as the evidence seems to indicate, animals have moral status, even if it is a lower degree of moral status than what humans possess, then they are entitled to moral consideration. Nevertheless, even with moral status, neurologically developed animals may still be used in pain research. However, moral status does level out the ethical playing field, so to speak, between humans and animals. Emotional and cognitive capacities can grant both humans and animals moral status, and this moral status, in turn, indicates that both humans and animals are worthy of moral consideration. This shared moral consideration necessarily entails comparable protections and limits in pain research.

Today, research, including pain research, is conducted on humans. In the U.S., human research subjects are protected via the Common Rule, which can be found in Subpart A of 45 CFR part 46. (HHS.gov, 2013). In § 46.111 of the Common Rule, in order for research on human subjects to be approved by an institutional review board, the following criteria must be met: (1) The risks to human research subjects must be minimized; (2) after balancing the benefits and risks, the risks that human research subjects are exposed to must be reasonable in light of the expected benefits; (3) the selection of research subjects is fair, and special consideration is given to helpless or vulnerable groups, such as children. (45 C.F.R. § 46.111 (2013)). In § 46.102(i) of the Common Rule, minimal risk "means that the probability and magnitude of harm or discomfort anticipated in the research are not greater in and of themselves than those

ordinarily encountered in daily life." (Id. at § 46.102(i)). Pain research may fall under the ambit of research that involves greater than minimal risk.

The regulatory structure for the protection of human children as research subjects has useful components that can be applied to animals in research. Compared to other models, the children regulations are the most applicable to animals because like young children, animals are vulnerable and lack decisionmaking capacity. Two children-focused sections of subpart D of 45 CFR part 46 that are particularly relevant are § 46.406 and § 46.407. Section 46.406 focuses on research involving greater than minimal risk, with no prospect of direct benefit to child-subjects. (Id. at § 46.406). While there is no direct benefit to the individual child-subjects participating, the type of research that falls under this risk category is likely to produce generalizable knowledge about a particular disorder or condition. (Id.) Section 46.407 focuses on research that is not otherwise approvable, but is still justified because the possibility exists that information could be gained that may prevent or lessen a serious health or welfare problem for children. (Id. at § 46.407). If pain research on animals is permissible at all based on a significant justification, animals should receive protections that at least mirror the protections that are granted to children research subjects as found in § 46.406 and § 46.407 of the regulations.

Essentially, moral consideration does not evoke a complete ban on animal pain research, but rather creates a moral framework by which pain research on animals can be judged. Based on their emotions, cognition, and moral status, both humans and animals are entitled to moral consideration. Intrinsically, since both are entitled to moral consideration, the same kinds of protections and limits that are found in the regulations that protect human research subjects, particularly those that protect children in § 46.406

and § 46.407, should also be put in place in the regulations specific to animal research.

Pain research may technically be conducted on neurologically developed animals when there is a significant justification for the research. However, even when there is a significant justification and severe restrictions and protections are put in place that are comparable to the protections granted to children research subjects, animal pain research may still be invalidated. Because evidence suggests that animal pain models are poor models for human pain, the potential for clinical utility with animal pain models may be quite low. Hence, without another significant justification for using animal pain models, besides social and scientific need or the potential for major human health benefits, then moral consideration would necessarily entail a technical ban on animal research. That is, even if there is a great human need to study pain in animals for human benefit, because translation is poor, the justification for the continued use of animal pain models is lacking.

This thesis will examine the role that emotion and cognition play in granting animals moral status, and in turn, the role that moral status plays in granting animals and humans moral consideration. The first chapter will define animal moral status, and then discuss several theories of moral status. Each theory will be applied to the argument that animals possess moral status and therefore, they are entitled to moral consideration. The second and third chapters will discuss animal emotion and cognition, respectively. There are similarities between human emotion and cognition and animal emotion and cognition. Even if these capacities in humans and animals are not exactly on par, the fact that there are similarities suggests that animals have moral status, and therefore they are entitled to moral consideration. The fourth chapter will take the conclusions developed from the

previous chapters and use the information to argue for the implementation of new legislation that places severe limitations on animal pain research, specifically. The fifth chapter will reiterate why pain research is ethically unique, and will also include a conclusion and personal recommendations for how the U.S. should proceed on the issue of pain research involving animals. The conclusion will summarize key points from the previous chapters and will highlight the overall argument that because animals have moral status and are entitled to moral consideration, pain research on animals should be banned unless there is a significant justification for the research and severe limitations and protections are put in place that are similar to the protections granted to children in research.

# CHAPTER ONE

## Moral Status: Leveling the Ethical Playing Field

"Each to count for one and none for more than one."
-Jeremy Bentham

There is a tendency among humans to separate themselves from and elevate themselves above other animals. The term speciesism refers to the way in which humans tend to treat nonhuman animals as lesser beings, solely because they are not human. (Walker & King, *Biodefense Research*, p. 285). Humans often justify their treatment of animals based on a conception of moral status, holding that humans have moral status and nonhuman animals do not. The desire to avoid giving animals this label is strong, because to say that animals have moral status is to say that they have morally important interests that are independent of human interests that matter in their own right. (DeGrazia, 1996, p. 37). Many humans, particularly pain researchers, are uncomfortable with the notion that animals have moral status. (Id.) To these humans, animal usage in pain research is not a significant enough ethical issue to restrict or end their use.

Moral status is important, ethically speaking, as it determines which entities have value and interests, and to what degree those interests should be protected. (Cavalieri, 2001, p. 27). In determining moral status, morally relevant characteristics are considered. Species membership is not, however, a morally relevant characteristic. (Stanford Encyclopedia of Philosophy, 2012). That is, "membership in a biological category" is not itself morally significant and does not confer moral status or the attendant moral consideration. (Id.) It is still commonly believed, however, that all humans have moral status, regardless of their emotional and cognitive capacities, simply based on their human genetic makeup. (Beauchamp & Childress, 2009, p. 67).

If animals lack moral status, then humans can cause pain and suffering to animals through pain research, simply because it would not be possible to morally wrong animals. (Id.) Moral status essentially confers moral rights and moral protections to those who fall under its ambit. (Bekoff, 2009, p. 404). Conversely, those individuals without moral status have no moral rights that need protection; that is, those without moral status cannot be morally wronged. (Beauchamp & Childress, 2009, p. 64).

Despite arguments to the contrary, evidence supports a determination that at least some animals possess moral status based their ability to suffer and feel pain, as well as based on their cognitive similarities to humans. (Id.) If neurologically developed animals are sufficiently similar to humans in regard to their ability to suffer and experience other emotions, and if these animals share with humans at least some degree of cognitive capacity, then they possess moral status, even if not a moral status equal to that of humans.

The French philosopher René Descartes held that animals lack moral status because they have no language skills or ability to reason. (Cavalieri, 2005, p. 58). From there, he deduced that animals do not possess the ability to feel pain; he likened animals to machines devoid of mental and emotional states. (Id.) In later years the German philosopher Immanuel Kant stated that it is morally wrong to hurt an animal, not because animals have moral status, but because brutality to animals could potentially lead to brutality to humans. (Rowan, 1984, p. 30).

Unlike the philosophies of Descartes and Kant, Charles Darwin, an English naturalist, focused on the biological, emotional, and cognitive similarities between humans and animals. (Bekoff, 2009, p. 404). Instead of creating a greater divide between

species, he stressed the idea of differences in degree between humans and animals, rather than differences in kind. (Id.) He believed that fundamentally, there is no essential difference between the mental faculties of humans and animals, and that both share the ability to reason and to feel pleasure and pain. (Darwin, 1989, p. 27). Over the years, there has been some movement away from the desensitized moral philosophy of Descartes and the animal protection vis-à-vis human protection philosophy of Kant, and movement toward the Darwinian view of difference in degree. However, animal moral status is still very much a significant ethical issue, particularly in regard to pain research.

**Theories of Moral Status**

Several types of theories are currently utilized in discussions of the moral status of animals. The theories are based on human properties, cognitive properties, moral agency, sentience, and relationships. (Beauchamp & Childress, 2009, p. 67-81). None of the theories are all-encompassing or are completely adequate to grant moral status to animals. (Id. at 67). Additionally, the theories do not clearly delineate how much moral status to allot to those who are deemed to possess moral status. However, each theory does present morally relevant characteristics that may be referred to when determining the moral status of animals in pain research and the implications of granting moral status.

The traditional view of moral status is based on human properties. In this view, only those individuals with human biological properties have moral status. Because only humans possess human properties, they are the only ones with full moral status and membership in the moral community. Being a human is both a necessary and a sufficient condition for possessing moral status. (Id. at 67). This view is flawed, however, because as stated previously, species membership is not a morally relevant characteristic.

(Stanford Encyclopedia of Philosophy, 2012). This theory is also flawed in that while human properties may be sufficient conditions, they are not necessary conditions for moral status. (Beauchamp & Childress, 2009, p. 68). It is possible that some nonhuman animals possess the ostensibly human characteristics of language, intelligence, memory, reasoning, planning, and a sense of autonomy and moral judgment. (Id.) Additionally, not all humans possess these allegedly human-only characteristics, yet all Homo sapiens are granted full moral status. Since some neurologically developed animals possess these capacities while some humans do not, as Rebecca L. Walker and Nancy M.P. King put it, "we should be forced, on pain of contradiction, to extend the same level of moral consideration to those animals as we do to the human beings at issue." (Walker & King, *Biodefense Research*, p. 285).

Many animals appear to be capable of displaying rationality, intentional action, self-awareness, and social awareness. (DeGrazia, 2006, p. 42). As such, it would seem unreasonable to grant moral status to humans but not to animals based solely on a label of species. (Beauchamp & Childress, 2009, p. 68). Furthermore, the exact definition of a person, with certain cognitive and moral capacities, is constantly fluctuating, so that a hard and fast rule of moral status based on personhood seems unworkable. (Id. at 70). Additionally, broadening the definition of personhood to include both biological and psychological characteristics such as emotion, cognition, and motivation would have the effect of denying moral status to certain groups of humans who lack these capacities. (Id.) This, in turn, would defeat the goal of the theory to grant moral status to all humans. (Id.)

A second theory of moral status is based on cognitive properties, with five common criteria being self-consciousness, the ability to engage in purposeful actions,

reasoning, language, and volition. (Id. at 71). Moral status is granted to those individuals, both human and nonhuman alike, who are able to cognitively reflect on their lives and function with intention and purpose based on their own belief systems. (Id.) Since humans may not be the only beings who possess these properties or characteristics, they may not be the only beings with moral status. (Id.) Evidence shows that some animals possess and display various levels of intelligence, awareness, memory, and intentional action. (Id. at 72). Conversely, some humans, including infants, the mentally handicapped, and the senile, as well as some animals, will not be granted moral status under this theory if they are required to meet every criterion for cognitive ability. (Id.) Furthermore, it is also possible that some animals will be given moral status, while some humans who do not possess certain cognitive capacities will be denied the same status. (Id.) Excluding any humans from the ambit of moral status seems questionable. In the same vein, to use animals in certain types of pain research, but to not use similarly cognitively situated humans in such research, seems not only questionable, but also immoral and unfair; to not use marginal humans demonstrates the assignment of a higher value on human life and a prejudice against animals, a concept known as speciesism. (Bekoff, 2009, p. 459). While cognitive capacity may be a sufficient condition for moral status, it is by no means a necessary condition. (Beauchamp & Childress, 2009, p. 73).

A third theory of moral status focuses on moral agency. Under this theory, moral status is only granted to moral agents. (Id. at 74). Moral agents are those who can judge actions based on their inherent rightness or wrongness, and who have motives that can "be judged morally." (Id.) Moral agents are deeply connected to nature and have duties to nature that must be fulfilled. (Bekoff, 2009, p. 161). Those with the title of moral agent

must be morally respected as they have moral status. (Beauchamp & Childress, 2009, p. 73).

Though some humans may be considered moral agents, animals arguably are not moral agents, and thus, they may be denied moral status. (Bekoff, 2009, p. 161). This is because the motives and actions of animals cannot be considered morally praiseworthy or blameworthy. (Id.) However, like the other theories, this one is also flawed. Not only does this theory deny moral status to animals, but it also has the effect of denying moral status to groups of humans, like patients with dementia or severe brain damage, who are incapable of both making moral judgments and having their motives morally judged. (Id. at 75). Thus, moral agency may be a sufficient but not a necessary condition for the assignment of moral status. (Id.)

A fourth theory of moral status focuses on relationships. Essentially, moral status is conferred based on the existence of relationships between individuals, and the duties that are inherent within those relationships. (Id. at 79). Even if they are not moral actors themselves, animals can be granted moral status based on the relationships that humans have with them, and the importance of those relationships to humans. (Id.) For example, if a human has a relationship with a laboratory animal, and the human assesses the relationship to be important, then the human must bestow moral rights, protections, and moral status to the animal. (Id.)

This theory is also potentially flawed and subjective. It appears flawed in that it requires an established relationship between humans and animals before moral status can be bestowed. Furthermore, it appears subjective in that if humans do not value the lives of animals, then animals are denied moral status. (Id. at 80).

A fifth theory of moral status is based on sentience, or the capacity to feel and suffer. According to this theory, humans and animals that are sentient and are capable of feeling emotions, such as pain and pleasure, have moral status; cognitive capacity is of no importance because cognition is not necessary to experience pain. (Id. at 75). At a very fundamental level, humans and animals that are sentient have an interest in avoiding pain. (Cavalieri, 2005, p. 65). Pain is morally significant in that actions that cause pain should be minimized or prohibited. (Beauchamp & Childress, 2009, p. 73). Since humans and animals both have an interest in avoiding pain, when pain is inflicted upon them, they are both morally wronged. (Id.) Furthermore, since humans and animals have the same interest in avoiding pain, their interests should be equally considered. Pain is pain, and suffering is suffering regardless of species. The same pain that affects humans affects sentient animals as well, though perhaps to different degrees. This theory appears flawed in that nonsentient beings, such as early-stage fetuses and lower animals, are denied moral status. (Id. at 77). However, though this theory does not grant moral status to nonsentient animals, like most invertebrates, it is particularly applicable to pain research because the animals that are used in such research give the indication of sentience and thus, may have moral status.

**Additional Ethical Theories for the Treatment of Animals**

Aside from moral status theories, other ethical theories can be used to examine the treatment of animals. These theories help to develop an interpretation of when, if ever, humans should recognize that animals have moral status, and the significance of that recognition. One such theory that is often used in an analysis of ethics or morality is virtue ethics. In this theory, moral virtues are the basic units of analysis; moral virtues are

the traits of character that are considered to be morally valuable. (Beauchamp & Childress, 2009, p. 31). These virtues are thought to predispose both humans and animals to act morally. (Bekoff, 2009, p. 603). Virtues are the ultimate human excellence – the way humans think about what is good for humans. (Id.) In terms of animals, the basic virtue ethics analysis involves determining whether animals ought to be treated well because it is good for humans. (Walker, 2007, p. 2). Broadly speaking, treating animals well means caring about protecting their interests, and ensuring that they are living "lives that are good ones for their kind." (Id.) In order to justify treating animals well, the very act of treating animals well must be a virtuous thing and result in human flourishing. (Id.) Virtues are good and desirable in the sense that an accumulation of virtues results in the ultimate goal of living a good life for humans. (Id.) Nonhuman animals play a role in human flourishing when it is virtuous to treat animals well, because doing so adds to the humans' stockpile of virtues and puts them one step closer to attaining the ideal, good life. (Id. at 5).

Upon examining the case for nonhuman animals, it is important to note that the human good life and the nonhuman animal good life share similar characteristics. (Id. at 9). Although animals do not possess or act upon moral virtues as humans do, it is not difficult to discern what a good life for an animal would be based on the characteristics of that animal's species. (Id. at 13-14). A good life for humans may include living in a safe and comfortable place, having enough food and water, engaging in adequate social and sexual interactions, having physical and psychological health, and avoiding pain and suffering; overall, a good life for animals may also include these same things. (Id.) If the avoidance of pain and suffering is a part of the good life for both humans and animals,

then using animals in pain research ipso facto prevents animals from living flourishing lives. Additionally, if both human flourishing and animal flourishing are so deeply connected, then by causing pain and suffering to animals in pain research thereby preventing animals from living good lives for their kind, humans are inadvertently prohibiting their own flourishing.

Virtue ethics focuses on the traits that moral humans should want to exhibit. (Stanford Encyclopedia of Philosophy, 2012). However, even if one adopts the virtue ethics approach, a major obstacle to any real change in how animals are treated is the fact that pain research on animals is already deeply engrained in both the medical and pharmaceutical fields. (Hursthouse, 2006, p. 12). To address the issue, the question has to be framed as what a virtuous human could do under the circumstances. (Id. at 13). Individually, a virtuous human cannot do much; it is only with the collective voice of virtuous humans that any changes can be made with pain research on animals. (Id.) In order to apply virtue ethics correctly and completely to nonhuman animals, it must first be acknowledged that the lives of humans and animals are intertwined with one another. As such, since pain research is an injustice to animals, virtuous humans should abhor the practice and seek to have it stopped.

The virtue ethics approach may not definitively protect neurologically developed animals from pain research. Animal research, including pain research, would be permissible under the virtue ethics approach, unless it violated a human's perception of what it means to be a virtuous human, or prevented a human from flourishing; only if pain research using animals would be abhorred by the virtuous human would a human reject such research. The approach is very human-focused, and animals may not

themselves possess virtuous character traits. (Bekoff, 2009, p. 604). The argument is that without a rather high level of consciousness and rationality, animals cannot be virtuous. (Id.) Any virtuous or moral actions that animals display are not due to their desire to reach an ideal way of life, but rather, are isolated behavioral responses specific to a particular situation. (Sapontzis, 1987, p. 43). That is, while animals can behave virtuously or morally, they do so instinctively, rather than through careful reflection. (DeGrazia, 2006, p. 201). If virtuous characteristics are innately human, then animals have only an instrumental role in bringing about human flourishing.

Aside from virtue ethics, other approaches like utilitarianism, rights-based ethics, and principle-based ethics have taken on prominent roles in animal discussions. Utilitarianism, founded by Jeremy Bentham and championed by Peter Singer, is essentially a theory of equal consideration. Under this theory it is believed that everyone deserves equal consideration of their interests; animals are included, since they are sentient and are capable of experiencing pain and happiness. (Matheny, 2005, p. 17). According to Singer, equal consideration of interests is necessarily extended to animals because "our concern for others and our readiness to consider their interests ought not to depend on what they are like or on what abilities they may possess." (Singer, 2009, p. 5). Instead of arbitrary cognitive abilities, it is an animal's sentience or capacity to suffer that grants the animal interests and the right to have those interests equally considered with like suffering in humans; simply, like humans, animals also have an interest in not suffering. (Id. at 7). As such, before taking a course of action, individuals must put themselves "in the shoes of" each human or animal who could potentially be affected by

the action. (Id. at 14). An adding up and weighing of interests is then made with a focus on the expected consequences of the action being deliberated upon. (Id.)

The ultimate goal of utilitarianism is to follow a course of action – or perhaps inaction, however the case may be – that will allow for the greatest net satisfaction of interests of everyone involved; the outcome that will produce the most good for the greatest number of parties should be pursued. (Id.) The good interests that are often sought to be promoted and satisfied include a happy, reasonably pain-free life, with minimal suffering. (Id.) If these basic interests are not satisfied, any other interests, including essential life-sustaining ones, "tend to recede into the background." (Id. at 15). In the realm of pain research, the suffering of animal subjects must be equally considered with the suffering that humans may face without the potential benefits of such research. (Midgley, 1984, p. 89). Any human benefits from pain research are questionable, however, as the results may be obvious, worthless, or insignificant, yielding little to no potential for human clinical benefit. (Singer, 2009, p. 49).

While the utilitarian approach has the ability to even out the ethical playing field for animals to a degree, it does not necessarily guarantee the protection of animals in pain research. Though the suffering of animals is impartially considered with the suffering of humans, the weighing of interests can result in some types of animal research being deemed permissible. (DeGrazia, 2006, p. 280). If, overall, there would be a greater net satisfaction of interests by performing the research, animals can have their interests in avoiding pain and suffering overridden. (Id.) These interests may be sacrificed and animals can be subjected to pain research, all in the name of the greater good. (Id.) Equal consideration of interests has the potential to put animals on the same starting block as

humans, but the possibility remains that animals may end up inevitably serving as a mere means to the end of human health.

A view that connects to and overlaps with the moral status argument is based on rights. A rights-based approach to animals centers on the idea that animals have inherent value and rights that stem from their inherent value. (Regan, 2004, p. 267-71). According to Tom Regan, an American philosopher, animals have inherent value that is equally distributed among all animals and is not dependent on cognition or emotion. (Regan, 1989, p. 110). If humans fail to show respect for animals' inherent value, they violate animals' rights. (Id. at 111). Under this rights view, animals cannot be used in pain research because to do so would disrespect their inherent value as animals, and in turn, violate their rights. Basically, pain research is discriminatory to animals because it violates their rights, and thus, can never be justified. In Regan's terms, animals and humans "are each of us the experiencing subject of a life, a conscious creature having an individual welfare that has importance to us whatever our usefulness to others." (Id.) Since animals are experiencing subjects of a life, they have inherent value of their own. Since they have inherent value, they have rights that must be respected, which include the right to avoid pain and suffering. The connection and overlap between moral status and this rights-based view stems from the notion that the possession of rights essentially implies moral status.

Another ethical approach that can be applied to the issue of pain research on animals is based on the four principles of autonomy, beneficence, nonmaleficence, and justice. These four principles are applied to animals once it is established that they indeed have moral status. The principles are then used to dictate how animals should be treated.

One view of autonomy holds that individuals are autonomous if they are capable of having preferences or desires, with the ability to engage in actions in order to satisfy those preferences or desires. (Regan, 2004, p. 85). Basically, as long as an individual has a desire and the belief that that desire can be satisfied, and then initiates action to satisfy that desire, the individual is said to be autonomous. (Id.) Some animals may possess this type of autonomy as long as they possess at least some degree of cognitive ability that would enable them to have desires and preferences and to form beliefs. (Id.) Evidence suggests that animals used in pain research have the requisite cognitive abilities to grant them autonomy. As such, they may have the capacity for autonomous choice, and thus, their choices should be respected. To respect their decisions means to acknowledge that those decisions have value. (Beauchamp & Childress, 2009, p. 103). Since it is very doubtful that neurologically developed animals would make the autonomous choice to participate in pain research, their decision to not be harmed is something that should be respected, and they should not be forced to be subjects in pain research.

The principle of beneficence essentially requires that animals be treated with respect for their needs and protected from undue harm. (Id. at 150). Beneficence can be broken down into three duties: the duty to prevent harm or evil, the duty to remove harm or evil, and the duty to do good. (Id.) In the realm of pain research, all three of these active duties would require researchers to stop using animals. Pain can be considered both a harm and a moral evil to animal subjects. (Id. at 75). As such, beneficence requires that researchers prevent pain, remove pain, and do good for animals, which would entail preventing pain and removing animals from pain research.

The principle of nonmaleficence requires that individuals intentionally refrain from actions that cause harm. (Id. at 151). Unlike beneficence, which requires individuals to take an active role in preventing and removing harm or evil and promoting good, nonmaleficence is prohibitory. (Id.) When applied to pain research, nonmaleficence holds that researchers must not inflict harm or evil. Again, pain can be considered both a harm and an evil to animal subjects. (Id. at 75). In keeping with the idea of nonmaleficence, researchers must not initiate pain research because it would inflict pain – harm and evil – on neurologically developed animals.

The principle of justice requires that individuals not be unreasonably harmed. (Id. at 241). It is basically a principle of fairness and appropriate treatment. (Id.) Those individuals who have a claim based in justice, because they have been wronged in some way, have a right to whatever they are owed, be it resources or protections. (Id.) Since evidence suggests that animals may have moral status, they also have inherent value. (Regan, 2004, p. 248). Accordingly, justice requires that animals be treated in ways that respect their inherent value. (Id.) The principle of justice is violated whenever animals are treated as if they lack inherent value, such as when they are used as mere means in human pain research. (Id.) The principle of justice holds that pain research is disrespectful and unjust to animals. In order to respect the inherent value of animals, researchers may have a duty to not inflict pain on them.

There are five theories of moral status, several of which may ultimately confer at least some level of moral status to animals. The two types of theories that are the most effective in granting moral status to animals are based on emotion and cognition. Both emotion and cognition play a major role in determining moral status. In the next chapter,

the link between emotion and moral status will be established and further detailed. Evidence suggests that animals, like humans, are capable of experiencing and expressing a variety of emotions, even complex emotions like suffering. The argument will be made that since neurologically developed animals can experience emotions just like humans can, albeit to different degrees, they are able to suffer. The ability to suffer, in turn, confers moral status. Consequentially, since animals have moral status, they are entitled to moral consideration. The result of moral consideration suggests strongly that pain research using animals for the benefit of humans is rarely, if ever, justified.

CHAPTER TWO

Animal Emotion: Bridging the Species Gap

"You discover in it all the same organs of feeling that are in yourself. Answer me, mechanist, has nature arranged all the means of feeling in this animal so that it may not feel?"
-Voltaire

## The Argument

Both humans and animals have the capacity to experience and express various emotions, albeit to different degrees. Emotions, in turn, indicate the ability to engage in moral behavior. Consequentially, emotions and moral behavior confer moral status. Since animals, like humans, have moral status, they are worthy of moral consideration. This moral consideration permits pain research on neurologically developed animals only when there is a significant justification for the research. When such research is permitted under limited circumstances, the animal subjects are entitled to the same kinds of protections and limits that human research subjects, like children, are entitled to.

## Emotions and Moral Behavior in Animals & Humans

When attempting to justify the use of animals in pain research, humans often refer to the supposed distinctions between humans and animals. One such cited distinction is based on sentience, or the conscious experience of emotion. Though an exact definition has not been agreed upon, emotions and emotional responses basically refer to how a neurologically developed being mentally and physically copes with a particular situation or stimulus. (Alain et al., 2007, p. 377). Emotions are complex mental states consisting of a combination of behavioral, physiological, neuronal, subjective, and cognitive components. (Pinka, 2012, p. 170). These intermingling components result in the

experience and expression of various feelings that can be either pleasant or unpleasant. (Id.)

It is generally believed that humans and not animals are capable of feeling emotion. If animals cannot experience the negative emotional state of suffering, for instance, then they are mere machines lacking in moral status, as Descartes described them. (Cavalieri, 2005, p. 58). In the laboratory setting, scientists often describe evidence of animal emotion as merely conditioned or learned responses. (Masson & McCarthy, 1995, p. 12). Emotion, however, may not be an exclusively human experience. Rather, from physiological processes to behavioral responses, evidence tends to indicate that humans and neurologically developed animals feel and express similar emotions. Moreover, it is possible that animals can experience a greater variety of emotions than humans are able to experience. (Bekoff, 2007, p. 7). Furthermore, whereas humans have ways of masking their emotions, the emotional responses of animals can be more observably transparent and genuine because "animals never lie." (Mayer, 2008, p. 402-03).

Since animals may experience emotions that are similar to human emotions, they are able to suffer; since they are able to suffer, they have moral status. (Beauchamp & Childress, 2009, p. 75). Additionally, having the ability to experience emotion is itself a mental capacity that is sufficient to give animals inherent value. (Regan, 1989, p.110-11). Animals with inherent value have certain rights, such as the right to avoid pain and suffering. (Id.) Given the possibility that animals have moral status and potentially, inherent value, they also have interests and moral rights and are owed moral protections. (Bekoff, 2009, p. 404). An interest that is common to both humans and animals is an

interest in avoiding pain. (Beauchamp & Childress, 2009, p. 75). While it can be argued that humans experience more complex emotions than animals do, the fact that animals can experience any emotion at all, however basic, is enough to argue that they have moral status and are thus entitled to moral consideration. This moral consideration warrants that neurologically developed animals not be used in pain research that benefits humans only, unless there is a significant justification for the research. However, in cases where there is a significant justification to use animals in pain research, given their moral status and entitlement to moral consideration, they should receive the same protections and limits via regulations that human research subjects, specifically children research subjects, receive.

Pain itself is not an emotion. Pain is physical and involves physiological responses to stimuli. Suffering is a term that is often connected with pain. (Cassel, 1982, p. 640). However, whereas pain is physical, suffering involves both physical and subjective psychological and emotional characteristics. (Id. at 639). According to physician and author Eric J. Cassel, "Suffering can be defined as the state of severe distress associated with events that threaten the intactness of the [being]." (Id. at 640). Although pain and suffering are distinct, there is certainly a link between the two terms. Ordinarily, an increase in pain results in an increase in suffering. (Id. at 641). Furthermore, suffering can occur when pain is overwhelming, chronic, or unidentified. (Id.) Suffering also has temporal and knowledge components, in that suffering can be lessened if an individual knows that the pain will end in the near future and has an understanding of the meaning of the pain. (Id.) In order to determine whether an individual suffers, it is necessary to "ask the sufferer." (Id. at 643). In pain research,

animals may experience the emotion of suffering. Unlike humans, however, who can describe their suffering verbally, the suffering of animals must be read from bodily movements and other types of vocalizations. Moreover, in research where pain is overwhelming, chronic, and unidentified, animals are not able to lessen their suffering due to their inability to comprehend the meaning of pain or its temporal characteristics.

Emotions are divided into primary and secondary emotions, and evidence tends to indicate that both humans and animals are capable of experiencing both types. (Bekoff, 2007, p. 7). Primary emotions involve basic and instinctual responses that do not require cognitive awareness. (Id.) Among these emotions are happiness, anger, fear, sadness, surprise, and disgust. (Id.) Evolutionarily speaking, primary emotions serve as useful survival mechanisms for animals confronted with potentially dangerous sights, smells, and sounds. (Bekoff, 2000, p. 862). Within both humans and animals, primary emotions involve activation of the limbic system, primarily the amygdala. (Bekoff, 2007, p. 7-8). Other brain systems, however, are also implicated in the processing of emotion. (Id.) Animals respond to chemicals that affect primary emotions much in the same way that humans respond to the same chemicals, which evidences shared neurobiology, as well as shared emotions. (Id. at 10). Secondary emotions, on the other hand, are more developed and involve "higher brain centers in the cerebral cortex." (Id. at 8). These emotions involve thought before action, and a careful weighing of options by the individual being. (Id.) Secondary emotions can include both primary and more intricate emotions, such as jealousy, embarrassment, guilt, and suffering. (Id.)

In instances where humans acknowledge that animals do have emotions, it is believed that the emotions are much less complex than human emotions. (de Waal, 2011,

p. 191-92). While animals may experience a few primary emotions, it is difficult for many to believe that they are capable of experiencing secondary or mixed emotions. (Id.) However, as Dutch ethologist Frans de Waal puts it, "One only needs to see an aroused chimpanzee, with all its hair on end, pick up a stick to safely poke at a snake that it has approached with great hesitation, to understand that mixed inclinations, such as between fear and curiosity, are entirely possible." (Id.) Rather than assuming that animals are either incapable of experiencing and expressing emotions or are limited in their emotions, it seems more logical to assume that if animals and humans react similarly to the same stimuli or situations, then they are capable of experiencing similar emotions. (Id. at 192-93).

Scientists and ethologists are often encouraged to avoid discussing animal emotion and using human concepts of emotion to describe animal behavior. (de Waal, 2011, p. 191). When humans ascribe allegedly human-only characteristics to animals, such as the ability to experience emotion, they are often accused of engaging in anthropomorphism. (Bekoff, 2009, p. 68). The main fear associated with anthropomorphism is that the attribution of emotion to animals will somehow diminish the evolutionary superiority that humans claim to have over other animals. (Cavalieri, 2001, p. 15). Charles Darwin was often criticized for engaging in anthropomorphism. (Darwin, 1998, p. xxix). Despite such criticism, Darwin was committed to the idea that humans and animals share a spectrum of emotions, and he wrote about animals experiencing and expressing the very human-esque emotions of joy, anger, sadness, grief, and suffering. (Id.) For example, he described how animals in pain would "writhe about with frightful contortions," and "utter piercing cries or groans," and attempt to escape

from the source of pain. (Id. at 73). Furthermore, he observed body language and various facial expressions in animals and noted how they would clench and gnash their teeth when experiencing pain. (Id.) All of these behaviors and the associated facial expressions are also common among humans in the midst of painful stimuli. (Id.) Eventually, with severe and prolonged pain, both animals and humans frequently experience and display behaviors associated with fear, despair, and helplessness. (Id. at 85-86, 176-77).

Although perhaps guilty of anthropomorphism, Darwin was a pioneer of animal emotion. By weaving together emotion and humans' evolutionary connectedness to animals, he helped to pave the way for a greater focus on animal welfare. (Mayer, 2008, p. 402-03). By not only declaring that animals have emotions, but also by highlighting the emotional similarities between humans and animals, Darwin called for better treatment of animals by humans. (Id.) Animals are certainly not humanlike in many respects, but emotionally speaking, evidence seems to suggest that they are very similar to humans. Consequentially, because animals experience emotions like humans do, they have moral status. Based on their moral status, they are entitled to moral consideration. This moral consideration requires comparable human and animal regulations, protections, and limits in research, and more specifically, in pain research.

Although animals cannot use verbal language to express their emotions, the similarity between emotion in humans and emotion in animals is readily observable. (Midgley, 1984, p. 57-59). Emotions that can be observed include not just primal urges and drives, but also more complex emotions comprising thoughts and beliefs. (Id.) One way that emotions can be observed is through behavior. Humans can identify emotion in animals by observing "a consistent set of reactions which makes sense only on the

assumption of a given belief." (Id. at 59). In other words, humans can compare animal behavior to known human behavior while experiencing emotions, in order to gauge whether animals experience the same or similar human emotions. (Bekoff, 2007, p. xx). Just as human behavior can be interpreted as an indicator of human emotion, so too can animal behavior be interpreted as an indicator of animal emotion. (Midgley, 1984, p. 57-59).

Emotion, behavior, and morality are also linked in another way. Animals sometimes engage in actions that appear to be moral; that is, by human behavioral standards, the actions are moral. (Sapontzis, 1987, p. 27-28). From these actions, the emotions of animals can be interpreted. (Id.) Through their actions, animals showcase the moral and social characteristics and attendant emotions of responsibility, loyalty, compassion, heroism, parental concern, forgiveness, and affection, just to name a few. (Id.) Additionally, animals have shown these socially relevant qualities not only within their own species but also occasionally to other species, including humans. (Id. at 27). If moral status is based on emotion, and emotion can be identified through behavior, then animals are moral agents with moral status. Based on their moral status, like humans, animals are entitled to moral consideration and all of the attendant protections in pain research that human research subjects, particularly children, are entitled to.

An argument against the existence of animal emotion is based on the idea that animal minds are subjective and private, and can never be properly or thoroughly analyzed. While emotion is subjective, that subjectivity spans across different species. (Midgley, 1984, p. 57-59). Humans may not be able to know exactly what animals are feeling because they cannot "get inside of the heads" of animals, but the same goes for

other humans; it is impossible to know with absolute certainty the subjective experience of emotion in other humans. (Id.) As described by the English philosopher Mary Midgley, when identifying emotional states in humans and animals, "the generic likeness [of emotion] is sufficient." (Id. at 131). Since humans make assumptions about the feelings of other humans, it seems permissible to do the same with animals, especially if the biological underpinnings and physiological processes of the animals are known and can be compared to that of humans. (Dawkins, 2005, p. 28).

Sentient animals are able to experience positive and negative emotions to varying degrees. (Bekoff, 2009, p. 419). One common approach to studying emotion is to place an animal in a particular situation and observe its behavior. (Id. at 32). By placing an animal in a fearful or painful situation, for instance, based on the animal's given reactions, its emotion can be assumed. (Id.) The difficulties with this method, however, include the fact that an animal can express a single emotion in various ways. (Id. at 32-33). Additionally, emotion can be uniquely expressed across different species. (Id.) Moreover, in terms of determining a threshold for pain, it can be difficult to determine at what point negative emotion can be labeled as suffering. (Id.)

Another approach to studying negative emotional states is to analyze the physiological changes that an animal presents when it is placed in a painful situation. (Id. at 31). Such observable changes can be in temperature, hormone levels, brain activity, heart rate, and ammonia content in muscles. (Id.) For example, noninvasive brain imaging scans of animals have indicated fluctuations in brain blood flow, which is suggestive of an emotional response. (Bekoff, 2009, p. 5-6).

Animals can indicate how they are feeling by making choices and preferring one situation or environment to another; like humans, animals tend to prefer pleasurable things and avoid unpleasant or negative things. (Dawkins, 2005, p. 33-34). The strength of those choices and preferences is also important in determining the strength of the positive or negative emotion experienced, and necessarily, the strength of the desire to seek pleasure or avoid pain. (Bekoff, 2009, p. 527). This objective assessment of emotion essentially examines how hard animals will work to earn positive reinforcers, which perhaps precedes the experience of a positive emotion. (Dawkins, 2008, p. 939). The converse is also true; this objective assessment of emotion also examines how hard animals will work to avoid negative reinforcers, and hence, negative emotions. (Id.) A combination of behavior, physiology, and animal preferences can be used to identify and assess animal emotion. (Dawkins, 2005, p. 37-38).

Many neurologically developed animals seem to experience and express colorful, rich, and diversified emotions, such as fear, sadness, joy, affection, anger, and empathy. These emotions serve as evolutionarily useful survival and communal bonding mechanisms. (Bekoff, 2007 p. xvii). In a very fundamental way, emotions enable animals to avoid injury and punishment, to pursue resources needed for survival, and to bond with and protect offspring and fellow species members. (Alain, 2007, p. 377). Additionally, some emotions have arguably no survival benefits, but just feel good to animals. (Masson & McCarthy, 1995, p. 13). Because these emotions feel good, animals will behave in ways that maximize and replicate these feelings. (Id.) According to Marc Bekoff, "Emotions also catalyze and regulate a wide variety of social encounters among friends, lovers, and competitors, and they permit animals to protect themselves adaptively and

flexibly using various behavior patterns in a wide variety of venues." (Alain, 2007, p. 377). Particularly among social animals, emotions can also be transferred between different members of the same species either through unintentional prompts, or through deliberate signals. (Pinka, 2012, p. 170). Emotional contagion refers to the transfer of positive or negative emotions from one animal to a group of animals; the emotional state of one animal is perceived by the group, which in turn, causes the entire group to experience the same emotional state. (Id.)

**The Evidence**

Biologically, humans and animals have many structural, functional, and neurochemical similarities that are implicated in emotion. For example, four different species of whale possess spindle cells in a certain part of the brain that are also found in the human brain. (Bekoff, 2007, p. xix). These spindle cells, which are involved in the processing of emotion, were once thought to belong only to humans. (Id.) Additionally, in the realm of anxiety – a physical and mental state with emotional components – laboratory animals respond to antianxiety drugs known as benzodiazepines in the same way that humans respond to the drugs. (Rowan, 1984, p. 83). Though it cannot be said with absolute certainty that animals experience anxiety in the same way that humans do, the fact that many mammals, birds, reptiles, and some fish have brain receptors for benzodiazepines indicates that these animals do experience at least some degree of the emotional state of anxiety. (Id.)

Since anxiety and suffering are related, when an animal experiences the emotional state of anxiety, which is a common component of pain research, it also suffers. (Id. at 84). Fear is also a common emotional state experienced by animals in pain research, and

a combination of anxiety and fear can increase animals' sensitivity to pain. (Orlans, 1993, p. 141). Furthermore, chronic and intense anxiety, fear, or other negative emotional states in both humans and animals result in increased blood levels of catecholamine, cortisone, and adrenocorticotrophic hormone. (Id.) Additionally, with both positive and negative emotions, various neurons in the amygdalas of animals and humans become activated. (de Waal, 2011, p. 193). Hormones that affect human emotions such as oxytocin, epinephrine, testosterone, and serotonin, are also found in animals, and are believed to play a role in animal emotion. (Masson & McCarthy, 1995, p. 15). Also, stimulation of other deep brain structures creates similar avoidance behaviors in both humans and animals. (de Waal, 2011, p. 193).

Anecdotal evidence from field research has often been used to bring attention to the topic of animal emotion. Though such evidence has often been criticized as being unscientific and unreliable, the anecdotes, in combination with hard empirical data, serve as useful sources of information and inspiration for further study of animal emotion. (Bekoff, 2000, p. 861). Since empirical data are lacking on the subject, anecdotal evidence through personal observation is particularly beneficial. (Id.) Anecdotal evidence also has an advantage over empirical studies that are conducted in laboratories; whereas anecdotal evidence can be based on observations of animals in their natural habitats and describes emotion in different contexts, the artificial and monotonous environment of the laboratory has the potential to negatively influence data on animal emotion, especially because the environment is so innately stressful. (Id. at 868). Through stories and observations of animals that are collected in field research, the various and humanlike emotions of animals can easily be recognized even by the nonscientist. According to

Bekoff, "changes in muscle tone, posture, gait, facial expression, eye size and gaze, vocalizations, and odors (pheromones), singly and together, indicate emotional responses to certain situations." (Id. at 862). Animal emotions are certainly observable, but humans must take the time to look at nonverbal cues such as gestures, actions, and vocalizations. (Masson & McCarthy, 1995, p. 21).

Researchers who perform pain research on animals tend to mentally distance themselves from the animal subjects, perhaps to shield their consciences from the thought that with every cut, burn, or injection, the animals experience negative emotions, like fear and suffering. (Masson & McCarthy, 1995, p. xx). To imply that animal subjects are capable of experiencing pain is to also imply that they have moral status and are worthy of moral consideration. This moral consideration that is granted to both humans and animals warrants similar protections in research. While information on animal emotion can be obtained in a laboratory setting, most comes from observations of animals in captivity or wild animals in field studies. (Id. at xxi). These observations show that animals are capable of experiencing various emotions, ranging from relatively simple primary emotions to more complex secondary emotions. (Id. at xxii). As Jeffrey Masson describes it, field studies show that "animals love and suffer, cry and laugh; their hearts rise up in anticipation and fall in despair. They are lonely, in love, disappointed, or curious; they look back with nostalgia and anticipate future happiness." (Id. at xxii). Several emotions that are commonly described in humans, but which can also be observed in neurologically developed animals, are fear, sorrow, joy, affection, anger and empathy. (Id. at 10). Though there are many other emotions that animals and humans

share, both primary and secondary, these particular emotions serve as evidence that animals are indeed emotional beings with moral status.

Fear is an emotion that has an adaptive advantage and that does not require cognition to experience. (Id. at 47). The amygdala is a common structure in both humans and animals. In a laboratory setting, fear can be elicited through intense stimulation of the amygdala. (Id.) Animals who have had their amygdalas removed display no fear responses. (Id.) Additionally, the hormones epinephrine and norepinephrine, which are involved in the transmission of fear within the body, are present in animals and humans. (Id. at 48). Behaviorally, when humans and animals experience fear, they freeze in place, move around wildly, cower, whimper, cry, scream, or widen their mouths and eyes. (Id. at 49). Additionally, their teeth chatter, their hair stands on end, their muscles shiver, and they urinate or defecate uncontrollably. (Id.) Rats and mice in pain research often scream and cry during procedures. (Id. at 229). Pigs have been known to scream and cry as they are being slaughtered. (Id.) Aside from these common indications of fear, different species also display unique signs of the emotion, much as individual humans can uniquely experience and express fear. (Id.) Furthermore, like humans, animals are able to remember stimuli and situations that previously caused them fear, and form associations between present and past fear-eliciting stimuli. (Id. at 50). Fear can also be experienced by individuals for their own sake or for others, such as mothers fearing for the safety of their offspring. (Id. at 55-56).

Sorrow or sadness is another emotion shared by humans and animals. Behaviorally, various species are capable of displaying signs of grief. These grieving animals withdraw from groups, stop eating, become listless, sit with dying or ailing

family members, attempt to revive newly dead individuals, bury their dead, cry, howl, examine bones of their relatives, and even exhibit signs of post-traumatic stress disorder. (Bekoff, 2007, p. 62-70). In terms of survival value, sorrow can be important in strengthening social bonds and intimacy during times of loss or struggle. (Id. at 63). Chemically, during times of sadness, grief, and stress, animals and humans have increased levels of circulating glucocorticoids. (Id. at 65). Mice that display signs of sadness respond positively to the human antidepressant Prozac. (Id. at 10). Furthermore, mice that display suicidal tendencies due to toxoplasmosis show improvement with human antipsychotic drugs. (Id.) Because animals behave similarly to humans and respond similarly to human drugs, it seems likely that they can both experience sadness.

Humans experience joy in various circumstances. Animals too experience joy in various conditions, such as when they greet other animals, when they play, when they groom, when they sing, and for confined animals, when they are released from their cages. (Id. at 53). Animals show their joy through vocalizations, embrace, tail wagging, or other behaviors and bodily movements. (Id. at 53-57). For example, elephants that reunite with other members of their herd "flap their ears, spin about, and emit a 'greeting rumble.'" (Id. at 54). Additionally, wild dogs have been known to run towards pack mates, wag their tails, whine, lick one another, and even smile and laugh. (Id. at 55-56). Joy also has an adaptive value in that animals that are happy and joyous are motivated to survive, seek out pleasurable things, create lasting social bonds, and reproduce. (Id. at 54). During times of animal joy, dopamine, serotonin, and norepinephrine are released in the body; this is also true for humans. (Id. at 56).

Affection, or love, is another emotion that animals experience. Affection, which has also been labeled a drive, is a complex emotion. Bekoff defines affection as "preferring the close company of another individual, seeking them out, and if necessary, protecting and caring for them." (Id. at 70). Among the different forms of affection or love that have been observed in animals are romantic, maternal, and filial. (Id.) Animals show affection just like humans show affection, because they can form bonds with others that are just as strong as the bonds that humans form. Besides feeling good, affection as an emotion has an important survival value in terms of mating and parental care. (Masson & McCarthy, 1995, p. 65). Some species romantically court before they mate, are monogamous, and mate for life. (Bekoff, 2007, p. 71-72). Many mother animals, including elephants and whales, diligently care for their young, will fight to the death to protect them, and experience tremendous grief if and when their offspring die. (Id. at 73). Additionally, unrelated animals of the same or different species may protect, care for, and become inseparable from each other following injury, disability, or abandonment. (Id. at 75). These examples of affection or love seem to go beyond the realm of genetic altruism and into the ambit of genuine non-biologically-driven emotion.

Just like humans, animals can get angry. Biologically, humans and animals possess brain structures, like the hypothalamus, and chemicals, like testosterone and serotonin, that are implicated in anger. (Id. at 78). Behaviorally, birds have been observed narrowing their eyes, puffing up their feathers, stealing food, and fighting and killing other birds, even their own siblings. (Id. at 79-81). Additionally, like humans, hyenas and baboons express anger through fighting clan mates or troop members. (Id.) Chimpanzees have also been observed throwing feces at researchers who have taunted them. (Id. at 82).

Anger, however, often gives way to reconciliation and forgiveness. After fighting, chimpanzees have been observed kissing and embracing. (de Waal, 2011, TED talk). As with humans, the principle is essentially that valuable relationships that become damaged must be repaired. (Id.)

Empathy in animals, much like empathy in humans, can be readily observed. Animals have shown behaviors that demonstrate their ability to selflessly care for others. (Id. at 11). For instance, various anecdotes describe how orphaned animals stick with and help siblings to survive in the wild. (Id.) Other anecdotes describe how groups of animals rescue and assist sick, injured, or stranded members of their group. (Id.) Additionally, in one laboratory study, rhesus monkeys would not accept food, even though they were hungry, if accepting the food would cause other monkeys to receive an electric shock. (Id.) These monkeys were less likely to shock monkeys that they knew, or if they themselves had previously experienced the shock. (Masson & McCarthy, 1995, p. 162). Mice in pain research who witness other mice being injected with painful chemicals respond more strongly to the same injections. (Bekoff, 2007, p. 11). In another laboratory study, a Diana monkey assisted a mate in obtaining food when the mate could not get it on her own. (Id. at 130). These anecdotes and observations reveal that animals can indeed be empathetic, even if the empathy is not expressed exactly the same way as it is in humans.

According to Frans de Waal, reciprocity and empathy are the foundation of morality. (de Waal, 2011, TED talk). In one study on cooperation and reciprocity in animals, two chimpanzees worked together to move a heavy box filled with food; with synchronization, they pulled ropes connected to the box, until the box was close enough

for them to reach the food. In a variation of the study, one of the chimpanzees was fed beforehand. Even though the chimpanzee had already been fed and was no longer interested in obtaining the food within the box, it still pulled its end of the rope in order for the other chimpanzee to get the food. Both of the chimpanzees understood the need for cooperation, and the chimpanzee that was not interested in the food essentially performed a favor for the other chimpanzee. (Id.)

Cooperation and reciprocity have also been witnessed in research involving elephants. One study required that two elephants pull on separate ends of a rope simultaneously in order to move an apparatus filled with food. If only one end of the rope was pulled, the apparatus would not move. When both elephants reached the rope simultaneously, they each picked up one end of the rope and pulled together. When one elephant reached the rope first, it waited for another elephant to come along and help before pulling. The elephants understood the need to cooperate in order to obtain the reward of food. (Id.)

Empathy has also been demonstrated in chimpanzee studies. The yawn contagion that commonly occurs among humans is related to empathy. When chimpanzees are shown images of other yawning chimpanzees, they themselves begin to yawn. As Frans de Waal describes it, "[Yawn contagion] is related to that whole body channel of synchronization that underlies empathy and that is universal in mammals." (Id.)

Chimpanzees also display empathetic consolation behavior that is very similar to the human behavior. After a chimpanzee loses a fight, other chimpanzees have been seen to approach and place their arms around the defeated and distressed animal. In another study involving chimpanzees and food tokens, chimpanzees were observed to use social

food tokens, which awarded food to themselves and another chimpanzee, more often than selfish food tokens that awarded food only to themselves. In a separate study on fairness, chimpanzees were required to perform a task in order to receive grapes. Despite the desire to eat the grapes, the chimpanzees would refuse the food until their chimpanzee partners in the study also received grapes. In all of these studies, the chimpanzees displayed behaviors that indicated their empathy and consideration for other members of their species. (Id.) These behaviors are markedly similar to human behaviors, and therefore, serve as evidence that like humans, animals are also capable of engaging in moral behavior.

Since animals have emotions and engage in moral behavior, they have moral status. Based on their moral status, animals are entitled to moral consideration. In terms of research, though animals may be used in pain research, their use is limited to only those circumstances when there is a significant justification. Additionally, even when there is a significant justification, animals are entitled to the same protections and limits that human research subjects, like children, are granted through the regulations.

**The Closing**

When discussing animal emotion, humans struggle to avoid anthropomorphizing behaviors. (Midgley, 1984, p.130). Yet, to discard anthropomorphic language altogether and to instead institute an objective, non-humanized language in such cases would effectively deny that animals have an active mental life, which evidence seems to indicate that they do possess. (Regan, 2004, p. 26). Using anthropomorphic language does not imply that humans and animals subjectively experience emotions in exactly the same way. (Bekoff, 2000, p. 867). Instead, such language simply makes animal emotion

predictable, practical, and "more accessible to [humans]." (Id.) To believe that humans are emotionally driven beings, but to deny that animals are capable of experiencing and expressing similar emotions, is both arrogant and a clear demonstration of speciesism. (Regan, 2004, p. 30-31). Those who argue against the existence of animal emotion have yet to definitely prove that emotion is a human-only experience. (Bekoff, 2000, p. 862). Until the exclusivity of emotion can be proved, animals should be given the benefit of the doubt, and they should be granted moral status based on their ability to experience and express various emotions.

Though animal emotions can be difficult to study, particularly the subjective component, it does not mean that animal emotions do not exist or that they should be disregarded. Humans and animals experience similar emotions. Though not all animals have the same emotions, the emotions that each species do have can be readily observed and studied. Even though it may be impossible to know with absolute certainty whether neurologically developed animals experience humanlike emotions, based on similarities in behavior, anatomy, physiology, neural and biochemical processes, it is likely that their emotions are similar to human emotions. (Alain, 2007, p. 376-77). These similarities suggest evolutionary continuity of emotion between animals and humans. Emotions are important and unique to humans individually and in their relationships with others. Similarly, emotions are important and unique in the lives of individual animals and in their social interactions with other animals. When more time and energy are devoted to the study of animal emotions and the topic becomes less taboo, humans may finally come to realize that like themselves, animals are emotional beings. The more evidence that can be collected on animal emotions, the stronger the argument can be made that based on

their sentience, animals have moral status and are worthy of moral consideration and the same protections that humans, specifically children, are granted in research.

CHAPTER THREE

Cognition and Emotion: Linking Process to Experience

"A conscious being is one which can mind what happens to it, which prefers some things to others, which can be pleased or pained, can suffer or enjoy."
-Mary Midgley

## The Argument

One definition of cognition proposed by Bekoff refers to it as the capacity for animals "to flexibly and adaptively exploit the sources of information in their physical and social environments." (Bekoff, 2009, p. 139). Cognition broadly encompasses the concepts of thinking, awareness, judgment, and reasoning. (Id.) Animal cognition is a highly contested concept, particularly among pain researchers. Pain is multidimensional, and one component of pain is the conscious perception, or feeling, of painful stimuli. (Orlans, 1993, p. 129). To say that animals have mental experiences and are self-aware is to lend credence to the idea that they can perceive pain and can suffer in pain research. Because there is ample evidence that neurologically developed animals are indeed sentient, conscious, and self-aware beings with moral status, they are entitled to moral consideration, and have the right to not be subjected to pain research that is not justified under all the relevant circumstances.

Emotion and cognition are inextricably linked. The link is primarily based on the fact that many complex emotions, such as regret, guilt, and even suffering, require high-level conscious thought and reflection. (Bekoff, 2007, p. 13). Cognition and emotion are demonstrable human capacities that are related and interdependent. Humans as a class can be granted moral status based on these two capacities. Since evidence tends to indicate that animals are also emotional and cognitive beings, they arguably also have moral status.

Animal moral status is on a continuum with human moral status. The cognitive capacities of animals may not be on par with average human cognitive capacities. Additionally, not all animals exhibit higher-level cognition. Nevertheless, even if animal cognition differs in degree in comparison to human cognition, cognitive continuity between humans and animals is difficult to deny. As the American moral philosopher David DeGrazia puts it, ". . . we have good reason to suppose that all conscious animals can experience pleasant and unpleasant feelings, that such feelings implicate desires, and that desires work with beliefs in intentional action." (DeGrazia, 1996, p. 175). Essentially, as the evidence implies, like humans, animals have minds and the capacity to know what they are feeling. One cannot acknowledge that animals have colorful emotional lives without also acknowledging that they have rich cognitive lives. (Cavalieri, 2001, p. 16-17). Additionally, cognitive processes play a role in initiating and managing animal emotion. (Paul et al., 2005, p. 469). In the same vein, emotion can affect cognitive processes through attention, memory, and judgment biases. (Id.)

**Cognition in Detail: The Appraisal Process**

Cognition involves the acquiring, processing, and storing of information. (Boissya et al., 2007, p. 378). In its relation to emotion, in order to experience and gauge the quality of an emotion, a cognitive appraisal of the emotive stimulus or event may be necessary. (Id.) Whereas simple and basic emotions may be triggered without much conscious cognitive appraisal, more complex emotions require conscious thought processes and necessarily, cognitive appraisal. (Paul et al., 2005, p. 476). Essentially, individuals use cognitive appraisal in order to assess the relevance of stimuli or events in their own lives at a given point in time. (Paul et al., 2005, p. 475). In regard to emotive

stimuli, individuals engage in cognitive appraisal to assign value and importance to the stimuli in order to determine how to emotionally and physically react. (Id.)

Complex emotions, both positive and negative, are believed to arise as a result of cognitive appraisal. (Désiré et al., 2002, p. 165). This appraisal process involves an evaluation of several criteria. (Id.) The first criterion involves an assessment of the central characteristics of the emotive stimulus or event, such as its suddenness, newness, or pleasurableness. (Id.) Another criterion considers any conflicts that arise between the emotive stimulus or event and the individual's own needs and wants. (Id.) A third criterion examines the individual's coping potential, or his or her ability to control the stimulus or event. (Id. at 165, 177-78).

The appraisal is not necessarily a highly complex or analytical process, but rather can be an automatic and intuitive assessment of positive or negative stimuli or events. (Boissya et al., 2007, p. 378). In one model of the cognitive appraisal, the appraisal process itself is two-layered. (Id.) The first layer involves the assessment of whether an event or stimulus will affect or alter the wellbeing of the individual. (Id.) The second layer involves interpreting the meaning of the effect or alteration on wellbeing. (Id.) Other models of cognitive appraisal involve multiple layers. (Paul et al., 2005, p. 476). As one research group explained it, the multilayered appraisal process can range "from rapid evaluations (e.g. of angry faces or dangerous animals), which are immediately relevant to approach or avoidance and take place even prior to conscious perception, to subtle and complex evaluations (e.g. of interpersonal communications) which are slower and probably take place with conscious involvement." (Id.) No matter how many layers

are involved, cognitive biases can affect the type of emotion that is experienced, as well as the intensity of the given emotion. (Id.)

The speed of the cognitive assessment varies depending on the type of emotion that an event elicits. (Boissya et al., 2007, p. 378). Additionally, the being's assessment of a particular emotive stimulus can be influenced by its memory of prior encounters with similar stimuli, and the general concepts that it previously formulated. (Id.) Stimuli that are appraised as being positive tend to lead to the experience of positive emotions such as happiness and joy. (Id.) Alternatively, stimuli that are appraised as being negative can lead to emotions such as sadness, fear, and suffering. (Id.) Following the complete cognitive appraisal, the individual usually behaves in a way that it believes will maximize pleasure and avoid pain. (Id.)

**The Historical Arguments Against Animal Cognition**

Cognition is a psychological property that is often described as being distinctly human. Descartes believed that only humans are conscious beings, because unlike animals, humans have the ability to reason. (Midgley, 1983, p. 11). Since animals cannot reason, they are not conscious; since they are not conscious, they are mere machines lacking mental and emotional states. (Id.) If animals are not conscious beings, then they merely exist as a means to a human end; here, the end is furthering knowledge of human pain. Consequentially, if animals are not conscious beings, then they cannot have desires, beliefs, and complex emotions, because each requires thoughts, rationality, and intellect. (Id. at 58).

Along similar lines as Descartes, Russian physiologist Ivan Pavlov proposed an animal stimulus-response model that minimized the possibility of animal cognition.

Basically, Pavlov's work was based on the idea that a given stimulus causes a reflexive physiological response that does not require the cognitive processes of thinking, awareness, judgment, and reasoning. (Clark, 2004, p. 279). In essence, animal behavior can be boiled down into simple automatic physiological responses.

According to the philosopher Ludwig Wittgenstein, consciousness is only accorded to those beings with language skills. (Singer, 2009, p. 14). Since animals are unable to use language that humans can understand, they lack beliefs and perceptions. (Rollin, 1989, p. 43). Since animals lack beliefs and perceptions, "they can only live at best only in a world of isolated, fragmented, momentary particulars." (Id. at 44).

The theories and work of Descartes, Pavlov, and Wittgenstein serve as arguments against the existence of animal cognition. All three individuals seem to suggest that for various reasons, cognition is a human-only capacity. Consequentially, if animals are not cognitive beings, then they cannot have moral status. However, cognition is not necessarily associated with being human, as evidence suggests that most neurologically developed animals possess similar cognitive capacities as humans do, albeit to different degrees. Moreover, cognition is a sufficient but not a necessary condition for moral status. (Sapontzis, 1987, p. 62).

The arguments against animal cognition fail to consider empirical evidence that neurologically developed animals are intelligent and self-aware, even without the ability to use verbal language. Accordingly, like humans, animals have moral status based on cognition. Since animals are conscious and self-conscious beings with moral status, they have interests, such as the interest in avoiding pain. Moral status, plus the fact that the goal of pain research is to inflict pain; that pain research benefits humans only; and that

animals cannot consent to participating in pain research, all warrant animals being granted moral consideration. This moral consideration is the same moral consideration that is granted to human research subjects. As such, while animals may be used in pain research, their use should be limited to only those circumstances when there is a significant justification. Furthermore, even when a significant justification exists, neurologically developed animals should be granted the same protections and limits that human research subjects are afforded in current regulations.

**The Evidence**

Evidence of animal cognition includes brain and behavioral studies. Physiology and behavior are important in examining cognition, as both suggest inner mental states and biological processes that are associated with information processing and emotional states such as fear and suffering. (DeGrazia, 1996, p. 85). The results from animal physiological and behavioral studies can be compared to human physiology and behavior in order to support the idea of cognitive continuity between animals and humans. (Regan, 2004, p. 80). As Regan puts it, ". . . the content of animals' beliefs is empirically determinable." (Id.) Brain studies have shown structural and functional similarities between humans and animals. (Beauchamp & Childress, 2009, p. 73). Behavioral studies have shown that many animals can learn from past experiences and remember and use the information gained to anticipate and plan for prospective intentional behavior. (Id.) For instance, animals including wolves, red foxes, and some species of birds have been observed hiding or ignoring food only to retrieve and consume it later. (Bekoff, 2007, p. 14). According to Bekoff, "Animals talk to us using a myriad of behavior patterns –

postures, gestures, and gaits – along with their mouths, tails, eyes, ears, and noses." (Id. at 15). The way animals behave is indicative of their cognitive capacities.

Many animals are self-conscious the same way that humans are self-conscious. (Sapontzis, 1987, p. 29). Self-consciousness, or self-awareness, refers to the ability of a being to have a self-concept, or the ability to recognize oneself as an individual that is separate from other members of the same species. (Bekoff, 2009, p. 141). Self-consciousness also implies the ability to engage in intentional action in order to satisfy one's desires. (DeGrazia, 1996, p. 174-75). As an example of self-consciousness, some great apes that can use sign language are able to recognize and identify themselves in mirrors. (Cavalieri, 2001, p. 118). Additionally, these great apes are able to sign about themselves in reference to past and future events. (Id.) These animals are also able to devise and perform complex tasks that require cooperation, for instance, in order to satisfy their desires. (Id.) Self-consciousness differs from basic consciousness and awareness, in that self-consciousness is more complex and involves a deep understanding and recognition of one's own body as distinct from the rest of the world. (DeGrazia, 1996, p. 101, 167). While basic consciousness may be necessary for some cognitive tasks, self-consciousness and not basic consciousness may be necessary for higher order cognitive functioning, such as that related to reasoning. (Id. at 103).

Another form of self-awareness is social self-awareness, or an understanding of how individuals mesh with other members of a species or group. (DeGrazia, 1996, p. 176-77). Social self-awareness has been demonstrated among animals, and serves as further evidence that animals share cognitive capacities with humans. (Id. at 177). Great apes, lesser apes, dolphins and elephants have all shown signs of social self-awareness.

(Id.) For example, individual dolphins within a school emit a signature whistle. (Id.) This signature whistle identifies and separates each dolphin from every other dolphin within a group. (Id.) As a separate example of social self-awareness, some species of whales and dolphins have been observed helping other species that are stressed or struggling in the water. (Id. at 178). The assistance that the animals give to other species demonstrates their ability to behave morally, and to abstractly perceive and identify distress in others. (Id.)

Animals with a self-concept have certain thoughts, beliefs, perceptions, and desires. (Bekoff, 2009, p. 141). Additionally, these animals often recognize members of their species as unique individuals with individual mental states, and "treat them accordingly." (Sapontzis, 1987, p. 61). As stated by the authors Tom L. Beauchamp and James F. Childress, "These animals are aware of their bodies and their interests, and they distinguish those bodies and interests from the bodies and interests of others." (Beauchamp & Childress, 2009, p. 73). Great apes, for example, are able to see or postulate events from the viewpoint of other apes and use that information to engage in actions, such as intentional deception. (Cavalieri, 2001, p. 118). Essentially, animals are capable of acting with intention and purpose. As described in chapter one of this thesis, one theory of moral status is based on cognitive capacities, including self-consciousness, the ability to engage in purposeful actions, reasoning, language, and volition. (Beauchamp & Childress, 2009, p. 71). As both humans and animals possess similar cognitive properties, both have moral status.

Even without verbal language, animals are capable of communicating their beliefs and desires in other ways. (Sapontzis, 1987, p. 29). Language is not required in order for

animals to have thoughts, beliefs, and desires, nor is it required for animals to have cognitive capacities, generally. (DeGrazia, 1996, p. 183). Although humans cannot know with absolute certainty how animals feel without human verbal language, nonlinguistic body language, facial expressions, odors, and sounds can effectively communicate both the feelings and thoughts of animals. (Bekoff, 2007, p. 13-15).

Not only can animals effectively communicate with other animals, but they can also communicate with humans to convey information about their emotions. (DeGrazia, 1996, p. 183). Aside from natural and instinctive communication, animals such as great apes, dolphins, and sea lions have demonstrated significant capacities for learning and understanding verbal and gestural commands from humans. (Id. at 193). Additionally, some trained great apes are able to communicate both nonverbally through sign language or symbols, and verbally by pressing keys on a keyboard, to communicate their desire for certain things such as food, water, tools, and toys. (Id. at 194). These apes have been observed signing to themselves and to other apes, initiating conversations with humans, deceiving human trainers, and requesting things that are not currently before them. (Id. at 196-97).

Animals do not react haphazardly or reflexively to all forms of external stimuli. (Sapontzis, 1987, p. 29). Instead, many neurologically developed animals act intentionally and possess rationality, individuality, and intelligence. (Id.) They uniquely use their abilities when they encounter and assess practical problems or certain stimuli. (Id.) Animals know that they are experiencing a particular event or stimulus, and they change their behaviors and beliefs in order to learn and form memories. (Rollin, 1989, p. 47-48).

In the realm of pain research, since animals can learn and form memories, they may be able to foresee and remember the pain that they experience in research. (Id. at 48). The fact that animals experience negative emotions and behave in particular ways in pain research suggests that they have mental states and are consciously aware of the pain that is being inflicted upon them. Even without the ability to use language, animal consciousness can be identified and explored through their emotions. Due to their ability to experience and express emotion, along with their status as conscious and self-aware beings, neurologically developed animals have moral status. Based on their moral status, and the unique circumstances surrounding animals and pain research, they should be granted moral consideration. Based on this moral consideration, animals, like humans, should be given the same protections and limits in research that human research subjects are given; specifically, the animal regulations should mirror the children regulations.

**Linking Emotion and Cognition**

When neurologically developed organisms experience a change in emotion, there can also be a change in "the way they think about the world." (Paul et al., 2005, p. 470). Even without the ability to communicate with verbal language, cognitive measures can be used to measure animal emotion. (Id.) Although the cognitive components of animal emotion have not been extensively studied, the emotional states of animals can be assessed through their decisionmaking and the manner in which animals process information. (Burman, 2008, p. 330).

The cognitive components of emotion involve changes in information processing. (Paul et al., 2005, p. 471). More specifically, cognition involves the initial assessment and processing of situations or stimuli that subsequently produce various emotional

responses. (Id. at 469). Emotional responses, in turn, affect cognitive functioning by stimulating attention, judgment, and memory biases. (Id.)

Through the use of emotions, such as pleasure and suffering, animals are able to utilize different behaviors to increase their overall wellbeing. (Dawkins, 2000, p. 886). As Marian Dawkins explains it, ". . . without emotions to guide it, an animal would have no way of knowing whether a behavior never performed before by any of its ancestors should be repeated or not." (Id.) Through trial and error in cognitive tasks, animals are eventually able to learn and build a repertoire of behaviors that lead to pleasure and avoid suffering. (Id.) For example, rats can learn to push a lever if the action leads to a pleasurable reward, such as food. (Id. at 886-87). The rats are not naturally programmed to push the lever, but engage in the behavior based on their feelings of pleasure in obtaining the reward. (Id. at 887). Essentially, neurologically developed animals are able to perceive their environment and then, based on their feelings and on reason, tailor their behavior accordingly. (Griffin, 1989, p. 57). These animals also change their behavior based on changing circumstances in order to promote happiness and avoid pain and suffering. (Id.) In this sense, cognition is adaptive and evolutionarily advantageous in that instead of acting haphazardly, animals think about all of their potential courses of action, and then behave in ways that will reap them the greatest net benefit. (Id.) Additionally, cognition enables animals to think about the consequences of a behavior before engaging in actions that are life-threatening or futile; this is especially true when the events or stimuli are particularly difficult, new, or unfamiliar. (Id. at 58).

The cognition-emotion link can also go in the opposite direction. Emotion can affect cognitive processing and create attention, memory, and judgment biases. (Boissya

et al., 2007, p. 379). In terms of attention bias, the emotional states of fear and anxiety can cause an individual to focus on the fear-or anxiety-eliciting stimulus or event. (Id.) With this attention bias, fearful or anxious stimuli or events can cause individuals to bias their attention toward the stimuli as a means of avoiding harm and protecting themselves from pain. (Paul et al., 2005, p. 477). Attention bias in animals can be measured through rapid body movements or jumps, eye widening, and enhanced watchfulness, and physiologically through amygdala activation. (Id. at 480-81).

With memory bias, stimuli or events from the past that previously led to positive or negative emotions are more easily remembered than more neutral stimuli or events. (Id.) As an example, the emotional state of sadness can cause an individual to remember and reflect upon past sad stimuli and events. (Boissya et al., 2007, p. 379). Memory bias in animals can be observed hormonally in animals. (Paul et al., 2005, p. 481). These hormones interact with the amygdala and hippocampus in the forming and storing of memories. (Id.)

In terms of judgment bias, emotions can affect judgment either directly or indirectly. (Id. at 478). Emotions can affect judgment directly by altering risk assessment behavior. (Id.) Emotions can affect judgment indirectly by altering related attention and memory processes that in turn, affect judgment. (Id.) Judgment bias in animals is complex and difficult to measure; however, anxiety tests that measure risk-taking behavior, as well as motivation, anticipation, and discrimination tasks are commonly utilized. (Id. at 482-84).

An illustration of cognitive biases can be observed among rats. Rats have displayed greater startle responses to sudden stimuli when they are experiencing negative

emotions. (Boissya et al., 2007, p. 379). Additionally, rats experiencing constant negative or stressful emotions while living in unpredictable housing have judgment difficulties. (Harding, 2004). When presented with neutral, ambiguous, or positive stimuli, these depressed or anxious rats are slower to respond and display reduced anticipation of future positive stimuli or events. (Id.) The animals are also slower to move toward positive food rewards. (Burman, 2008, p. 330). These findings coincide with human findings that indicate that humans with anxiety or depression are less likely to anticipate positive events. (Harding, 2004). Similar studies have been conducted on rhesus monkeys, dogs, and birds, all with the same hypothesis: Animals in negative emotional states will be more likely to judge neutral or ambiguous stimuli in the same way that they judge negative stimuli. (Mendl, 2009, p. 161). Thus far, the results from various animal studies have supported this hypothesis.

Evolutionarily speaking, humans and animals share similar brain structures. One such structure is the amygdala, which is involved in the processing of emotion. In terms of cognition, the amygdala plays a role in associating otherwise neutral stimuli with fear responses, a learning process known as fear conditioning. (Phelps & LeDoux, 2005, p. 175). Additionally, the amygdala has molecular and synaptic connections that are involved in forming and storing memories associated with fear conditioning. (Id.) As an example, rats can learn to associate a neutral tone with an aversive stimulus, such as an electric shock; the association is essentially a learned fear response. (Id.) In such instances, the amygdala plays a role in forming and storing memories of the fear conditioning and the expression of the fear response. (Id.) Along with playing a role in memory formation, the amygdala is also implicated in attention and perception; it is

believed that once a stimulus is detected by the amygdala, there is a signal transfer to the cerebral cortex, which in turn leads to attention and perception. (Id. at 178). Animals that have had their amygdalas damaged in research display a reduction in fear arousal, along with difficulties in utilizing cognitive coping strategies and in regulating their emotional responses. (Id. at 183).

Just as emotions can affect cognition, cognitive processes can increase amygdala activation and the subsequent expression of emotions. (Id.) Aside from the amygdala, other brain structures are implicated in the processing and measuring of emotion. Such brain structures include the thalamus, hippocampus, and prefrontal cortex, to name a few. (Paul, et al., 2005, p. 472).

**The Closing**

According to the Italian philosopher Paola Cavalieri, to have cognition and to be conscious "means to have experiences and to care about these experiences. It means to have at least the interest in avoiding pain and experiencing pleasure." (Cavalieri, 2001, p. 38). It is not anthropomorphic to say that neurologically developed animals are conscious and even self-conscious beings. Cognition, like emotion, is a property that is not human-only, but is shared by both humans and animals. As Darwin correctly postulated, the difference between the species is one of degree rather than kind. The biological and behavioral evidence tends to support the idea that human and animal emotional and cognitive capacities essentially fall on an evolutionary continuum of complexity. (Bekoff, 2007, p. 33). While biology and behavior do not prove absolutely that animals have cognition and colorful mental lives, the evidence is consistent with and supports the existence of animal cognitive functioning. (Regan, 2004, p. 27). Even if humans are

unwilling to ascribe consciousness and self-consciousness to animals, it is reasonable to assume, based on the evidence, that animals are indeed aware and self-aware beings with beliefs and desires.

According to philosopher and professor R.C. Solomon, "We need not ask whether animals have intelligence, or language, or emotions, but rather what intelligence, what kind of language and which emotions." (Solomon, 1982, p. 47). The issue of animal cognition is important to the questions of moral status, emotion, and specifically, the ability for animals to perceive pain and suffer in pain research. Cognitive properties are morally significant properties, and since neurologically developed animals have cognition and the capacity to suffer, they also have moral status. Additionally, since animals indeed have the capacity for understanding, intending, and suffering, these morally significant properties themselves confer some form of moral status.

Compared to other types of research, pain research is particularly ethically concerning. The goal of pain research here is to inflict pain on animals. The pain research itself is meant to benefit humans and not animals. Moreover, since animals cannot verbally articulate how they think or feel, they are unable to give consent to participate in the research. Humans are conferred moral status based on emotion and cognition. The fact that animals have emotional and cognitive capacities, even if they are not equivalent in complexity to human emotional and cognitive capacities, grants them moral status. Animal moral status essentially lies on a continuum with human moral status; this continuum ranges from the simplest neurologically developed animals to higher developed animals, and finally to humans. Moral status plus the unique circumstances of animals in pain research warrant animals being granted moral consideration. Necessarily,

this moral consideration requires that animals be afforded the same protections and limits in research that humans are afforded. Ideally, the protections would be on par with the protections granted to children research subjects.

CHAPTER FOUR

U.S. Legislation: A Work in Progress

"In a gentle way, you can shake the world."
-Mohandas Gandhi

## The Argument

Compared to the protections granted to human research subjects in the United States, current laws and regulations for the protection of animal research subjects are weak and somewhat vague. Despite the fact that U.S. regulations have set up some guidelines for animal research, it has been argued that they do not necessarily go far enough to protect animals. (Walker & King, *Biodefense Research*, p. 294-96). This argument can be applied to pain research on animals, specifically. The protection of animals in pain research is particularly ethically significant because the goals of such research are accomplished through the intentional infliction of pain, most often without the use of analgesics, for human-only benefit. Though laws and regulations in the U.S. have greatly reduced the number of animals used in research, the concern over using animals in pain research solely for the benefit of humans is still an ethically significant issue that must be further addressed.

Without granting animals moral status, humans may be able to use animals freely in research, generally, without being obligated to adequately respect the animals' rights, interests, needs, and welfare. (Id. at 297). However, evidence of emotion and cognition among neurologically developed animals strongly suggests that like humans, these animals have moral status and hence, they are worthy of moral consideration. This shared moral consideration necessarily requires comparable protections and limits in pain research. Although animals may be used in pain research, due to poor translation, the justification for the continued use of animals is missing. In this chapter, evidence will be

presented that (1) animals are, in many cases, poor models for humans; and (2) animal studies are often poorly done. This evidence serves to reinforce the lack of appropriate consideration of animal moral status in pain research.

While removing all animals from all types of research is not completely feasible at this time for various reasons, a drastic reduction, as opposed to a complete removal, is not only feasible, but may also be ethically required in the case of neurologically developed animals in pain research. Since neurologically developed animals have moral status, are able to perceive and experience pain, are unable to give informed consent, are unable to verbalize their subjective experience of pain, are unable to refuse or withdraw from participation to avoid suffering, and are worthy of moral consideration, U.S. laws and regulations should reflect such actualities. Essentially, the vulnerability of animals, combined with their moral status and their entitlement to moral consideration indicate that animal regulations should mirror human research subject regulations.

In order to put into perspective the uniqueness of animal pain research, as well as the urgency in better addressing it legislatively, it is necessary to examine how laws, regulations, and policies currently address animal research generally.

**Background: The Three R's**

One source of guidance on more humane animal research techniques originated in the 1950s with the concept of the Three R's by the British biologists William Russell and Rex Burch. (W.M.S. Russell & R.L. Burch, 2013). In order to make research more humane, the Russell and Burch approach advocates the Three R's of reduction, refinement and replacement. (Id.) Reduction refers to reducing the overall number of animals used in research; the whole idea is to reduce the total number of animals used in

a particular study and to avoid duplicative studies. (Id. Chapter 6). Refinement refers to decreasing the number of inhumane procedures conducted on animals, as well as minimizing the level of pain, suffering, and distress inflicted upon them. (Id. Chapter 7). Replacement, generally, refers to removing living, sentient, and cognitive animals from the research setting. (Id. Chapter 5). The concept of replacement is divided into incomplete and complete replacement. (Nuffield Council on Bioethics, 2005, p. 191). Complete replacements do not utilize any animal-derived materials in research. Examples of complete replacements are human models, mathematical or computer models, and tissue chips. Incomplete replacements utilize cells, tissues, or other biological materials from either living or dead animals. In vitro models are considered to be incomplete replacements. However, in vitro models that utilize human biological materials as opposed to animal materials are considered to be complete replacements. (Id.)

In the realm of animal pain research, the Three R's are highly applicable. In terms of reduction, the number of animals used in pain research can and should be greatly reduced. Since, as previously discussed, neurologically developed animals possess moral status based their emotional and cognitive capacities, they are also entitled to moral consideration. Based on this moral consideration, animals are entitled to comparable human protections and limits in pain research. Even with these protections and limits, pain research is only justifiable if and when the harm to subjects is minimized and justified in light of the knowledge to be gained. Because most pain research on animals does not minimize harm, and may not result in human clinical potential due to poor translation, the overall number of animals used in pain research should, for ethical and practical reasons, be reduced. For the same reasons, refinement and replacements should

be actively pursued and applied. Refinement would involve decreasing the levels of pain, suffering, and distress on animals, and recognizing when animals have reached their limits, and allowing them to refuse or withdraw from further participation to avoid suffering. With replacement, complete replacements such as human models, computer models, or tissue chips should be used in place of animals in pain research. Though it may take time to further develop these pain models, in order to properly respect animals' moral status and to potentially improve human clinical potential, they should be vigorously pursued and utilized.

**Current Laws & Regulations**

Animal research regulation is a subset of the regulation of animals more generally. Current laws and regulations in the U.S. attempt to protect animals by limiting the number of them used, and the degree of pain and suffering that is inflicted upon them. (Rowan et al., 2013). Animals are widely used in research notwithstanding the fact that evidence suggests that animal models are expensive, time consuming, and are poor predictors of human clinical utility. (Bekoff, 2009, p. 236). The exact number of animals used in research in the U.S. is difficult to quantify; it is even more difficult to determine the exact number of animals used in pain research, specifically. (Id.) Estimates from the year 2006 were that approximately one million cats, dogs, and primates were used in all types of research; and anywhere from eighty to one hundred million mice and rats served as animal subjects. (Id.)

When human efficacy studies are deemed unethical, the 2002 U.S. Food and Drug Administration's Animal Rule permits data from animal studies to be translated to humans. (Walker & King, *Biodefense Research*, p. 278). That is, when studies are too

unethical to conduct on humans, animals may be used instead, with the goal of obtaining a human-only benefit. (Id.) However, the attribution of moral status to animals conflicts with the Animal Rule. (Id. at 279). If neurologically developed animals have moral status based on their emotional and cognitive capacities, then to subject animals but not humans to certain types of research that involve pain and suffering effectively discounts animals' moral status. Pain research negatively affects the interests of animals through the infliction of pain, suffering, distress, and even death on the animal subjects. Even if animals have a lower degree of moral status than what humans possess, to allow certain types of pain research on animals but not on humans seems morally impermissible.

Aside from the Animal Rule, the U.S. regulatory structure as a whole does not address animal moral status. (Id. at 295). Despite evidence that neurologically developed animals have moral status based on their emotional and cognitive capacities, humans and animals are treated very differently in research. Human research subjects are protected by the Common Rule found in Subpart A of 45 CFR part 46. (HHS.gov, 2013). In order for a research protocol to be approved, an institutional review board must ensure that the risks to human subjects are minimized. (45 C.F.R. § 46.111 (2013)). Additionally, there must be a balancing of benefits and risks in order to make sure that the risks to humans are justifiable considering the expected human benefits. (Id.) Furthermore, the selection of human research subjects must be fair, and special attention must be given to vulnerable groups, such as children. (Id.)

Today, animal research in the U.S. is mostly regulated by the Animal Welfare Act of 1966 (AWA), which is enforced by the U.S. Department of Agriculture, and the U.S. Public Health Services Policy on Humane Care and Use of Laboratory Animals (PHS),

which is implemented by the NIH Office of Laboratory Animal Welfare (OLAW). (Walker & King, *Biodefense Research*, p. 295). The AWA and the PHS have polices in place that require strict institutional and committee oversight of animal research. (Id.) The AWA regulates the use of animals in laboratories and sets requirements for protecting the welfare of animal subjects. (Walker & King, *Animal Care*, p. 8). Additionally, the AWA sets requirements for oversight by institutional animal care and use committees (IACUCs). (Id.) These IACUCs are assigned the responsibility of reducing pain and suffering in animal research, which includes requiring that researchers utilize alternatives to painful research when they do not interfere with the goals of the research. (Rowan et al., 2013). Regulations pertaining to the AWA can be found in the first chapter of Title 9 of the Code of Federal Regulations. (USDA.gov, *Final Rules*, 2013). The other major source for U.S. regulation of animal research, the PHS, applies to research on vertebrates. (Walker & King, *Animal Care*, p. 9). Under the PHS, laboratories that conduct animal research must abide by certain guidelines spelled out by the NIH Office of Laboratory Animal Welfare, to protect the safety of the animal subjects. (Id.) The PHS also requires that there be oversight by an IACUC. (Id.)

The arena of pain research on animals poses unique difficulties. Under Policy #11 of the AWA, a painful research procedure is defined as "any procedure that would reasonably be expected to cause more than slight or momentary pain or distress in a human being to which that procedure is applied, that is, pain in excess of that caused by injections or other minor procedures." (USDA.gov, *Policy #11*, 2013). Examples of painful procedures listed in the policy include surgery, tumor growth, food and water deprivation, electrical shock, thermal stress, paralysis, infectious and inflammatory

disease models, irradiation, and inhalation toxicity studies. (Id.) While IACUCs are in place to ensure that pain is minimized in research and that alternatives to painful procedures are considered, existing policies allow pain research to go forward when the goal of the research could not be achieved if pain is minimized or analgesia is administered. (Id.) IACUCs must either make sure that analgesics are properly used on animals in pain research, or approve the scientific reason for withholding analgesia. (Walker & King, *Biodefense Research*, p. 297). The whole idea of pain research is to inflict painful procedures on animals; the painful procedures that are directly listed in the AWA policy are the very same procedures that are often utilized in animal pain research. Policy #12 of the AWA requires that researchers consider the Three R's and alternatives to painful procedures, and then put those considerations into writing. (USDA.gov, *Consideration*, 2013). However, as stated in the policy, "methods that do not allow the attainment of the goals of the research are not, by definition, alternatives." (Id.) Just like Policy #11, Policy #12 also seems to give the green light for pain research on animals.

An additional concern with the AWA is that it does not cover rats, mice, coldblooded vertebrates, birds, or farm animals. (Walker & King, *Animal Care*, p. 8-9). In fact, the AWA, as written, does not cover 90% of animals currently used in research. (Ferdowsian, 2010). Moreover, the AWA does not set any kind of threshold for the amount and severity of pain that animals can be subjected to in research. (Id.) Due to this overall lack of information and clarity, IACUCs do not have clear ethical guidance on the amount and degree of pain and suffering that is acceptable for pain research protocol approval. (Id.)

Pertaining to moral status and research, generally, certain aspects of the policies and regulations, such as the requirement to treat animals humanely, seem to imply that all animals have moral status. (Walker & King, *Biodefense Research*, p. 296). However, there are other aspects of the regulations that indicate the opposite view, that animals lack moral status. (Id.) In order to recognize the moral status of a neurologically developed being, there must be a limit placed on the amount of pain and suffering that can be inflicted upon it. (Id. at 298). A critical concern is that none of the U.S. regulations spell out any moral limitation on the amount of pain and suffering that may be inflicted on animals in studies where pain and suffering are allegedly necessary components to the research. (Id. at 296-98). Essentially, there are no regulations in place that put limits on what animals are forced to endure, or that prevent the duplication of painful experiments. Furthermore, there is no clear requirement to balance the harms to animal subjects against the potential benefits to humans. (Id. at 298). The lack of a moral limitation on animal pain and suffering and the failure to require a balancing of animal harms and potential human benefits demonstrate how the U.S. regulatory structure essentially discounts animals' moral status.

The U.S. is the only country to still conduct invasive research on chimpanzees. (Ferdowsian, 2010). However, new federal rules have been proposed that would limit the use of chimpanzees in medical research. (Vastag, 2013). As a direct result of the federal rules, many of the 451 existing chimpanzees currently used in research by the NIH would retire from research. (Id.) Ongoing research would be allowed to continue until completion. (Id.) Furthermore, infectious disease and immunology research could

continue, as well as other types of potentially painful research, under certain conditions. (Id.)

Current U.S. laws, regulations, and policies do make strides to protect animals. However, the protection that is granted is limited and does not adequately extend to neurologically developed animals in pain research that solely benefits humans. Evidence indicates that neurologically developed animals have the capacities for cognition and emotion, which mean that they capable of experiencing pain and suffering. Additionally, based on their emotional and cognitive capacities, these animals have moral status, even if it is a lower degree of moral status than what humans possess. Since these animals have moral status, they deserve moral consideration. This moral consideration, in turn, requires that humans and animals have comparable protections and limits in pain research.

**Pain Research: Animals as Inadequate Models**

Biologically speaking, animals may not serve as suitable models for human pain. Translation from animal models to humans is one of the primary goals of animal research. However, in the realm of pain research, the results from many animal studies have not adequately predicted human outcomes, and have not significantly led to the development of new and effective pain treatments. (Mogil, 2009, p. 283). Though it is possible that animal models can provide some basic information on the pathways of human pain, the information that can be garnered is limited. (Langley et al., 2008, p. 468). Human pain is complex, multidimensional, and diverse, and animal models only tend to replicate "one or two simple aspects of human pain conditions." (Id. at 469). Furthermore, information from behavioral observations can be difficult to understand, let alone translate to humans. (Id.) As such, since animals may not satisfactorily model

human pain, it seems highly unnecessary to subject them to pain research, as the goal of gaining knowledge to benefit humans would not be satisfied.

Empirical data from systematic reviews of animal pain research, specifically, have shown poor clinical utility with animal models. As an example, one systematic review from 2009 examined animal pain studies published in the journal PAIN, where pharmacological intervention was assessed. (Rice, 2009, p. 244). Methodologically, of the fourteen isolated studies, only five were described as blinded; and only four were described as randomized. (Id.) Furthermore, none of the published studies described a power calculation, which refers to the probability that a clinical trial of a given pharmacological intervention will have a significant result. (Id.) Other examples of animal studies on pain have shown that NK1-receptor antagonists and enkephalinase inhibitors, while effective in animals at treating pain, were not clinically useful in humans. (Langley et al., 2008, p. 471).

Although it is entirely possible that poor translational data may be due to pain studies not being conducted well, or data not being adequately reported, it is also possible that poor data may be due to the lack of clinical utility of animal pain models. Aside from pain research, systematic reviews of animal models of stroke, coronary heart disease, heart failure, spinal cord injuries, low level laser therapy for wounds, and fluid resuscitation for bleeding have also failed to yield evidence of sufficient clinical potential in animal models. (Pound et al., 2004, p. 514-16).

According to Jeffrey S. Mogil, it is nearly impossible to translate information from animal pain studies because "we know less than we think." (Mogil, 2010). While animal pain studies can potentially lead to some scientific knowledge, the studies seldom

lead to clinical benefit. Mogil attributes poor translation to bad luck, bad clinical trials, species differences, bad animal models, and the complexity of animal models. In terms of the complexity of animal models, researchers can fall victim to overgeneralizing findings or becoming overly optimistic about results; at times, a drug or pain intervention may appear to work in animals, but the positive results may occur in only a small subset of cases and then not carry over to humans. Furthermore, whereas human pain is primarily spontaneous, the study of pain in animals is usually based on reflexive and evoked behavioral responses to painful stimuli. Human pain is complex, and the bottom line is that there is a serious divide between animal models of pain and human clinical pain. (Id.)

Over the years, animals have been used extensively in the study of human pain. (Mogil, 2009, p. 283-84). From the years 1963 to 2007, the animals most used in pain research were rats, mice, dogs, cats, and rabbits. (Id. at 285). Other species that have also been used include guinea pigs, cows, pigs, sheep, birds, hamsters, frogs, and reptiles. (Id.) Moreover, the United States is the only country to keep chimpanzees for medical and behavioral research. (Vastag, 2013). Today, young male rats are the most commonly used animal in pain research because it is assumed that they process pain in a similar fashion to the way that humans process pain. (Id.) However, human sufferers of chronic pain are characteristically middle-aged, female, and ethnically and genetically diverse. (Id.) Due to the complexity and diversity of human pain, animals may not sufficiently represent such pain. As such, animal models may play no significant role in the progress of human pain treatments.

**The Complete Replacement Alternatives**

Increased effort and funding must be devoted to developing replacement alternatives to animal models of pain. Current animal models are ethically unjustifiable and tend to have poor clinical utility. Complete replacement alternatives have the ability to remove animals entirely from research. (Balls, 1994, p. 195). These alternatives, in general, are also more advantageous than normal animal models in several respects. (U.S. Congress Office of Technology Assessment, 1986, p. 7). Besides eliminating animal pain and suffering, these alternatives can allow researchers to save time and reduce costs, as well as enable them to have greater ability to alter conditions and variables and to reduce error caused by animal variability. (Id.) Among the potential complete replacement alternatives are using human research subjects, in vitro models, computer models, and tissue chips composed of human cells.

A logical alternative to animal pain research solely for human benefit would be to conduct pain research on humans. In order to gain the most practical and applicable information on human pain, the best research subjects would be human patients or healthy human volunteers who can verbalize and describe the unique pain that they are experiencing. Unlike animals, humans can give details on the level, quality, and location of the pain that they feel. (Langley et al., 2008, p. 469). Additionally, conducting research on humans in conjunction with neuroimaging and in vitro human cell and tissue models can serve as viable replacements for animal pain research. (Id. at 468). Neuroimaging techniques, including positron emission tomography, functional magnetic resonance imaging, and magnetic resonance spectroscopy, are noninvasive and highly useful in examining the activity of brain structures and other organs that are involved in pain, as

well as the effects of various drugs and other pain treatments on cerebral blood flow, for example. (Id. at 468, 470). In vitro models involve testing isolated living tissues or cells in glass or petri dishes instead of performing research on whole living animals. (Draggan, 2013). In vitro models of human cells and tissues can be used to examine cellular and molecular mechanisms and pathways of pain. (Langley et al., 2008, p. 471). Cells and tissues from the human brain, nerve roots, and spinal cord that can be used to study pain, for instance, can be harvested from both living human patients, in the form of leftover tissue, and recently deceased humans. (Id.)

In silico or computer models can be used to test or even predict how particular chemicals or drugs will react or be processed in living organisms. (Draggan, 2013). Computer models may be used to study associations between molecular structures and biological activities "in the prediction of potential desired and undesired effects of a series of related chemicals." (Balls, 1994, p. 196). Additionally, through existing data, computer models may be used to graphically design various pain medications, and can model physiological and pharmacological processes within the body. (Id.) An example of one such computer program, called Tox21, is currently used to test potential cancer-causing chemicals. (Cohn, 2010). The toxicological data generated from computer models, like Tox21, are placed into a database to form a complete, accurate, and reliable list of various drugs, as well as information about their biological pathways, effects, and overall safety. (Blanckenburg, 2012, p. 17). Then, other researchers can access the database to garner information on particular drugs instead of performing unnecessary research on animals in an attempt to get the same information. (Id.) Computer models,

like Tox21, save time, money, and prevent animals from having to experience unnecessary pain and suffering in research.

Another alternative to animals that is currently being developed is a 3D cell-culture model called a tissue chip. (Huh, 2011, p. 745). Basically, tissue chips consist of human cells grown on a gel matrix. (Id.) Dubbed "organs-on-chips," these 3D models allow for the study of human physiology by creating essentially human organ-level functioning through microengineering and cell biology. (Id. at 751). The 3D cell-cultures mimic human organ functioning and can be used to study human diseases and to test the efficacy of various drug treatments. (Id.) Tissue chips can predict human clinical responses and can greatly reduce reliance on costly, time-consuming, and painful animal research. (Id. at 745, 751-52).

Though alternatives to animal pain models are available, none are perfect replacements. However, given enough effort, time, and funding, alternatives to animal pain research, and possibly even to all animal research, generally, can become a reality. Eventually, instead of using animals, absolute alternatives may be considered the "best practice." (Howard, 2005). The greater the progress in the development of complete replacement alternatives to animal pain research, the more reason there will be for legislators to amend laws and agencies to promulgate regulations that recognize the moral status of animals, and that eliminate their use in pain research.

**The Conclusions**

There seems to be a great divide between desiring progress in human pain research and liberating neurologically developed animals from the pain and suffering that they endure in such research. While animals undoubtedly serve as a major source of

knowledge on human disease, the potential benefits to humans and the harms to animals should be equally considered. Emotion and cognition are two properties that are often used in granting humans moral status. Evidence of animal emotion and cognition suggests that at least neurologically developed animals also have moral status. Based on their moral status, like humans, these animals are also entitled to moral consideration. Though pain research may be conducted on animals, there needs to be a significant justification for the research. Additionally, moral consideration requires that even when there is a significant justification, severe restrictions, protections, and limits must be put in place that are at least comparable to the protections granted to human research subjects.

Neurologically developed animals are used as subjects in pain research when it would be considered unethical to use humans. Under the U.S. Food and Drug Administration's Animal Rule, researchers are allowed to translate animal data to humans. However, it seems unethical to conduct pain research on animals because animals suffer in the research and there are no regulatory limits on their suffering if it is deemed necessary to the research. Additionally, pain research on animals is unethical because the research is solely for the benefit of humans, because animals are not free to refuse or withdraw from the research, and because animals are not good enough models for human pain to justify using them.

Essentially, it is permissible to use animals in pain research as long as the harm to animals is minimized and justified in light of the knowledge to be gained. Because harm to animals is not typically minimized in pain research, and because translation is poor, all or nearly all current and future pain research on animals would be invalidated. As it

currently stands, the Animal Rule and U.S. animal regulations do not adequately respect animals' moral status, and therefore, do not sufficiently protect animals.

Major legislative and policy-based changes need to be made in the field of pain research. Ultimately, there should be a complete phasing out of using neurologically developed animals in such research. Instead, complete replacement alternatives should be aggressively developed and legislatively required nationwide through laws, regulations, and policies. Complete replacement alternatives are not only more humane, but are also more applicable to human pain, and are less costly and time-consuming in the long run.

# CHAPTER FIVE

## Recommendations: The Right Not to be Harmed

"When it comes to having a central nervous system, and the ability to feel pain, hunger, and thirst, a rat is a pig is a dog is a boy."
-Ingrid Newkirk

It is undeniable that many humans subjectively experience pain. Pain is a serious matter, and society would indeed benefit from better knowledge of human pain and from the development of stronger, faster, and more effective treatments. However, the manner in which human pain is currently being studied has questionable moral implications.

Animal models are often used in pain research due to common anatomical, hormonal, neurochemical, and pain inhibiting systems between humans and neurologically developed animals. (Rollin, 1989, p. 63-64). Countless primates, dogs, cats, birds, fish, rabbits, guinea pigs, rats, and mice are subjected to horrific acts involving cutting, crushing, shocking, burning, freezing, and the injecting of chemicals and tumor cells. (Short, 1998, p. 126). The goal is to inflict and study pain that mimics human pain in order to gather information from the research that may be translated to humans with the goal of future clinical application.

In pain research, animals scream, cry, moan, grimace, and try to move quickly away from sources of pain – all behaviors that are a far cry from mere mechanistic responses to painful stimuli. Additionally, animals experience physiological changes, like humans do, during and following the administration of painful stimuli. (Bateson, 1991, p. 828). Such physiological changes include an increase in heart rate, blood pressure, temperature, and levels of circulating hormones, as well as heavy breathing and sweating. (Id.) While the experience of pain may be subjective, the behavioral and physiological patterns that are typically used to identify and gauge human pain can also be used to

identify and gauge animal pain. (Id. at p. 827-28). Compared to animals, humans may be more complex based on their ability to use language, but verbal language is not a necessary factor in recognizing and assessing pain. (Id. at 828). Behavior and physiology are more than sufficient indicators of animal pain. (Walker et al., 1999, p. 319).

Pain is multidimensional in that it involves physical as well as emotional and cognitive components. (Rowan, 1984, p.77). The ethical issues from pain research mostly center on the extreme levels of pain, suffering, and distress that the animal subjects experience, usually while conscious and without relief from anesthesia. Researchers and supporters of pain research on animals often condone the practice based on a moral status argument. If animals lack moral status, then they are not entitled to moral consideration, and humans are permitted to use them in pain research, regardless of the levels of pain, suffering, and distress involved. As the second and third chapters of this thesis elucidate, animals may very well possess moral status. Their moral status can be conferred based on their emotional and cognitive capacities.

The emotional and cognitive continuities between humans and animals are difficult to deny. Biological, behavioral, and evolutionary evidence strongly suggests that humans and neurologically developed animals share the ability to experience complex emotions, including the emotional state of suffering. Additionally, both humans and animals have varying levels of cognitive capacities. In order to demonstrate the similarities between humans and animals, humans can compare animal behavior and physiology to human behavior and physiology while experiencing emotions or engaging in various cognitive activities. (Regan, 2004, p. 80). A comparison would reveal that

although humans may have more complex emotions and cognitive skills, overall, both humans and animals are emotionally and cognitively similar.

Animal emotion is evidenced by biology and anecdotes of behavior. Biologically, during various emotional states, both humans and animals have activation of neurons, the amygdala, and other brain structures commonly associated with positive and negative emotions. (de Waal, 2011, p. 193). Furthermore, humans and animals in negative emotional states have increases in temperature, heart rate, breathing, and circulating blood levels of the emotionally-linked hormones oxytocin, epinephrine, testosterone, serotonin, catecholamine, cortisone, and adrenocorticotrophic hormone. (Orlans, 1993, p. 141). Anecdotal evidence of emotional behavior seems to indicate that animals and humans behave in very similar ways when experiencing various positive and negative emotions. Animals act in a characteristically human fashion when experiencing stimuli that elicit the emotions of suffering, fear, sadness, joy, affection, anger, and empathy.

Evidence of animal cognition includes brain and behavioral studies. Both brain and behavior are important in that both can indicate that like humans, animals have inner biological processes and mental states that are associated with cognition. (DeGrazia, 1996, p. 85). Furthermore, brain and behavioral studies provide strong evidence that animals can engage in information processing and other cognitive processes that are commonly associated with pain and suffering. (Id.) Structural, functional, and behavioral evidence overall suggests that both animals and humans are conscious and self-conscious creatures.

Evidence of animal emotion and cognition is exactly what it is – just evidence. It is not definitive proof that animals are emotional and cognitive beings with moral status.

It is, however, strong enough evidence to raise a doubt that animals are mere machines that are unable to experience pain. It is impossible to know with absolute certainty how animals feel or think. (Midgley, 1984, p. 57-59). Yet, the same goes for humans; it is impossible to know with absolute certainty how humans feel or think. (Id.) Since this uncertainty does not stop humans from ascribing emotion and cognition to other humans, it should not stop humans from ascribing emotion and cognition to neurologically developed animals. (Id.)

The combination of cognition and the ability to experience emotion are important factors in granting individuals moral status. Humans are readily granted moral status based on their emotional and cognitive capacities. Based on evidence of animal emotion and cognition, animals can and should be counted as members of the moral community with moral status. The fact that animal emotion and cognition may not be on the same level of complexity as human emotion and cognition is of little importance. The differences are in degree rather than kind, and an indication of emotion and cognition should be enough to grant moral status to animals. Individuals who argue against the existence of animal emotion and cognition have the burden of proof, but they have yet to substantiate the claim that animals lack emotional and cognitive capacities. (Bekoff, 2000, p. 862). Until emotion and cognition are proven to be human-only capacities, animals should be granted moral status based on these two faculties.

The possession of moral status alone is not the end of the story. That is, moral status by itself does not necessarily warrant excluding neurologically developed animals from pain research. However, moral status plus additional factors entitle animals, specifically, to moral consideration. The other factors that must be considered include the

fact that the pain research at issue benefits humans and not animals; that the goal of the research is to inflict pain on animals to further knowledge on human pain treatment; that animals are not decisionally capable and cannot give informed consent to participate in pain research; and that animals cannot withdraw from participation in order to end their suffering. Moral status plus these other factors lead to a discussion of moral consideration. Moral consideration entails determining what morality requires humans to do. (Stanford Encyclopedia of Philosophy, 2013). The argument can be made that animals have moral status based on their emotional and cognitive capacities, and hence, they are entitled to moral consideration. Moral consideration, in this case, requires that animals receive comparable human protections and limits in pain research. Ideally, the regulatory structure for the protection of animals should mirror the protections for human children as research subjects.

The research regulations for children have useful components that can be applied to animals in research; like children, animals are vulnerable and lack decisionmaking capacity. The child regulations basically suggest the levels of review and protection that might be appropriate for animal pain research. Two sections of Subpart D of 45 CFR part 46 are particularly applicable. Section 46.406 centers on research that involves greater than minimal risk with no prospect of direct benefit to child-subjects. (Id. at § 46.406). Although a direct benefit to the child-subjects is lacking, the research is still justifiable in light of the generalizable knowledge about a particular disorder or condition that can be garnered as a result. (Id.) In order for this type of research to be approved, the following criteria must be met: (1) The level of risk is only a minor increase over minimal risk; (2) the research will involve experiences that are reasonably proportionate to experiences

that the subject has undergone or may undergo in his or her medical, educational, psychological or social circumstances; (3) the research is likely to produce general knowledge about the condition or disorder that is vital in order for researchers to better understand or somehow ameliorate the disorder or condition; and (4) adequate steps are taken in order to gain the child-subject's assent, and the consent of parents or guardians. (Id.) In other words, children can be used in research that causes greater than minimal risk, which may include certain types of pain research with no prospect of direct benefit to child-subjects, as long as there is a significant justification, the research is severely limited, and major protections are in place for the children. Significant justifications for the research can include strong social or scientific need and the potential for major health benefits. (Emanuel et al., 2000, p. 2703).

Another section of the child regulations, § 46.407, centers on research that is not otherwise approvable, but is still justifiable in light of the possibility that information could be gained that could prevent or lessen a serious health or welfare problem for children. (Id. at § 46.407). Under this section, in order for this type of research to be approved, the following general criteria must be met: (1) The IRB must believe that the research has the potential to increase knowledge of and treatment of a serious health or welfare problem for children; (2) the research will be ethically conducted; and (3) sufficient efforts will be made to garner both assent from the child-subjects and permission from the parents or guardians. (Id.) If there is a significant justification to conduct pain research on animals, animals should receive protections that are at least comparable to the protections granted to children in § 46.406 and § 46.407 of the regulations. While other levels of review and protection may be pursued, the child

regulations are simply one way to determine whether a particular animal pain research protocol can go forward; for example, a particular animal protocol may go forward if it is categorized and examined according to the risk categories used in the child regulations.

The ascription of human-only characteristics to nonhumans is known as anthropomorphism. (Bekoff, 2009, p. 68). Oftentimes, humanized language is used to describe neurologically developed animals. The central concern with anthropomorphism is that the attribution of allegedly human-only emotions and cognition to animals will somehow place animals and humans on the same evolutionary level; humans fear losing or having to share their crown of superiority. (Cavalieri, 2001, p. 15). In reality, however, there is nothing inherently wrong with using anthropomorphic language to describe animals. The use of such language does not necessarily imply that animals feel and think in exactly the same way that humans do. (Bekoff, 2000, p. 867). Rather, it helps to make animal emotion and cognition predictable and practical for humans to identify and understand. (Id.)

The goal of this thesis is to place neurologically developed animals in pain research on the same ethical playing field as humans by presenting evidence to support the claim that these animals have moral status. To accomplish this aim, anthropomorphic language is necessary to describe animal emotion and cognition. At times, it is best to just call it what it is: pain is pain, suffering is suffering, fear is fear, and self-awareness is self-awareness. It matters not whether the individuals experiencing such feelings or possessing such skills are of the human or animal variety.

Both humans and neurologically developed animals have an interest in avoiding pain, and their interests should be equally considered. The same pain that affects humans

also affects neurologically developed animals. Luckily, animals are not the only means by which human pain can be studied. Complete replacement alternatives to animals include human models, in vitro models, computer models, and tissue chips composed of human cells. While none of these complete replacement alternatives are ethically, logistically, or medically ideal models, the use of these alternatives is ethically necessary in light of the moral status of animals, as well as the special circumstances surrounding pain research and the vulnerability of animals.

Though human pain research does occur, researchers are hesitant to use actual humans in such research. However, researchers are more willing to subject nonhuman animals to procedures where the whole goal is to study pain that could all be ethically studied in humans, by inflicting pain, suffering, and distress, all for human benefit. Animals do not benefit from the research, nor are they able to voice their willingness to participate. Additionally, animals' unwillingness to experience pain is not regarded as a refusal to participate – as would be the case if even disabled humans unable to verbally say no were to be seen to exhibit distress and attempt to avoid painful stimuli.

Since neurologically developed animals have moral status just like humans do, they too should receive moral consideration. Based on their moral status and their worthiness of moral consideration, animals should be granted the same protections and limits in pain research that humans, particularly children, are granted. Essentially, neurologically developed animals may continue to be used in pain research. However, there needs to be a significant justification for conducting the research, and severe restrictions and protections must be put in place that are at least comparable to the protections granted to children research subjects. Nevertheless, even with a significant

justification and adequate protections and limits put in place, evidence suggests that animal pain models are poor models for human pain. With the potential for human clinical utility low, the justification and the need for the continued use of neurologically developed animals in human pain research is lacking.

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