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Katelyn Rosen

University of Puget Sound

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The Ethics of Using Animal Stem Cells

Katy Rosen

ABSTRACT: Stem cell research is highly debated in fields of bioethics. This project examines the often-overlooked issue of using animal versus human stem cells. Stem cells can either be cultivated from embryonic cells, which are undifferentiated and pluripotent, or they are cultivated from adult stem cells, which normally replace worn out or damaged cells. Regenerative medicine uses stem cells to create new therapies to produce new cells, organs, and tissues with the intention to improve someone's functioning, being healthier. Most research on stem cells aims to use embryonic stem cells to help create therapies to treat diseases and injuries or use adult stem cells to regenerate a person's damaged tissue or organ. There is a gap in the literature about the ethics of using animal stem cells for human benefit. This gap raises questions such as whether or not it is ethical to take animal stem cells from nonhuman beings. Peter Singer's essay, "All Animals are Equal," explains the moral obligations humans have toward animals. The counterargument to his argument of moral obligations states that if human stem cells can be used for research, then animal stem cells can be used as well. Bonnie Steinbock's essay "What does 'Respect for Embryos' Mean in the Context of Stem Cell Research" argues that if we are not frivolously using embryos then it is morally permissible to use them. The research of Peric et al. (2015) on the rational use of animal models in the evaluation of novel bone regenerative therapies also illuminates how humans can be morally allowed to use animal stem cells. The importance of animal stem cell research is to see how their regeneration process unfolds, that is, to discover how animals naturally restore body parts lost to trauma. I argue that if it is morally permissible to use human stem cells in research, then animal stem cells ought to be morally permissible as well, so long as both animal and human stem cells are treated with equal respect.

Stem cell research is highly debated in fields of bioethics. This project examines the often-overlooked issue of using animal versus human stem cells. Regenerative medicine uses stem cells to create new therapies to produce new cells, organs, and tissues with the intention to improve someone's functioning. Most research on stem cells aims to use embryonic stem cells to help create therapies to treat diseases and injuries, or use adult stem cells to regenerate a person's damaged tissue or organ. The importance of animal stem cell research is to see how their regeneration process unfolds, that is, to discover how animals naturally restore body parts lost to trauma. I argue that if it is morally permissible to use human stem cells in research, then animal

stem cells ought to be morally permissible as well, so long as both animal and human stem cells are treated with equal respect.

Stem cells are grouped into two categories: adult and embryonic. Adult stem cells, also known as tissue-specific stem cells, only have the characteristics of a particular tissue. An example of adult stem cells is the hematopoietic stem cells in bone marrow and umbilical cord blood. These cells make the various types of blood cells, and have been used in therapy for decades for bone marrow transplants to treat diseases like leukemia, where the normal development of blood cells have changed (Nature Reports Stem Cells 2016). Embryonic stem cells, abbreviated ES, are obtained by extracting cells from very early embryos, during the blastocyst stage, and growing them in a laboratory. Human embryonic stem cells are generated mainly from blastocysts that are the result of in vitro fertilization for assisted reproduction, but were not needed for implantation into the mother and can be donated for research (Nature Reports Stem Cells 2016). I am not discussing the ethicality of stem cell research generally; rather, I am discussing whether or not humans should use animal stem cells, either adult or embryonic, for research since animals cannot give consent for the research being done.

Humans use stem cell research to find cell-based therapies, both for drug discovery and for expanding our basic knowledge of tissue regeneration and the pathology of diseases. Cell therapies use stem cells to replace damaged tissues, and involves two main approaches (Nature Reports Stem Cells 2016). Embryonic stem cells are used to make more specialized tissues that have been lost to disease or injury. Regenerative medicine uses stem cells to create new therapies to produce new cells, organs, and tissues with the intention to improve function. Most research on stem cells aims to either use embryonic stem cells to help create therapies to treat diseases and injuries, or use adult stem cells to regenerate a person's damaged tissue or organ.

The Role of Animals in Stem Cell Research

The study of regeneration looks into how adult tissues heal and rebuild themselves so that scientists can replicate this process in a clinical setting. While mammals are limited in their ability to regenerate, studying both closely and distantly related species and how they can successfully achieve regeneration is necessary to our understanding of regeneration. Many different animals from almost all phyla have an innate ability to rebuild missing adult structures lost to injury or disease (Gurley and Alvarado 2008). For example, a starfish can regenerate an arm when it has been detached. Animals most closely related to humans and how humans function are used for research on cell and drug therapies. They usually consist of mice, rats, monkeys, and pigs. Research done by Peric et al. (2015) suggest that in the process of designing an animal study for bone repair, researchers should consider: “skeletal characteristics of the selected animal species; a suitable animal model that mimics the intended clinical indication; an appropriate assessment plan with validated methods, markers, timing, endpoints and scoring systems; relevant dosing and statistically prejustified sample sizes and evaluation methods; synchronization of the study with regulatory requirements and additional evaluations specific to cell-based approaches.”

Most research on stem cells aims to either use embryonic stem cells to help create therapies to treat diseases and injuries, or use adult stem cells to regenerate a person’s damaged tissue or organ. There is a gap in the literature about the ethics of using animal stem cells for human benefit. So, the purpose of this project is to examine how the neglected area of animal versus human stem cell research is carried out by using the ethical arguments from James Lindemann Nelson, Peter Singer, and Bonnie Steinbock; and referencing animal research (specifically, studies conducted by Peric et al., Hedlund et al., and Jong-Hoon et al.). I argue that

if it is morally permissible to use human stem cells in research, then animal stem cells ought to be morally permissible as well, so long as both animal and human stem cells are treated with equal respect.

Animal Equality in Research

Some questions that arise about using stem cell research are: is it ethical to take stem cells from nonhuman beings? Is it safe and ethical to use animal stem cells for human benefit? Most people view animals such as dogs, cats, and monkeys to have their own personalities and soul. While people might be anthropomorphizing how these animals act and see the world around them, this should not matter when it comes to evaluating taking adult and embryonic animal stem cells. If humans view animals like they view other humans, then their stem cells should be treated exactly like human stem cells should be treated. However, not all species are as highly regarded by humans as monkeys are. Invertebrates and some less evolved vertebrates are doomed to be seen not as animals but as creatures. For example, a snake may be viewed as less of an animal needing rights than compared to those of a chimpanzee. If humans and animals are regarded as different, it is because people have an innate ideology that human-hood and animalhood are different. It is possible that this is because humans have been able to create their own societies with language, technology, and moral codes. However, humans have inhabited this earth for a miniscule amount of time compared to every other animal on the planet; and these animals have created their own versions of “society” with rules and ways of communication. Famous social psychologist Harry Harlow performed many experiments with rhesus monkeys about attachment in the 1950s. He found that monkeys who were kept in isolation from their mothers and other infant monkeys right after birth for over 90 days became psychologically

damaged (Harlow 1959). These monkeys did not learn appropriate behavior and were therefore deemed to be outcasts. They could not learn how to behave in social situations and were virtually shunned and left behind by their families. These monkeys' behavior does not seem that different from how humans behave (Harlow 1959). Harry Harlow's studies generalize to children and how they treat outcasts. But, rhesus monkeys are very intelligent and more highly evolved than other animals. Should certain animals be given more respect than others?

In Peter Singer's essay "All Animals are Equal," he argues that humans have been wrongfully prejudiced against animals. He starts by comparing the women's suffrage movement to the animals liberation movement, and states that "the extension of the basic principle of equality from one group to another does not imply that we must treat both groups in exactly the same way, or grant exactly the same rights to both groups... The basic principle of equality, I shall argue, is equality of consideration; and equal consideration for different beings may lead to different treatment and different rights" (1974). Singer is suggesting that equality is not equal rights for all, but having the same opportunities and respect. Equality is subjective towards the minority group, and their view according to Singer is that the majority should think in terms of consideration for others. Singer says that the consideration towards the minority should concern "the interests of every being affected by an action are to be taken into account and given the same weight as the like interests of any other being" (1974). For example, a less intelligent person gets all the same rights as a person with a college education because they are both human. So, a brute has the right to do whatever they want as long as they abide by society's laws and norms. Another example is that of a racist who violates the principle of equality by giving greater weight to the interests of members of his own race, whereas a speciesist allows the interests of his own species to override the greater interests of members of other species (Singer

1974). Singer explains that a scientist shows bias in favor of their own species whenever they carry out an experiment on a nonhuman for a purpose that they would not think justified for using on a human being. Therefore, equality is based on who is human and not based on whose intentions are fruitful or who is in need of basic respect. Along these lines, Singer equated animal testing with experimentation conducted on mentally handicapped people because they cannot express why they should not be experimented on (1974). Because consent from animals cannot be given, stem cells should not be taken from animals. However, equating human handicaps to animals seems outrageous even though both cannot give valid consent to experimentation.

The Importance of Consent and Respect

Autonomy is a problem when discussing who can and cannot give valid consent to research. James Lindemann Nelson defines autonomy as the notion of being free to choose one's own values and actions in his essay "Autonomy and the Moral Status of Animals" (1992). When autonomy is threatened, people become very insecure and defensive because liberty is one of the most highly regarded aspects of human life. When humans are subjugated to other people's laws, they feel stripped of their natural rights. Deception and manipulation does not allow people to fully understand their situation and thus undermines their autonomy, leaving people misguided and betrayed. This is no different than how animals act; they roam the earth surviving under their laws, and when humans subject them to research, their autonomy is threatened. Lindemann explains that the animal liberation movement has contributed to reexaminations of the range and importance of autonomy (1992). The movement has defined that nonhumans have preferences and can make choices reflecting them. Philosophers interested in animals have suggested that autonomy might not be determinant of moral standing (Lindemann 1992). This means that

animals and humans alike might not need autonomy in order to be worthy of respect and protection. Lindemann states that, as a utilitarian, he “does not assign to autonomy any kind of ‘trump card’ status. Possessing autonomy does not guarantee the inviolability of one’s life or other interests against sufficiently important competing interests. Nor does lacking it render a being without moral value” (1992). For example, when a human has to do things that they do not want to do because of another force, they are not being autonomous. This does not mean their life should not be considered less important. If a human lacks autonomy due to a handicap, they still have value. Since autonomy means the ability to make choices, and animals have been proven to have preferences, then they should be autonomous beings. If autonomy is not a determinant of being moral, then all creatures are in need of basic rights and respect. Therefore, all animals should be treated with the same consideration and respect regarding consent.

However, animals still cannot communicate with humans and express their consent to whether or not research using their biological property is okay. Consideration of autonomy and consent raises the question of whether or not animals raised in captivity should be released. If they are deprived of the skills they would need to survive in the wild, is it ethical to give them back their autonomy? Most people would say no because they would not survive in the wild and they can be, relatively, happy in captivity. Thus, if animals are better off with less autonomy, utilitarians would argue that as long as the greatest good for the greatest number of beings is being applied, consent from animals should not matter. As long as the research is benefitting all species, then proper consent is not a violation of animals’ rights.

If people were subjugated to the harsh conditions that animal research was conducted under, then little progress would be made in medical care. Humans do not want to be the guinea pigs for research and would rather outsource this to animals. As long as autonomy is not the

determinant of a good life, then consent is not needed from the animals and research can progress. It is important to treat animals with the same respect as humans. As I discussed in a previous section regarding Peter Singer, humans should treat animals with the same respect and protection. Just because they are a different species does not mean they should have less of a life. The Animal Welfare Act (AWA) was the first federal law in the United States in 1960 to regulate animals in research (Animal Welfare Institute 2016). The AWA applies to animal carriers, handlers, dealers, breeders, exhibitors, and research laboratories. It sets the minimum standards of care that has to be shown to the animals, which includes housing, handling, sanitation, food, water, veterinary care and protection from weather extremes (Animal Welfare Institute 2016). Since 1960, this act has been helping animals maintain their quality of life. For research animals, this is especially important because animals in distress sometimes do not function the same as when humans are in distress. Research conducted by Peric et al. (2015) stated that poorly designed animal studies with inappropriate goals in mind make inaccurate conclusions.

The American Veterinary Medical Association (AVMA) has an official stance on using animal stem cells, which says they recognize “the promising impact that research on stem cells will have on a diverse array of clinical applications in veterinary and human medical care” (AVMA 2016). The AVMA has outlined their reasoning: the studies must be performed under the guidelines of the Animal Welfare Act and the Association for Assessment and Accreditation of Laboratory Animal Care International (AAALAC) in order to use animal stem cells. This includes embryonic, induced pluripotent, and adult stem cells, as well as the development of regenerative therapies. These studies can occur for the advancement of creating safe and effective stem cell-based therapies for the benefit of both animals and humans. They believe that

the use of scientifically-validated stem cells models of animal and human diseases may minimize religious or political constraints connected with the use of human embryonic stem cells, as well as advance the treatment of disease or injury common to humans and animals like spinal injury or diabetes. Lastly, the AVMA supports the use of stem cell therapies that have been shown to be safe and effective to treat animal disease from scientifically-valid clinical trials. The AVMA is a nonprofit association that acts as a collective voice for the veterinary profession and represents more than 88,000 veterinarians working in private and corporate practice, government, industry, academia, and uniformed services (AVMA 2016). Therefore, their opinion on the matter of animal stem cell research is vital in discerning whether or not using animal stem cells is morally permissible. In summation, using animal stem cells for research according to the AVMA is morally permissible if followed by the Animal Welfare Act and the research benefits both animals and humans.

Logical Boundaries for Stem Cell Use

Animal stem cells and human stem cells should be treated equally in safety, protection, and respect when harvesting them for therapy treatment. Bonnie Steinbock's essay, "What Does 'Respect for Embryos Mean in the Context of Stem Cell Research?'" argues that if scientists are not frivolously using human embryos, then it is morally permissible to use them. This argument can be used in terms of animal embryos as well. Respect for embryos requires the understanding that they have the potential to become a living creature. Kantian theory explains that as long as one's actions can be universal then they are deemed to be fulfilling one's duty. Since animals are not capable of having goals, in Kantian ethics, they cannot have personhood status and therefore cannot have that type of respect. Their potential to become living beings gives the embryos a

particular significance and importance, which imposes boundaries on what is permissible to do to embryos (Steinbock 2000). These boundaries are a sign of respect and are shown by not using them in unimportant or frivolous ways. For example, a sign of respect would be to not use them to make cosmetics (Steinbock 2000, 129). Respect for embryos does not require abstaining from research that will likely progress medical advancement (Steinbock 2000). If the research benefits medical advancement, it is not considered frivolous. Research is important and is therefore a morally acceptable use of stem cells.

Some examples of stem cell use in animal models include the research conducted by Peric et al. (2015), Hedlund et al. (2007), and Jong-Hoon et al. (2002). Peric et al. discuss how to correctly use animal models for bone regenerative therapies. Their suggested guidelines for the rational use of animals in an attempt to advance bone research has ten necessary steps, including: choosing an animal model that optimizes the goals of the study; the animal species for the same reasons; the animal's sex and age; the study duration that allows for the biological process to initiate and complete; the number of animals per study group in order to get sufficient data for statistical analyses; the dose and route of administration of the therapy that mimics the anticipated clinical use; the appropriate controls conditions to ensure the credibility and reproducibility of the data; the supply of the test article should be sufficient for the entire study; the optimal in vivo and ex vivo biomarkers, and tissue collection, storage and analyses planning (2015). Following these guidelines should support the development of investigating new therapies in bone regeneration. One example is using non-human primates for skeletal research because their skeleton, their posture, and their bone structure, composition and remodeling patterns are similar to humans (Peric et al. 2015). However, using non-human primates has many ethical and technical considerations, which include high cost, limited availability and strict

regulations. According to the authors, non-human primates should only be used in situations when efficacy, safety and toxicity studies in other species could not provide appropriate answers, like in studies looking at long bone fibrodysplasia since humans and non-human primates have similar bone structure.

Eva Hedlund and her team of researchers found that animal models are helpful in research regarding motor neuron disorders. Disorders like ALS and Kennedy's disease use stem cells to replace the motor neurons that are degenerating and causing voluntary muscle movement to stop working. Using models of minor motor neuron injury has shown that embryonic stem cell-derived motor neurons implanted into the spinal cord can innervate muscle targets and improve functionality (Hedlund et al. 2007). Therefore, a rationale exists for the development of cell therapies in motor neuron diseases. An example of such an improvement for Parkinson's disease, another type of neurodegenerative disease, is found by Kim Jong-Hoon and his team who reported that using anatomical, neurochemical, electrophysiological and behavioral tests with embryonic stem cells can efficiently generate midbrain precursors and dopamine neurons (Jong-Hoon et al. 2002). They used a rat as their animal model because they are easily raised, contained, and have similar brain function to humans. Once their experiment took place under their conditions, the differentiated neurons were enriched and dividing cells were not seen in a series of grafts that were analyzed up to 8 weeks after transplantation (Jong-Hoon et al. 2002). This shows the promising use of stem cells in animal models when the correct guidelines are in place.

Morality and Choice with Research

Animal research is necessary in the modern day scientific field. Getting humans to participate in pre-clinical trials is almost impossible since humans have the cognitive advances to

understand that these trials could have serious side effects. Therefore, animal studies are inevitable. This does not mean that animals can be subjugated to less than hospitable conditions. The National Research Council in 2009 stated that “if a procedure is considered painful in humans, it should be assumed to be painful in laboratory animals, regardless of their age or species” (Stem Cell Bioethics 2016). So, according to Peter Singer and James Lindemann Nelson, humans must treat animals like humans in the research setting. A utilitarian or consequentialist view believes that the greatest good should be achieved for the greatest number. Utilitarians justify the use of animal stem cells because they are beneficial to both animals and humans because both species benefit from the research. An example of this dual benefit is for the mice researched by Hedlund et al. These mice with neurodegenerative disorders are being treated with cell therapies, and that also allows humans to find therapies and cures for disorders and diseases that would otherwise be not researched. Some might say that if humans will not consent to the pre-clinical trials, they should not subject animals to that treatment either. There is a difference between animals and humans, however. Both types of species have autonomy, but the different types of autonomy make them unique.

Humans have the ability to communicate moral codes. Whether or not animals have moral codes, they cannot express them to humans. Humans have the ability to restrain from brutish nature while animals have animal instincts that could be mistaken in certain situations, like when a cat scratches a child when they want to pet them. Humans, normally, speak their mind when something bothers them and learn to appropriately come to conflict resolutions. Animals use physical behavior to come to a resolution. Physical violence is viewed as less evolved when it comes to advanced species. People who revert back to violence are viewed as animal-like. This is due to the evolutionary paradigm society is in. Autonomy for humans means

the ability to have goals, be inspired, and want to be better, while animals do not seem to have these aspirations for a “good” life. However, if autonomy is not a determinant of moral standing, then humans and animals should be considered equal. Lindemann Nelson stated as a utilitarian that autonomy is not a factor for moral standing since people who do not have the ability to make moral choices are still equal to people who can make moral choices. As long as both animal and human stem cells are treated with equal respect and benefit both species then animal research and using animal stem cells is morally permissible.

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