



**DIVISION OF MEDICAL ETHICS
HIGH SCHOOL BIOETHICS PROJECT**

LESSON 8:

Ethics of Animal Use in Research



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| | |
|-------------------------------------------------------------------|----|
| Overview..... | 2 |
| Introduction..... | 3 |
| Animal Use, Cases, and Controversies..... | 3 |
| Do Animals Have Moral Status or Value?..... | 8 |
| The Modern Philosophical Debate About Animal Use in Research..... | 13 |
| Rules and Regulations..... | 19 |
| Alternatives to Animal Use in Biomedical Research..... | 25 |
| References & Additional Resources..... | 26 |

Environmental Ethics and Climate Change

Overview

This module urges students to think about how we use animals in our everyday lives and in biomedical research, and to evaluate philosophical and ethical issues surrounding animal use. Animals are obviously living, breathing, complex beings like humans, but at the same time they differ from us in many ways, and we treat animals very differently from the way we treat humans. In what fundamental ways do animals differ from humans? What justifies our different treatment of animals? Do animals deserve the same level of rights and respect as humans? If so, why? Or are they so significantly different that we should treat them with a different code of ethics? Students will explore these and other questions from a variety of religious and philosophical perspectives.

Learning Outcomes

1. Understand the ethical issues surrounding killing or inflicting pain on animals for human benefit
2. Review and evaluate philosophical and ethical arguments concerning the value, rights, and welfare of animals
3. Assess possible shortcomings and challenges of current regulations of research on animals and consider changes

Procedures and Activities

This unit uses a student-centered and interactive approach to teaching. Activities are designed to allow for a maximum degree of student participation and collaboration. Each activity is marked as an individual, partner, or group activity, or as a teacher-directed class discussion.

The following terms are used to designate the different types of activities:

- **Individual Activity**
- **Partner Activity**
- **Group Activity**
- **Teacher-Directed Class Discussion**

Introduction to Topic

A note on terminology: Emphasize to students that human beings are animals, but for purposes of this lesson the term “animals” will be used to refer specifically to non-human animals.

This lesson plan includes classic, longstanding debates about animal use and welfare. However, recently some ethicists have begun calling for broader and more stringent animal rights protections, including for insects and for improving the well-being of wild animals.

Individual Activity

Students will answer the following questions to gauge their pre-existing knowledge of the topic:

- Have you ever conducted experiments in science class using living animals?
- Have you ever dissected an animal in science class?
- Do you own a pet? Do you think it/he/she experiences pain in the same way we do?
- What do you think is the main difference between animals and humans?
- Do animals have emotions?
- Do you think animals have, or should have, rights the way humans do?

Animal Use, Cases and Controversies

Teacher-Directed Class Discussion

Below are various options for teacher-directed activities to spur class discussion of animal use in our society and controversial cases.

- Look at the picture on the side. Write down the first 3 to 5 words that come to mind.
- Share and compare your notes with a partner. How did your response differ from your partner’s? Divide words into two categories: positive, negative. Which of the two categories has more items? What prompted your negative reactions (e.g. disgust, pity, compassion, hunger, etc.)?
- Mention to the class that the Whole Foods supermarket chain stopped selling live lobsters in 2006. Any idea why?



Share the following quotations with your students:

PETA (People for the Ethical Treatment of Animals): “Lobsters are known to live more than 145 years in the ocean and can travel more than 100 miles per year. Lobsters have sophisticated nervous systems and experience pain and suffering. In their natural ocean homes, they have been observed walking claw-in-claw, the old leading the young.”

John Mackey, Whole Foods’ co-founder and chief executive: “We place as much emphasis on the importance of humane treatment and quality of life for all animals as we do on the expectations for quality and flavor.”

Bruce Friedrich, a former spokesperson for PETA: “The ways that lobsters are treated would warrant felony cruelty to animals charges if they were dogs or cats.”

Tony Blankley, Washington Times op-ed, June 21, 2006: “Invertebrates, such as lobsters and snails (which are also delicious), conveniently (for those of us who love to eat lobsters and snails also feel sympathy for animals) have simple nervous systems made up of chain ganglia—groups of neurons connected by nerve fibers. According to Professor Craig W. Stevens of Oklahoma State University in Tulsa, the chain ganglia network is so simple it doesn’t require a brain.”

Ask students: **Are the statements in the quotations above for or against the sale and cooking of live lobsters?**

For:

- Lobsters have simple nervous systems that don’t require a brain, so they don’t feel pain.

Against:

- Lobsters have complex nervous systems and are capable of experiencing pain and suffering.
- The treatment of lobsters would warrant felony [charges for] cruelty to animals if they were dogs or cats.

Discussion questions:

- How can the obvious contradiction between the descriptions of the nervous system of lobsters be resolved? What are the definitions of “simple” and “complex” in these statements?
- Are there ways to determine whether animals can experience pain based on the make-up and structure of their brains?

- Is it possible (at all) to determine with certainty whether animals (human or nonhuman) can experience pain?
- If so, should our knowledge about pain influence the way we treat our animals?
- One of the arguments above compares the treatment of lobsters to that of dogs and cats. Is this argument convincing? Why or why not?
- If the lobster in the picture above were instead a cat or a chimpanzee, would you feel differently? How and why?

Teacher-Directed Class Discussion

Let's assume the ability to experience pain could, and should, be used in determining the way we treat animals. Where should we draw the line?

Consider the following list of animals:

- chimpanzee
- clam
- elephant
- octopus
- mouse
- dog
- your pet
- goldfish
- cow
- corals
- fly
- dolphin
- canary
- shark
- horse
- rat
- spider

At the top of the next column, divide these animals into three categories to the best of your ability: *animals that can feel pain*, *animals that cannot feel pain*, and *animals you aren't sure about*.

| Feels pain | Does not feel pain | Not sure |
|------------|--------------------|----------|
| | | |

Compare your assumptions with a partner. What criteria, principles, or assumptions determined your decision (e.g. animals' behavior indicates pain, assumptions about nervous system, intuition, degree of similarity to humans, etc.)?

Collect and discuss the students' findings. What are these decisions based on? Record and organize principles used to make their decisions on the board, such as behavior indicating pain, human reactions to pain, which class of animals they belong to, level of intelligence, structure/make-up of brain/nervous system.

Discussion questions:

- Based on what we know so far, do you believe it is possible to determine whether an animal experiences pain, and to what degree?
- Should the ability to experience pain be our main criterion in determining how we should treat animals?
- If so, is it always wrong to inflict suffering on those animals that definitely experience pain?

Let's take a step back for a moment and look at the different ways in which animals are used in our society. What are some examples? (Sports, food, pets, research, agriculture, etc., might be mentioned).

Break students up into small groups of 3 to 5. Each group will research one of the following areas in which animals are used by humans.

Based on our previous discussions about pain and the status of animals, consider whether the use of animals in the category you research is:

- Always justified
- Never justified
- Sometimes justified

Students should provide reasons for their decisions.

Categories:

- Raising and killing animals to serve as food for us
- Killing animals that are a direct threat or nuisance to us (e.g. sharks, mosquitos, rats, deer in urban areas, etc.)
- Using animals in research that could help protect us from disease, pain, suffering, premature death, etc.
- Using animals to make our lives more pleasurable (e.g. to make fur products or test perfumes and beauty products).
- Using animals in sports/entertainment (horseback riding, hunting, dog-/bull-/cockfighting, circus, etc.)

- Using animals to work or perform tasks for us (agriculture, seeing-eye dogs, police dogs, dogs in the military, etc.)

Groups will present their findings. As they listen, students should identify and record the reasons/ principles that were used to decide which of these uses of animals are justified or not (degree of benefit to humans, necessity, nature, suffering, etc.).

Further Questions for Discussion:

- If in some cases it is permissible to kill or inflict some level of discomfort or pain on animals, what justifies such treatment?
- If pain is not the main criterion, are there other criteria that could be used to determine how we should treat animals?
- Should we determine varying degrees of discomfort, pain, or suffering?
- Finally, does our treatment of animals (and our justification for inflicting pain and suffering) depend on the purpose and benefit for us?

Do Animals Have Moral Status or Value?

As we have seen in the first segment of this module, one approach to the question of how animals should (and, more important, shouldn't) be treated is to look at whether animals experience pain as we do. The problem with relying on pain as the only criterion is that it may not be easy (or possible) to determine whether animals experience pain at all, or to what degree.

Furthermore, there may be cases in which we consider it ethically permissible to inflict at least some level of discomfort or pain, or even death on an animal.

Perhaps there is another way to determine how we should treat animals. We could try to determine the value or moral status of animals, which may then allow us to formulate principles that could be used as a guide to our treatment of them.

When we talk about something having "value," what exactly do we mean? To understand this, we must distinguish between intrinsic and extrinsic value.

Intrinsic vs. Extrinsic Value

Intrinsic value and goods:

- Some just is valuable, non-derivatively good
- The value is an internal property of something; it defines its existence
- Something has intrinsic value if it is valuable "in itself," "for its own sake," "as such," or "in its own right"

Extrinsic value:

- Instrumental goods
- Good for something else, "is a means to an end"

Based on the definitions above, students should decide on at least three things they believe have intrinsic value; examples might include democracy, freedom, liberty, life, beauty, art, the earth/environment, or nature.

Collect and discuss students' findings. What gives these items intrinsic value? In other words, what makes them good "as such" or "in themselves"? (Recall the line in the Declaration of Independence: "We hold these truths to be self-evident..." This indicates basic principles that we can all agree upon and that cannot, or should not, be further questioned).

In what way can we say that humans have intrinsic value that is not limited to being used for some purpose, that a human is an end-in-itself rather than a means to an end?

Do animals also have intrinsic value, or do they merely have extrinsic value— value for being of use to humans as a means to an end?

Questions for discussion:

- What would make animals not have intrinsic value the way humans do?
- What are some key differences that give humans rights and moral standing but not animals?
- Do some animals have more (or a different degree of) intrinsic value than others? Why?

Religious and Philosophical Views on the Value of Animals

With a partner, decide which of the following quotes from a variety of religious and philosophical texts consider animals to have intrinsic value, extrinsic value, or both.

Christianity

“Be fruitful, and multiply, and replenish the earth, and subdue it: and have dominion over the fish of the sea, and over the fowl of the air, and over every living thing that moveth upon the earth.” (Genesis)

“For what happens to the sons of man and what happens to the beasts is the same; as one dies, so dies the other. They all have the same breath, and man has no advantage for man over beasts, for all is vanity.” (Ecclesiastes 3:19)

New Testament

“According to the Divine ordinance the life of animals and plants is preserved not for themselves but for man. Hence, as Augustine says (*De Civ. Dei* i, 20), ‘by a most just ordinance of the Creator, both their life and their death are subject to our use!’” (St. Thomas Aquinas, *Summa Theologica*)

“Not to hurt our humble brethren is our first duty to them, but to stop there is not enough. We have a higher mission—to be of service to them wherever they require it.” (St. Francis of Assisi)

Judaism

“If you see your enemy’s donkey lying under its burden would you refrain from helping him? You shall surely help along with him.” (Shemot/Exodus 23)

“Of all that the Holy One, blessed be He, created in His world, He did not create a single thing without purpose.” (Talmud, Shabbos 77b)

“These creatures were created to serve man and man was created to serve his Creator.” (Talmud, Kidushin 82a)

Hinduism

“Having well considered the origin of flesh foods, and the cruelty of fettering and slaying corporeal beings, let man entirely abstain from eating flesh.” (Manusmriti 5.49, Early Hindu Scripture)

“To my mind the life of a lamb is no less precious than that of a human being. I should be unwilling to take the life of a lamb for the sake of the human body. I hold that the more helpless a creature, the more entitled it is to the protection by man from the cruelty of man.” (Mahatma Gandhi)

“I abhor vivisection with my whole soul. All the scientific discoveries stained with innocent blood I count as of no consequence.” (Mahatma Gandhi)

“He only prohibits for you the eating of animals that die of themselves, blood, the meat of pigs, and animals dedicated to other than God.” (Quran 2:173)

"Whoever kills a sparrow or anything bigger than that without a just cause, Allah will hold him accountable on the Day of Judgment." (reported as said by the Prophet)

Islam

“He only prohibits for you the eating of animals that die of themselves, blood, the meat of pigs, and animals dedicated to other than God.” (Quran 2:173)

"Whoever kills a sparrow or anything bigger than that without a just cause, Allah will hold him accountable on the Day of Judgment." (reported as said by the Prophet)

Jainism

“In happiness and suffering, in joy and grief we should regard all creatures as we regard our own self and should therefore refrain from inflicting upon others such injury as would appear undesirable to us if inflicted upon ourselves.” (Yogashastra, Jain Scripture)

“This is the quintessence of wisdom; not to kill anything. All breathing, existing, living sentient creatures should not be slain, nor treated with violence, nor abused, nor tormented, nor driven away. This is the pure unchangeable Law...

“Therefore, cease to injure living things.” (Yogashastra, Jain Scripture)

Buddhism

“All living things fear being beaten with clubs. All living things fear being put to death. Putting oneself in the place of the other, let no one kill nor cause another to kill.”
(Dhammapada 129, Karma and status)

Native American

“What is a man without the beasts? If all the beasts were gone, men would die from great loneliness of spirit, for whatever happens to the beasts also happens to man.”
(Chief Seattle)

Aristotle

“In like manner we may infer that, after the birth of animals, plants exist for their sake, and that the other animals exist for the sake of man, the tame for use and food, the wild, if not all at least the greater part of them, for food, and for the provision of clothing and various instruments. Now if nature makes nothing incomplete, and nothing in vain, the inference must be that she has made all animals for the sake of man.” (Politics)

Immanuel Kant

“Every rational being exists as an end in himself and not merely as a means to be arbitrarily used by this or that will... Beings whose existence depends not on our will but on nature have, nevertheless, if they are not rational beings, only a relative value as means and are therefore called things. On the other hand, rational beings are called persons inasmuch as their nature already marks them out as ends in themselves.” (Groundwork of the Metaphysics of Morals)

“So far as mere reason can judge, man has duties only to man; for his duty to any subject is moral necessitation by that subject’s will. Hence the necessitating (obligating) subject must, first, be a person; and this person must, secondly, be given as an object of experience...but with all our experience we know of no being other than man that would be susceptible of obligation. Therefore, man can have no duties to beings other than man.” (Groundwork of the Metaphysics of Morals)

Jeremy Bentham

“The day may come when the rest of the animal creation may acquire those rights which never could have been withholden from them but by the hand of tyranny. The French have already discovered that the blackness of the skin is no reason why a human being should be abandoned without redress to the caprice of a tormentor. It may one day come to be recognized that the number of the legs, the villosity of the skin, or the termination of the os sacrum, are reasons equally insufficient for abandoning a sensitive being to the same fate.” (An Introduction to the Principles of Morals and Legislation)

“What else is it that should trace the insuperable line? Is it the faculty of reason, or perhaps the faculty of discourse? But a full-grown horse or dog is beyond comparison a more rational, as well as a more conversable animal, than an infant of a day, or a week, or even a month, old. But suppose they were otherwise, what would it avail? The question is not, Can they reason? nor, Can they talk? but, Can they suffer?” (An Introduction to the Principles of Morals and Legislation)

Arthur Schopenhauer

“Compassion for animals is intimately associated with goodness of character, and it may be confidently asserted that he, who is cruel to living creatures, cannot be a good man.” (On the Basis of Morality)

“The assumption that animals are without rights and the illusion that our treatment of them has no moral significance is a positively outrageous example of Western crudity and barbarity.

Universal compassion is the only guarantee of morality.” (On the Basis of Morality)

Ask students to categorize the views represented in the quotations above by how they interpret non-human animals’ value.

| Primarily Intrinsic | Primarily Extrinsic | Not sure/Both(?) |
|---------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> • Buddhism • Jainism • Francis of Assisi • Bentham • Schopenhauer | <ul style="list-style-type: none"> • New Testament • Thomas Aquinas • Aristotle • Kant | <ul style="list-style-type: none"> • Hebrew Scripture / Old Testament • Hinduism • Islam • Native American(?) |

Collect student’s findings and consider the following questions:

- What are the main criteria used in these quotes to determine whether animals have intrinsic or extrinsic value?
- Which of the arguments/criteria used to determine how we should treat animals do you find most compelling, and why?
- Do you believe that there is a conclusive answer to this question, or is it ultimately up to each individual person to decide how to treat animals?
- What additional information do we need to arrive at a conclusion?

The Modern and Philosophical Debate About Animal Use in Research

In this section, we will discuss the modern philosophical debate about the use of animals in research. Students will explore the positions held by four prominent ethicists: Peter Singer, Tom Regan, Arthur Caplan, and Bernard Rollin. After considering possible arguments for and against the use of animals in research, students will be introduced to some basic facts about the scale and nature of animal use in research today, followed by a discussion of views of the four ethicists mentioned above.

Vivisection

The question of the treatment of animals (in the West) began with a public debate about the pros and cons of vivisection in England in the 19th century. This debate led to the first legislation on the treatment of animals in 1876.

What is vivisection? (Etymology: Combination of the Latin words “vivus” (alive) and “secure (to cut). Vivisection is the practice of doing scientific or medical experiments on live animals.

- Based on our discussions so far, what do you think would have been the main arguments for and against vivisection in England in the 19th century?

Collect and discuss students’ findings, then share with students some of the actual arguments used in the debate and the principles on which these arguments were based, as well as information about legislation from the debate about vivisection.

| | Pro Vivisection | Contra Vivisection |
|---------------------|-------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Need | For human health and well being; no real alternatives. | We can eliminate much of the animal research we currently conduct; continued reliance of scientists on animal models because of an economic or financial power structure maintaining the status quo; cosmetics |
| Moral Equity | Animals don’t experience pain and distress the way humans might; humans count more. | Research shows animals are remarkably similar humans; sentience, consciousness; feel pain. |
| Priority | There’s plenty of misery in human conditions that could use the attention of the antivivisectionists. | High priority because animals are vulnerable to unavoidable suffering caused by humans. |

Contemporary Use of Animals in Research

Although vivisection constituted a very small part of research in the 19th century, when the debate about vivisection took place, animal use is now a huge part of research and experimentation in many different industries.

Number of animals currently used in research in the US:

In 2021, 71,921 non-human primates were subjected to experimental procedures in the US. These include several species of macaques, monkeys, baboons, and other animals.

The species that are not covered by the Animal Welfare Act, such as rats, mice, other farm animals, etc., are not counted. Nor do these statistics cover animals that are caged in for conditioning or breeding rather than for experiments.

Four Views of Contemporary Philosophers

Introduction

The four ethicists highlighted in this section of the unit represent different positions in the current debate on the treatment of animals.

Their positions are summarized in direct quotations from their writings and interviews. Your task will be to identify the key arguments contained in the views they hold.

Individual or Group Activity

Students will work in small groups. They will be provided information on each thinker's position. Alternatively, groups of students may be provided with the information on just one of these thinkers listed below and be asked to research him independently.

Each group will try to answer the following questions about the view of the ethicist they have been assigned:

- What is the main criterion or guiding principle used to determine how we should treat animals?
- Does your ethicist believe that conducting research on animals is morally legitimate or not?
- Do you agree with the position represented by your ethicist? Why or why not?

#1 PETER SINGER

This book [Animal Liberation] is about the tyranny of human over nonhuman animals. This tyranny has caused and today is still causing an amount of pain and suffering that can only be compared with that which resulted from the centuries of tyranny by white humans over black humans. The struggle against this tyranny is a struggle as important as any of the moral and social issues that have been fought in recent years. (Animal Liberation)

[The] Argument about vivisection...has been put in absolutist terms: would the abolitionist [i.e. a person in favor of abolishing animal testing] be prepared to let thousands die if they could be saved by experimenting on a single animal? The way to reply to this purely hypothetical question is to pose another: Would the experimenter be prepared to perform his experiment on an orphaned human infant, if that were the only way to save many lives? If the experimenter is not prepared to use an orphaned human infant, then his readiness to use nonhumans is simple discrimination, since adult apes, cats, mice, and other mammals are more aware of what is happening to them, more self-directing and, so far as we can tell, at least as sensitive to pain as any human infant.

There seems to be no relevant characteristic that human infants possess that adult mammals do not have to the same or a higher degree.

Someone might try to argue that what makes it wrong to experiment on a human infant is that the infant will, in time and if left alone, develop into more than the nonhuman, but one would then, to be consistent, have to oppose abortion, since the fetus has the same potential as the infant—indeed, even contraception and abstinence might be wrong on this ground, since the egg and sperm, considered jointly, also have the same potential. In any case, this argument still gives us no reason for selecting a nonhuman, rather than a human with severe and irreversible brain damage, as the subject for our experiments. (All Animals Are Equal)

#2 TOM REGAN

There are many people who feel that we have an obligation to be kind to animals, and not to be cruel to them. But this view doesn't make it a matter of justice that we treat animals in a certain way—just that it is nice if we are kind and not very good if we are cruel. Many people think that we should be nice to animals because if we are not nice to animals we will not be nice people, and then we will end up beating up our children and our neighbors and so on. The problem is, these views don't focus on our duty to animals but only on the effects our treatment of animals has on us. The rights view says, "We owe it as a matter of strict justice to treat animals in a certain way." In particular we owe it to these animals not to eat them, for example, or not to put them in cages for our entertainment, or not to use them

in education or in surgery, which is so anachronistic and yet characteristic of modern medical education in the United States. The current view is, “These animals are ours, we may do with them as we wish.” The rights view says, “No you may not. They cannot claim their rights, they cannot understand their rights, and in this way they are very much like mentally enfeebled human beings. But they have them nonetheless.”

(Interview, taken from: <http://appethics.blogspot.com/2010/05/interview-with-regan-animal-rights.html> and <http://thinkdifferentlyaboutsheep.weebly.com/animal-rights-a-history-tom-regan.html>)

In the case of the use of animals in science, the rights view is categorically abolitionist. Lab animals are not our tasters; we are not their kings. Because these animals are treated routinely, systematically as if their value were reducible to their usefulness to others, they are routinely, systematically treated with a lack of respect, and thus are their rights routinely, systematically violated.

This is just as true when they are used in trivial, duplicative, unnecessary or unwise research as it is when they are used in studies that hold out real promise of human benefits. We can't justify harming or killing a human being (my Aunt Bea, for example) just for this reason. Neither can we do so even in the case of so lowly a creature as a laboratory rat. It is not just refinement or reduction that is called for, not just larger, cleaner cages, not just more generous use of anesthetic or the elimination of multiple surgeries, not just tidying up the system. It is complete replacement. The best we can do when it comes to using animals in science is not to use them. That is where our duty lies, according to the rights view. (*The Case for Animal Rights*)

#3 ARTHUR CAPLAN

If animals and humans are so organized as to be purposive creatures with various desires, drives, intentions, and aspirations, it seems wrong to cavalierly frustrate these purposes. It might be argued that if animals and humans are biologically constituted so as to pursue their own existence, which is a fact quite consistent with current thinking in evolutionary theory, then it is morally wrong to interfere with or deprive animals of the opportunity to fulfill this basic drive. In other words, animals and humans, endowed by nature with a will to survive, have a right to survive—rights being consequent upon the purposiveness and teleological orientation of living things. If all creatures who possess purposiveness have a right to be left alone to pursue their ends, then the basic moral repugnance felt by many people about animal experimentation can be easily understood—most experimentation deprives animals of the right to exist, or, at minimum, frustrates certain basic drives and intentions they manifest. While human beings are under no moral obligation to aid their fellows or animals in the pursuit of their basic

purposes, they do appear to be under some constraint not to uncaringly interfere with other organisms.

I believe that purposiveness rather than sentience [the ability to feel pain and pleasure] is a property that suffices for conferring moral worth upon entities. When organisms have sufficient organization to have basic drives, desires, and intentions, be they amoebas, bees, birds, or retarded humans, it is wrong to interfere with their efforts to fulfill these desires. It needs to be quickly added that such interference is wrong unless there exists some other reason or justification for doing so. The fact is that, as is the case with the abortion debate, most persons erroneously believe that once animal rights are established, the issue of animal experimentation is settled. If it is wrong to interfere with purposive creatures, then no animal research could ever be morally legitimate. But such a view confuses the question of how moral worth and moral rights arise with the question of what to do when rights conflict—a common, ordinary, and unavoidable consequence of the nature of the world we live in. No animals or humans capable of purposiveness should be interfered with by others, other things being equal. But other things are rarely equal. If humans are to survive, they must eat, and animals may have to suffer the consequences. If human beings are to fulfill their desires to have medicines, then some creatures will have to suffer in the course of discovering whether different substances have therapeutic value. While it is true that we ought not to interfere with or hinder the bringing to fruition of the desires and purposes of others, animals and humans, in a world of limited resources and conflicting purposes, some creatures will, of necessity, have their basic rights overridden. (...)

Perhaps the strongest caveat to emerge from an analysis of the morality of animal research is that the burden of proof always rests upon the experimenter to justify the use of animals in experimental contexts. The antivivisectionist has nothing to prove; many animals used in experiments are sentient and purposive, and thus have prima facie rights to live and be left alone. Those who would override or abrogate these rights must provide compelling reasons for doing so. Humility and sensitivity, not arrogance and hubris, must be the hallmarks of animal research since it is only out of ignorance and expediency that we put members of the animal kingdom to our purposes rather than theirs. The other conclusion that follows from the analysis of the moral legitimacy of animal experimentation is that such activity is always morally tragic. No matter what goods are promoted by the process, some creatures who are unable to alter their circumstances will have their basic rights of life and fulfillment infringed.

Since this is so, it would seem imperative that steps be taken to reduce waste and duplication in the use of animals for research purposes, put more funds toward the development of alternatives to animal testing, and make the public aware of the moral trade-offs that must be faced in deciding how best to achieve human

well-being, health, safety, and knowledge at the expense of animal suffering. Ultimately, the public will have to decide what sorts of trade-offs are morally acceptable when animal and human interests conflict. (*Beastly Conduct: Ethical Issues in Animal Experimentation*)

#4 BERNARD ROLLIN

Consider, then, a chimpanzee or an orangutan or a gorilla who has learned to communicate with humans using a system perceived by most people as indeed linguistic. The experiment is terminated, and the animal is no longer of use and is turned over to a zoo, or to a laboratory. When I first discussed this sort of case, in the late 1970s, this scenario was hypothetical. By the late 1980s, however, it was all too real. Unfortunately, as Eugene Linden has so deftly documented, this sort of case has occurred with heart-rending frequency. Linden has told of how these animals have communicated their sorrow and perplexity and anxiety and anger and fear and grief when they are wrenched out of a rich environment where they were being treated as ‘honorary humans’—sometimes living as a child in the researchers’ homes—and suddenly incarcerated in a place where they are used for invasive research, and have no one, human or ape, to communicate with, and live wretched, isolated, deprived, lives. Most tragic, perhaps, is that they cannot understand what they have done to merit what they, in their sublime innocence, must surely see as punishment.

Here, I have suggested, we can accelerate the moral and legal enfranchisement of animals, at least of these animals, by using the extant legal machinery, and letting them tell their story in the context of the judicial system. I am envisioning a plausible legal case based on the notions of denial of due process and cruel and unusual punishment. Surely one can make the reasonable case that these animals are, by all rational standards, persons who have been denied the fundamental civil rights and procedures due to persons. These animals possess measurable intelligence, sometimes in excess of that possessed by certain humans, they can reason and, most important, they can eloquently speak for themselves, and tell of their anguish and sorrow.

I am thus envisioning a new ‘monkey trial,’ at least as spectacular in its appeal and implications as the Scopes trial, which tested the Tennessee law against the teaching of evolution. Such a trial would be extraordinarily salubrious in just the same sense... This trial would force an examination of our moral and attendant legal commitments, and illuminate areas too long left in the dark.

Whatever the outcome of such a trial, the animals would of necessity win. If the trial were lost, the issues would still have been powerfully and unforgettably aired, and the failure of our current law and morality to protect these innocent creatures forcefully and indelibly imprinted in the public mind. Indeed, even if the case never

came to trial, the same result would be accomplished by the vast—and doubtless sympathetic—publicity which a skillful attempt orchestrated by first-rate legal, philosophical and scientific minds would undoubtedly generate.

And, in the end, the new ethic we discussed earlier would be articulated and enlivened, to the benefit of all animals, and most assuredly to the benefit of the great apes, whose shameful treatment at human hands occasioned the need for the trial. (*The Ascent of Apes—Broadening the Moral Community*)

Group Activity

When students or groups of students have finished their research (either in class or at home), collect and discuss their findings. Whatever our beliefs are with regard to how animals should be treated, and whether it is morally permissible to use them in research, it seems likely that we would be in favor of some kind of regulation of the treatment of animals. As we will see in the next section of this unit, some of the issues we have discussed so far will re-emerge in our discussion of current regulations (e.g. Caplan’s point about the conflict between the rights of humans and those of animals).

Rules and Regulations

Teacher-Directed Class Discussion

One of the problems with the establishment of rules and regulations concerning the welfare of animals is that those regulations may conflict with the principles and regulations aimed at protecting human beings.

The Nuremberg code, for example, states: “The experiment should be so designed and based on the results of animal experimentation and a knowledge of the natural history of the disease or other problem under study that the anticipated results will justify the performance of the experiment.”

Accordingly, experimentation on animals is a crucial step in getting a drug approved for human use by the U.S. Food and Drug Administration.

Results from animal models of disease or experiments on animals are part of various stages of drug development:

- Basic life science and behavioral research relies on animal models
- Preclinical testing of drugs (Phase 1)
- New drug applications (NDAs) must include animal data
- Determining risk, as animal data is sometimes included when eliciting informed consent from people for human subjects research

Questions for discussion:

- In what way does the use of animals in research represent a direct conflict between the protection of human beings and animals?
- Even if we believe that we should never intentionally inflict pain or suffering on animals, what if such treatment would lower the risk of inflicting pain or suffering on humans?
- If we have to choose between an animal and a human being as the subject of a research project, is it ever justified to use a human subject instead of an animal?

Teacher-Directed Class Discussion

Discuss with students the following controversial cases of animal use in research meant to protect human beings:

1. Pharmaceutical companies or animal testing facilities test the safety of chemicals used in a variety of products. This is called toxicology testing. These tests are typically conducted without anesthesia, because drugs used for anesthesia could interfere with test results. The substances that are being tested are applied to skin or dripped into the eyes of animals; injected intravenously, intramuscularly, or subcutaneously; inhaled; or administered orally.
 2. Two especially controversial acute toxicity tests are the LD50-Test (“Lethal Dose 50%”) and the Draize test. The LD50 test is used to evaluate the toxicity of a substance by determining the dose required to kill 50% of the test animal population. The Draize test consists in applying a test substance to an animal’s eyes or skin, usually that of an albino rabbit.
- In what ways do these kinds of tests represent an example of a direct conflict between the rights and interests of humans and animals?
 - Would it be justified to ban these tests, even if that would increase the risk of humans being hurt or killed by exposure to toxic substances?

Present the current regulations on animal use in research:

Animal Welfare Act of 1985

The Animal Welfare Act provides some guidance for the utilization and care of animals in research. The following guidelines are used to determine whether the use and care of animals is ethical:

- Balancing societal benefits with imposition on animals (with respect to suffering and numbers of animals used)
- Minimization of pain, suffering, and distress in all procedures
- Species-appropriate housing, feeding, and care
- Involvement of veterinary personnel
- Qualifications of investigators and their personnel
- Research is overseen by an Institutional Animal Care and Use Committee

Institutional Animal Care and Use Committees

The IACUC has the responsibility to evaluate, report on, and inspect the facilities of all units employing animals for research, teaching, or testing. The mission of an IACUC is to ensure the humane handling, care, treatment, and transportation of covered animal species.

IACUCs must have a minimum of three members:

- One must be a doctor of veterinary medicine
- One must be a practicing scientist with relevant animal experience
- At least one must be a “public member” not otherwise associated with the institution or an immediate family member of someone affiliated with it and who is not a user of laboratory animals

The three main criteria used in the evaluation of animal use in research are:

1. Provide a clear rationale of animal use
2. Justify number of animals used in the study
3. Risk/benefit analysis

Subjecting animals to risk or certainty of discomfort, pain, and distress requires that the scientific benefits be at least commensurate. Investigators are responsible for designing research in which benefits outweigh risks or harm to animals and for persuading the IACUC that this is so. Investigators must show that there are no acceptable alternatives to animal use such as non-animal alternatives. They should also use the “lowest” species possible, minimize the numbers of animals used (statistical planning of the experiment minimizing variability within the model, etc.), and minimize the pain/distress associated with a particular model.

Students will get into groups of three. Each of the group members may take on the role of one of the persons on an IACUC: veterinarian, scientist, and public member. Each group will discuss an example (from below or one found online) of an actual animal research protocol and try to reach a consensus on whether the study should be approved or not. To that end, students should answer the following questions:

Do you (the IACUC) believe that this study is compliant with current rules regulating the humane treatment of animals used in research and should therefore be approved?

Do you believe, independent of the official rules and regulations, that the use of animals (including the infliction of discomfort, pain, and/or death) is justified in this research project, or not?

How did you arrive at your answers?

What principles, if any, did you use in addition to those articulated in official regulations?

For these and other examples see:

<https://clinicaltrials.vetmed.ucdavis.edu/>

Example 1

Study heart mechanics after resynchronization and evaluate heart efficiency.

Heart failure is an increasingly common disease. This is caused by a range of different mechanisms (e.g. heart attack), which ultimately weaken the heart's capacity to contract, and results in cardiac failure. To ensure optimal contraction, the heart's four chambers have to work in a synchronous fashion. In some diseased hearts this contraction is dyssynchronous, which means that some parts of the heart contract earlier than others, reducing the efficiency of the heart. To rectify this abnormality, pacemakers have been introduced in some patient groups with heart failure to resynchronize the heart. Unfortunately, not all patients respond to this therapy, and some even become worse.

In an attempt to improve patient selection, we wish to conduct animal experiments with pacemakers where we induce heart failure to study heart mechanics after resynchronization, by looking at the efficiency of the heart. It is unethical to conduct these tests on humans. There are data models that could simulate the heart's function, but these are too simplistic to replace the data collected during an animal experiment and would be of low scientific value. These experiments rely upon an organism with intact regulatory mechanisms. Due to the invasive nature of the experiment and size of instruments, animals smaller than dogs are less useful because of the frequent occurrence of lethal irregular heart rhythms and lower tolerance of the cardiovascular system.

Study protocol:

Mixed-breed dogs bred specifically for research purposes. Age 2–3 years, weight 25–35 kg (about 55–75 lbs.). Experiments are performed in a standard operating theater. The animal receives a venous cannula in one forelimb. Initiation of anesthesia is started with sodium thiopental followed by pentobarbital. Anesthesia is maintained with a continuous infusion of pentobarbital and morphine. Intubation is performed and a respirator is connected. A urine catheter, ECG, and pulse oximeter are then connected.

Sternotomy (splitting the breastbone) is performed in order to expose the heart. Pressure catheters are inserted into the aorta, left ventricle, and atrium. Ultrasonic crystals are implanted in various areas of the myocardium. Constrictors are inserted over the vena cava and aorta, and a Swan-Ganz catheter is inserted into the pulmonary artery. During the experiment, pressure measurements are made in the heart chambers. Monitoring includes measurement of blood gasses, body temperature and anesthesia. The animals are euthanized while remaining under anesthesia using pentobarbital.

Example 2

Protective effect of medicinal plant polysaccharides against systemic *Streptococcus pneumoniae* infection in mice.

A major public health concern today is the increasing resistance of bacteria to antibiotics. It is therefore important to find preventive and curative alternatives to existing antibiotics. A strain of bacteria that has shown resistance toward antibiotics is *Streptococcus pneumoniae*. This bacterium may cause potentially lethal diseases like meningitis.

Studies have shown that specific plant sugars, for instance glucans and pectins, protect against various bacterial infections and stimulate the immune system. These studies have mainly been performed in vitro (outside the living organisms). To find out if these substances are active also in vivo, within a living organism, and to study the mechanism behind this effect, the use of experimental animals is necessary. The research will study whether characterized pectins isolated from Malian medicinal plants can give protection against *S. pneumoniae* infection. Mice will be given certain doses of the pectin before challenge with *S. pneumoniae*.

In Mali, West Africa, approximately 80% of the population relies almost entirely on traditional medicines for their primary healthcare. The provision of safe and effective therapies based on traditional medicine would therefore become a critical tool to increase access to healthcare in the country. The positive side of using plant sugars as therapeutics is that to date, no negative or toxic effects have been recorded for this group of natural compounds.

Study protocol:

The mice will be given the test substances as injections 3h prior to challenge with *Streptococcus pneumoniae* serotype 6B. Mice will be followed for survival over a 9-day incubation period.

Determination of survival and blood sampling will be performed at 3h, 24h, 48h, 72h, 96h, and 9 days after challenge with *S. pneumoniae*. Blood samples of 25µl will be drawn from the distal part of the lateral femoral vein of each mouse. 10µl of the blood will be used for seeding onto blood agar plates to determine the number of colonies forming units (CFU).

Mice that are moribund will be euthanized by cervical dislocations, and the time of euthanasia will be recorded as the survival time. At the time of euthanasia blood samples from the abdominal cavity will be drawn for measurements of macrophage activity in this region.

Example 3

Colitis mouse model to study IgA on microbial composition and mucosal immunity. The main goal of this project is to explore the interaction between intestinal microbes and secretory immunity. We will use a colitis mouse model to observe the effect of IgA on microbial composition and distribution and thereby investigate the importance of polymeric immunoglobulin receptor (pIgR), which plays a vital role in mucosal immunity. The project will use mice knocked out for polymer immunoglobulin receptor, compared to wild type mice.

No alternative to an animal model is possible due to the intricacy of the system being investigated.

Since we are unable to physically create 8,001,000 commensal bacteria in the human intestinal environment, we wish to generate such a type of microenvironment in laboratory animals. As we know polymeric Ig receptor neutralizes intestinal bacteria, we want to investigate this receptor, so we need the bacteria.

In vitro studies can be used to create a monolayer of intestinal epithelial cells, but they cannot create the unique environment in the intestine, including subepithelial inflammatory cells, blood vessels, commensal bacteria, fungi, and so on.

To determine the composition of intestinal microbes on bacterial fecal pellets and fecal content, there is no alternative to experimental animals.

The animals will be 5–7 weeks old; this will probably create variable tumor progression since younger animals are more sensitive to the carcinogen. In the pilot we will consider this fact and improve breeding techniques in further experiments.

Alternatives to Animal Use in Biomedical Research

Based on what we have talked about so far and regardless of where we come down on some of the issues, it seems that we will always have to make tough decisions when weighing the protection of animals and the benefits of biomedical research to humans. But what if we could find alternatives to the use of animals in research? According to one of the generally accepted principles for the use of animals in research, namely “replacement” (the other two are “reduction” and “refinement”), non-animal methods should be preferred over animal methods whenever the same scientific aim can be achieved.

- With a partner, students should consider ways in which animal use in research could, in the future, be replaced by other methods that do not involve animals (or humans). Encourage students to be as imaginative as possible. (If necessary, mention possible candidates for the development of such new methods: computer technology, stem cell research, cloning, etc.)
- Collect and discuss students’ findings. Mention that some of similar ideas are actually already being explored. Share with students the article “Reconstituting Organ-Level Functions on a Chip,” which was published in *Science* in 2010, or just the abstract of the article, below:

Dongueun H, Matthews BD, Mammato A, et al. Reconstituting organ-level lung functions on a chip
Science. 2010;328(5986):1662–1668

Here, we describe a biomimetic microsystem that reconstitutes the critical functional alveolar-capillary interface of the human lung. This bio-inspired microdevice reproduces complex integrated organ-level responses to bacteria and inflammatory cytokines introduced into the alveolar space. In nanotoxicology studies, this lung mimic revealed that cyclic mechanical strain accentuates toxic and inflammatory responses of the lung to silica nanoparticles. Mechanical strain also enhances epithelial and endothelial uptake of nanoparticles and stimulates their transport into the underlying microvascular channel. Similar effects of physiological breathing on nanoparticle absorption are observed in whole mouse lung.

Mechanically active “organ-on-a-chip” micro-devices that reconstitute tissue-tissue interfaces critical to organ function may therefore expand the capabilities of cell culture models and provide low-cost alternatives to animal and clinical studies for drug screening and toxicology applications.

Discuss with students the following questions:

- How is this article relevant in the context of this unit?
- Do you believe that the technology described in this article could, one day, replace all use of animals in research?
- Do you believe that finding alternatives to the use of animals in research will put an end to the discussion about the treatment and moral status of animals? Why? Why not?

References & Additional Resources

For additional background information: http://en.wikipedia.org/wiki/Animal_testing

For more cases of animal use in experimentation: University of Minnesota website on Research Animal Resources: <http://www.ahc.umn.edu/rar>, <http://www.vetmed.ucdavis.edu/research/>

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