Online Ethics Center
FOR ENGINEERING AND SCIENCE

Selected Issues in Depth - Genomics and Domesticated Animals

Description

Part of unit 4 of the Course on Genomics, Ethics, and Society, this section discusses the ethics of genome engineering in animals and includes video clips from presentations by Dr. Mark Westhusin and Dr. Peter Sandøe.

Body

In this section of Selected Issues in Depth, we will explore aspects of genome engineering in animals, including discussion of the nature and use of these technologies, public perceptions, and ethical concerns and issues. We hear from Dr Mark Westhusin, Professor and Director of the Reproductive Sciences Laboratory at the College of Veterinary Medicine & Biomedical Sciences at Texas A&M University, and from Dr Peter Sandøe, Professor of Bioethics at the University of Copenhagen.

In this first segment, Dr Westhusin discusses the use of cloning for conservation, and points out that conservation isn't for wild species alone. Conservation may apply to valuable individual animals, including livestock and companion animals, with many types of applications.

Dr. Sandøe introduces the concept of *naturalness.* One example he discusses is the idea of breeding blind chickens to enhance animal welfare. What do you think of this application of technology?

Does cloning of animals raise concerns about potential reduction of biodiversity? Dr. Sandøe discusses here:

Dr Sandøe describes some advances in reproductive technologies over the years.

Here Dr Sandøe gives examples of embryo transfer and embryo cloning in farm animals and other "tools" in the biotech toolbox. He also describes the methods of selective animal breeding based on gene mapping and genomic selection.

Dr. Westhusin explains some of the technical detail splitting embryos to make animal clones. He explains how people were generally accepting of embryo splitting for cloning -- as opposed to the clones we think of today that are produced from adult cells. He also describes production of the cloned sheep, Dolly. Dolly was the first clone produced from an adult cell.

In the next video clip, Dr Westhusin explains some methods for making transgenic animals. He introduces methods that were used when this field began in 1981, and talks about how the emergence of transgenic technology opened new areas of scientific research. He notes that although we now see that mistakes were made, but scientists learned how to think about the whole animal as a physiological system, instead of focusing on just one gene.

Dr Sandøe also describes some of the history of transgenic animal production.

With the emergence of cloning, trangenics, and various reproductive technologies, discussion of ethical issues began. Dr Sandøe tells us that a 2008 European Ethics Comission found that "there are no categorical arguments against animal cloning for breeding with the purpose of food production," but the commission was not convinced that the reasons were not yet good enough to alleviate ethical concerns. He points out 3 types of concerns: concerns for animals, concern for nature and the environment, and concerns for humans and society.

Dr Westhusin talks about the difficulties of the "early days" of animal biotechnology, and explains how scientific understanding and advances in technology let to current capabilities, especially for modifying livestock. He also introduces the idea of

utilizing farm animals for producing pharmaceuticals, and explains the financial and regulatory requirements for these types of projects.

Next Dr Westhusin goes into more detail about producing therapeutic pharmaceuticals in milk. For example, 1 cow could be used to produce enough Factor IX clotting agent to meet worldwide demand. He also describes anti-thrombin 3, the first pharmaceutical produced in transgenic livestock, that was granted FDA approval. This compound is produced in goats, and drastically reduced manufactoring cost for production of this drug which is a critical need for stroke patients.

Dr. Westhusin discusses how animal scientists have made significant advances in science and technology, but now face great scrutiny from FDA regulation and difficulties in public perception and public understanding of the science. Dr. Westhusin explains how these conditions slow the application of transgenic animal technology for production of biopharmaceuticals.

In the next clip, Dr Sandøe tells us about his experiences related to prodcution of transgenic farm animals - with some parallels to Dr Westhusin. He talks about some early objectives and goals for producing products in livestock.

Dr Sandøe continues a discussion of transgenic animals, and points out that in biomedicine, use of transgenic animals is now commonplace and aceepted, even though GM livestock production has moved very slowly.

Here Dr Sandøe talks about public perception, risk assessment and food safety. Both US and European studies, he suggests, have established cloned animals as safe sources of food. However, risk is not the same as risk perception. He also notes that human psychological perception of risk is different from a scientific perception of risk. Many scientists view genetically modified and cloned animals as a way to improve production of pharmaceutical products and food, but public perception of these technologies is different. What do you think about current policies? What is your view of risk related to these technologies? How should scientists proceed in this matter?

Dr Sandøe continues the discussion about ethics of Dolly the cloned sheep. He explains how Dolly was the catalyst for much of the discussion about biotechnology and animals.

In this clip, Dr Sandøe talks about the results of a 2010 European study on perception of cloning.

What do you think about the outcome of these surveys? How have you formed your own views on genetic modification of food animals?

In this video, Dr Westhusin tells us stories about specific cloning examples.

Dr Sandøe describes Andi, a rhesus monkey who was the first transgenic non-human primate. Andi contained the same gene that enables jellyfish to emit fluorescence. A number of ethical questons were generated by the birth of Andi. Does Andi represent a "slippery slope" in cloning because this is a species closer to humans?

Here, Dr Sandøe discusses issues of animal welfare related to cloning.

In this segment, Dr Sandøe goes into further discussion about the history of ethical debate related to animals (a topic he thinks is 200 years old or more). Dr Sandøe notes that technology or genetic modification doesn't really seem to affect the overall issue.

Finally, Dr Sandøe discusses ethical issues in greater detail. An important underlying concept relates to views about animal welfare (which permits animal use, if animals have good welfare, however that is understood) and animal rights (which is much less likely to permit animal use, especially where use is understood to be an animal's only purpose). He describes 5 views about humans' duties to animals, and suggests that the debate about animal use is influenced by ethical debate about whether animals have rights that should not be violated. However, he maintains, there may be room for compromise, it may be acceptable to use animals for research if 1) there is no other way to get results, and 2) the results are highly important for alleviating human suffering and disease. He suggests we should ask whether animals are really undergoing the mimimum suffering necessary to meet the goals

of research, whether there's a credible argument that the research is really important, and whether (independent of the research itself) the animals are cared for appropriately.

Continue to Readings

Resource Type

Instructor Materials

Topics

Animal Use
Emerging Technologies
Public Health and Safety
Environmental Justice

Discipline(s)

Animal Science
Genetics and Genomics
Biomedical Engineering and Bioengineering
Life and Environmental Sciences