



Explore More: Genetic Engineering

Genetic Engineering has the potential to change the way we live. The science behind the agricultural, medical, and environmental achievements is spectacular, but this excitement is tempered by concern for the unknown effects of tampering with nature. Students viewing *Explore More: Genetic Engineering* will examine the issues, survey the experts, and make their own decisions about the possibilities of this technology.

This 30-minute video program outlines several issues surrounding the genetic engineering topic, surveys stakeholders and experts in the field, and presents thoughtful questions to challenge your students. The program can be used as a stand-alone piece or used in conjunction with the in-depth Web site and the interactive *Explore More: Genetic Engineering* DVD. Each Explore More program allows your students to investigate important issues in your classroom. The videos are designed to be flexible and are organized around clear segments for pausing for classroom discussion. Watch a five-minute clip to jump-start classroom discussion. Watch the entire program to go in-depth on the issues.

The Explore More feature videos give the big picture, increase awareness, and facilitate discussion with thought-provoking issues and expert interviews. Each 30-minute video introduces compelling issues, surveys stakeholders and experts in the field, and presents thoughtful questions to challenge students. The Viewpoint Extras, following each feature VHS program, are 15-20 short interview segments of in-depth analysis of issues. Companion viewing guides with pre-viewing and post-viewing questions, timecodes for easy accessibility, and key vocabulary words, as well as video scripts help students examine and evaluate perspectives and arguments.

PROGRAM INFORMATION

Companion Web site at www.iptv.org/exploremore

Title: Explore More: Genetic Engineering

Series: Explore More

Producer: Iowa Public Television

Distributor: Iowa Public Television

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Physical Format: VHS

Length: 29:00 minutes (plus additional 15:00 minutes of interview segments)

Audience: 6 grade +

Closed Captioning: Yes

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Video Discussion Questions

Explore More: Genetic Engineering is a 30-minute feature video that outlines several issues surrounding the topic, surveys stakeholders and experts in the field, and presents thoughtful questions to challenge your students. Following the main feature are five additional Viewpoint Extras. The feature video and Viewpoint Extras have a set of pre-viewing and post-viewing questions for classroom discussion.

EXPLORE MORE: GENETIC ENGINEERING FEATURE VIDEO

Timecode

- 00:00** **Genetic Engineering and Who Is Involved?**
Don Mattson, Researcher for Kemin Industries; Georg Anderl, Plant Manager for Genencor International, Inc.; Charles Link, M.D., Researcher for Human Gene Therapy Research Institute; Norma Hirsch, M.D.
Pre-Viewing Questions
What comes to mind when you think of genetic engineering? • How could genetic engineering change the world?
Post-Viewing Questions
Why would industry care about an environmentally safe detergent? • What are some interesting and clever uses of genetic engineering? • Why would production needs be met before consumer needs? • Why would farmers, doctors, and manufacturers be interested in genetic engineering?
- 07:10** **Labeling Genetically Engineered Food**
Jerry Fleagle, President of Iowa Grocery Industry Association; Steve Druker, Lawyer with Alliance for Biointegrity; Fred Kirschenmann, Organic Farmer with the Leopold Center for Sustainable Agriculture; Tom Vilsack, Governor of Iowa
Pre-Viewing Questions
Do you want genetically engineered foods labeled? Why?
Post-Viewing Questions
What political, environmental, and production obstacles could arise in the effort to label genetically engineered foods?
• What could be done to overcome these problems? • Is it worth the effort?
- 13:10** **Feeding the World**
Steve Druker, Lawyer with Alliance for Biointegrity; Jerry Harrington, Public Relations with Pioneer Hi-Bred; Fred Kirschenmann, Organic Farmer with the Leopold Center for Sustainable Agriculture
Pre-Viewing Questions
What food traits would you like to see genetically engineered? • What would be the long-range effects of this food trait?
Post-Viewing Questions
How will we meet growing demand for food around the world? • Build a case for or against production of genetically engineered foods such as golden rice. Defend the opposite side with counterpoints against your case.
- 18:13** **Genetic Engineering and the Animal Kingdom**
Monica Post, Education Curator of Blank Park Zoo
Pre-Viewing Questions
How would you use genetic engineering to design the ideal pet?
Post-Viewing Questions
What are the rewards and risks of using genetic engineering to assist endangered and extinct animals? Are the rewards worth the risks? • How can some risks be minimized? • How can cloning help / hurt farmers?
- 21:38** **Human Cloning**
Norma Hirsch, M.D.
Pre-Viewing Questions
Think of someone who could have benefited from genetic engineering in the treatment of disease. How would this have changed the present? • Is this an ethical use of science?
Post-Viewing Questions
Why are some uses of human cloning considered ethical or unethical? • Are you doubtful, fearful, or hopeful about human cloning?

27:29

Moral and Ethical Dilemmas

Brother Dave Andrews, Priest, National Catholic Rural Life Conference; Charles Link, M.D., Researcher for Human Gene Therapy Research Institute; Norma Hirsch, M.D.

Pre-Viewing Questions

Who should be involved in determining the ethical uses of genetic engineering?

Post-Viewing Questions

What are the potential consequences, positive and negative, of discovery in the genetic engineering field? • How could the public be informed of the issues of genetic engineering in a non-biased way? • What ethical and moral issues should be debated when discussing the effects of genetic engineering?

EXPLORE MORE: GENETIC ENGINEERING VIEWPOINT EXTRAS

Timecode

- 30:34** **State's Stake: Industry Regulation – What are the challenges of regulating genetic engineering?**
Tom Vilsack, Governor of Iowa; Steve Drunker, Lawyer with Alliance for Biointegrity; Rod Townsend, Director of Regulatory Sciences for Pioneer Hi-Bred; Cliff Mulder, Iowa Farmer
Pre-Viewing Questions
Should an industry be responsible for regulating itself? Why? • What questions or concerns would arise? • Are regulations designed to protect consumers, the industry, or both? • How does regulation affect consumer confidence?
Post-Viewing Questions
What are benefits and drawbacks of industry conducting tests on its own products and submitting the results to the federal regulatory agencies? • Should the state take greater responsibility for regulation? • How can the state best carry out its responsibility to educate everyone about genetically engineered crops and food? • How can farmers get objective information on genetically engineered crops?
- 33:39** **State's Stake: Industry Investment – What are the financial reasons for a state to adopt or reject genetic engineering?**
Tom Vilsack, Governor of Iowa; Steve Drunker, Lawyer with Alliance for Biointegrity
Pre-Viewing Questions
Who and what influence a state's budget? • How does the public play a role in that process?
Post-Viewing Questions
What systems or services would a community, state, and country need to develop to support the biotech industry? • How could investment in the biotech industry help or hurt a community, state, or country?
- 35:16** **Farming's Future: Family Farms – What are the advantages and harms of using genetic engineering in farming?**
Tom Vilsack, Governor of Iowa; Fred Kirschenmann, Organic Farmer with the Leopold Center for Sustainable Agriculture; Steve Drunker, Lawyer with Alliance for Biointegrity
Pre-Viewing Questions
What crop traits could genetic engineering offer farming (e.g., herbicide resistance, greater yields)? • What are the differences between monocrops and sustainable agriculture?
Post-Viewing Questions
What are the benefits and risks for farmers using genetic engineering? • What are the benefits and risks to consumers when farmers use genetic engineering? • How do you see genetic engineering affecting the next generation of farmers? • What will a typical Iowa farm look like as a result?
- 37:40** **Tinkering with Nature: Traditional Breeding and Beyond – What are the benefits and risks when comparing traditional and genetically engineered breeding?**
Gary Comstock, Bioethics Professor at Iowa State University; Fred Kirschenmann, Organic Farmer with the Leopold Center for Sustainable Agriculture; Steve Drunker, Lawyer with Alliance for Biointegrity;
Pre-Viewing Questions
What is traditional breeding? • How does genetic engineering differ? • What does self-replicating mean for plants and animals?
Post-Viewing Questions
What could the outcomes be of self-replicating plants and animals? • How will a farmer's role change?
- 40:52** **Tinkering with Nature: Should We or Shouldn't We – What ethical dilemmas are created when genetic engineering is put into practice?**
Gary Comstock, Bioethics Professor at Iowa State University; Brother Dave Andrews, Priest, National Catholic Rural Life Conference; Norma Hirsch, M.D.
Pre-Viewing Questions
How do we view the differences between genetically engineering plants, animals, and humans? • What happens when a science is more advanced than the laws that govern it?
Post-Viewing Questions
In your discussions, have your opinions been based on extrinsic or intrinsic points of view? • When does inquiry or scientific discovery cross the line and become a moral dilemma? • Why would genetically engineered plants or animals, be more readily accepted than genetically engineered humans?

Key Words GENETIC ENGINEERING FEATURE VIDEO

bST	Bovine somatotropin is a genetically engineered copy of a naturally occurring hormone produced by cows. Manufactured by Monsanto Company, the drug is sold to dairy farmers under the name POSILAC. Also referred to as BGH, rBGH, and rBST.
clone	<ol style="list-style-type: none">1. A group of genetically identical cells descended from a single common ancestor.2. To duplicate an organism asexually by cloning.3. Multiple copies of one piece of DNA.
DNA	The long molecule found in the nucleus (usually) of a cell that carries instructions from generation to generation.
embryo	A developing human from the time of implantation to the end of the eighth week after conception.
enzyme	A complex protein produced in living cells that makes specific biochemical reactions happen.
genes	<ol style="list-style-type: none">1. Pieces of DNA.2. Units of heredity that hold and release information for building and controlling cells.
genetic engineering	A scientific process that involves changing an organism's original genetic code.
recombinant DNA	A chemical similar to a single strand of DNA. In RNA, the base chemical uracil (U) is substituted for thymine (T) in the genetic code. RNA delivers DNA's genetic message to the cytoplasm of a cell where proteins are made.

Key Words GENETIC ENGINEERING VIEWPOINT EXTRAS

EPA	The Environmental Protection Agency is responsible for protecting our environment.
extrinsic	<ol style="list-style-type: none">1. Originating from the outside.2. Not forming part of or belonging to a thing.
FDA	The Food and Drug Administration is responsible for making sure our foods are safe to eat and our medicines and medical treatments are safe to use.
intrinsic	Belonging to the essential nature of a thing.
monocrop	A crop of a single kind of organism (e.g., corn, wheat, sorghum) grown on land.
nanotechnology	The nanoscale is ten to the minus ninth power (one billionth). Nanotechnology is the study of learning how to manipulate atoms and molecules into tools people can use.
robotics	The study of mimicking human actions and abilities using machines (i.e., robots).
self-replicating	An organism or molecule that is capable of reproducing an exact duplicate of itself.
World Food Prize	The World Food Prize is the foremost international award recognizing the achievements of individuals who have advanced human development by improving the quality, quantity, or availability of food in the world.