

THE ENVIROPIG: How will Genetically Modified Animals treat our tax dollars?



Summary

This is a significant development in Biotechnology. As you may have already heard, the EnviroPig™ has been gaining much attention throughout the past few years, becoming a controversial topic on the Canadian political platform. Given the information that is assigned below in the following paragraphs, you and a group of 4-5 other students will be giving a 1 minute presentation on whether or not the town council (consisting of various influential and important provincial and federal politicians) should continue funding the EnviroPig™ project or not. It is your decision to choose which side you wish to pursue, to continue funding or not to continue funding. A rubric is attached at the back of the package for your guidance, use the materials provided at your will. You have **30 minutes** to do your work.

WHAT is the EnviroPig™?

Most farmers feed their pigs the enzyme phytase as a supplement, because phosphorous cannot be broken down by pigs naturally. But ingested phytase isn't as effective at breaking down phosphorus as phytase created inside the pig would be, so a fair amount of the element gets flushed out in pig waste. That waste, in turn, can make its way into the water supply.

Enviropig would eliminate the need for added phytase, because the animal has been engineered to make its own.

Researchers spent more than a decade hunting for an enzyme in nature responsible for breaking down phosphorous, finally finding it in the genome of the bacterium *E. coli*.

To make sure the modification would work in mammals, the team paired the *E. coli* genes with a mouse DNA promoter, a section of DNA that encourages replication of a specific segment—in this case the bacterial genes. Researchers then injected microscopic fertilized pig embryos with the mixture.

Early trials revealed that the bacterial enzyme was not only incorporated into the pig genome, it could be inherited by the genetically engineered pigs' offspring

Ministry of Environment

Liberals (For):

The EnviroPig™ can process more phosphorus than other pigs, which means less phosphorous is available in its manure, meaning runoff from crops spread with this manure will also contain less phosphorous. When phosphorus from runoff goes into lakes, rivers, etc. algae thrive in those waters, which tend to deplete the water of oxygen. This lack of oxygen kills fish, as well as other aquatic life. The EnviroPig™ will decrease the amount of phosphorous in the manure, therefore algal booms will decrease, killing less aquatic life.

Conservative (Against):

The EnviroPig's environmental benefits only apply to large scale hog production, where massive amounts of pig manure provide a threat for water systems if manure is not safely stored away from water systems. However, for small scale hog farms, the amount of phosphorous leaking into the system would be minimal. In fact, phosphorous rich manure is beneficial to a small hog farmer because crops need phosphorous to grow. Also, the run-off that goes into the water system consists of other pollutants such as nitrogen (which is a concern as well) still remains in the pig manure. Therefore the whole problem is not being tackled, but a portion of it.

Also, there are already supplements on the market which are competitively priced, meaning that the EnviroPig will not be saving a hog farmer much money.

Sources:

<http://news.nationalgeographic.com/news/2010/03/100330-bacon-pigs-enviropig-dead-zones/>
http://www.uoquelp.ca/enviropig/environmental_benefits.shtml

Ministry of Economic Development

Conservative MP (For):

Introducing a technology that suppresses phosphorus production will provide a sense of financial relief to many hog farmers. In addition, the EnviroPig will reduce the costs of phosphorous supplements for the pigs because the pigs will now be able to digest the phosphorous in their grain rather than have to get it added to their feed. An unmodified pig requires phosphorus in their diets because they need minerals for skeletal growth.

Farmers put supplemental phosphorus in an unmodified pig's diet because pigs are unable to absorb the phosphorus that is naturally presented in their food. However, the cost of these supplements is rapidly increasing. For example, Mon-Dicalcium Phosphate, (one of the supplements) has increased from approximately \$200 per ton to \$900 per ton in the past few years. This drastic rise in cost is forcing farmers to find more cost effective solutions. By introducing the Enviropig, hog farmers would save the hassle of having to seek funding from alternative sources, such as government subsidies.

NDP MP (Against):

In contrast, extrinsic monetary and non-materialistic factors may impose a greater economic challenge to Canadian hog farmers. Given that the Enviropig is in prospect of being a patented technology, companies who design the Enviropig would likely charge a fee for the usage of each hog, in similarity to what Monsanto technology did with their GM seeds. CBAN (Canadian Biotechnology Associated Network) has reported that "the Enviropig threatens to add more costs and severely undermine domestic and export consumer confidence in Canadian pork products". Canada constitutes about 20% of the world pork trade, is the third largest pork exporter, sending pork products to over 100 countries. Thus, there is also the concern in that export markets will hesitate to open up to GM pigs, which in turn would further deflate prices and reduce overall profits.

Sources:

<http://www.cban.ca/Resources/Topics/Enviropig/Enviropig-Background>

Ministry of Ethical Affairs:

Liberals (For):

The truth is, "If you invented something and you start to develop, put money into it – suddenly you become very biased. And equally, the response to bias... is another bias in the opposite direction, probably more extreme and less rational." We need to be careful not to let our human fear of the unknown and unfamiliar get in the way of rational thought. Especially now when we really need to start considering the environmental impact of agriculture, something at which our forefathers failed.

Even though the problem could be solved alternatively in a more 'natural' way by reducing so-called 'factory-farms', the reality of the Canadian hog-market is that this is the only way for the industry to survive at the international level. Over the past 20 years, the revolutionized hog industry has changed to a few large corporations owning them, while small, family-run farms have gone bankrupt and out of business.

Conservatives (Against):

"Scientists lose sight of the fact that there's right and wrong in the world. Just because you *can* do something, doesn't mean you *should* do something. I think in this case,

they've modified the pig to address a sort of non-existent need." An alternate way to address the problem of phosphorus pollution would be to reduce the concentration of hog-confinement facilities and the numbers of animals in them. Quote: "The problem isn't with the pigs. The problem of hog operations polluting the water has to do with the whole industrialization scale that has been developed to raise hogs."

"...there are safety issues that need to be addressed. As the researchers themselves acknowledge, it's unclear if the DNA or proteins might cause problems if it jumps to another species. This gene is totally novel to pigs, and who knows how it might behave. Low levels of phytase in the meat might be toxic or allergenic." Do humans have the right to modify life forms for private profit? We are ingesting 'unnatural' foods into our future generations, what are the side effects of this?

Sources:

<http://www.theontarion.com/2011/02/rally-voices-opposition-against-enviropig%E2%84%A2/>
<http://somethinktochewon.blogspot.com/2006/05/enviropig-tm.html>

Ministry of Regulatory Affairs

Liberals (For):

"If the Enviropig hits shelves, it would open the market for more research and more GMO products" and continuing funding this research will be what allows us to determine what is safe and what isn't in the future. "Genetically modified food is already on your table. Corn, soy, and rice (the big staple foods) have been GM for a while now, especially in the US, and the practice is growing all over the world." Putting the issue aside right now will stifle growth and research to understand the issue further and will cripple future generations' ability to regulate these issues when it's their turn.

On February 20 2010, the Department of the Environment of the Canadian Government determined that Enviropig is in compliance with the Canadian Environmental Protection Act and can be produced outside of the research context in controlled facilities where they are segregated from other animals. Steven Liss, associate vice-president (research services) of the University of Guelph said in February 2010 that "Applications to other federal agencies to assess the safety of Enviropigs for human food and animal feed were currently under review both in the U.S. and Canada and there is no set date when or if these reviews will conclude."

Conservatives (Against):

"In Canada, the public has borne the onus of cost for development of Enviropig through the University of Guelph and Health Canada, the agency that supposedly protects public health, but apparently doesn't believe the public has the right to know how it makes decisions." "It raises the question of whether we can trust regulators to make the right decision for consumers and pork farmers."

“There [are] very few independently funded, peer reviewed, scientific studies that look at specific health questions about genetically engineered foods.” Do we know enough about this to really say that it is safe? And should we fund something potentially dangerous that might get into the homes of Canadians?

Sources:

<http://www.thestar.com/Comment/article/541710>

<http://www.mcgilldaily.com/2011/02/enviropig-the-other-white-meat/>

<http://gefreesbc.wordpress.com/2010/03/19/guelphs-enviropig-satisfies-requirements-of-epa/>

<http://www.gaia-health.com/articles301/000314-enviropig-genetically-modified-pigs.shtml>

Outcome

Questions

Questions for the case study

1. **Ethical:** Would you eat a meat product in which the animal was genetically modified?
2. **Economic:** If you had to design a label on a package for a genetically modified animal, what would it look like and why?
3. **Economic:** Suppose you are a business analyst for the Enviropig. What would be your strategy in marketing/advertising the commercial sale of the product?
4. **Ethical:** The media has implied that the acceptance and adaptation towards genetically modified animals will be analogous to what occurred with genetically modified crops? Do you agree with this statement?
5. **Political/Legal:** What types of regulations would you impose on the production of genetically modified animals?
6. **Environmental:** Do you believe that the Enviropig has a large-scale environmental benefit? Why or why not?

Enviropig Case Study: Judging Sheet	
Knowledge and Understanding Information and ideas are thorough, well chosen and relevant to the topic.	/10
Application Makes detailed and focused connections. Challenges topic by analysing three perspectives (i.e. ethical, economic, environmental etc.)	/10
Thinking Material is organized with a high degree of clarity and logic. Explanation of topic is insightful and analysed thoroughly.	/10
Creativity Information was presented using an original and unique approach.	/10
Communication Audience Engagement, Persuasiveness is incorporated, Style and tone is appealing	/5
Final Score	/45