

ENVIROPIG™ 1

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Fifteen years ago in a lab at the University of Guelph in Ontario – then home to some of Canada’s most ardent supporters of the new science of genetic engineering – an idea was conceived. Five years later, “Wayne,” a genetically modified (GM) pig was born. Now, the so-called “Enviropig™” could soon be approved for human consumption in Canada and possibly the US as well.

As technology grows increasingly complex and our environmental problems ever more serious, the proposed “technological fixes” from industry grow more ludicrous and dangerous. And so it is with genetic engineering. The common disconnect between science and reality is represented perfectly by the ridiculous, and yet threateningly real GM Enviropig™ project. Enviropig™ is the grotesque realization of early scientific aspirations and laboratory accidents. Born of scientific curiosity, hubris and a complete misunderstanding of the real world, a GM pig with less phosphorous in its feces is being proposed as a solution to water pollution caused by run-off from factory farms.

Enviropig™ is the trademarked industry name for a pig that has been genetically engineered to excrete less phosphorous in its feces. It will produce the enzyme phytase in its salivary glands to enable more effective digestion of phytate, the form of phosphorus found in pig feed ingredients like corn and soybeans. Scientists inserted a transgene sequence that includes an E-coli bacteria phytase gene and a mouse promoter gene sequence.

Enviropig™ is a classic false technological fix that ignores the real causes of a problem and instead tries to develop, at great cost, a shiny, new, patented product for sale to mask the symptoms.

Phosphorous from animal manure is a nutrient for plants that becomes a pollutant if there’s too much of it for crops to absorb and the excess runs off into streams and lakes. When pig manure spread on farmland exceeds the amount crops can use while growing, the excess phosphorus runs off as fields drain into surface waters. There, it promotes excessive algae growth. The algae form thick mats, blocking sunlight from reaching deeper waters and when the algae dies and decomposes, it uses up dissolved oxygen in the water, killing fish and other organisms. Blue-green algae, which often grow in phosphorus-rich waters, produce cyanotoxins that can kill livestock and pets if they drink the polluted water.

How it started

The Enviropig™ was developed using specific gene sequences from mouse and *e coli* DNA, which were further modified to work in a pig. In combination, the genetic code would trigger the production of a digestive enzyme (secreted into the saliva) not found in domesticated hogs.

The genetic material was inserted into a fertilized pig embryo via microinjection. In turn, the embryo was surgically implanted into the reproductive tract of a sow, and born about four months later. When mature, the genetically modified pig was crossed with a conventional pig, and about half of the offspring exhibited the new, stable, modified gene. The Enviropig is now in its eighth generation.

– P. S. Bromley

But phosphorus pollution is a problem specific to the industrial model of hog production where tens of thousands of pigs under one roof produce too much manure for the surrounding land to use productively. Such intensive, concentrated production means that operations import tonnes of pig feed from distant sources and must then pay the cost of disposing of millions of gallons of

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liquified hog manure. Operations prefer to spread manure on land within a mile or two of the industrial pig barns rather than pay to transport heavy liquid manure to more distant fields. Enviropig™ is designed to reduce the amount of phosphorous produced by the pigs themselves so factory farms don't have to pay for other measures, such as reducing the number of pigs they raise in one place, trucking liquid manure longer distances or expanding the area of land for spreading manure. The real solution, however, lies in changing the model of production, not in genetically engineering the pigs.

Enviropig™ is expressly designed to support existing factory farming practices. In the early days, before the advent of extensive public relations, University of Guelph scientist and Enviropig™ developer John Philips said as much. In 1999, a *Reuters* article* included Philips articulating the economic rationale that, if phosphorous in pig manure is reduced by 50 percent, theoretically, farmers can raise 50 percent more pigs and still meet environmental restrictions. Philips went on to say that, in North America, Europe and in some parts of Asia, the only thing holding back a farmer's hog output is the restriction on phosphorous leaching into the water table. (**This Little Piggie Smells Better.*)

Stop this little piggy

The Canadian Biotechnology Action Network has started a new campaign, "Stop Enviropig™." For more information and to take action, visit www.cban.ca/enviropig

1. Write to the Minister of Health today at www.cban.ca/enviropigaction.
2. Join the campaign at www.cban.ca/enviropig
3. Donate today to support the campaign. Your support is urgently needed. www.cban.ca/donate

Smaller Farms Means Less "Waste"

In an alternative model characterized by smaller hog production units dispersed over a wide geographic area, phosphorus in pig manure does not become an environmental problem; it is used as a valuable fertilizer instead. Phosphorus is an important plant nutrient and an essential element of soil fertility in farming. Animal manure is a source of phosphorus for growing field crops, including those used to feed pigs.

Twenty years ago, hog production in Canada was based on a successful model where tens of thousands of farmers earned a livelihood raising pigs in modest-sized operations. Now, the hog industry is dominated by a few giant hog production corporations where thousands of pigs are raised under one roof. Smaller, independent farmers have been forced out of business through loss of market access and unfair competition from huge, vertically integrated companies that own hog barns as well as packing plants and other related businesses. Hog production has doubled over the past 20 years, but in the 13 years between 1996 and 2009, the numbers of farms reporting hogs was cut by nearly two-thirds – from 21,105 to 7,675.

Intensive production has made Canada a major global supplier of hogs, but we can't compete with other countries that have lower labour and feed costs. The result is that Canada's hog producers have been forced to sell below their cost of production for many years and small producers have retired, sold out or gone bankrupt. Only the biggest producers and some contract producers are left, surviving almost exclusively on government subsidy programs and bailout packages. Adding a GM pig to this economically and environmentally unsustainable model will only deepen the crisis.

Who's Your Daddy?

Enviropig™ is the child of researchers at the University of Guelph and is almost fully funded by the public purse, with one exception. The hog producers' association, Ontario Pork, is the single private investor and has funded research and development to the tune of at least \$1.371 million.

The money invested came directly from Ontario hog producers who pay a compulsory fee to the association on each hog marketed in Ontario. Ontario Pork holds an exclusive licence to distribute the pig to swine breeders and producers worldwide, but the association might want to rethink this plan in light of the global uproar over GM pork it is about to witness. What might have looked like a progressive and technologically advanced position 10 years ago has been overtaken by other technological developments, namely an enzyme feed supplement that can cut phosphorous by around 30 percent.

Is Enviropig™ Safe to Eat?

Enviropig™, like all GM foods in Canada, will be assessed for human safety by Health Canada and classified as a “novel food.” Health Canada, however, has not yet developed specific guidelines for evaluating the safety of GM animals for human consumption. Instead, Canada will rely on the United Nations Codex guidelines and refer to the US Food and Drug Administration. Health Canada does not conduct any of its own safety tests of GM foods, but relies on data submitted directly from the product developer, in this case the University of Guelph. The data is classified as “Confidential Business Information” and is not accessible to the public or to independent scientists. Of course, there is no mandatory labelling of GM foods in Canada or the US so approval of GM pork is likely to spark an unprecedented crisis of consumer confidence in the food system.

Enviropig™ on the Loose?

We have already witnessed the bio-safety risk posed by Enviropig™. In 2002, a precedent for contamination of the food system by Enviropig™ was set when eleven GM piglets at the University were sent to a rendering plant and turned into animal feed instead of being destroyed as biological waste. The GM pigs were not approved for animal feed and they contaminated 675 tonnes of poultry feed that was sold to egg farmers, turkey farmers and broiler chicken producers in Ontario. As then vice president of research at the University of Guelph told the *Globe and Mail*, “Things you don’t expect to happen can happen”.

That incident was not the only time that experimental GM pigs have contaminated the food system in Canada. In 2004, experimental GM pharma-pigs from the Quebec company TGN Biotech were accidentally turned into chicken feed instead of being incinerated.

GM Pork Coming to a Plate Near You?

In February of this year, Environment Canada granted approval to the University of Guelph for the reproduction and exportation of Enviropig™. This is the first time that Environment Canada has been directly involved in the approval of a GMO and the department was given the responsibility because no regulations for GM animals exist in Canada. In cases where regulations do not exist, new products are assessed under the Canadian Environmental Protection Act. (All GM crops in Canada have been approved for environmental release by the Canadian Food Inspection Agency, which falls under Agriculture and Agri-Food Canada, under the “Plants with Novel Trait” guidelines.)

The University of Guelph is now waiting for Health Canada to approve Enviropig™ for human consumption. According to the University, it submitted an application on April 23, 2009. The application and the process for its evaluation are kept secret by the University and Health Canada so there’s no way to know when the application could be approved, but it could be granted at any time. (The University also submitted an application to the Canadian Food

Inspection Agency, which is probably a request to approve Enviropig™ for use in other livestock feed.)

It's possible that Enviropig™ could be approved in the US before Canada, as the University of Guelph submitted an application to the US Food and Drug Administration in 2007. Canadian university researchers-turned-entrepreneurs know to try US food safety assessment first, as a strategy to gain faster approval and then pressure Canada to follow. This is the case with the Canadian company AquaBounty, which has requested US approval for its fast-growing GM salmon. The company won't even bother to request approval in Canada until this happens. The GM fish is now competing with Enviropig™ to be the first GM food animal approved in the world.

Canada's hog producers rely on export sales more than any other country, exporting to more than 110 countries in 2009. But the predictable scenario is worldwide rejection of GM pork, causing harm to Canadian export sales and depressing prices.

The reality is that hog farming in Canada is already in deep economic crisis. For several years, farmers have been losing money on every hog they sell, surviving primarily on off-farm jobs and government subsidies. While managing phosphorus over-production is a cost for intensive operations, the GM pig will likely also come at a very high price. Patented GM technologies are notoriously expensive and control over them is wielded to bleed farmers of as much money as possible.

With so many large-scale industrial hog operations collapsing in Canada, a return to smaller, less concentrated hog production – combined with other policies that ensure independent farmers have access to markets, get a fair share of returns, and are not undercut by cheap imports from jurisdictions with weak environmental and labour laws – could also be the solution to the severe income crisis in the hog industry.

Enviropig™ was allowed to happen because there has never been a democratic debate in Canada about genetic engineering and there is no public overview of the direction of public research. Not only did Canadians pay for the research and development of Enviropig™, we are now paying for Health Canada to decide if it's safe enough for us to eat.