**The Next Pig** **Thing**

Canadian researchers have developed a genetically-engineered pig that could help clean up a major source of water pollution -- but environmental groups want the swine squelched.

by Leora Broydo Vestel October 26, 2001

Once upon a time there were three little pigs. They were very special pigs. Their genes were engineered by scientists to make them less damaging to the environment than any of their swine brethren. And everybody lived happily ever after.

Or maybe not. The three pigs in question, developed by researchers in Canada and already patented as 'Enviropigs,' represent a unique dilemma for environmentalists. Major green environmental organizations are virtually unanimous in the view that genetically-modified products should be banned. But the Enviropigs address a major environmental problem -- one those same groups have been fighting for years.

At this point, while researchers and pig farmers have extolled the environmental benefit Enviropigs present, most of the leading environmental groups aren't following suit. While the hogs' virtues may be attractive to the green groups, their modified genes represent a vice too significant to overlook.

The crux of the debate centers around the manure pigs produce. Modern pig farming often involves raising thousands of swine in a single facility -- which can in turn generate thousands of tons of manure every year. That manure is then spread in fields or stored in "lagoons." The contaminants in the manure can spread from either fields or lagoons into water sources. In 1995, for instance, an eight-acre hog-waste lagoon in North Carolina burst, spilling 22 million gallons of manure into a nearby river and killing enormous numbers of fish. Concentrations of manure rank "among the greatest threats to our nation's waters and drinking water supplies," according to a recent Environmental Protection Agency study.

The Enviropig, developed at the University of Guelph in Ontario and introduced to the world in August, have been modified so that their manure contains up to 75 percent less phosphorus than the average swine. Several substances in pig manure cause environmental damage, but phosphorus is one of the major culprits. The presence of phosphorus in waterways can cause fish kills, biodiversity loss and foster the growth of toxic organisms, according to the EPA.

Unlike their predecessors, such as a salmon that are designed to grow faster, the Enviropig is the first animal engineered for environmental benefit. Not surprisingly, scientists and pork industrialists are thrilled, since proposed government limits on phosphorus output threaten the industry's growth. Ontario Pork, a trade association representing pig farmers in the Canadian province, calls the Enviropig "the biggest breakthrough in pig farming since the invention of the trough."

"The environmental barriers are the largest in terms of growing as an industry," says Clare Schlegel, chairman of Ontario Pork, which represents 4,400 hog farmers in the province and has been a primary funder of the Enviropig research. "[Pork producers] are being looked at as polluters -- this is one technology to show that we do care." Environmentalists aren't buying it.

The Sierra Club, which has made lobbying for controls on pig manure pollution a centerpiece of its clean water campaign, calls the Enviropig a load of hogwash.

"This is just another quick fix," says Laurel Hopwood, chair of Sierra Club's genetic engineering committee. "The way to reconcile [the problem] is to stop factory farming." Greenpeace and other environmental groups have echoed the Sierra Club message, arguing that the only real solution is moving away from massive industrial-style hog-growing and instead raising fewer pigs in bigger outdoor spaces.

Other technical fixes also exist. Pigs don't digest most of the phosphorus in their grain-based diet, so it ends up in their manure. A new breed of corn, developed by a USDA researcher, reduces phosphorus in manure by up to 50 percent. A widely practiced strategy of adding the enzyme phytase to feed can also reduce phosphorus content by 56 percent.

"There are a lot of sustainable agriculture programs that offer real benefits to food security and to the environment that take far less resources than the biotech solutions being proposed," says Michael Khoo of the Union of Concerned Scientists. The Guelph researchers addressed the problem by modifying the pigs' digestive abilities. They combined a bacterial gene which makes an enzyme that breaks down the form of phosphorus found in pig feed with a mouse gene that causes the enzyme to be secreted from an animal's mouth. The composite gene was then injected into one-celled pig embryos that were subsequently surgically implanted into a surrogate mother.

The results were the first three Enviropigs, which researchers named Wayne, Jacques and Gordie after famous Canadian hockey players. Today, Guelph houses more than 100 Enviropigs -- the result of three generations of breeding, and all of them have inherited the genetic trait that allows for the digestion of phosphorus. All produce manure that contains 60-75 percent less phosphorus than non-engineered pigs.

Apart from that helpful trait, "there's nothing we've seen so far that would indicate that there's any abnormality" with the pigs, says molecular biologist Dr. John Phillips, the lead researcher in the Enviropig project. Nonetheless, he adds, these piggies still must undergo three to five years of testing before they can go to market. "These animals are going to be tested like no other animals have been tested before they're certified to go into the human food chain," says Phillips. Pig farmers are apparently eager for the day when they can begin raising Enviropigs, saying they represent a particularly promising solution to the phosphorus problem. Some independent experts also think Enviropig is a solid bet. Dr. Joann Whalen a soil expert at McGill University in Montreal, Canada, thinks Enviropig is even better than a non-biotech solution to the phosphorus problem that she helped develop. Whalen found that mixing limestone in with hog manure could net a 50 percent reduction in phosphorus content. But, she says, this method is expensive and impractical, as the limestone has to be trucked in to farms and requires extensive manpower to spread.

"It's dealing with the problem after the fact," Whalen concedes. "[Enviropig] is definitely a much better approach -- it's more cost effective to have a pig that excretes less phosphorus."

Still, for virtually all major environmental groups, the matter boils down to the fact that they oppose the introduction of genetically-engineered organisms into the environment.

"The GMO issue is a deal breaker," says Melanie Shepherdson Flynn, an attorney with National Resource Defense Council's Clean Water Project. "It's an extreme solution without knowing what the result will be."

If Enviropig passes regulatory muster, the rights to the technology will be sold to pig breeders. But given the charged debate developing around it, Enviropig's path to the dinner table remains questionable.

"It's a technology that adds a great deal of value," says Schlegel. "But we're not interested in seeing the technology commercialized if the public is not interested in genetically modified foods."