



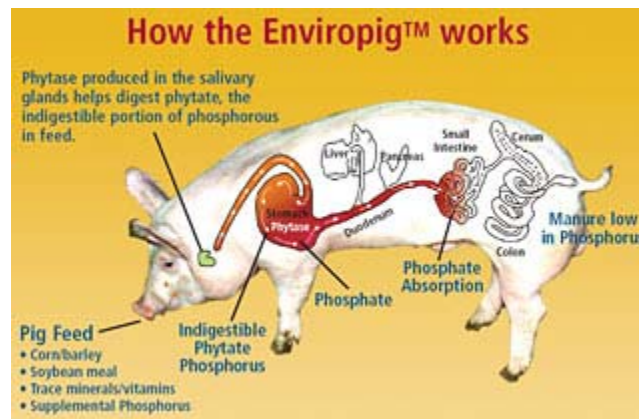
Jon Clark is an environmental lawyer and a PhD student in rural sociology at Penn State. He is interested in animal studies, agri-food studies, environmental sociology, and political ecology. Jon's research focuses on the topic of agri-environmental governance.

Jon's dissertation examines how environmental regulations governing livestock and poultry feeding operations are leading to new technoscientific interventions into animal biology. Most researchers have focused on the industrialization of livestock and poultry bodies. But what Jon is interested in is the greening of these industrial organisms. As an ASI fellow, he will write a dissertation chapter that describes how nutrient management regulations governing the manure disposal practices of swine feeding operations led to the creation of a transgenic organism named Enviropig™. In his project, *Political Physiology: The Case of Enviropig™*, Jon will argue that Enviropig™ is a biotechnological fix to the industrial pork provisioning system's regulatory problems.

The feed eaten by the swine confined on feeding operations is made of corn and soybeans. Swine require digestible forms of phosphorus (P) in their diets. Much of the P in corn and soybeans is bound up in the organic compound phytic acid. The enzyme phytase is required to release digestible P from this compound, but swine do not produce phytase. Although digestible inorganic phosphates can be added to feed in order to fulfill dietary requirements, the phytic acid from the corn and soybeans will still pass through the digestive system and into the manure. For many swine feeding operations, the least costly way of disposing of manure is to spread it on cropland. But if the manure generated on an operation contains more P than is needed by the

crops growing on that operation—as is common on high density operations that rely upon imported feedstuffs—using cropland as a low-cost sink for the disposal of manure can cause P to accumulate in the soil. Storms can wash this P into aquatic ecosystems, where it can accelerate the process of eutrophication and lead to fish kills.

Fortunately for fish, Canadian researchers in the Guelph Transgenic Pig Research Group recently developed the Enviropig™. This pig expresses a transgene that consists of a mouse “parotid secretory protein promoter linked to the *E. coli appA* phytase gene” (Golovan et al. 2001:741). Thanks to this transgene, Enviropig™’s salivary glands secrete phytase into the pig’s saliva. The following diagram shows how Enviropig™ works (the diagram is from Silver 2006).



Fed a diet of corn and soybeans, an Enviropig™ will produce manure that is lower in phosphorus than the manure produced by an ordinary pig given the same diet. This is why the Guelph Group’s website refers to Enviropig™ as an “environmentally friendly breed of pigs” (Guelph Transgenic Pig Research Group).

There is a vast literature on the transformation of livestock and poultry into industrial organisms (e.g., Boyd 2001; Clarke 2007; Finlay 2004; Watts 2004). But almost nothing has been written about the creation of environmentally friendly livestock or poultry (for a few isolated remarks, see Best 2006:10; Harvey 2007:16; Twine 2007:107, 110). Using Enviropig™ as a case study, this project will contribute to the field of human-animal studies by addressing this neglected topic. But the project will also make a theoretical contribution to the field.

As the title of my project suggests, I will offer a way of conceptualizing physiological processes as political processes. My approach builds on recent work in the field of science and technology studies. In a recent article on the 2001 UK foot and mouth outbreak, John Law and Annemarie Mol (2008:133) argue that “the mundane and material practice of boiling pigswill” is a political technique. Building on their work, I will argue that the mundane physiological process of secreting phytase from salivary glands is also political. The concept of political physiology will help researchers in the field of human-animal studies think about other ways in which nonhuman animal bodies can be political. Political anatomy, for example, might prove to be a potentially fruitful topic.

So what is political about saliva? Fred Buttel coined the term *environmentalization* to refer to the process by which “agriculture is becoming increasingly subject to environmental criteria and regulations” (Buttel 2003:185). In some states in the United States, livestock and poultry feeding operations have become subject to P-based nutrient management regulations that attempt to reduce the flow of P from these operations into surface waters. Manure that has a high concentration of P can be costly to dispose of in jurisdictions with such regulations. Buttel (2006) also noted that public agricultural research institutions have sought to reduce the environmental impacts of feeding operations. He criticized this work, characterizing it as a quest for technoscientific fixes for environmental problems that require more radical solutions. But Buttel did not explain the relationship between agri-environmental technoscience and agri-environmental regulation. If Enviropigs™ ever become commercially available their saliva will help prevent environmental regulations from reducing the profitability of industrial pork provisioning networks. My thesis is that Enviropig™ saliva is political because it helps prevent these networks from collapsing under the weight of environmentalization.

My first research question is this: *how* does Enviropig™ saliva do the political work that my thesis claims it does? It should be noted that, like the practice of boiling pigswill, Enviropig™ saliva is likely to be political in more ways than one. My preliminary review of the scientific literature on Enviropig™ suggests that its saliva might also help conserve the world’s finite geologic deposits of phosphate rock and promote food security in developing countries. This leads to my second research question: what are some of the different *ways* in which Enviropig™ saliva is political? By answering this question, I will create an account in which saliva has a “layered” political importance (Law and Mol 2008:133).

I will answer my questions by analyzing what members of the Guelph Transgenic Pig Research Group have written about Enviropig™ in the scientific literature, in the popular press, and on the group’s website. I have already read much of this literature, but I have yet to code the data systematically, with my research questions in mind. I plan to code my data and write a draft article before beginning this fellowship. I currently do not know whether I have collected all of the important literature. I will use the electronic science citation index to attempt to stay current. But I also plan to interview members of the Guelph group in order to make certain that I have not missed any important papers. I plan to conduct these interviews during the fellowship. Before beginning the fellowship, I will obtain the necessary human subjects approvals.

The interviews will also help ensure that my thesis is plausible. Following Bruno Latour (2000) and Sarah Whatmore (2003), I will give the Guelph researchers an opportunity to object to my preliminary interpretations of Enviropig™. I will also invite them to provide their own interpretations. These interviews will force me to address alternative views, including, perhaps, the view that there is *nothing* political about Enviropig™. Considering alternative ways of making sense of my case will help make my account more plausible (and interesting!) than it might otherwise be.

Jonathan’s project is related to the work on “Animals and Cultural Transformations” that is being done in the Michigan State Ecological & Cultural Change Studies Group. Two of the host faculty—Linda Kalof and Thomas Dietz—are members of this group. At the broadest level, his project is about a major shift that is occurring in livestock and poultry technoscience. This is the

shift from industrializing to environmentalizing organisms. As the first in-depth case study of “environmentally friendly” transgenic livestock, my project would benefit from my involvement with a research group that is at the forefront of the effort to build bridges between animal studies and environmental studies.