pigpens
NEWS FROM THE U of G / OMAF SWINE RESEARCH PROGRAM

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Towards safer swine semen

Researchers look to prolong swine semen without contamination risks

By Murray Tong

The notoriously short life of swine semen means that extenders – liquid chemical formulations that prolong the useful life of semen so it can be used for artificial insemination (AI) – are an essential tool to any swine breeder. And with nearly three-quarters of all Ontario piglets being produced using AI (a 15-fold increase from just a decade ago), high-quality extenders are always in demand.

Trouble may be looming, however. Commercial extenders typically contain salts, sugars and, in some cases, plant products, which help keep sperm functional and fertile for up to seven days. But some extenders – including several of the most effective ones on the market – also contain biological materials derived from animals. That's raised some concerns on biosecurity and disease spread among swine, and even among humans.

While extenders with animal products have never posed a problem, Canadian producers are well aware of potential disease risks, such as bovine spongiform encephalopathy (BSE) and avian influenza. Both of these diseases can be spread by contact with animal products, and carry grave health and economic consequences.

That's where University of Guelph Prof. Mary Buhr, Department of Animal and Poultry Science, comes in. She and her research group are developing a new extender from scratch that's entirely animal product-free. This strategy, she says, will avoid any possible spread of contaminants or pathogens associated with animal products.

Martin Schwalbe

Prof. Mary Buhr, left, and graduate student Adrianne Tisch are developing an animal product-free extender to prolong the useful life of boar for artificial insemination.

"Nothing in our experience has given us any reason for concern when it comes to the safety of extenders that contain animal products," says Buhr. "We're just being careful, making sure we aren't introducing any harmful organisms through animal products – and I think that's the right path to take."

This initiative will re-examine the fundamental properties of boar semen, to gain a fresh approach on developing extenders. From there, Buhr and her team will develop and evaluate new extender formulations to see how well they extend the life of boar semen, and assess the sperm's fertility after being preserved.

But the ultimate test, she says, is to actually artificially inseminate sows using the extended sperm, then measure the conception rate. The sperm must remain high quality enough to ensure healthy piglets and maintain the traits producers want, such as rapid growth rate, fecundity and leanness.

"We can look at whether sperm are alive, whether they're swimming and how long they live in order to evaluate extenders," says Buhr. "But no lab test accurately predicts fertility. The real final test for any extender will be successful artificial insemination."

This research is funded by the Ontario Ministry of Agriculture and Food, the Natural Sciences and Engineering Research Council and L'Alliance Boviteq.

Keeping an Ontario-wide eye on food safety

Swine database provides benefits all around, says researcher

By Robert Fieldhouse

Freezers – not farms – may become the new hub of food animal disease surveillance, as a University of Guelph research group makes progress on a province-wide database on disease control information from Ontario hog farms.

Prof. Robert Friendship, Department of Population Medicine, has created a centralized database of swine production information – such as production system, feed types and housing types – from 100 randomly selected Ontario hog farms, complete with accompanying blood and manure samples, stored in freezers to test for microbes.

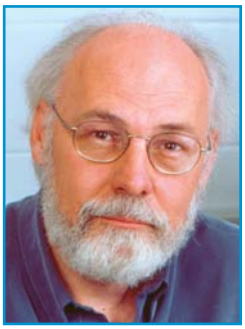
He's using this system to determine the prevalence of infectious diseases, devise strategies to reduce this prevalence, improve food safety for consumers – and provide early warnings about emerging diseases.

"Until we started doing this, researchers would find farms and gather information and samples for one specific question," says Friendship. "Now if a new question arises, we can go to the freezer and get a sample rather than go out and take samples again."

The database, established in 2001 and updated annually with new data and samples, has provided valuable baseline information, and identified trends and risk factors for food-borne diseases. That's allowing researchers to more accurately determine disease risks when a pathogen is detected. For example, using Friendship's samples, University of Guelph Prof. Carlton Gyles, Department of Pathobiology, was the first researcher in North America to find extremely low levels of the human pathogen E. coli 0157:H7 among pigs, helping to ease consumer concern about food safety.

It's important to know which pathogens aren't cause for concern, says Friendship, because it allows researchers to turn their attention to ones that are, such as *Salmonella* and *Yersinia*, which are more common on farms and often associated with illness.

"We will concentrate efforts to look for ways to reduce these organisms at the farm level," says Friendship.



Martin Schwalbe

Prof. Robert Friendship

That's using resources efficiently. For farmers, the database means fewer hassles and greater confidentiality, because investigators will go straight to the freezers where samples are stored, and receive only the information relevant for their studies without identifying facts about who supplied it. For swine and disease researchers, it means less time spent gathering samples and more time analyzing them – which is especially important when results are needed quickly.

Friendship hopes the database will continue to provide insight into disease risks while helping farmers improve production, and building confidence among consumers through better food safety.

Other researchers involved in this project include graduate students Zvonimir Poljak, Cesar Corzo and Vahab Farzan. This research is funded by Ontario Pork, the Ontario Ministry of Agriculture and Food, Health Canada and corporate partners.

University of Guelph

Farm database aims to give better economic forecasts

The hog cycle is a four-year economic cycle. High hog production numbers lead to low hog prices. That prompts low hog production, leading to high hog prices. This challenges even the most fiscally savvy pork producer. Subtle supply-and-demand changes set off dramatic fluctuations in pork prices. So, Ridgetown College economics professor Ken McEwan and research associate Lynn Marchand have established the Ontario Data Analysis Project (ODAP) database to track production and economic information, providing insight to industry stakeholders. ODAP has already been used nationally to help analyze and refine the new Canadian Agricultural Income Stabilization (CAIS) Program. McEwan and Marchand hope ODAP will help provide accurate economic assessments of current markets and reinforce the need for solid farm policy.

Stopping *Salmonella* at the source

Can a producer-oriented approach lower multi-drug resistance?

By Murray Tong

At home and abroad, multiple drug resistance in bacteria is rapidly becoming one of agriculture's biggest concerns. New strains of *Salmonella* in swine have been found to be resistant to up to 15 different antimicrobials, making them almost impossible to treat using conventional methods.

Prof. Jeffrey Gray, Department of Pathobiology, says these multi-drug resistant *Salmonella* are a concern for all, from producer to consumer. So, he's combining laboratory research with a farm-level approach to find new ways to beat the bugs. He and his research team are studying the influence of different production factors – such as production system type, feed components, biosecurity measures and overall herd health – on the *Salmonella* profile in swine.

Gray says this information could help researchers develop more effective strategies to keep multi-drug resistance under control early in the food chain, reducing the chances that resistant *Salmonella* will spread to other animals. For example, there's considerable concern over antimicrobial drug use and its possible relationship to the spread of multi-drug resistant organisms. However, Gray's research suggests that the spread of these organisms is more complicated than simple antimicrobial use issues. What's needed, he says, is more information to ensure that antimicrobials are used safely and properly to maximize their effectiveness.

The researchers are also in early stages of developing a laser-based technique to rapidly scan and identify microbes. Gray hopes that new technologies like this can be employed at the producer level to detect – and stop – multi-drug resistance at its earliest point.

"Antimicrobial drugs are a key tool for both animal health and animal welfare," he says. "Some antimicrobial uses are fine, while others cause problems – but right now, we don't know enough to say which is which. That's what we hope to find out with this research."

Gray's collaborators on this project include Profs. Kees de Lange and Brian McBride, Department of Animal and Poultry Science; Prof. Robert Friendship, Department of Population Medicine; and technician Amanda van der Vinne, Department of Pathobiology.

This research is sponsored by the Natural Sciences and Engineering Research Council and Ontario Pork.

Prof. Jeffrey Gray is combining laboratory research with a farm-level approach to battle multi-drug resistant Salmonella*, which can endanger human and animal health.*

Martin Schwalbe

Multi-drug resistance on the rise

The risk factors for the development and spread of multi-drug resistant *Salmonella* and the implications for animal and human health are not fully understood. But recent studies have shown that drug resistance in *Salmonella* is becoming more prevalent. Multi-drug resistant strains made up approximately two percent of all *Salmonella* found on U.S. swine operations in 2004 – still relatively low, but three times the percentage that was found in 2001.

A current event

Electrolysis research advances to pilot scale

By Hilary Edmondson

Spurred on by growing concerns about farm odours, University of Guelph Prof. Nigel Bunce and research associate Dorin Bejan, Department of Chemistry, have been sniffing out new solutions to help intensive hog operations. They had previously discovered that electrolysis can remove odour from hog manure. Now, they have identified two materials that make stable and effective anodes (positively charged electrodes) for the electrolysis.

The materials – boron-doped diamond and tin dioxide coated onto titanium – are commercially made materials that are highly stable. That allows for repeated use in electrolysis.

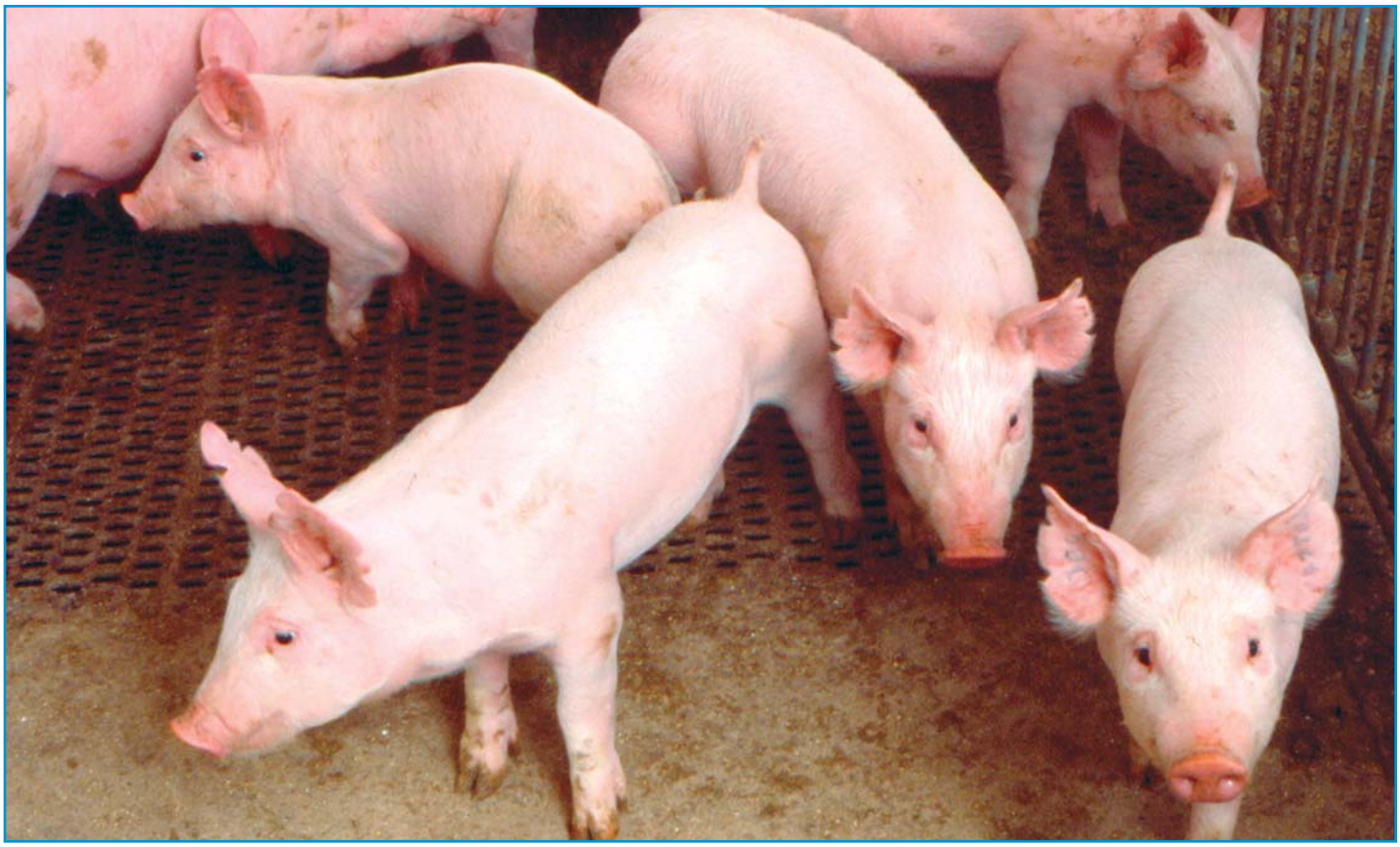
"These materials can withstand a high applied voltage," says Bunce, "and they're also good at stimulating a chemical reaction that attacks the compounds responsible for the odour."

Here's how the system works. During electrolysis, water on an anode surface is broken down by an electric current, forming chemically reactive molecules called hydroxyl radicals. In a manure solution, the hydroxyl radicals attack the odour compounds and break them down. The nitrogen value of the manure is left intact, preserving its usefulness as a fertilizer.

This spring, Bunce and Bejan will take their research from the laboratory to an intermediate pilot scale. They're designing a device approximately one cubic foot in volume, to test greater volumes of manure.

"This project will help us predict whether the current success in the lab can be applied on a larger scale," says Bunce. Eventually, they hope this process can be used on major hog operations, eliminating manure odours – and providing a breath of fresh air for farmers and their neighbours.

This research is sponsored by Ontario Pork and the Ontario Ministry of Agriculture and Food.



University of Guelph

Hog manure, hold the odour: a University of Guelph pilot project will attempt to remove offensive odours from manure using electrolysis.

PigPens reports on the University of Guelph/OMAF swine research program activities. It is written and co-ordinated by participants in the Students Promoting Awareness of Research Knowledge (SPARK) program at the University of Guelph.

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