

Ontario Pork Research

Jean Howden, Research Coordinator, Ontario Pork

Ontario Pork is dedicating 20 cents from each hog market towards research and development projects, resulting in more than 1 million dollars allocated to the projects summarized in the following 5 pages. The projects span across a wide variety of areas that will lead to increased knowledge and improvements that will advance the Ontario Industry. A significant amount of funding is targeting herd health, particularly examining Porcine Respiratory and Reproduction Syndrome (PRRS), while also continuing funding pork quality, animal welfare, nutrition and environment projects. The projects range from basic studies on pathogens that may result in knowledge and treatments of swine illness and diseases. Research into feeding and nutrition, is considering benefits of liquid diets and gut health. Continued funding of environmental projects studying manure and deadstock disposal methods are evaluating potential improvements and options for the industry. It is critical that the industry continue to move forward and this requires a strong research base.

These projects are not funded by Ontario Pork alone, but with the assistance of numerous research programs from both the federal and provincial governments, and also other industry partners. Many researchers have doubled their funding, with Ontario Pork contributing only a small portion of the total project funding. A 2004 study estimated the benefit of each public dollar spent on agri-food research as high as 27.5 : 1, and for hogs alone at 9.5 : 1 (Brinkman, G. L., 2004. "Strategic Policy Issues for Agricultural Research in Canada". *Current Agriculture, Food and Resources Issues*). The adoption of research outcomes, into practical application also results in direct and indirect cost efficiencies. The actual benefit is very difficult to measure – but we know it is significant.

However, we do know the benefits of research funding lead to an industry that will grow and prosper. Research is a cornerstone of the industry and serves as the building blocks for successes. Ontario Pork continually strives to fund research projects that will benefit this industry and all producers.

Research funded in 2005:

Researcher: Cate Dewey

Title: Developing PRRS control strategies by understanding how the virus is changing and moving in Ontario

Synopsis: Objectives of the research proposal:
 1. Create a system to transfer information about the spread of PRRS virus to the industry in a timely and effective manner while maintaining confidentiality. 2. Determine the genetic sequence of all PRRS viruses that are causing overt clinical and sub-clinical problems in herds in Ontario, from September 2004 – August 2006. 3. Compare the genetic sequences of the PRRS viruses among herds in Ontario to other regions of North America that share pig flow with Ontario. 4. Identify factors associated with the spread of the PRRS in Ontario using such potential factors as location of the farm (GPS), source of breeding stock and semen, pig transport used, pig flow (system information),

current control methods. 5. Recommended strategies which will reduce the spread of PRRS virus among farms and which may be used in a PRRS virus elimination program.

Brief Description of the Project:

To understand the moving and changing patterns of PRRS in Ontario the researchers will map the PRRS viruses by genotype in Ontario and determine the associations between potential methods of transmission of PRRS and the location of the PRRS viruses in Ontario. With additional funding that is being sought out – further projects will develop appropriate cleaning and disinfecting procedures for nursery facilities and trucks. Then appropriate monitoring protocols will be evaluated. Finally, gilt acclimation procedures identified by the Quebec researchers will be validated on farms in Ontario.

Benefit of the Research to the Ontario Pork

Industry:

The aim of these projects is to understand how PRRS is changing and moving among herds and within herds in Ontario and to use that information to develop control strategies to reduce the losses experienced by the industry due to this virus. The implementation of this research will ensure that Ontario maintains its position as a major exporter of pigs

Researcher: Graeme Hedley

Title: The Economics of Ontario Hog Hauling Fees

Synopsis: The purpose of this project is to provide an economic analysis of hog transportation regulation in Ontario. The objectives of this project are: - to describe hog transportation cost allocation in other jurisdictions relevant to Ontario - to provide a description of the Ontario hog transportation segment - to determine the needs of producers, processors, and transporters in terms of hog transportation services and fees - to determine how alternative hog transportation cost allocation schemes impact base hog prices - to facilitate development of Ontario Pork objectives establishing hog transportation regulations, and to evaluate existing regulations based on these objectives

Researcher: Peter Purslow

Title: Enhancing the Pork Meat Quality Value Chain

Synopsis: Objectives of the Research
The proposed research project will measure variability in Ontario pork and take a value-chain approach to examine how genetics, on-farm management, packing plant management, and nutrition interact to affect the main mechanisms determining pork meat quality and what these quality variations cost the industry.

Researcher: Phil McEwen

Title: The Effects of Gender and Feeding Strategy on Growth Performance and Pork Quality.

Synopsis: This initiative will investigate performance, carcass characteristics, meat quality and economic ramifications of limit feeding during the growing phase. During the first experiment a control (ad libitum feeding of

a grower diet) and two restrictive feeding strategies (feed offered at 70 and 85% of the amounts consumed by pigs fed ad lib) will be evaluated followed by ad libitum feeding of all pigs during the finishing phase. Barrows and gilts will be fed separately to examine gender effects and the presence of gender by feeding strategy interactions. The pigs will be weighed weekly and marketed at 110 kg body weight (BW) to a commercial packing plant. A loin from each pig will be acquired for subsequent carcass and meat quality evaluation at the U of G Meat Laboratory.

Researcher: Kathy Zurbrigg

Title: The effect of noise level in gestation barns on human hearing loss and swine production

Synopsis: This study will provide benchmark information on noise levels in gestation barns and the risk this poses to worker hearing. Loud vocalizations at feeding may indicate increased sow anxiety, which can negatively affect reproduction. Knowledge of this relationship and how barn design and husbandry factors affect sow vocalizations may improve sow reproductive performance on many farms.

Researcher: Harold Gonyou

Title: Gestation Housing for Sows: Studies on Electronic Sow Feeders and Stalls

Synopsis: Final year of a four year study, that examine questions critical to the management of pregnant sows in both group housing and stalls. Four studies are being conducted to improve management of gestating sows in group housing using electronic sow feeders, and to determine the interaction of sow and gestation stall size on productivity and behaviour. These questions are directed at reducing social stress in groups, and issues of crowding in stalled sows.

Researcher: Patrick Boerlin

Title: Molecular epidemiology of resistance to extended-spectrum cephalosporins in *Escherichia coli* from Pigs in Ontario

Synopsis: The objective of this research is to assess if resistance to extended-spectrum cephalosporins (ESC) in *E. coli* from pigs in Ontario is transferable. To characterize in details the genetic elements associated with this

resistance and to compare them to those from *Salmonella enterica*. It will look to develop recommendations to avoid the spread of resistance to ESC in bacteria in pigs. The benefit of this research is to assess the real potential for the spread of resistance to ESCs in bacteria from pigs in Ontario. A strong basis for the amendment of prudent use guidelines will be provided. This will increase the confidence of consumers and help safeguard the efficacy of ESC for both the industry and human medicine.

Researcher: Robert Friendship

Title: Control of *Salmonella* in Ontario Pig Farms

Synopsis: The research team will continue to work to develop a better serological test to detect antibodies to *Salmonella* by including serovars that have been isolated from Ontario farms. They will test essential oils, vaccines, probiotics, phages and other products to determine what are the best methods to reduce or prevent *Salmonella* infections. This will be tested by using experimental challenge studies and the results will be applied to on-farm studies. They will also examine ways to minimize contamination of carcasses at the packing plant. The main benefit of the work will be to make Ontario pork safer to eat and reduce the risk of *Salmonella* infection among farm and packing plant workers. Reduced levels of *Salmonella* may be very important with regard to the export of pork, resulting in increased demand.

Researcher: Dongwan Yoo

Title: Genetically engineered PRRS virus that may not persist in Pigs

Synopsis: This is a two year basic research project set to identify the PRRS virus viral protein responsible for persistence, and develop a genetically modified PRRS virus as a vaccine candidate. PRRS virus persists in infected pigs, which is a major source of transmission. The modified PRRS virus will be made as a potential vaccine candidate that can hopefully be effective in controlling the spread of PRRS.

Researcher: Bruce Wilkie

Title: Immune Response Regulation by Neonatally Administered Cytokines

Synopsis: The research tests the hypothesis that

variation in immune response (IR) and consequently in resistance to infectious disease, has a large environmental component that is influenced by immuno-modulating treatments acting on the developing immune system. Potential benefit may be derived from cytokines administered to neonatal pigs, possibly as bacterial or viral recombinant live vehicles acting as designer probiotics. This will be examined using standard immunization regimens to test for induced IR bias. The industry needs alternatives to current health maintenance practices to reduce reliance on exogenous therapeutics in addressing disease, the number one source of loss in productivity. Advantages derived from enhanced innate ability to resist infectious disease may be in the order of \$4.00-5.00 per animal. Additional gains due to market access and acceptability of product are also possible.

Researcher: Tony Hayes

Title: Defects in innate disease resistance genes in Ontario Swine

Synopsis: The objective is to identify defects in genes responsible for increased susceptibility of young pigs to various common infectious diseases. Genetic tests will be developed for abnormalities in innate resistance genes that protect young pigs from various infections. These DNA tests will allow the researcher to determine the frequency of these defects, and those that increase susceptibility of young pigs to various common infections. The results from this research could provide new opportunities for the control of some infectious diseases by selective breeding. Tests for these defects could increase value of breeding stock with defined resistance traits.

Researcher: Aiming Wang

Title: Development of a Plant-Based, Low Cost, Orally Administered Vaccine Against PRRSV

Synopsis: This is funding for the first year of a three year project to develop a plant-based, low-cost, orally administered vaccine against PRRS. The results of the three year study could provide the development of a novel, safe, low cost, convenient and uniform, edible vaccine for

clinical use to protect Ontario pigs from PRRS. It could also be a model for the control of other animal infectious diseases.

Researcher: Serguei Golovan

Title: Sexing of boar semen using single stranded DNA aptamers

Synopsis: The objective of this research is to develop aptamers that could selectively bind to X/Y sperm and be used for sperm sexing of pigs. The researcher will use a method of in vitro evolution to perform multiple rounds of selection/amplification to select aptamers which will bind with high affinity and selectibility to X/Y sperms. If successful the method will allow preselection of the sex of piglets at the time of artificial insemination.

Researcher: Lee Whittington

Title: Livestock Issues Resource Centre

Synopsis: This is one year support for a web based resource for producers, to bring order and accessibility to the large and growing body of information available on key issues facing the future of the pork industry. This is accomplished through summarizing of peer reviewed papers, conference proceedings and popular press articles condensed in 250-500 word summaries and available on line through an easy to use searchable database.

Researcher: Julang Li

Title: The feasibility of isolating antimicrobial peptides from slaughtered pig blood and the potential application of these antimicrobial peptides

Synopsis: The objective of this project is to study the feasibility of isolating antimicrobial peptides from pig blood collected from slaughterhouses, and the potential of these peptides to treat infection. Funding is for the first year to evaluate if the necessary components can be collected and purified in vitro.

Researcher: C.F.M. de Lange

Title: Liquid Feeding of Swine

Synopsis: This research will explore and assess beneficial effects of liquid feeding technology (control and flexibility in developing feeding programs, gut health, carcass and pork quality, nutrient excretion, animal well-being, production efficiencies) that may be transferred

to dry feeding systems. It will also support development of liquid feeding technology for swine in Ontario.

Researcher: Paul Luimes

Title: Determining sow performance and mineral requirements with phytase

Synopsis: This research will compare a typical ration feed during lactation to one supplemented with phytase and reduced calcium, phosphorus and trace mineral supplementation to observe the sow and piglet's performances, and determine the extent of reduction of the sow's fecal and urinary excretions.

Researcher: C.F.M. de Lange

Title: Impact of fermenting high-moisture corn on dynamics of starch and phytate degradation, as well as growth performance, nutrient utilization and gut health in starter pigs

Synopsis: This research will examine (in vitro) the impact of fermentation conditions on starch and phytate degradation in high-moisture corn. It will assess the effects of high-moisture corn in liquid feeding systems on gut structure and function and microbial ecology, with emphasis on the beneficial and pathogenic bacteria present in the gut and in the feed. Further the researchers will examine the production indices and nutrient utilization of starter pigs fed high-moisture corn in liquid feeding systems. The effect of added phytase in liquid feeding systems containing high-moisture corn on nutrient (particular phosphorus) digestion and manure composition will also be assessed.

Researcher: Ming Fan

Title: Dehydrated Chicory Root Powder for Modulating Intestinal Fermentation to Reduce Odour Impact: Study Phase-I with Post-Weaned Pigs

Synopsis: The major objective is to determine a suitable level of dietary supplementation of dehydrated chicory root powder for reducing odor impact in the post-weaned pig. Dietary chicory root powder grown and processed in Ontario can be a functional and cost-effective source of fermentable water-soluble fiber, which has been shown to reduce odor. The research will also examine the affect of such chicory

root powder addition on key off-flavour compound retention, growth and nutrient utilization efficiency.

Researcher: Ron Ball

Title: Determination of sow amino acid requirements using the indicator amino acid oxidation method

Synopsis: Objectives of Research Proposal:

1. Develop factorial estimate for the gestation lysine and energy requirement considering maintenance requirement, parity, stage of gestation and litter size 2. Determine efficiency of energy utilization as affected by parity and gestation stage 3. Assess the suitability of the indicator amino acid oxidation for lactation 4. Create base-line data for protein metabolism in lactation

Researcher: Bonnie Ball-Coelho

Title: Zone-jection New Conservation Till Manure Nutrient Delivery System

Synopsis: This is the second year of a three year project to develop a system where manure is applied during zone tillage in one operation and evaluated in terms of corn yield and environmental impact. The field experiments are being replicated with treatments to test different methods of zone-jection with and without sidedressing and to isolate physical (ie tillage) from nutrient responses. The researchers are looking for the system which will minimize movement of phosphate, ammonium and soil to surface waters, nitrate to groundwater and reduce or eliminate commercial fertilizer costs. The demonstration of good stewardship, concurrent with elimination of odours will improve public relations and help growers avoid environmentally related litigation.

Researcher: Bill Van Heyst

Title: Environmental Characterization of Selected Dead Animal Disposal Methods

Synopsis: This is the first year of a two year study to assess the environmental impact of on-farm cremation and deadstock composting. The fate of sulfa-based drugs during the composting process will be determined. The project will provide sound scientific results for the environmental impact of on-farm cremation and deadstock composting that can be used for

policy decisions by stakeholders

Researcher: John Lauzon

Title: Effectiveness of manure injection and incorporation methods for reducing pathogen and nutrient contamination of water sources

Synopsis: This is the first of a three year trial to assess the losses of nitrogen, phosphorus and E-coli and the agronomic benefit from liquid hog manure applied at three different times of the year and with different application methods (surface application, surface application followed by incorporation, manure injection @75 cm spacing, manure injection @ 37 cm spacing, Aerway system, side dress injection)

Researcher: Claudia Wagner-Riddle

Title: Nitrogen transformations and losses following application of liquid swine manure to agricultural soils as determined by N tracer methods

Synopsis: The objectives of this three year project are: To study transformations of organic and inorganic N in manure following application to agricultural soils with contrasting hydrologic properties; and, to directly quantify the amount of organic and inorganic N in manure recovered in crops, retained in soil and lost through N₂O leaching, and gaseous emissions. Findings from this research will be utilized to further improve and verify the Ontario N-index; a regulatory tool under the Nutrient Management Software 'NMAN' which is based on findings from indirect measurements. The proposed approach will provide a direct measure of nitrogen flows and more accurate agronomic balances.

Researcher: George Lazarovits

Title: Evaluation of Pasteurization of Liquid Swine Manure for Use as a Soil-borne Plant Disease Control Product of High-Value Crops

Synopsis: This is the second year funding of a two year study which is evaluating continuous batch thermophilic compost for eradication of potential animal and human pathogens and for ease of use under barn conditions. The pasteurized compost can be reformulated into a saleable product that can be used to control soilborne plant disease of high value crops such as potatoes, and an excellent source of fertilizer.