For Use as Press Release
Drs. B. Mallard and J. Schmied
August 19, 2015

UNIVERSITY OF GUELPH, PART OF SUCCESSFUL GENOME CANADA GRANT APPLICATION 2015

Application of Genomics to Improve Disease Resilience and Sustainability in Pork Production

Principal Investigator at the University of Guelph (Animal Models to Select for Disease Resilience): Professor Bonnie Mallard, Department of Pathobiology, Ontario Veterinary College

Project leaders: Dr. Michael Dyck, University of Alberta; Dr. John Harding, University of Saskatchewan; Dr. Bob Kemp, PigGen Canada Inc.

Lead Genome Centres: Genome Alberta, Genome Prairie, Ontario Genomics Institute

Total funding: $9.8 million

Immunogenetics Project Funding – Animal Models to Select for Disease Resistance: High Immune Response (HIR) Technology: $361 540

Pork is big business for Canadian producers, both domestically and internationally. In Canada, it is the second-most consumed meat. Globally, Canadian pork is exported to more than 100 countries and it is consumed throughout the world more than any other source of protein. Managing disease in pork populations is one of the most costly and difficult challenges for pork producers. In addition to its economic costs, disease likely contributes to public perceptions of animal products in terms of animal welfare, food safety and antimicrobial resistance. Genomics offers new ways to fight disease in pigs, reducing costs for producers, increasing product quality and improving public perceptions. This will become increasingly important as global demand for animal proteins rises in concert with growing populations.

Researchers at the University of Alberta (Dr. Michael Dyck), University of Saskatchewan, (Dr. John Harding), University of Guelph (Dr. Bonnie Mallard) and Dr. Bob Kemp of PigGen Canada Inc. are part of a team that will increase the international competitiveness of the Canadian pork industry and its contributions to global food safety and security. The team is developing genomics tools that Canadian genetic companies and breeders can use to select pigs that are more genetically resilient due to increased tolerance and/or resistance to multiple diseases (as opposed to simply resistant to one particular disease). The tools will also permit producers to manage the nutritional content of pig feed to optimize pig health such that pigs stay healthier, grow more efficiently and have more successful litters and reduce the need for antibiotic use in pig production.

One such tool being investigated is the High Immune Response Technology (HIR™) developed by project co-applicant and principal investigator Professor Bonnie Mallard and colleagues at the University of Guelph. The technology was first successfully tested in pigs, and recently globally implemented in the dairy industry by Canada's largest dairy genetics company, the Semex Alliance Inc. under the trade-name, *Immunity+*™. The unique features of the HIR technology allow for the identification of animals with more robust and balanced immune responses. This includes high antibody-mediated (AMIR) and

cell-mediated (CMIR) immune responses which control resistance to both extra- and intra-cellular pathogens.
Previously, when Yorkshire pigs were selectively bred using this method it was found that high immune responder pigs had improved AMIR to vaccination and pathogen challenge compared to the control line and low responders. Noteworthy is the fact that high responders were generally more robust pigs with increased average daily gain, reaching 100kg 10-12 days before low responders.

Although previous research in pigs clearly demonstrated favorable responses to breeding pigs for HIR, this method has not been tested in commercial herds as efforts shifted focus to the implementation of the technology for use in dairy cattle. However, since the HIR technology can identify food-producing animals with increased capacity for IR and subsequently increased disease resistance, its implementation and integration into pig breeding programs is timely. It is expected that commercial adoption of this technology in the swine industry will lead to improvements in health and productivity by enhancing general resistance to recurring and newly emerging infectious disease, as exemplified in commercial dairy production. This approach will also complement more agent-specific approaches such as vaccination, while reducing reliance on high risk health management strategies, including the use of antibiotics and breeding for pathogen-specific host resistance. This study, headed by Postdoctoral fellow Dr. Julie Schmied (former PhD student of HIR co-inventor Professor Bruce Wilkie) seeks to test the HIR technology in approximately 3600 commercial pigs. IR-phenotyping results will be correlated with herd health and production traits. Additionally, DNA samples will be used to derive useful genomic information associated with immunity.

The involvement of industry partners in this project means that, within five years of its end, the rate of genetic improvement and productivity will have an impact on pig production of more than $137 million, further improving the international competitiveness of the Canadian pork industry.