



Pig gut microbiome project: Characterization of the core gut microbiome associated with pig health and performance: Towards fecal diagnostics and microbiome therapy

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Why is this project important?

There is ample evidence that the gut microbiome has a great influence on disease resistance, health and performance of humans and domestic animals, including pigs. In addition, intervention strategies and products are now commercially available that are designed to promote health and performance of pigs, as well as replace the usage of antibiotics. Many of these strategies and products are associated with an ability to modify the composition of the gut microbiome.

The use of molecular tools has allowed scientists to demonstrate that the gut microbiome is complex and highly dynamic, and is influenced by a combination of genetic, maternal and environmental factors. This complexity poses a major challenge in identifying which members of the gut microbial communities are associated with improved health and performance, or, alternatively, with infection and poor performance. To date, there is no clear consensus on the composition of a healthy microbiome that can guide product developers as well as those in the industry who are charged with improving pig health and performance.

What will researchers do?

The following will be done over the course of the project:

- Cohort studies on commercial swine farms representing diverse management systems in Alberta, Manitoba, Ontario, Quebec and Saskatchewan.
- Observational studies in swine genetic nucleus herds.
- Microbial profiling and analysis.

What will be the benefit of this research?

This project addresses an industry priority to optimize the microbiome in newborn pigs via the dam and progeny and to determine the role of nutrition in optimizing the gut microbiome and immunity.

The knowledge of the core microbiome produced by this research will directly inform the development of novel products consisting of a cocktail of core members. Exposing neonatal piglets to a core microbiome cocktail could help stabilize or “normalize” succession among piglets, minimizing enteric infection and diarrheal diseases during the first few weeks of a piglet’s life. This will decrease production loss and increase feed efficiency, while reducing antimicrobial use and drug resistance in swine herds. A first step in developing such an approach is the determination of the core microbiome, which will be achieved in this project.

What has been done so far?

As of 2021:

- From the cohort studies on commercial sow farms, 1140 pig rectal swabs from Ontario and Quebec have been analyzed. The preliminary results suggest that diversity in fecal microbiota may increase from a few days after birth to one week post weaning.
- For the observational studies in swine genetics nucleus herds, researchers have agreements with Fast Genetics, Hypor and Topigs Norsvin for access, and have completed sampling for two of the three lines. An initial examination of performance results suggested these pigs represent a valuable dataset with significant variation in performance.
- Lab closures due to COVID-19 delayed microbial data generation. Now that labs have reopened, researchers are back on track and catching up. They have also addressed their protocols to avoid colliding with the supply chain needed for SARS-CoV2 PCR testing. Notably, the project was able to loan labware to the Saskatchewan Health region to support thousands of diagnostic PCRs for SARS-CoV2 in the spring of 2020.
- COVID-19 has also restricted access to commercial farms for sample collection in Alberta and Saskatchewan. Easing of restrictions in 2021 will hopefully resolve this and permit sampling to resume.

Collaborators

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Project status

Currently in progress.
Results expected in 2023.

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