

INVESTIGATING INTERVENTION MEASURES TO REDUCE ON-FARM USE OF ANTIBIOTICS IN PIG PRODUCTION

Prairie Swine Centre – Project#24034

Prairie Swine Centre has received funding for a research project with the overall goal of determining whether the pattern of antibiotics usage in farms is correlated with the prevalence of specific pig pathogens as well as antimicrobial resistance. In this study, we will conduct a 2-year longitudinal surveillance monitoring of on-farm usage of antibiotics, as well as periodically collect samples in and around pig production barns and analyze these for the presence of selected pathogens and antimicrobial resistance genes. Hence, we are looking for a set of RWA and non-RWA barns to participate in the study.

Scope of work

Activity 1: Determining on-farm antibiotic usage patterns and total use over 2 years

The inventory of antibiotics on the farm will be documented, and any use of antibiotics for animal treatment, including type of drug, dosage, type of animal treated, treatment, cause, location in the barn, date and time will be monitored. Typically, these information are already recorded in the existing treatment records in the barn, so the research team will be requesting for photocopies of these records to be sent to us every month over the course of the study.

In addition, the participating barn has an option to try and use an electronic data capture device (i.e., injector system equipped with an RFID reader, please see <https://www.v-etic.com/> for more information on the device) which is a practical tool for improving efficiency and accuracy in monitoring the antibiotic usage (and all other injectables) in your barn. We will be giving out this complete set (including the smartphone) to the participating barn once they commit to trying the system out for a year. We will also provide in-barn training and support for the use of the device.

Activity 2: Surveillance monitoring of prevalence of antimicrobial resistance and pathogens

We plan to obtain fecal, manure and environment samples from each participating barn to obtain total bacterial genomes whereby we will be able to identify the abundance of different microbial species (i.e., different pathogens as well as other resident microflora) as well as a total inventory of antimicrobial resistance genes (the resistome).

As this will be a longitudinal study, samples will be taken over time, i.e., once every 6 months for about 2 years. At each sampling event, 8 samples per barn (depending on the type of barn) will be collected, as detailed below:

- 1 fecal and 1 manure from 6 week-stage pigs at Nursery
- 1 fecal and 1 manure from 12 week-stage pigs at Growers
- 1 fecal and 1 manure from 20 week-stage pigs at Finishers
- 1 manure from sewage lagoon
- 1 from the dirt/soil at the entrance of the barn

Sample collection will only take a maximum of one hour. We will request for a designated barn staff to collect the samples on our behalf. Research team members will train the designated staff on the proper sample collection, and will be on hand during the first sampling event. Collected samples will be shipped to our lab at the University of Saskatchewan.

Accordingly, we will do the following:

- isolate total DNA using appropriate fecal, manure, and soil extraction kits/methodology

- perform Shotgun whole genome sequencing (WGS) using a high throughput DNA sequencing platform
- using bioinformatic tools, present results/data in an interpretable format (e.g., a hierarchical presentation of organisms/genes in terms of their relative gene sequence abundance)

Benefits

- **FREE microbial profile of the barn for 2 years**
 - An inventory of organisms and genes will help identify the most prevalent genes/bacteria in a particular facility, enabling producers and their veterinarians to implement intervention/management strategies to avoid financial and production-related losses. This type of information, collected over time, could further have benchmarking/predictive value as high throughput sequencing becomes more commonplace/less expensive; trends/precursor-events related to health and diseases in the barn could become visible.

Such information will enable an increasingly “global” approach to managing pharmaceuticals in the health of animals, humans, and the environment (the “One Health” approach). See the attached video from the *Australian Center for Genomic Epidemiologic Microbiology* for a nice explanation on this.

https://www.youtube.com/watch?time_continue=4&v=rozda1m111A

- **OWN a complete set of electronic data capture device (i.e., injector system equipped with RFID reader, including the smartphone)**
 - Electronic data capture device is a practical means for improving efficiency and accuracy in monitoring critical production parameters
 - The increasing use of technological tools in everyday tasks could attract younger generations to the workforce, thus helping to address the acute shortage of manpower in the industry

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