Understanding Salmonella Dublin Transmission on Ontario Dairy and Veal Farms

A Data Management Plan created using DMP Assistant

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Project abstract:

Salmonella Dublin is a concerning issue for the cattle industries in Canada. Recent research has demonstrated its presence on 7% of Ontario dairy farms and in a small study, on 50% of Ontario veal farms. Due to the high rates of morbidity and mortality observed in calves, the level of resistance to antimicrobials, and the zoonotic nature of this pathogen, there is a need to address Salmonella Dublin. This proposal seeks to further understand the transmission of this pathogen within dairy and veal farms in order to create better recommendations for its control. Specifically, intensive sampling will be conducted on farms infected with Salmonella Dublin with mathematical modelling used to better characterize it's spread. With this knowledge, veterinarians, advisors, and farmers will be able to create improved management plans to reduce the spread of this disease. We will also explore economical testing methods to identify the presence of this pathogen.

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Data collection

Provide an overview of the data that will be generated, collected or acquired to support this project. If data will be acquired from a third party, specify the source.

The data collected during this project will consist of laboratory data (Salmonella Dublin positivity from serum, milk, and fecal samples), movement data, as well as treatment record data from each individual farm. The data will be used to determine factors associated with the spread of disease within veal and dairy farms.

What method(s) of data collection will be employed?

Once the farms are selected, they will have an initial visit where producers will have the project detailed and the calving pen, preweaned housing, and lactating housing will be identified. In addition, a questionnaire will be administered to understand the management practices in place for the herd.

On weekly visits to the herds over the period of a year and a half, blood and milk samples will be collected from adult cows that had calved within the previous week. In addition, heifer calves will be sampled every 2 weeks from birth to 10 weeks of age and every 2 months from 10 weeks of age until 12 months of age. Blood samples will be collected using a 20-gauge, 1-inch hypodermic needle to draw 10 mL of blood from each animal into a sterile glass with no anticoagulant. Blood and milk samples after processing will be stored at the University frozen until testing. Information on the time the calves were within the calving pen prior to movement to calf housing will be captured using camera's that will be placed above the calving pen. A cleanliness score of the pen will also be estimated using the cameras. Environmental sampling will be conducted using boot cover swabs where students will walk in each of the following areas: calving pen, preweaning housing, and lactating cow housing. After the samples are collected, they will be submitted fresh for bacterial culture. Post-mortems will be conducted on all enrolled calves that die, where tissues from the lung, liver, and spleen will be submitted to bacterial culture.

Serum and milk ELISA will be used to detect Salmonella Dublin specific antibodies. Samples will be tested at the Animal Health Laboratory at the University of Guelph, and results will be interpreted as described by Nielsen and Ersboll (2004).

A proximity logging system will be used to record contacts between individuals. Loggers deployed on individual calves as well as all farm personnel to continuously record contacts that occur between all of the deployed loggers. Each logger has a unique ID and when two loggers come within a specific distance of one another the loggers exchange information including the date, time at which the contact started, duration of contact and the unique ID of the individual associated with the logger with whom contact was made. This information will quantify all individual close proximity contacts, and how long each contact lasts. Our team has developed a modified proximity logging tool using active RFID that has been tested and deployed in the Ontario equine population during a number of our previous studies (Milwid et al., 2019a,b,c; Rossi et al., 2019). By having logger data over the course of the study we can collect data that will contribute to our understanding of routes of pathogen transmission, the number of unique contacts that individuals (people and animals) have during a day, and the intensity of those contacts (by measuring the time that individuals are in contact).

What types of data will be included?

Numeric data only.

What software or digital formats will be used to collect, manage and analyze the data?

Qualtrics surveys will be used to collect the questionnaire data, and MS Excel will be used to manage and analyze the data.
Ms Excel will be used to collect, manage and analyze the treatment data as well as data related to laboratory analyses.

Provide an indication of the scope of the data?

Approximately data will be collected from 1500 calves and 1000 cows at ten dairy farms and one veal farm.

Data storage

Estimate the size of data storage that will be required.

We anticipate 200 GB of data storage required for this project.

Where will your data be stored during the collection, collation and analysis phases of the project?

All data is stored on an encrypted password protected laptop and a second copy is stored in OneDrive.

What backup strategy will be employed?

The data will be backed up on a remote hard drive once a week. The hard drive will be stored off site in a locked cabinet.

How will your data files be organized? What file naming conventions will you use? A brief overview or example would be adequate.

Folders will be created for the data in each phase: raw, cleaned, collated and final. Files within each folder will be named with a combination of date of data collection (in theformat YYYYMMDD) and type of data. Example: farm1_SDub_20221032.xlsx.

What metadata will be developed for your data? Will there be supplemental documentation prepared to assist with the interpretation and analysis of your data?

If any abbreviations are needed on the excel spreadsheets, another sheet will be created within the same workbook to explain details about units of measure, abbreviations or codes used in the dataset. Units of measurement will also be noted to ensure that numeric values are interpreted correctly (e.g. "mmol/L").

Data archiving and preservation

Will you deposit your data in the UG data repository or an external data repository? If you are opting to not archive your data in a repository, where will your data be housed after completion of your project?

The data will be archived in the UG data repository for long-term preservation.

Discuss any data transformations that will be needed so your data is preserved in appropriate, non-proprietary formats.

The data will be exported from Excel and preserved as plain text CSV files.

If some of your data will not be preserved, how long will you retain it? Will the non-preserved data be destroyed?

The data will be preserved in the U of G data repository

Sharing and reuse

Will the data that you archive in a data repository be made available for sharing and reuse by other researchers?

The data will be freely and openly shared through the UG data repository.

Explain which version of your data or subset of your data will be shared.

The raw, processed, and final data will be made available

When will your data be available for discovery by other researchers? Will you impose an embargo on publication of your data? If so, please provide details on the duration of the embargo.

The data cannot be shared until after the study has been published.

Will you limit who can access your data? If so, who will that be and why are you limiting the data's reuse?

Final, de-identified data will be openly available. The raw data may be provided to researchers who submit a request to the PI

Are there specific license terms you will assign to users of your data?

No

Restrictions/limitations

Are there limitations or constraints on how you manage your data resulting from legal, ethical or intellectual property concerns?

The raw data cannot be shared because of a confidentiality agreement signed with the dairy farms and veal farm

Would your data need to be anonymized or de-identified before being shared with others?

The data will need to be de-identified before sharing. The version of the data containing confidential information will be archived in a data repository but not available for sharing.

Confidential information

What information do you want to include in your DMP that should not be publicly shared?

The external hard drive containing all of the data will be stored in a locked cabinet in room 2507 of the Steward Building.