Evaluation of an automated feeder algorithm as an intervention to ameliorate diarrhea and improve performance in calves using a non-steroidal anti-inflammatory drug

A Data Management Plan created using DMP Assistant

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Project abstract:

The objective of this randomized clinical trial is to determine if intervention with a non-steroidal anti-inflammatory drug (NSAID) upon a feeding behavior alert can improve calf behavior, glucose status, and performance in response to diarrhea during the first 35 days on the automated feeder. To achieve these aims, the intervention will be applied when the calf has a relative change in their milk intake or drinking speed calculated by an algorithm following behavior from the previous 2 days. Then calves will be followed by health exam daily for diarrhea, while blood glucose, feeding behavior and body weights are also collected. The overall goal of this study is to investigate if NSAID provided to calves upon the detection of sickness behavior can ameliorate disease severity and improve calf response to diarrhea.

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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 growth performance measures of calves (feeding behavior and body weights), activity measures (acceleration collars, pedometers), as well as the results of laboratory analyses of biological blood samples collected from the calves (e.g., serum for baseline passive immunity status, blood glucose status). The data will be used to determine if providing an NSAID to calves improves growth performance, is associated with activity measures, and improves blood glucose status compared to controls.

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

Two main researchers will health score calves daily using a survey in an Ipad, and enter feeding behavior data for each calf into a google sheet on the Ipad to determine which calves have an alert or not. Alerts will be automatically generated by an algorithm in the data sheet (≤ 60% relative change milk intake or drinking speed).
These researchers will also take a baseline blood sample on each calf at 24 hours of age, as well as the day of the alert, the day after the alert, and the day of diarrhea (if different then above). Whole blood will be used to assessed for calf blood glucose status.
Calves who have an alert will receive a random assignment in groups of 12 (pen size) of either saline subcutaneously or Meloxicam calculated dosage 0.5 mg meloxicam/kg body weight (2.5 mL/100 kg) or saline by farm staff so that researchers are blind to treatment assignments. Random assignment is done by farm staff picking a treatment from an envelope for each calf. Only the first alert is enrolled.
Calves will be weighed by farm staff at birth, and researchers will weigh calves weekly thereafter until 35 feeder days at study completion.
All feeding behavior and activity behavior collars are recorded automatically to a data cloud, and will be manually backed up to an SD card as a backup weekly.
A convenience sample subset of calves will wear pedometers to validate the activity collars. Pedometers will be worn be heifers and manually scanned for data download twice weekly. Pedometers will be removed when calves are ready to leave the barn.
Weekly a sample of calf starter and hay will be frozen to later determine dry matter content and nutrient content of the feedstuffs.

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 health data, and MS Excel will be used to manage and analyze the health data.
Ms Excel will be used to collect, manage and analyze the algorithm data, feeding behavior data, activity data, body weights data, feed stuff data, and passive immunity status as well as blood glucose status data.

Provide an indication of the scope of the data?

Approximately data will be collected from 80 calves at one research facility.

Data storage

Estimate the size of data storage that will be required.

We anticipate 200 GB of data storage required for this project. Most of this data storage will be used by the automated feeder which uses 30 GB of data storage monthly.

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

Health and performance data, feeding behavior data, and collar activity data will be automatically stored online in a cloud protected by password for all phrases of this project. Health data will be uploaded from the Ipad internal storage daily using Qualtrics software for data entry.
Blood glucose data will be manually written by researchers in a data sheet and entered manually weekly and then uploaded to a google drive.
Treatment assignments will be manually written by researchers in a data sheet and entered into DairyComp software weekly by a dairy employee not participating in the project, and not health screening calves. Researchers will not look at Dairycomp for the duration of the study.
Feedstuff data will be calculated by the lab performing nutrient analysis once at the end of the study in excel and emailed to the primary investigator.
Subset pedometer data will be stored on pedometer in between samplings, scanned, and automatically uploaded to a google drive twice weekly.

What backup strategy will be employed?

All data is automatically sent to a cloud or google drive except blood data/treatment assignments where pictures of data sheets will be taken and stored on a cloud as a backup plan. Furthermore, treatment assignments will be entered in herd management software by one farm employee as a backup plan.

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: Cantormelox_healthscoring_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. Furthermore, the feeding behavior data, health data, and activity data will already have common variable names, as well as a pre-created data sheet explaining the variable list.

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?

No

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?

There are no sensitivity concerns

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

No. The data will not contain any confidential information.

Confidential information

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

N/A