Southeast Dairy Producer's Check-Off Program

Research Summary

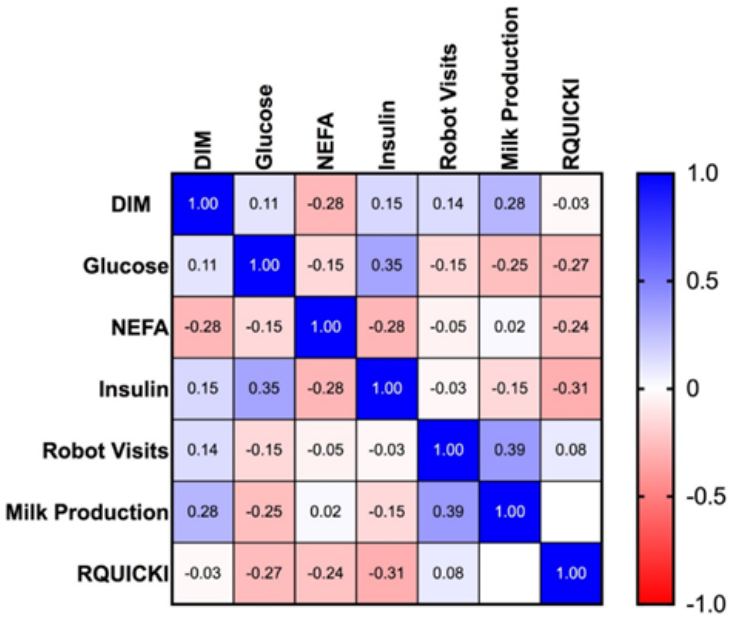
Characterizing postpartum resumption of cyclicity using AMS and its impact on future heat characteristics and reproductive parameters

Sarah Johnson, University of Georgia, Department of Animal and Dairy Science
Jillian Bohlen, University of Georgia, Department of Animal and Dairy Science

Funding Year: 2022 **Amount Awarded:** $8,200

Implications

Understanding the variables that impact an animal's ability to cycle back quickly and normally is imperative for management to have improved reproductive efficiency. This study is one of the first to take a multi pronged approach to evaluating an animal's ability to resume cyclicity postpartum from a biological, metabolic, and management-based approach. In the VMS, milk production had no direct impact on resumption of cyclicity postpartum yet metabolites associated with increased production did impact the timing of cyclicity resumption. The nuances of associations between AMH and Insulin with cyclicity resumption and EI warrant further investigation as they are both more heritable than traditional genetically selected for reproductive metrics. Increased knowledge of factors impacting the time to resumption of cyclicity in the postpartum cow will aid producers in more easily identifying potential problem animals, creating intervention strategies, and selecting for ideal traits in future generations to promote reproductive success.



This is a correlation matrix of all R values between variables tested. A correlation of 1.0 in the dark blue color is a strong positive correlation between two variables. A correlation of 0 in the white color is no correlation between two variables. A correlation of -1.0 in the dark red color is a strong negative correlation between two variables. This population consists of 95 Holsteins on the VMS farm.

Methods

While data collection is complete, final metabolic profiles and statistical analysis are ongoing. Holsteins at a conventional (n=38) and a voluntary milking system (VMS; n=95) dairy, both using the DelPro™ activity monitoring system to capture heat events were enrolled in the project at 14 days (± 3) postpartum. Upon enrollment, blood collections were made weekly while activity, robot visits (if applicable), and milk production was monitored continuously. Animals are removed from the project once the DelPro™ AMS detected a heat event of ++ or +++ strength on the robotic dairy and a ++, +++ or estrous intensity >120% at the conventional dairy or once the animal has reached 100 days postpartum with no

heat event identified in DelPro™. An animal without a recorded heat event at 100 DIM was ultrasounded to examine the ovarian status along with uterine health to discern true anestrus from missed heat events.

A subset of conventionally milked Holsteins (n=18) and a comparative Jersey population (n=18) were sampled for analysis of uterine microbiota at 40-60 DIM. These uterine samples were collected using a double guarded sterile swab and were taken in duplicates for each animal. Once collected, samples were placed on dry ice and transported to the lab to be stored at -80° C. Samples were thawed and analyzed using the QIAmp BiOstic Bacteremia DNA Kit to isolate pure genomic bacterial DNA and microbes from the uterine endometrium were analyzed to the species level. This will help the researchers gain a greater understanding of biological contributors to observable, reproductive parameters.

Results

Of the 95 cows enrolled at the VMS farm, 43 resumed cyclicity (normal; <45 DIM) while 52 had a delayed return (delayed; >45 DIM). Those that resumed cyclicity normally had a numerically higher intensity of first estrus (191.0 ± 6.0) compared with delayed (179.0 ± 6.0); however, this was not statistically different. AMH concentration tended to be positively correlated with EI at first estrus (P=0.052). Milk production sharply increased in the delayed animals from 14-49 DIM while that same pattern was only found in the animals resuming normally from 14-35 DIM. This corresponded with higher circulating glucose in the normal animals at 28, 35, and 42 DIM (P<0.05) while the delayed animals had higher circulating NEFA at 21 and 28 DIM (P<0.05). Insulin sensitivity increased over time in all animals. The pattern of sensitivity found is intriguing with higher sensitivity to insulin in the normal cows compared with delayed until 35 DIM at which point the groups reversed positions with delayed cows now having higher sensitivity. However, further work is needed in this area to fully evaluate and elucidate causative factors for the patterns observed. This data in combination indicates when glucose reserves were too low to be reliably utilized for energy, cows converted to the inefficient use of NEFA to meet their energy demands. This was found to be more drastic in delayed animals, with possible faster homeorhesis to meet the metabolic demand of milk production in the normal animals. In both groups, visits to the RMS increased with milk production (P<0.05).

Of the 38 cows enrolled at the conventionally milked farm, 24 resumed normally while 14 were delayed. As with the VMS operation, animals with a normal resumption had a numerically higher EI (157% ± 8.8%) compared with delayed (143% ± 5.2%) but it was not statistically different. Metabolic data from this group of animals is currently finishing laboratory analysis for further review.

There is current preliminary analysis of uterine microbiome data. Initial runs indicate a breed interaction on population diversity and density. Additionally, there is an interaction indicated between cows with normal resumption of cyclicity and cows with delayed resumption of cyclicity. Both commensal and pathogenic microbes are identified within the uterine microbe samples. However, further analysis is underway to determine the extent of their influence on reproductive metrics recorded for this study.

References of Published Work

Final analysis is currently being completed. There are currently three abstracts accepted for national presentation at the 2023 American Dairy Science Association meetings that contain data from this study.