A step toward improving fertility of dairy cattle

Connection of daughter pregnancy rate and services per conception with hormone signaling are presented in a recent article in Applied Animal Science

Champaign, IL, March 28, 2022—For decades, milk yields increased in Holstein cattle within the dairy industry in the United States. At the same time, reproductive efficiency has decreased, with only recent attenuation because of improved reproductive management, fertility trait selection, and so on. Many genes contribute to fertility, and fertility traits have a low heritability, making improvement in this area particularly challenging. Scientists at Colorado State University and Bovine Reproduction Specialists made some new observations that could improve fertility in the dairy industry, and their results are presented in a recent article in *Applied Animal Science*.

"Early-life genomic testing procedures were recently reported to be associated with later-life measures of reproduction (i.e., traits such as daughter pregnancy rate and cow conception rate)," said corresponding author Milton G. Thomas, PhD, Department of Biomedical Sciences and Department of Animal Sciences, Colorado State University, Fort Collins, CO, USA. In response, this study investigated whether there are relationships among direct genomic value for daughter pregnancy rate (DGV-DPR), services per conception (SPC), characteristics of day-16 conceptuses, and hormone signaling for maternal recognition of pregnancy.

To determine whether there were connections between reproductive efficiency and early-life genomic and physiological factors of conceptuses, the team of researchers first categorized cows into high- and low-fertility groups. High-fertility pregnant (HP) cows had both high DGV-DPR and low SPC, whereas low-fertility pregnant (LP) cows had low DGV-DPR and high SPC. In these cows and conceptuses, the scientists then analyzed components and processes of maternal recognition of pregnancy, such as interferon tau and interferon-stimulated gene 15.

Caption: Embryo classification from low-fertility pregnant (LP) and high-fertility pregnant (HP) dairy cows. The photos show a collapsed, narrow, short-and-dark-pink embryo mortality (EM) conceptus and a viable, normal, long and translucent conceptus. Note that the guides on the metric ruler are aligned in both photos to provide perspective regarding the size of these conceptuses. (Credit: B. E. Liebig)

The researchers made several observations when comparing the high- and low-fertility cows. "Normal conceptuses from HP cows tended to be longer than normal LP conceptuses," said Bethany E. Liebig. These results were part of her master of science research at the Animal Reproduction Biotechnology Laboratory at Colorado State University, Fort Collins, CO, USA. She added, "Greater concentrations of interferon tau were discovered in uterine flushings from all HP compared with LP cows." The scientists also found interferon-stimulated gene 15 mRNA concentrations in peripheral blood mononuclear cells of HP cows tended to be upregulated compared with LP cows.

"Our results support the hypothesis that sorting dairy cows for high DGV-DPR and low SPC improves interferon tau production and, potentially, endometrial signaling of maternal recognition of pregnancy on day 16, although the cow numbers in this preliminary study were minimal," said Thomas Hansen, PhD, Director of the Animal Reproduction Biotechnology Laboratory at Colorado State University, Fort Collins, CO, USA. These combined improvements from high-fertility cows could make maternal recognition of pregnancy more likely, which could improve the embryo and pregnancy success rate. David K. Beede, PhD, Editor in Chief of *Applied Animal Science* said, "With additional research and evidence, it may be possible to combine genomic and physiological information to improve fertility in dairy cattle."

The article appears in the April issue of *Applied Animal Science*.

Full text of the article is also available to credentialed journalists upon request; contact Brittany Morstatter at +1-217-356-3182 ext. 143 or ARPAS@assochq.org to obtain copies. To schedule an interview with the author(s), please contact Milton G. Thomas at milt.thomas@colostate.edu.

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