South Dakota State University
Department of Animal Science

Beef Day 2020

Reproduction

The interactions of change in nutrition on uterine environment and cholesterol concentrations in beef cattle

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Objective

The objective of this study was to evaluate the impact of nutritional changes prior to and after artificial insemination (AI) on uterine environment and plasma cholesterol concentrations.

Study Description

The study consisted of 79 beef heifers that were randomly assigned to 2 dietary treatment groups (High or Low) for 30 days prior to AI (pre-AI). Then at the time of AI, heifers were randomly divided and assigned to new diet treatment groups (post-AI). This created four pre- x post-AI diets (High-High, High-Low, Low-High, and Low-Low). Post-AI diets continued 7 or 8 days after AI when uteri were flushed for embryos. The high diet provided 155% of maintenance energy requirements and the low diet provided 86% of maintenance energy requirements. Blood samples were also collected on days -3,-2,-1, and 0 (day of AI), 1,3,5,7, and 8 post-AI. Blood was collected for analysis of plasma cholesterol concentrations using a colorimetric assay. Uterine flushes were analyzed for concentrations of magnesium, aluminum, phosphorus, sulfur, potassium, calcium, copper, zinc, selenium, and iron by inductively coupled plasma mass spectroscopy. Thus far, cholesterol concentrations changed over time ($P < 0.0001$), with concentrations increasing from the day of AI to day 3 and 5 after AI, but then decreasing again. There were no differences between treatments ($P > 0.10$). Also, there was no pre-AI diet by post-AI diet by time interaction ($P = 0.99$). There was an effect of embryo presence on uterine flush mineral concentrations for magnesium ($P < 0.04$), aluminum ($P < 0.01$), sulfur ($P < 0.01$), potassium ($P < 0.01$), and calcium ($P < 0.01$), with concentrations decreasing in uterine flushes that contained an embryo. There was no effect of pre-AI diet on mineral concentrations; however, there was an effect of post-AI diet on sulfur ($P < 0.02$) and calcium ($P = 0.03$). Heifers on the high diet had greater concentrations of both sulfur and calcium compared to heifers on the low diet. Mineral concentrations were not affected by the interaction of pre-AI diet by embryo presence with the exception of sulfur ($P < 0.03$). There was a post-AI by embryo interaction on phosphorus ($P < 0.03$), zinc ($P = 0.02$), and selenium ($P = 0.02$).

Take home points

In conclusion, changing the plane of nutrition pre- and post-AI had no effect on plasma cholesterol concentrations; however, the presence of an embryo as well as both pre- and post-AI diet did affect uterine mineral concentrations. In the future, more work needs to be done on

what the embryo is using the minerals for and the impact of the mineral concentrations on embryo development.

Acknowledgements

This project was possible through collaboration between [1]Department of Animal Science, South Dakota State University, Brookings SD, U.S.A., [2]USDA-ARS, Fort Keogh Livestock and Range Research Laboratory, Miles City, MT, U.S.A., [3]Department of Dairy Science, South Dakota State University, Brookings SD, U.S.A.

Keywords: cholesterol, embryo, mineral, uterine environment