



“Field Study of the Impact of Trace Minerals and Infectious Disease on Reproductive Performance in Beef Cow-Calf Herds”

## IMPROVING THE REPRODUCTIVE PERFORMANCE OF BEEF COWS

**PROJECT NO.:** 0008-002

**RESEARCH INSTITUTION:** University of Saskatchewan (Western College of Veterinary Medicine)

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**Background:** Both nutritional deficiencies and infectious diseases can impact reproductive performance. In dairy cows, selenium and vitamin E deficiencies have been associated with retained placentas, inflammation of the uterus, cystic ovaries, and delayed conception. Copper deficiencies are suspected to reduce conception rates. Due to differences in management and the nutritional demands on beef cows, the effects of trace mineral deficiencies in cow-calf herds are not well known. The mineral composition of forage varies throughout Western Canada. Minerals can also interact with each other; e.g. high sulfate concentrations in the water may bind the copper from the feed, reducing copper availability to the animal. As a result, the need for mineral and vitamin supplementation varies in different regions.

Unlike BVD, IBR, and *Neospora*, there have been no recent studies of the prevalence of *Campylobacter fetus* or *Leptospira hardjo* in Western Canadian beef herds. *Campylobacter fetus* (Vibrio) can cause abortion, repeat breeding and infertility. *Leptospirosis hardjo* can cause abortion, stillbirth, weak calves, and infertility. Commercial vaccines are available for both diseases, but more information is needed to determine whether using these vaccines is cost effective.

**Objectives:** To evaluate the relationship between trace mineral and vitamin status with reproductive efficiency, as well as estimate the prevalence of Lepto and Vibrio in western Canadian cow-calf herds.

**What they did:** To meet the objectives of this project, four sub-studies were initiated. The first sub-study looked at levels of micronutrient concentrations at pre breeding and whether those levels had an effect on pregnancy. The second examined levels of micronutrient concentrations before and after the summer grazing season. The third and fourth sub-studies examined the incidence of Lepto and Vibrio in western Canada.

To determine levels of micronutrients present at pre-breeding and whether those levels have an impact on pregnancy rates, the researchers assembled 771 beef cows from 39 commercial cow-calf herds. The concentrations of various micronutrients circulating in the blood were measured prior to the cows leaving for community pasture in late spring. Cows were then palpated in the fall to determine pregnancy status. Producers and pasture managers were also surveyed to collect individual records on the cows enrolled in the study, as well as information on the entire herds and breeding field management. The second sub-study involved 791 commercial beef cows from 40 cow-calf herds pastured in five different community pastures. Serum concentrations of copper, manganese, molybdenum, selenium, vitamin A and vitamin E were measured at the beginning and end of the summer grazing season.

Exposure to Lepto over the summer grazing season was measured in 781 cows in late spring and early fall. Vaccination practices for Lepto were also surveyed in 205 cow-calf herds across western Canada, and 1539 weaned unvaccinated calves from 61 of these herds were tested to determine Lepto exposure. 232 mature bulls placed on five community pastures were examined for Vibrio infection using three different tests. All bulls had been vaccinated for BVDV, IBR and Vibrio prior to the start of the breeding season. Approximately 65% of the cowherds were also vaccinated for Vibrio.

**What they learned:** There was no association between levels of selenium, molybdenum, vitamin A or vitamin E and pregnancy status. Copper concentrations were more often below normal than the other micronutrients, and lowered copper levels did increase the risk of open cows younger than 10 years of age. Copper and vitamin A tended to increase during the summer grazing season, while molybdenum and selenium tended to decrease. Cow age also played a role, with older cows (10-14 years) experiencing lower levels of vitamin A and vitamin E overall. Copper concentration was lower in cows with thin pre-breeding body condition scores, and thin cows at the end of the grazing season also experienced lower vitamin A concentrations.

An increase in Lepto antibodies were more common in vaccinated cows. 11.3% of vaccinated cows experienced an increase, compared to only 2.3% of unvaccinated cows. Of the 1539 unvaccinated calves from these herds examined, only 0.8% were positive for Lepto. The specific test that determines antibody concentrations found that less than 2% of cows carried the hardjo type of Lepto, which has previously been reported as the most common type. However, hardjo was the dominant type found in the unvaccinated, weaned calves. The percentage of producers that vaccinated their herds for Lepto was 13.7% in the first year surveyed, 8.4% in the second year, and 40% six years later.

None of the 232 bulls tested for Vibrio tested positive under any of the three testing methods. There was one breeding field with an open rate of >10%, even though bulls were required to pass a semen test prior to being turned out on pasture. The six bulls from this field that had not been sold were retested for Vibrio with negative results. Testing for Vibrio in the field can be challenging, as the organism tends not to survive harsh environmental conditions or long transport times

to a laboratory for testing. Due to the sensitive nature of the Vibrio organism, better field testing methods need to be developed in order to have confidence in negative test results.

**What it means:** Herds in areas known to be copper deficient, and that are experiencing poor reproductive performance should institute a careful supplementation program with advice from their local veterinarian/nutritionist. In addition, age and body condition of the cows should be taken into account when designing any supplementation. It may be necessary to supplement different groups of cows differently based upon their requirements and physiological status.

This study determined that Lepto infection in western Canadian cow-calf herds is quite low. A study that focused on the causes of aborted fetuses in the region also found that Lepto was not the cause. However, due to increasing usage of vaccines against Lepto, the usefulness of testing for Lepto antibodies is limited. The researchers felt that more information was necessary before making a recommendation on the usefulness of vaccinating for Lepto.

Management practices can do a lot to reduce the risk of venereal disease in community pastures. Although no commercial vaccine for Vibrio is labeled for use in bulls, off label use is common and often recommended by veterinarians for bulls in high risk breeding situations. Every mature cow brought to the community pastures in this study had to have a calf at side, which would suggest that they were unlikely to be infected with Vibrio upon release into the pasture. Even with these precautions, it is still possible for Vibrio to enter community pastures. Cows could be bred by an infected bull before arriving at the pasture, and vaccination of the cow herd is not required by all community pastures. While no infected bulls were detected using culture methods in these pastures, the importance of vibrio infection in western Canada requires additional study. Further research is underway to develop a reliable DNA field test for carriers of Vibrio and determine the amount of Vibrio DNA in a carrier animal necessary to cause infection.



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