

**STUDENT  
RESEARCH  
PRESENTATION  
COMPETITION  
  
ABSTRACTS**

# Evidence of Transmission Among Group Housed Calves Following Exposure to Penmates Infected with *Mycobacterium avium* subsp. *paratuberculosis* (MAP)

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Johne's disease (JD) is a progressive, chronic enteritis in the small intestine of ruminants caused by *Mycobacterium avium* subspecies *paratuberculosis* (MAP). In the subclinical phase, cows have decreased milk production, increasing their risk of being culled. JD is usually transmitted through ingestion of fecal contaminated material, such as contaminated feed and milk. There is no vaccine or treatment for JD; therefore, control is primarily based on preventing transmission. One of the most common underlying assumptions is that only cows are infectious and only calves are susceptible. This has led to separating calves from their dams and placing them in calf barns; however, recent research by our group has confirmed that calves are not only susceptible but can also actively shed MAP.

**Methods:** 32 newborn Holstein bull calves were allocated into pens of 4, where 2 calves were inoculated with MAP (IN), and 2 calves were contact exposed (CE). Calves were group housed for 3 months to allow for any potential transmission to occur from IN to CE. CE calves were then individually penned for 3 more months until the conclusion of the trial to ensure any new infections would become detectable. To detect MAP shedding, fecal samples were collected three times a week for all animals, and intestinal tissue samples were collected at the end of the trial.

**Results:** Following group housing with IN calves, all CE calves began to shed MAP as indicated by positive fecal culture results. Tissue samples collected at necropsy indicated MAP infection in a high proportion of CE calves.

**Implications:** The results obtained from this study not only add to our understanding of MAP transmission, but also generate new knowledge regarding patterns and timing of shedding. Understanding the extent to which transmission occurs between penmates will lead to more effective management practices, minimizing the spread of JD.

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# Pen Walks as a Tool to Determine the Prevalence of Digital Dermatitis in Young Stock on Alberta Dairy Farms

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Digital dermatitis (DD) is an infectious, bacterial disease that can impact production and welfare of dairy cattle, and is the most prevalent foot lesion in Alberta (AB). DD management practices and peer-reviewed research mainly focus on the lactating herd. However, DD has been identified in young stock and is associated with an increased risk of DD after calving. It is essential to understand the prevalence of DD in heifers and identify potential risk factors for DD lesions specific to AB. The objectives of the study were to 1) determine the sensitivity and specificity of pen walks to identify DD lesions in young stock compared to hoof inspection in a chute, and 2) determine prevalence of DD in young stock (< 24 mo.) on AB dairy farms.

A cross-sectional field trial was conducted on 28 AB dairy farms and all young stock on farm were assessed for DD using pen walks that dichotomously (present/absent) scores DD on the hind feet. To determine the sensitivity and specificity of pen walks, 5 farms (583 heifers) were selected for chute inspection of DD lesions (scored using M-stage system) by the researcher following pen walk DD identification. The sensitivity and specificity of the pen walks was then applied to farms to determine apparent and true prevalence estimates of DD.

Pen walks as a means of identifying M2, M3, or M4 DD lesions on the hind feet in young stock had a sensitivity and specificity of 73.6 and 96.7%, respectively, with positive and negative predictive values of 84.8 and 93.7%, respectively. DD was identified in young stock on 14/28 (50%) farms using pen walks. Apparent within-herd prevalence estimates ranged from 0 to 15%, with a median and mean of 1.6 and 3.5%, respectively. The true within-herd prevalence of DD in young stock, calculated using the sensitivity and specificity of the pen walks, ranged from 0 to 17.4%.

DD lesions were identified in 54% of farms surveyed with within-herd true prevalence estimates of up to 17%. This provides evidence that this group may act as a potential reservoir of disease that will be transmitted to the lactating cattle upon calving. In future, determining risk factors for DD lesions in this group and implementing management practices to prevent disease proliferation and transmission is an important step to help manage DD on farms.

# Effect of Plane of Nutrition and Age on Glucose and Insulin Kinetics and Abomasal Emptying in Female Holstein Frisian Dairy Calves Fed Twice Daily

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Current dairy calf nutrition research is focusing on feeding an elevated plane of nutrition (EPN) pre-weaning (~8 L milk replacer/d or 20% birth weight), over low plane conventional feeding (LPN; ~4 L milk replacer/d or 10% birth weight). A common concern with feeding an EPN over two meals a day is that it has been hypothesized to decrease insulin sensitivity. The objective of this study was to investigate how pre-weaning plane of nutrition and age can impact insulin and glucose kinetics, as well as abomasal emptying rate, in calves fed twice a day. Twelve female Holstein-Frisian calves were randomly assigned to an EPN (8 L/d, 1.2 kg milk replacer/d; n = 6) or a LPN (4 L/d, 0.6 kg milk replacer/d; n = 6). All calves received 4 L of colostrum over two meals and then were directly transferred to their assigned feeding plans until they were stepped-down from milk by 50% during week 7, and weaned on week 8. Milk replacer (24% CP, 18% CF) was fed at 150 g/L twice daily and all calves had *ad libitum* access to pelleted calf starter, chopped wheat straw, and water. Jugular catheters were placed in calves at 4, 7, and 10 weeks of age to measure: 1) Pre-weaning postprandial plasma glucose and insulin response, as well as abomasal emptying by adding acetaminophen (150 mg/kg BW<sup>0.75</sup>) to the milk to use as a blood marker; 2) Pre- and post-weaning insulin response to high plasma glucose levels by conducting a glucose tolerance test (GTT) consisting of an infusion of 540 mg of glucose per kg of BW<sup>0.75</sup> via the jugular catheter. Postprandial plasma insulin was greater ( $P < 0.05$ ) in EPN calves compared to LPN due to larger meal sizes, however there was no difference in postprandial glucose between treatments indicating adequate control of glycaemia. This was further demonstrated by the abomasal emptying rate of the milk replacer meal being slower ( $P < 0.05$ ) in EPN calves compared to LPN, indicating emptying rate may be used as a means to maintain blood glucose levels. In addition, there were no differences in GTT kinetics ( $P > 0.05$ ) between the EPN and LPN dairy calves across ages, indicating no decrease in insulin sensitivity. Findings from this study suggest that feeding dairy calves an EPN in two meals per day does not negatively affect glucose and insulin kinetics.

# Effect of Digestible Fiber Contents in Newly Developed CDC Barley Silage Varieties as a Main Dietary Forage Source on DMI and Milk Production of Lactating Dairy Cows in Comparison with New Corn Silage

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The objective of this study was to evaluate the effect of enhanced in vitro NDF digestibility of barley silage varieties on dry matter intake (DMI), milk production and chewing activity of high-yield dairy cows. Four early lactating multiparous Holstein cows (body weight = 703 ±78 kg; days in milk = 101 ± 25; parities= 2.75±0.83) were used in a 4×4 Latin square design with four dietary treatments: T1 = diet contained whole plant corn silage (P7213R), T2 = diet contained whole plant CDC Cowboy barley silage, T3 = diet contained whole plant CDC Copeland barley silage, and T4 = diet contained whole plant Xena barley silage for one of four periods. The study was carried out at Rayner Dairy Teaching and Research Facility at the University of Saskatchewan. The in vitro 30h NDF digestibility NDFD of CDC Cowboy barley silage, CDC Copeland barley silage, and Xena barley silage were 32.0, 28.4 and 26.3%, respectively. The cow diets were formulated to contain 41% one of four silages, 10% alfalfa hay, and 49% barley-based concentrate (DM basis) based on lactating dairy cow requirements using NDS software based on CNCPS 6.5. The cows fed T2 with highest in vitro NDFD (among 3 barley silages) did not show the improvement of lactation performance, feed efficiency and chewing activity. Cows fed T1 with the new corn variety silage had similar DMI but produced more milk than those fed barley silages (40.1 vs. 35.3 kg /d. As a result, the cows fed T1 improved feed efficiency compared with those fed the barley silages (1.57 vs. 1.37 kg milk kg /DMI; p= 0.03).

**Implications:** This study demonstrated that feeding barley silage with 3.6 to 5.7% unit greater in vitro NDF digestibility does not necessarily correspond with greater in dairy cow performance. However, the newly developed corn silage has a potential to produce more milk and greater feed efficiency compared with barley silages.





