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Calf Note #142 – New Hope for Johne's Disease

Introduction

Johne's Disease (**JD**) continues to plague the dairy industry in the U.S. According to the USDA National Animal Health Monitoring System, than more than 68% of herds in the U.S. are infected with MAP. This endemic disease costs the industry more than $250 million per year in lost production, increased culling and reduced longevity of dairy cows. The disease is found in every state in the U.S. – even in areas where cows are intensively managed and where culling rates are high. A study in California estimated the prevalence of infection with MAP in cows was 9.4% (Adaska and Anderson, 2003).

Johne's Disease is caused by the bacterium *Mycobacterium avium* subspecies *paratuberculosis* (**MAP**). The organisms infect cattle very early in life – often in the first few days after birth. The organism is shed in feces of infected animals in large numbers and can quickly contaminate the farm environment.

Infection with MAP

MAP infection most commonly occurs by ingestion of feces, milk or colostrum containing the organism. Once ingested, MAP survives and replicates in the immune cells within the intestine and lymph nodes. The organism grows very slowly and has an incubation period of several years. Therefore, though infection often occurs in the first days of a calf's life, clinical signs are not seen until the animal is much older.

The clinical disease is manifested by inflammation of the intestine, reduced digestion and diarrhea. Milk production declines. Cows lose weight, become thin and frail and reproduction is impaired.

Small numbers of MAP are shed during the subclinical phase of the disease; over time, this shedding can result in a constant, low-grade contamination of the environment which can then lead to further risk of infection. In the clinical phase, cows shed huge numbers of organisms which quickly contaminate the environment.

Diagnosing MAP is difficult on the farm both because the organism grows slowly and the traditional measures of infection are inconsistent. Recent developments in testing of milk for presence of MAP antibodies can help in diagnosis of MAP-infected cows; however, identification of infected animals (particularly subclinically infected animals) remains a difficult challenge on the farm.

Infection occurs early in life

Though JD is a disease of cows, infection with the organisms takes place early in life. Many researchers believe that contamination occurs within the first few days after birth and contaminated colostrum has been implicated as a source of infection with MAP (Streeter et al. 2003).

Evidence exists that points directly to colostrum as a source of MAP infection with. Diéguez et al. (2008) surveyed 101 dairy farms in Northwest Spain. They determined specific management practices are associated with the risk of infection with JD. One important finding was that farms that fed colostrum from JD-positive cattle were much more likely to be infected with JD.

Research on a 1,500 cow dairy in California with a history of JD found considerable transmission of MAP from dam to daughter. Calves born to seropositive cows were up to 6.6 times more likely to become seropositive themselves compared to calves born to seronegative dams (Aly and Thurmond, 2005).

Colostrum Replacers and Johne's

If colostrum and/or the maternal environment is a vector for transmission of JD, then eliminating the feeding of colostrum should reduce the risk of transmission of JD. That's where colostrum replacers may play a role.

Colostrum replacers (**CR**) are products containing at least 100 grams of IgG (also known as Globulin Protein) and are designed to completely replace maternal colostrum when colostrum is unavailable, of poor quality or contaminated. These products are based on two different technologies – either dried colostrum or fractionated plasma.

Dried colostrum products are manufactured from first, second (and possibly) third milking colostrum collected from dairy farms. The colostrum is frozen, transported to the manufacturing facility, thawed, pooled into lots of consistent IgG content, pasteurized and dried.

Products based on plasma fractionation use IgG that is separated from bovine plasma by chemical fractionation. The IgG fraction is highly concentrated and spray-dried to produce a product containing 40% or more IgG. The IgG fraction is then blended with other ingredients to provide energy, protein, vitamins and minerals and a consistent IgG level.

A recent study (Pithua et al., 2009) published in the Journal of the American Veterinary Medical Association reported on the use of a plasma-derived colostrum replacer to determine whether eliminating the feeding of contaminated maternal colostrum would reduce the risk of calves developing Johne's disease in later life. In the study, 497 Holstein heifer calves were born on 12 dairy farms in Wisconsin and Minnesota. These herds were well managed (rolling herd average >25,000 lbs of milk) and were all endemic for Johne's disease.

Each calf was removed from the dam (to minimize the risk of fecal contamination from the calving pen) within 60 minutes after birth and was fed either cow colostrum (n = 261) or plasma-derived colostrum replacer (n = 236). Colostrum feeding and management was typical for the farm and was not changed during the study. Most farms fed calves 1 gallon (3.8 liters) of colostrum in the first feeding after birth. Some farms offered a second feeding of colostrum; other farms fed milk replacer at the second feeding. Calves fed the CR received one dose according to the manufacturer's recommendations. On farms that normally fed a second colostrum feeding, calves were fed a plasma-derived colostrum supplement at the second feeding. Thereafter, calves were all treated according to the normal management of the farm. All farms maintained a JD control program

during the study. Therefore, care was taken to minimize contact of calves with older cows and to minimize the risk of fecal contamination of the calves' environment.

Calves were raised normally, were bred and calved successfully. Calves were monitored for health prior to weaning and there were no differences between groups in morbidity, mortality or cost of veterinary treatments.

Cows were sampled for MAP using an ELISA test and bacterial culture at 30, 42 and 54 months of age to determine which cows developed JD. The data were then compared between the two groups to determine whether or not the colostrum replacer affected the risk of cows developing JD. Results were dramatic. Calves fed the plasma-derived replacer were 44% less likely to develop JD compared to cows fed maternal colostrum. These results show clearly that contaminated colostrum is a significant source of infection with MAP and using plasma-derived CR is an excellent tool to help reduce the risk of transmission of MAP to newborn calves.

A weak link in many JD control programs has been our inability to break the cycle of transmission. Colostrum is essential to the newborn calf, so few producers would consider the idea that calves shouldn't be fed colostrum. However, with the availability of cost-effective plasma-derived CR products, producers have a new tool in the fight against JD.

References

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