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The Colostrum Counsel

Effective colostrum management practices include the timely feeding of adequate volumes of clean colostrum with a broad spectrum of protective antibodies. This goal can be achieved by the careful selection, pooling and heat treatment of maternal colostrum harvested on farm or by the use of a standardized commercial colostrum product that is licensed as a veterinary biologic.

Colostrum Management: A Critical Control Point for Biosecurity Risk on Dairy Farms - Part II

In the previous issue we discussed the many biosecurity challenges and disease hazards that can be linked to colostrum-feeding practices. In that document, we introduced two basic epidemiological concepts that help to understand disease transmission within a group of animals. The first key concept was the **R_0 (R Zero) representing the degree of transmissibility of the pathogen** and the second was that of **"herd immunity"** or the level of disease protection in the population of animals. In this issue, we discuss how colostrum management practices can affect R_0 and herd immunity and impact the overall biosecurity and health in the dairy.

Management practices that affect R_0

The longer calves remain with their dam the greater the opportunity for direct and immediate transfer of infectious agents. Transmission may occur by droplets from coughing or urinating, by direct contact during social behaviour such as the dam licking the calf and/or through the calf suckling. The probability of transmission (R_0) will be significantly reduced if the calf is immediately separated from the dam and hand-fed colostrum.

Colostrum can be an important source of transmission of infectious agents in dairy herds. The presence of pathogens in colostrum can occur by direct transmission from the mammary gland of an infected cow or by contamination of the colostrum with feces, urine or other secretions after the milking of the cow. Therefore, colostrum can potentially be contaminated with any pathogen present on the dairy and may represent an important source of maintaining infections in the herd. Good hygiene and sanitation practices during collection of colostrum will reduce the risk of transmission due to contamination of colostrum with infectious agents after collection but has no effect on the risk of transmission of pathogens secreted directly into the mammary gland such as Mycobacterium avium Paratuberculosis (MAP). To minimize transmission of MAP and other pathogens secreted directly into the colostrum there are two approaches; collect colostrum only from cows that are proven to be free of the infections and/or use colostrum that has been heat-treated to destroy the pathogens. Testing of individual cows for the array of pathogens that can be transmitted via colostrum is impractical. Thus, only the second alternative is feasible. It has been shown that heat treatment (HT) of colostrum using a low temperature, longer-time method (60°C for 60

minutes) is achievable and commercially available batch "pasteurizers" are now in use on many dairies. This heat treatment has been shown to maintain most of the IgG bioactivity and colostrum fluid characteristics, while eliminating or significantly reducing important pathogens including E. coli, Salmonella spp, Mycoplasma bovis, and MAP (reviewed by Godden S., 2008). Is important to stress however that this HT protocol reduces bacterial counts but does not sterilize. If the colostrum is heavily contaminated these parameters will not eliminate all pathogens. In addition, the equipment must be carefully maintained and routinely calibrated to assure the quality of the heat treatment process. There is no test to assess the microbial load or the bioactivity of antibodies after on-farm heat treatment, thus the efficacy of this approach on a day-to-day basis on commercial operations remains uncertain. A recent long-term clinical study on MAP transmission found that by the end of the 3-year testing period there was no difference in the proportion of animals testing positive to MAP when comparing animals that consumed on farm heat treated colostrum and those consuming fresh colostrum (Godden S. M. et al. 2015).

The alternative that removes uncertainty and ensures no pathogens are transmitted in colostrum is through using commercially available colostrum products licensed as veterinary biologics by federal regulatory agencies. A study demonstrated a significant reduction in the risk of MAP transmission in calves fed a commercial colostrum supplement when compared with calves fed raw maternal colostrum at birth (Pithua et al., 2009). It is reasonable to postulate that feeding commercial colostrum products could similarly reduce the risk for transmission of many other diseases.

Management practices that affect herd immunity in the newborn

In newborn calves the main resistance to infection and disease is passive immunity (maternal antibodies) provided by the IgG1 absorbed from colostrum. Thus, herd immunity among calves during the first weeks depends on the quality of passive transfer of immunity. If the colostrum fed to the calves is of poor quality (low antibody mass and/or incomplete spectrum of protective antibodies) the proportion of animals susceptible to infections will be high, thereby increasing the numbers of infections arising in the group (increasing the R_0). Colostrum management for effective biosecurity requires that the "herd" of newborns have sufficient levels of protective immunity to the specific pathogens in the environment. Most common causes of calf morbidity and mortality during the first 3 weeks of life are pneumonias and diarrheas caused by pathogens capable of infecting the respiratory and intestinal mucosal surfaces. For antibodies of a given specificity to be present in colostrum the dams must receive an immune "boost" at the appropriate time during the dry cow period to generate high titers of antibody to each agent of concern. There are two ways to assure that the full spectrum of antibodies is present in the colostrum fed to an individual calf, either through a very comprehensive dry cow vaccination program or the use of commercial colostrum products produced from large pools of individual colostrums. The pooling process for commercial products can be done to assure both a standardized overall mass of IgG and protective antibody titers to all the important pathogens ubiquitous on dairy farms.

If we accept the definition of biosecurity as management practices implemented to prevent introduction and/or spread of infectious agents in a herd, we can be confident that the implementation of colostrum feeding practices as a critical control point will improve biosecurity on the dairy. Conversely, failure to do so omits one of the most important opportunities in a biosecurity program.

In summary, effective colostrum management can play a role in reducing the levels of infectious disease in a dairy herd both through reducing direct disease transmission and by increasing the herd immunity.

Effective colostrum management practices include the timely feeding of adequate volumes of clean colostrum with a broad spectrum of protective antibodies. While effective colostrum management can be achieved by the careful selection, pooling and heat treatment of maternal colostrum harvested on farm, the use a standardized commercial colostrum product that is licensed as a veterinary biologic by federal agencies is a convenient and reliable means to facilitate this goal.

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