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The Colostrum Counsel

An often overlooked contribution of colostrum and good colostrum management practices is the role of colostrum in ensuring biosecurity and preventing disease transmission from dam and the environment to the newborn calf. Practices around parturition and newborn calf management presents the first and greatest disease transmission opportunity on a dairy operation.

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

It is well accepted that feeding high quality colostrum is the single most important factor influencing successful transition of a newborn calf into an effective productive unit. In previous issues of The Colostrum Council (CC) we discussed 3 critical contributions of colostrum; first, as an immediate source of the energy that is essential for the survival of the calf in the first hours of life, second, its role in the transfer of maternal antibodies for protection from infectious disease during the first weeks of life and third, the contribution of colostrum (likely due to benefits from colostral growth and metabolic factors) to the long-term productivity of the animal.

An additional and often overlooked contribution of colostrum and good colostrum management practices is the role of colostrum in ensuring biosecurity and preventing disease transmission from dam and the environment to the newborn calf. In this issue of the CC we discuss the biosecurity challenges that exist when practices around colostrum feeding practices are not managed correctly. In a following issue of the CC we will discuss the opportunities to improve biosecurity posed by good colostrum management practices.

Biosecurity can be defined as management practices implemented to prevent introduction and/or spread of infectious agents in a herd. The elements of the well-known epidemiological triad (Host-Environment-Infectious Agent) influence the risk of disease transmission from the dam to the newborn. This triad is strongly influenced by husbandry and management factors. Recognizing how management practices affect each component of the triad is important because these are the source of opportunities to reduce the risk of infection to the newborn. Practices around parturition and newborn calf management presents the first and greatest disease transmission opportunity on a dairy operation.

Removing the calf quickly after birth has major implications on calf survival

There is a short time immediately after birth when the gut of the newborn is "open" such that cells and macro-molecules can directly enter the circulatory system of the calf, these hours provide the greatest opportunity for pathogens to infect the calf. The more contact a newborn has with the environment of the adults (including the maternity area), the greater the opportunity for disease transmission. The USDA reports that young calves have the highest rates of morbidity and mortality relative to any other age group on a dairy (USDA, 2010). There is an increased chance of dying in calves that remain with

the cow for more than 24 hours (Moore et al. 2010) and a reduced disease incidence in calves left with cows for less than 2 hours (Gulliksen et al., 2009).

Colostrum is essential to the newborn but it can also be a source of pathogens

Colostrum can be a significant source of infection of the calf with infectious agents that persist in dairy herds and could be partially responsible for maintaining disease in the herd. Pathogen presence in colostrum can occur either by direct transmission within the mammary gland of an infected cow or by contamination of colostrum with feces, urine and/or other secretions, after milking of the cow. Thus, colostrum can potentially be contaminated with any pathogen present on the dairy. Good hygiene and sanitation practices during colostrum collection will reduce the risk of transmission due to contamination with some infectious agents but has no effect on the risk of transmission of pathogens secreted within the mammary gland including Mycobacterium avium subsp. paratuberculosis (MAP, the causative agent of Johnes Disease), Salmonella spp., Mycoplasma bovis, Listeria monocytogenes, Staphylococcus aureus and Streptococcus agalactiae, Bovine Virus Diarrhea Virus and Bovine Leukosis Virus among others (Godden S. 2008). In countries were bovine tuberculosis and brucellosis has not been eradicated, colostrum can also be an important source of transmission of Mycobacterium bovis and Brucella abortus.

Colostrum management can reduce transmission of disease

Two basic epidemiological concepts emphasize how colostrum management increases or decreases the risks of disease transmission in the herd. The first key concept is the basic reproductive ratio, R0 (R Zero) of the infectious agent. R0 is the expected number of secondary infections arising in a population of susceptible individuals from a single infected individual during his or her entire infectious period (Heffernan J.M. et al. 2005). R0 is a measure of the ease of transmission of an infectious agent. For example, the R0 for a disease such as infectious bovine rhinotracheitis (IBR) caused by Bovine Herpes Virus 1 in a dairy herd is around 7 (Muylkens B et al. 2007), meaning that one infected animal usually infects 7 susceptible animals. If the R0 is less than 1, the agent can be eradicated from the group, so the goal of control and prevention strategies for infectious disease is to reduce R0 below one. Effective colostrum management is one opportunity to reduce the R0 of the many important infectious diseases that can be transmitted by colostrum.

Successful passive transfer in the newborn contributes to overall herd immunity

An understanding of the concept of "herd immunity" is the second epidemiologic principle that helps understand the importance of feeding all newborn calves high quality colostrum as soon as possible. Transmission of most infectious agents will not continue within an exposed group of animals if the proportion of resistant animals in that group is above a threshold level. The threshold level depends upon the agent and factors influencing the likelihood of transmission, such as environmental contamination, animal density and challenge dose necessary for infection. In the case of the newborn, the main resistance to infection and disease is passive immunity (maternal antibodies) provided by the IgG1 present in colostrum. Calves with inadequate antibodies have failure of passive transfer of immunity (FPT). If the prevalence of FTP in a group of calves is low the proportion of animals susceptible to infection will be low, thus reducing the potential for succumbing to a given infectious agent and thereby reducing the numbers of infections arising in the group (decreasing the R0).

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