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Calf Note #50 – Colostral leukocytes

Introduction

Most dairy producers are aware of the importance of colostrum as a source of immunoglobulins for newborn calves. Absorption of the important Ig in colostrum (IgA, IgG, IgM) are critical to the health of calves for the first few months of life. However, researchers are learning that colostrum is more than just a source of antibodies - in fact, colostrum provides important nutrients (protein, fat, carbohydrates, vitamins and minerals) for metabolism and growth. Colostrum also contains a significant number of *leukocytes*, which may play a role in calf health. Research in the U.S. and abroad have further identified the potential role for these important cells in the health of the calf.

Leukocytes (*white blood cells*) are found in udder secretions including colostrum. Depending on udder health and the presence of an intramammary infection, the number of leukocytes in colostrum can easily exceed 1,000,000 cells/ml. Colostral leukocytes are primarily composed of lymphocytes (»23%), neutrophils (»38%) and macrophages (»40%). Each of these cells contribute to the overall cellular immune system in animals. In addition, some research indicates that these cells may be important to the health of the calf. Other research suggests that while viable, these cells do not contribute significantly to the calf's immune response.

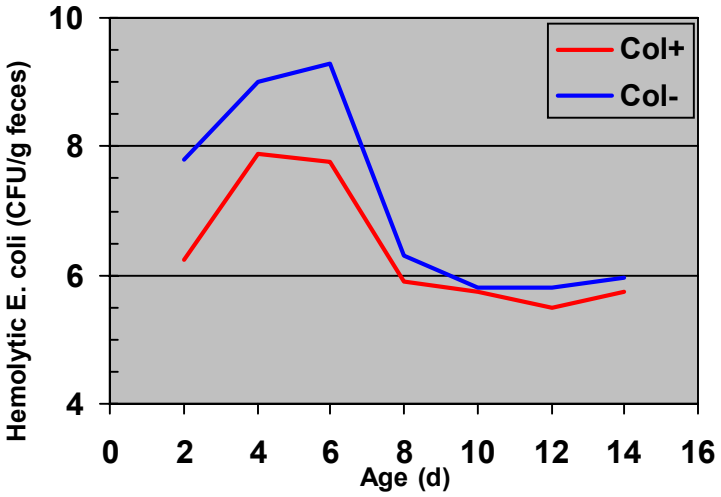

Figure 1. Shedding of fecal E. coli in calves fed colostrum with (Col+) or without (Col-) viable colostral leukocytes. From Riedel-Caspari, 1993.

Absorption of leukocytes

Colostral lymphocytes can survive in the intestinal tract due to the lack of proteases found in the intestine during the first 24 hours after birth and the presence of protease inhibitors such as trypsin inhibitor. Further, leukocytes have been shown to be absorbed into bloodstream of the newborn. It is therefore of interest to determine if these cells contribute to the animal's immune response.

Effect of viable colostral leukocytes

The immunological effects of colostral leukocytes have been evaluated in several studies. Riedel-Caspari (1993) inoculated calves with E. coli and fed the colostrum with or without viable leukocytes

(leukocytes were removed from colostrum by centrifugation). Calves fed cell-depleted colostrum shed more bacteria than calves fed colostrum containing leukocytes (Figure 1).

Duhamel (1986) obtained lymphocytes from heifers immunized with or without killed Mycobacterium bovis and added these cells to cell-free colostrum from tuberculin-negative cows. Colostrum was then fed to the heifers' calves. Lymphocytes obtained from the calves' blood were tested for their ability to respond to M. bovis. Calves fed colostrum containing lymphocytes from immunized heifers developed a response to M. bovis from 3 to 21 days, whereas calves fed colostrum from control heifers did not develop a response. This research indicated that the lymphocytes played an important role in the immunity of the calf during the first month of life. Freezing, storing, and thawing colostrum may have a detrimental effect on viability of colostral leukocytes. Cells do not survive for extended periods outside of the animal. Pitt et al. (1977) challenged neonatal rats with Klebsiella pneumoniae and found that frozen/thawed milk was not successful in protecting pups against enterocolitis. Therefore, it is likely that frozen colostrum would not provide the same level of protection as fresh colostrum.

References

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