

The protein from SBM in the rations comprised approximately 61 percent of total protein intake. The estimated percentage of ruminal bypass of feed protein was only slightly higher in cows fed extra-heat SBM compared to the control group (28.8 vs 27.8 percent). Therefore, based on these data and those in the feeding trial, it appeared that the extra-heat SBM (PDI-10) used in this trial was not heated extensively enough during processing to make it a high bypass feed protein source. Nevertheless, the values obtained on percentage of feed protein bypassing the rumen of cows consuming a 60 percent concentrate ration at the rate achieved in this trial are of interest. These data will be useful as reference points for future trials in which extent of degradation of different sources of feed protein will be estimated.

Literature Cited

Bush, L.J. et al. Okla. Agr. Exp. Sta. MP-107, pp 96-101.

The Effect of Pasteurization of Colostrum on Absorption of Immune Globulins by Calves

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Story in Brief

Seven batches of colostrum, collected at the first two milkings after calving, were divided so that one-half was pasteurized and the other was a control. Each was fed to an equal number of newborn calves obtained before nursing their dams. Concentration of the IgG class of immune globulins, as measured by radial immunodiffusion, was higher at 12 hours in serum of calves fed pasteurized colostrum. IgG values at subsequent sampling periods were similar for both treatment groups as were concentrations of IgM at all sampling periods.

Introduction

The importance of the transfer of passive immunity against disease from a cow to her newborn calf by way of colostrum is well established. Moreover, this is especially important in large dairy operations where newborn calves are likely to be exposed to a wide range of disease organisms due to concentration of animals and repeated use of the same facilities for raising calves. In some instances calves

left with their dams either consume an inadequate amount or no colostrum during the critical period soon after birth. To avoid this problem, a practice followed in some dairies is to feed colostrum to each newborn calf by nipple bottle or pail, or else administer it by drenching.

Regardless of the method by which calves are given colostrum soon after birth, there is concern about the effects of giving a calf colostrum that is heavily contaminated with bacteria due to udder infection in the cow. Although earlier work at this station (Corley et al., 1977) demonstrated that cells of infectious *Escherichia coli* were prevented from penetrating the intestinal barrier in the calf when introduced simultaneously with colostrum, the concern about feeding colostrum from infected cows continues to persist. One recommended method for handling the problem is to pasteurize colostrum prior to feeding it to calves. However, no information is available regarding the effects of this practice on the well-being of calves. The objective of this study was to evaluate the effects of pasteurizing colostrum on the absorption of immune globulins by newborn calves.

Materials and Methods

Seven batches of colostrum were collected from cows at the first two milkings postpartum. One-half of each batch was pasteurized by heating at 145° F for 30 minutes. Then, both the pasteurized and unpasteurized portions were packaged and frozen for storage. A sufficient amount of the appropriate type of colostrum was thawed and warmed for feeding to each calf as needed in the experiment.

Forty-eight calves were obtained immediately after birth, before nursing their dams. These were assigned at random to treatments within groups which were of a given breed and designated to receive a given batch of colostrum. One-half the calves within each group were fed pasteurized colostrum, whereas the other half received unpasteurized or control colostrum. The colostrum was fed at the rate of 10% of metabolic size per feeding generally within one hour after birth and 12 and 24 hours afterward.

Blood samples were obtained before the first feeding and at 12, 16, 20, 24, 28, 32 and 36 hours afterward. These were allowed to clot and then were centrifuged to separate the serum which was frozen until analysis for immune globulin concentration. The concentration of two classes of immunoglobulins, designated IgG and IgM, at each sampling period was determined by radial immunodiffusion.

Results and Discussion

The concentration of IgG in the blood serum of calves fed pasteurized colostrum was higher ($P < .005$) at 12 hours after first feeding than in calves fed control colostrum (Figure 1). Subsequently, the difference between groups was smaller and less consistent. Since the IgG class of immune globulins is the one occurring in greatest concentration in bovine serum, a higher concentration soon after first colostrum intake would have significance in terms of resistance of calves to infectious agents. A possible explanation for greater uptake of IgG in calves fed pasteurized colostrum than in control calves is that bacteria which might otherwise interfere with IgG uptake were destroyed. It has been demonstrated that bacteria penetrate the vacuolar tubules of the epithelial cells lining the intestine in much the same way as immune globulins (Staley et al., 1972). However, other work (James and Polan, 1978) has provided evidence that the presence of bacteria

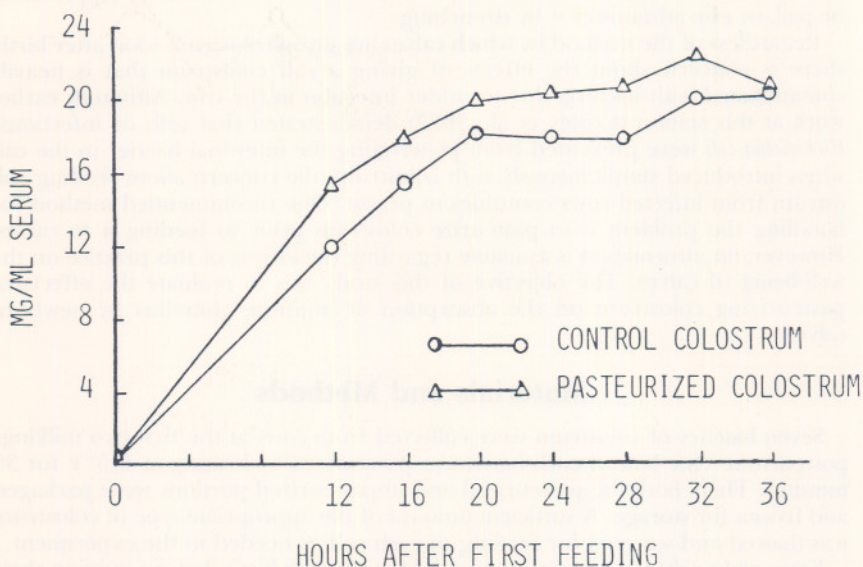


Figure 1. Concentration of IgG in blood serum of calves at different times after first feeding of colostrum

does not interfere with immune globulin absorption, unless exposure to bacteria occurs prior to colostrum consumption.

An alternative explanation for the higher concentration of IgG at 12 hours in serum of calves fed pasteurized colostrum is that the zones of antigen-antibody precipitate measured in the radial immunodiffusion test are not indicative of the actual quantity of intact IgG in the serum. If fragments of the IgG molecules resulting from breakdown of some of the IgG during pasteurization were precipitated, resulting values would tend to be high. Since it is important that a calf absorb sufficient intact immunoglobulins to afford some degree of resistance to infectious agents, the point as to whether the immune globulin concentrations measured in serum of calves fed pasteurized colostrum represent intact molecules capable of reacting with appropriate antigenetic agents, e.g., bacteria, needs to be resolved. Preliminary data from another experiment provide some evidence that antibody activity against specific antigens may be reduced in serum of calves fed pasteurized colostrum. Further work is planned to clarify this point.

Concentrations of IgM in the serum of calves were similar at each sampling period (Figure 2). Moreover, the highest average concentration of both IgM and IgG occurred at 32 hours after first feeding, indicating that closure of the intestinal epithelium to immune globulin transfer probably was between 24 and 32 hours. This demonstrates that intake of colostrum during the early life of a calf is important both from the standpoint of providing protection against infectious agents within the intestine and the attainment of satisfactory serum concentration of immune globulins.

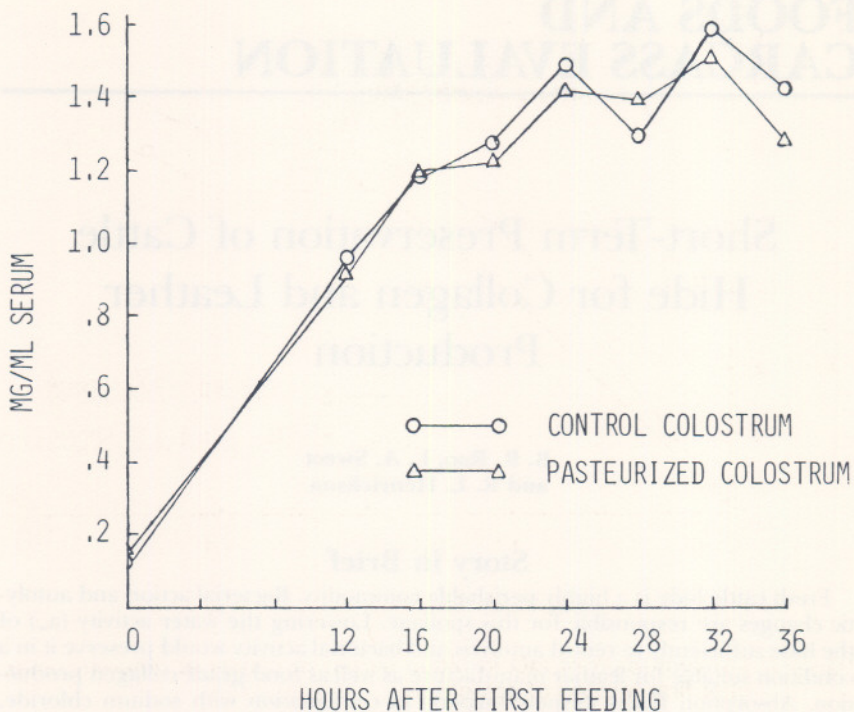


Figure 2. Concentration of IgM in blood serum of calves at different times after first feeding of colostrum

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Corley, L.D. et al. 1977. *J. Dairy Sci.* 60:1416-1421.
 Staley, T.E. et al. 1972. *Anat. Rec.* 172:559-580.
 James, R.E. and C.E. Polan. 1978. *J. Dairy Sci.* 61:1444-1449.