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Calf Note 200 – Pasteurizing colostrum – an update

Introduction

Colostrum, the first milk produced by the cow after giving birth, is a complex mixture of nutrients, immune components, cells and growth factors and hormones that are essential for the newborn calf. Many studies have shown that the contamination of colostrum by bacteria (especially fecal bacteria) reduces IgG absorption and dramatically increases the risk of poor calf health. Like other bio-fluids, colostrum is very perishable. The amount of microbial contamination depends on how carefully it was collected, handled and stored.

Pasteurizing colostrum has been shown to reduce bacterial contamination and improve IgG absorption. Heating colostrum to 60°C for 60 minutes has been shown to reduce total bacterial plate counts and can improve the efficiency of IgG absorption by 15-25% (Johnson et al., 2007; Elizondo-Salazar and Heinrichs, 2009; Kryzer et al., 2015).

The Research

Research from Penn State University (Gelsinger and Heinrichs, 2017) reported in the Journal of Dairy Science describes additional research regarding colostrum pasteurization and its effects on colostrum quality and IgG absorption. Results of this study differed from others and are worth reviewing and interpreting.

The researchers collected about 114 liters of first milking colostrum. Each cow's colostrum was collected and frozen prior to the study. When sufficient volume was available, all colostrum was thawed, mixed and then refrozen (control; **CON**) or pasteurized (60°C for 60 minutes) and frozen (pasteurized; **PAS**). The researchers monitored total plate count and IgG concentration in all samples.

Item	CON	PAS	SE
Colostrum bacteria, log cfu/ml			
Total plate count	4.1	1.3	…
Coliforms	2.8	0.0	…
Colostrum IgG, g/L	117.3	106.3	…
Birth BW, kg	41.8	40.9	1.2
IgG consumed, g	359.6[a]	321.4[b]	9.8
Serum IgG, g/L	23.3	20.5	1.9
AEA, %	26	23	1.2

Table 1. Colostrum quality, calf body weight (BW), IgG intake and serum IgG concentration in calves fed unpasteurized (**CON**) or pasteurized (**PAS**) colostrum. Adapted from Gelsinger and Heinrichs, 2017.

[a,b]$P < 0.05$.

Newborn Holstein calves (n = 26) were assigned to receive 8% of their body weight as colostrum as soon as possible after birth. All calves were fed by 4.5 h. Blood samples were taken at birth and 24-48 h for measurement of serum IgG and calculation of apparent efficiency of IgG absorption.

The Results

Pasteurizing colostrum reduced the total plate counts from an average of 4.1 log cfu/ml to 1.3. When expressed as standard counts, the numbers of bacteria were 12,589 and 20 cfu/ml prior to

and after pasteurization. Clearly, the colostrum used in the study was very clean and collected carefully even prior to pasteurizing. We generally consider colostrum <100,000 cfu/ml as acceptable to feed to calves.

The amount of IgG in the colostrum was reduced by nearly 10%, from 117.3 to 106.3. Although the loss of IgG was significant, the total amount of IgG in the colostrum was still quite high. This research suggests that heating colostrum to 60°C for 1 hour can reduce the concentration of IgG in colostrum.

Calves were fed colostrum according to their body weight, so the total amount fed varied from animal to animal. Because the pasteurized colostrum was lower in IgG following pasteurization, IgG intake was slightly lower in calves fed PAS (Table 1). However, neither serum IgG nor AEA were different in calves fed PAS compared to CON.

In this study, pasteurizing colostrum slightly reduced colostrum IgG and did not increase serum IgG in newborn calves. Why did these data differ from other studies wherein AEA was improved by pasteurization? There are a couple of possibilities.

Firstly, the colostrum used in this study was very clean. Even before pasteurization, total plate counts and the number of coliforms were quite low. This suggests that "clean colostrum" (i.e., with total plate counts less than about 15,000 cfu/ml and coliforms less than about 1,000 cfu/ml may not benefit from pasteurization. Previous trials with colostrum pasteurization generally used colostrum with higher initial bacteria counts.

Serum IgG concentrations were unaffected by pasteurization as was apparent efficiency of IgG absorption. Overall, calves absorbed enough IgG to be well protected against disease.

Bacterial contamination may markedly impact the ability of calves to absorb IgG from colostrum. However, it appears that if colostrum is carefully collected and is handled in a clean and sanitary method, the value of pasteurization may be limited.

References

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