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## *Calf Note 192 – Colostrum storage, bacteria contamination and serum IgG*

### Introduction

Colostrum handing and feeding are essential management protocols for dairy producers. We know that how the colostrum is collected, stored and fed can influence the health and growth of the young dairy calf.

Recent research from Ireland evaluated five different colostrum storage methods on colostrum contamination, absorption of IgG, health and growth of calves. It's a good study to review in this Calf Note.

### The Research

First-milking was collected from 49 cows (29 Holsteins, 20 Jersey x Holstein) was used. There were five colostrum feeding treatments: (1) colostrum collected fresh, pasteurized and fed immediately; (2) colostrum collected fresh and fed immediately; (3) colostrum stored at 4 C for 2 days prior to feeding; (4) colostrum stored at 13 C for 2 days prior to feeding; and (5) colostrum stored at 22 C for 2 days prior to feeding. Treatments 3, 4, and 5 were not pasteurized. Pasteurized colostrum was pasteurized at 60 C for 60 min.

All calves were fed at 8.5% of the calf's birth BW within 2 hours of birth. Calves were fed by tube feeder. Thereafter, they were fed 2nd or later milking transition milk was fed for four feedings. The transition milk came from the cow's dam or another cow.

Blood was sampled at 0 and 24 hours of age for measurement of IgG.

After the first 24 hours, calves were raised according to normal management of the experimental farm.

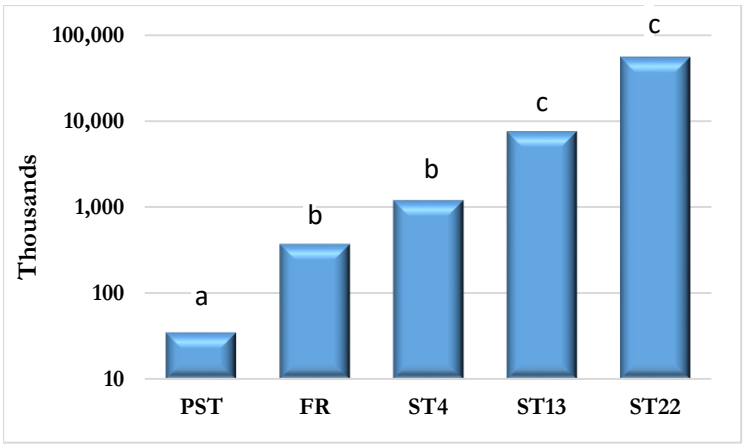


Figure 1. Bacterial counts (colony forming units per milliliter of colostrum) in colostrum. PST = pasteurized; FR = Fresh; ST4 = stored at 4 C for 2 d; ST13 = stored at 13 C for 2 d; ST22 = stored at 22 C for 2 d.

[a,b,c]Means with different letters are different, $P < 0.05$.

### Results

First-milking colostrum averaged 94.0 g of IgG/L and did not vary by treatment. Transition milk averaged 30.9 g of IgG/L. The overall intake of IgG in the first 24 hours from first-milking colostrum plus transition milk fed after the first feeding was 280 g. Again, there were no differences due to the five treatments.

The microbial quality of colostrum was markedly different, however. From Figure 1, we can see that pasteurized colostrum had the lowest bacterial plate counts with increasing amounts for fresh, stored at 4 C, 13 C and 22 C. Generally, most dairy experts recommend that colostrum should be <100,000 total bacterial counts per milliliter to feed at the first feeding. In this study, only the pasteurized colostrum achieved this goal.

Also, colostrum with >1 million bacterial cells per milliliter is considered far too contaminated to feed to calves; in this study, all stored colostrum was too highly contaminated to achieve the goal of less than 1 million.

Serum IgG concentrations (Figure 2) varied with the different treatments. Calves fed ST22 (stored at 22 C for 2 days) had lower serum IgG than other calves. Calves fed the ST4 (stored at 4 C for 2 days) had higher serum IgG than most other groups. Interestingly, calves fed the pasteurized colostrum did not show increased serum IgG concentrations, which has been shown in numerous other published research trials.

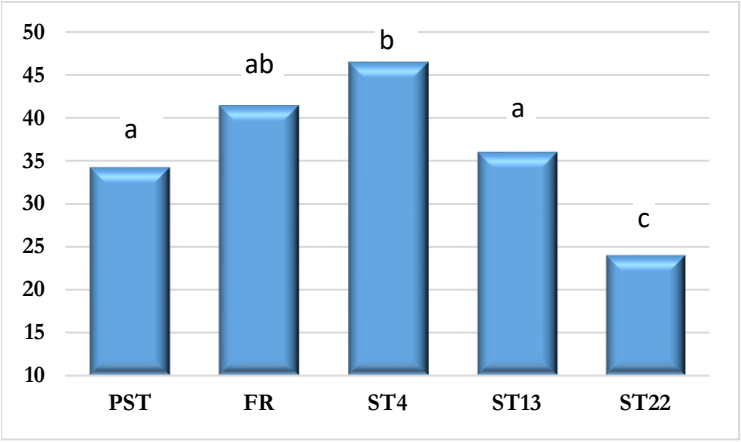


Figure 1. Serum IgG concentration (g/L) in calves fed different treatments. PST = pasteurized; FR = Fresh; ST4 = stored at 4 C for 2 d; ST13 = stored at 13 C for 2 d; ST22 = stored at 22 C for 2 d.

[a,b,c]Means with different letters are different, $P < 0.05$.

Generally, the serum IgG concentrations were quite high – ranging from 24.0 (ST22) to 46.4 (ST4) g/L. These values are significantly higher than many other studies and might indicate the presence of Jerseys in the groups. Jersey calves typically have higher serum IgG absorption compared to Holstein calves.

The authors reported that there was no effect of colostrum treatments on health events (number of respiratory or enteric disease events). A total of 40 of the 75 calves were treated for at least one disease episode and a total of 60 disease incidences were reported. Also, there was no effect of treatment on BW gain to weaning or to 6 months of age.

From these results, it is tempting to conclude that storage conditions and total bacterial counts may have no important role in acquisition of passive immunity or on health events or growth. However, these data should be interpreted with caution. Firstly, there were only 15 calves per treatment. Greater numbers of calves (particularly healthy calves) might have allowed numerical differences to be significant. Secondly, the incidence of disease was >50% of calves in the study. Thus, it is difficult to conclude that different treatment effects influenced increasing or decreasing disease if most of the calves (on all treatments) became ill.

Infection with a pathogen is usually thought to require a certain "infective dose" – that is, a certain number of organisms are required to confidently cause an infection in an animal. The infective dose will vary depending on the organism, the animal and the conditions under which animals are housed and managed. In any case, colostrum containing >1,000,000 bacteria per milliliter is far more likely to contain an infective dose of a pathogen than colostrum containing <50,000 cfu/ml. In many cases, bacteria in colostrum may be non-pathogenic. However, if a virulent pathogen contaminates colostrum, then allowing the pathogen to multiply by storing for 2 days is a huge risk. It is far better to pasteurize and freeze colostrum if it will not be used in

the first 24 hours. That this study did not show significant differences in diseases or mortality may simply be good fortune for the calves on the study.

**Summary**

This study showed that storing colostrum for 2 days, under any condition, led to rapid growth in bacterial contamination. It should be noted that even the fresh colostrum – presumably collected with clean equipment – had bacterial counts >100,000 cfu/ml. This goal should be achievable if proper care is used in cleaning collection equipment and using excellent hygiene when collecting colostrum. The high colostrum IgG concentrations and subsequent serum IgG in calves in this study also indicate the importance of passive immunity to neonatal morbidity and mortality.

**Reference**

Cummins, C., D. P. Berry, J. P. Murphy, I. Lorenz, and E. Kennedy. 2017. The effect of colostrum storage conditions on dairy heifer calf serum immunoglobulin G concentration and preweaning health and growth rate. J. Dairy Sci. 100:525–535.

**Written by Dr. Jim Quigley (11 February 2017)**

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