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Calf Note #221- Testing bacterial contamination in colostrum

Introduction

We have discussed on many occasions the importance of high-quality colostrum to the newborn calf. The term “quality” must be defined in terms of immunological quality, nutritional quality, and microbiological quality. We have developed quick on-farm methods to estimate immunological quality of colostrum (i.e., the BRIX refractometer), but estimating microbiological quality remains elusive. An article in 2021 from the Université de Montréal (Morin et al., 2021) reports on a method to quickly and easily determine the degree of bacterial contamination of colostrum, and this article will be the topic of this Calf Note.

The authors of this study used the Petrifilm system of bacterial culture. More information on the plating system is [here](#). Two different plates were used – the first to measure total aerobic bacteria and the second to measure total coliform count. Each plate contains different chemicals and measures a different type of bacteria.

The Research

The researchers collected 332 colostrum samples from commercial 33 dairy herds in Quebec from October 2015 to February 2016. Two samples of approximately 10 ml of colostrum were collected and frozen until analyzed. The first sample was analyzed using more sophisticated microbiological techniques and the second was analyzed using a Petrifilm aerobic plate and a Petrifilm coliform plate. The frozen colostrum samples were thawed at room temperature, then thoroughly mixed. The samples were then diluted 1:1,000 by adding 1 ml of colostrum to 999 ml of sterile water. This is necessary to allow reasonable counting of the bacterial colonies. The diluted sample (1 ml) was then placed on each plate, following the package directions. Then the aerobic plate was incubated at 38°C for 48 and the coliform plate was incubated at 38°C for 24 hours. After incubation, the colonies were counted.

Many veterinarians and researchers recommend that total plate count (i.e., total aerobic plate count) should be less than 100,000 cfu (colony forming units) per milliliter of colostrum, and total coliform count should be less than 10,000 cfu/ml. Contamination with coliforms is a reasonable estimate of fecal contamination, and is generally associated with greater risk of morbidity and mortality.

The researchers categorized each sample as contaminated (>100,000 cfu/ml total bacteria and >10,000 cfu/ml coliforms) or not contaminated (<100,000 total and <10,000 cfu coliforms) using the sophisticated lab methods and compared these groupings to the same categories from the Petrifilm tests.

Using the laboratory tests as the reference, 50% of the colostrum samples collected had >100,000 total bacteria cfu/ml and 13% had >10,000 coliform cfu/ml, indicating that a significant percentage of the colostrum had been contaminated during collection and processing. Using the Petrifilm system and the same criteria, 42% of the samples were reported to be contaminated with total bacteria and 20% with coliforms. The results were reasonable between the lab methods and the Petrifilm methods. However, the total bacteria Petrifilm test tended to underestimate bacteria compared to the lab tests. The Petrifilm coliform test had good similarity to the lab coliform tests.

To be sure to catch more of the truly contaminated colostrum, the authors recommend using thresholds of 24,000 cfu/ml for total plate count and 4,000 cfu/ml for coliforms. If you follow the procedure for dilution (i.e., 1:1,000), then if you can read <24 colonies on the aerobic plate and <4 colonies on the coliform plate, the colostrum is safe to use.

The best method to use this procedure is on a herd basis – that is, collect samples from a reasonable portion of the colostrum produced on the farm and monitor samples on an on-going basis. Individual samples will have some variability and not all of them will be completely reliable. However, if the results are consistently high, then it's time to carefully evaluate the overall colostrum program to find the source of contamination. Also, monitoring samples consistently can show if there has been a change in the process and identify when additional training is needed.

The Petrifilm plates require some training and equipment to properly dilute samples and incubate samples. Work with your veterinarian to set up the program, or perhaps the clinic has their own lab facilities and can provide the service for you. A list of distributors in the United States is [here](#).

Best of luck!

References

Morin, M. P., J. Dubuc, P. Freycon, and S. Buczinski. 2021. Short communication: Diagnostic accuracy of the Petrifilm culture system for identifying colostrum with excessive bacterial contamination in Quebec dairy herds. *J. Dairy Sci.* 104. <https://doi.org/10.3168/jds.2020-19474>.

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