# CALVING EASE

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## Putting the Brakes on Bacteria Growth in Colostrum

- **In the United States we estimate that at least 45 percent of all colostrum fed to calves contains enough environmental bacteria to make calves sick.**
- **About 77 percent of refrigerated colostrum has bacteria counts high enough to make calves sick (>100,000cfu/ml)**
- **Warm colostrum is an ideal growth medium for bacteria.**
- **Lowering colostrum temperature slows the rate of bacteria growth.**
- **Adding a food-grade preservative slows the rate of bacteria growth.**

A nationwide study of colostrum revealed that 45 percent of all samples had a total plate count of greater than 100,000 colony forming units (cfu) per ml, a level associated with calf illness. Only 23 percent of refrigerated samples had less than 100,000cfu/ml. This may be compared to fresh samples that had 67 percent under 100,000cfu/ml.

**Alternative #1**
Feed the colostrum before these environmental bacteria have an opportunity to grow. When bacteria are introduced into colostrum they do not begin to grow immediately. A short period of time, bacteriologist's call this the "lag phase," is needed for the bacteria to modify their new environment in order to reproduce. Thus, if colostrum is fed roughly within one-half hour after it is collected the bacteria will not yet have had time to replicate.

**Alternative #2**
Lower the temperature of the colostrum. The general relationship is that generation time (time to double) gets longer as the temperature goes down. For example, at cow body temperature coliform bacteria in colostrum double in about 20 minutes. At 60° this doubling or generation time is about 150 minutes. At the setting of most refrigerators (40°) generation time is over 24 hours.

Practical chilling protocols for on-farm use? One choice is to use an ice water bath. The water is important in order to get rapid heat transfer out of the colostrum containers. Fill some kind of containers (for example, nursing bottles) with warm colostrum. A flexible metal commercial product, Perfect Udder, works well also. Place them in a sink or tub containing both water and ice. As long as there is ice floating in the water the colostrum-filled containers will chill to about 60° in 30 minutes. Then they are ready to go into either a refrigerator or freezer. Some dairies cut the bottom 2 inches off of used gallon jugs in

order to freeze over-sized hockey pucks of ice. This alternative is attractive for dairies that have large volumes of colostrum to chill – any number of containers can be chilled as long as the ice supply in the water is maintained.

Another chilling choice is to place closed containers of ice into the colostrum itself. Many of my clients use 1 or 2 liter plastic beverage containers. Plastic gallon jugs work well also. It is important that the outside surfaces of these containers be scrubbed clean – we do not want to add bacteria when our goal is cleaner colostrum. When ice is added at the rate of one quart of ice to four quarts of colostrum it will take about 30 minutes to chill the colostrum to approximately 60°. This alternative is practical when labor is not available to package the colostrum right after collecting it. Some dairies drop a clean gallon jug of ice in each milker bucket to start the chilling immediately after the fresh cow is milked.

**Alternative #3**

Consider using a food-grade preservative. An economical choice is potassium sorbate. The most practical form for on-farm use is a 50 percent solution. See this resource for mixing from the dry pellets – click HERE. A protocol for using potassium sorbate solution may be found HERE.

We have found that an inclusion rate of 20ml per 2 quarts of colostrum is effective. Stewart et al. found that at this rate the potassium sorbate extended the generation time by a factor of ten. For example, if at cow body temperature we expect the generation time to be 20 minutes, then with potassium sorbate added this time is extended to 200 minutes.

I have only worked with one dairy that added the dry potassium sorbate directly to the warm colostrum. Using the threshold of not being able to identify any undissolved white pellets in the colostrum we figured that about 10 minutes of constant stirring were needed to use this method. This thorough mixing right when the colostrum is harvested will push the coliform generation time out to about 200 minutes. If you have small amounts of colostrum and are willing to be a persistent stirrer the dry method will work.

References: K.M. Morrill et al. "Nationwide evaluation of quality and composition of colostrum on dairy farms in the United States." Journal of Dairy Science 95:3997-4005. Also, see basic notes on bacteria HERE – accessed 12/20/16. S. Stewart et al.,"Preventing bacterial contamination and proliferation during the harvest, storage, and feeding of fresh bovine colostrum." Journal of Dairy Science 88:2571-2578.

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