

Colostrum Chilling

- **Chill colostrum quickly if it is to be stored.**
- **Water-bath method**
- **Ice-immersion method**

In the first place, if we are going to feed colostrum within thirty minutes after it is collected, why would we want to chill it? Obviously, the answer is that it does not need chilling. Just feed it promptly.

Why chilling?

We want to feed clean colostrum. Our goal is to minimize the bacterial load in colostrum in order to promote good gut health. Clearly it makes sense to avoid bacterial inoculation of colostrum as a first step toward this goal. That means clean teats in the parlor. In addition, we need to start with clean collection, feeding and storage equipment.

In many cases not all our colostrum is going to be fed directly from the dam. If it is going to be held more than one-half hour until it is fed the colostrum is at risk of growing bacteria.

Why chill quickly?

Colostrum is very good bacterial growth medium – favorable pH and lots of readily available nutrients. Also, when collected from a cow it is at an excellent temperature to encourage bacterial growth. By the way, we describe these growth rates using the term “Generation Time.”

At cow body temperature the generation time for coliform bacteria is about twenty minutes. Yes, that is correct. These bacteria can double in numbers in twenty minutes. That means in less than three hours after collection warm colostrum with an initial bacteria count of only 1,000cfu/ml (cfu/ml=colony forming units per milliliter) can have a terminal bacteria count of around 130,000cfu/ml! That is high enough to make a calf very sick.

One cost effective way to slow down the rate at which bacteria multiply is to lower the temperature of the growth medium – colostrum. For example, when we reduce colostrum temperature from 95 to 60 degrees (35C to 16C), coliform generation times increase from roughly twenty to one hundred and fifty minutes. Thus, if we want to cut down bacteria numbers that come from initial inoculation one alternative is to rapid chill the colostrum to at least 60 degrees. Then, when it is put into either a refrigerator or freezer the unit has plenty of time to do the rest of the chilling without the risk of excessive bacteria growth.

Farm-friendly ways to Chill: Water-bath method

In order to be “farm-friendly” a chilling method has to be simple and cost effective.

One such method is a water bath. Colostrum is transferred into containers smaller than milker pails or five-gallon pails. Most folks use calf nursing bottles. Others buy two or four quart plastic containers. Unless the containers are one-use disposable ones make sure that it is easy to brush all the inside surfaces.

Right-size the tub for the water bath based on your experience with colostrum volume. Larger farms may consider using several water bath containers for increased flexibility. Remember that for most efficient heat transfer at least $\frac{3}{4}$ of the container holding the colostrum needs to be submersed in the ice-cold water. And, avoid packing ice around the containers without water. This is not an efficient method of chilling because the ice water is needed to promote effective heat transfer. See picture below of a plastic water bath with nursing bottles. This farm purchased plastic tubs that fit inside their refrigerator to promote even better chilling. [Including what appears to be a worker’s lunch!]

Also, remember to close off the opening at the top of these containers. Note in the picture below the dairy chose to snap nitrile gloves onto the nursing bottles [by the way, at this dairy blue gloves indicated high quality colostrum and white glove indicated lower quality colostrum.].



Source of ice? Large operations should consider purchasing a used restaurant ice maker. Smaller dairies find it practical to use the freezer compartments of refrigerators or a small chest freezer for making ice. One dairy cuts the bottoms off of one-gallon plastic jugs to create big oversize hockey pucks of ice. Several of my clients repeatedly freeze “cold-packs” rather than use water for making ice.

Farm-friendly ways to Chill: Ice-immersion method

A second “farm-friendly” method is adding containers of ice directly to the warm colostrum. An ice:colostrum ratio that works well to chill just-collected colostrum to 60 degrees within one-half hour is 1 quart of ice to 1 gallon of colostrum (1 liter of ice to 4 liters colostrum).

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In general multiple small ice containers will do a quicker job of chilling compared to one larger container. For example, six 16-ounce recycled plastic soft drink bottles compared to one one-gallon plastic jug. See the picture below of a gallon jug of ice in a bucket containing about three gallons of colostrum. I took this bucket out of the refrigerator and removed the lid to take this picture. It is a good idea to cover containers of colostrum in refrigerators to reduce the thickness of the dry scum (mostly milk fat) that forms during storage.



A few dairies place the equivalent of 3 quarts of ice in the stainless steel milker bucket before milking the fresh cow. This procedure eliminates errors in remembering to add ice once the fresh cow is milked.

As shown above other dairies with more than a few quarts of colostrum to chill pour 3 gallons of colostrum into a five-gallon pail, add a one-gallon jug of ice, put a lid on the pail and put the entire pail-jug-colostrum into a refrigerator. The colostrum chills from the inside-out as well as from the outside-in.

One caution! When containers are placed directly into colostrum they need to have as few bacteria on their surfaces as is practical. Rinsing them quickly with tap water as they are transferred from the freezer into the colostrum is a best management practice. If these containers are used more than once someone needs to be given the responsibility of cleaning these each time they are cycled through the freezer. Also, the person cleaning the bottles needs to remember to avoid bacteria build-up underneath the caps where they screw onto the bottles and jugs.

Extended cooling may be desired

Many dairies have one person responsible for handling colostrum. In order to both rapidly chill colostrum and keep it cold until that person is available some farms extend chilling.

For example, after placing ice containers directly into colostrum for initial chilling the night shift workers simply replace the first batch of ice bottles with a fresh set as they leave. Or, additional ice is added to the ice bath to carry the colostrum over until the colostrum person is available. If an ice bath container is right-sized to fit into a refrigerator that solves the cooling problem. Another dairy immediately after harvesting colostrum places a one-gallon jug of ice in each stainless steel milker bucket and they go into a chest freezer to wait for processing.