

“What’s Happening?”

A Calf Notes video series

What’s Happening? #09 – Freezing colostrum

Introduction

Welcome to What's Happening, the Calf Notes video series where we explore the story behind the media. Enjoy today's episode.

In today's episode of What's Happening, we'll look at several photos taken on farms from around the world, all of which indicate a common error made by producers when they collect and manage colostrum from fresh cows. Our first photo was taken on a dairy outside of Boise, Idaho in the United States. Let's go to Boise. Boise is the home to Boise State University, the college football team that plays on a blue football field.

Idaho is a fast growing dairy state producing more than 640 million kilos of milk in 2024, ranking as the fourth largest milk producing state in the United States. So, what's happening with our farm in Idaho? Things look well managed with colostrum frozen and stored in the freezer prior to use. The issue here relates to the containers used to freeze the colostrum. The large blue buckets hold about 5 US gallons or just a little less than 20 L. That's a lot of colostrum to freeze at one time. That'll become a big ice cube.

Big ice cubes are a problem for a number of reasons. I heard big ice cubes were all the rage for keeping your bourbon cold. The problem with big ice cubes isn't that the bourbon stays warm. It's related to how long it takes for the colostrum in the bucket to cool to the point where bacterial growth is stopped. This is a big deal. The physics here is complicated, but we can reasonably predict how the colostrum will cool over time. Let's see what this looks like. Here's a theoretical example of how bacteria reproduce.

Let's say that we have a bottle of colostrum that we keep at a nice temperature for bacteria to grow. let's say 25° C or about 78° F. Let's also assume that we begin with about 10,000 bacteria per milliliter of colostrum. That's actually pretty clean. A lot of colostrum will have more than a 100,000 colony forming units per milliliter and some even with more than a million.

So, in this example, we start with a bottle of good colostrum. If bacteria can double about every 20 minutes, we see that by 2 hours and 40 minutes, we have more than 1 million bacteria per liter. So, what's happening when we put this big bucket in various places? Say we put it into the calf barn, a fridge, and into the freezer. What happens? Let's start with the calf barn. And we'll assume the barn is 25 degrees C or about 78 degrees Fahrenheit.

Here's a chart showing the decline in temperature for 10 L, about 2.6 gallons of colostrum in a plastic bucket to cool from 39° C to 25°. That's about 102 to 77° F. We can see two lines. The surface temperature is the light blue, and the center temperature is dark blue. Let's look at the surface temperature first.

We see at the 27° and then it gradually declines thereafter to reach 25° somewhere around 36 hours. The dark blue line is the temperature of the colostrum in the center of the bucket. That bit never actually reaches 25° and actually stays above 28° until about 24 hours.

Wait, what?

Okay, let's put that same bucket into the fridge at 3° C. What happens? Here's the same type of graph. Surface and center temperature, but this time our target is 3° C or about 37° F. The surface temperature declines quickly so that by 4 hours, the temperature is just above 5° centigrade. Cold enough to slow down but not stop microbial growth. But look at the center of the bucket. The temperature is above 20° until about 12 hours. And by the end of the first day, it's just barely below 10°. The temperature doesn't reach 3° until about 2 days after we put it into the fridge. This is a great way to make cheese, but not a great way to save colostrum.

That's just crazy.

Okay, what happens when we go to the freezer? Same graph, but this time we put the bucket into a freezer at -20° C or about -4° F. The surface of the colostrum cools quickly. It's frozen within an hour or so and - 10° C by about 1.5 hours. But what's happening in the center of that bucket?

Eight hours after we put it into the freezer, it's about 20°. It doesn't freeze until nearly 15 hours after collection. and it takes about 48 hours to reach minus20°. We've seen that large volumes are a bad idea. So, what are our options? We have a lot of options.

Many calf raisers use plastic bags to store colostrum. The Ziploc idea is pretty popular, though you need to be careful of leaks when thawing.

Bottles, whether nipple bottles or two or 4 L bottles, are also widely used.

I really like the dedicated storage systems like the perfect udder bags or the colouquick system for storing colostrum. Not only are they clean, but they're also easy to use and both systems have dedicated equipment to pasteurize, cool, and thaw colostrum in the bags. I highly recommend this approach over bottles or plastic bags.

Chilling colostrum before storage is a great idea. This is a photo from a farm in the western part of the United States that was chilling bottles of colostrum prior to storage. This active cooling makes the job of storage much easier.

Here are a few resources if you'd like to take a deeper dive into the topic of colostrum storage. Feel free to stop the video and scan the QR code to be taken directly to the URL.

Remember, calves crave clean colostrum and using the right size storage containers makes a big difference. action.

So, when you make ice cubes that are too big, it's not good for anyone and can be a big problem for your calves. Ah, brilliant. Well, that'll do it for today. Thanks for watching and see you next time.