Answering questions about colostrum

We can do a lot to ensure colostrum is as effective as it should be.

by A.F. Kertz

MOST dairy people know that colostrum is essential for antibody protection in newborn calves. But there are several questions related to why. Let's address the most fundamental.

Why is colostrum critical for newborn calves?

Ruminants do not transfer antibodies from the mother's blood across the placental wall into the fetal calf's bloodstream. I am not sure anyone knows exactly why this is the case for ruminants, but that is the reality.

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Let's dive into some older data and studies that can help better explain why things are the way they are. Figure 1 shows how much delay in time after birth before colostrum is provided reduces Ig (immunoglobulin) antibody absorption into blood, and how significantly the amount provided affects blood levels.

A series of subsequent studies in Arizona with calves from a large dairy around 1980 illustrated that IgG (immunoglobulin G) absorption was reduced by 25 percent at four hours after a calf was born, and it totally ceased by 24 hours. Blood level IgG rose somewhat linearly with greater amounts of colostrum fed.

Serum protein indicates

Another question is how long does the level of total serum protein stay up after colostrum administration, and how long can it serve as a proxy for blood IgG? If your dairy or a calf operation is getting calves from several dairy farms that may have some range in calf age, this is a key question. These levels indicate how well calves will do.

Figure 2 from a 2005 German study illustrates that 4 versus 2 liters of colostrum improved serum protein levels by about 11 percent. Blood serum levels stayed relatively steady for a week, and then those blood serum protein levels declined by about 10 percent by the end of the second week of life.

Also, note that if 5 g/liter (grams per liter) or 50 mg/mL (milligrams per milliliter) is the minimum desired target for serum protein, 2 liters of administered colostrum exceed that mark by about 10 percent. Four liters of fed colostrum bettered that coverage by an additional 20 percent.

The next question is when does the calf start producing its own antibodies? Figure 3 from a 1976 study shows that both total serum protein and gamma globulins (IgG) dropped from the time calves arrived through the next two to three weeks before the values began to rise again.

Think of the blood system being a reservoir, which was filled with antibodies absorbed from colostrum. The calf does not have the ability to produce its own antibodies until about 2 to 3 weeks of age.

During that time, it metabolizes the antibodies from its blood that it received from colostrum. That two to three weeks becomes a perilous time for the calf with lowering antibody levels, exposure to pathogens — most often at birth, and an inability to produce its own antibodies. That is why a dairy must address all these issues if it wants to minimize calf scours or reduce calf morbidity rates since death most commonly occurs in calves by 2 to 3 weeks of age.

It begins at birth

While an April 10, 2019, *Hoard's Dairyman* article "We need weaning transition periods" covered the third critical period for a calf — the weaning transition, which encompasses the two weeks before and two weeks after full weaning — the first two critical calf periods occur at calving.

That makes cleanliness of the cow, calving environment, and colostrum management and administration paramount. Scours events and calf deaths during the two to three weeks after birth often are directly related to the conditions in the first critical period.

What do we do with this information? First, make sure that everything is as clean as possible during calving and colostrum harvest.

Sandra Godden, D.V.M., at the University of Minnesota Veterinary School has found that dirty equipment used to milk the cow for colostrum, used to handle the colostrum, and used to feed it are the primary sources of pathogenic contamination. If you choose to heat-treat or pasteurize the colostrum, it should be done with a well-controlled and monitored batch pasteurizer to heat colostrum for one hour at 140°F.

Then, that colostrum should be fed within two hours, refrigerated and used within three days, or frozen. Remember, heat treatment is not sterilization, so pathogens will continue to grow albeit slower when refrigerated.

In a Penn State study that fed pasteurized waste milk on a number of dairy farms, it was found that the pasteurization system worked well on those farms. However, by the time calves were fed the milk, bacteria levels in many cases had regrown to the level before pasteurization.

Next, minimize stress at and after calving because stressed calves have lower antibody absorption. This reduces their blood "reservoir" levels of antibodies. Check the colostrum quality with a refractometer, and measure total serum protein levels as well. A recent British Columbia study has confirmed a high correlation between IgG levels in a calf's blood and total serum protein levels.

In general, stress levels in calves should be minimized as calves are the most vulnerable animals on a dairy farm. Stress at a young age is not limited to calves as human babies do not take stress well either. Human babies cry to let you know that, while calves mostly suffer in silence. They do more poorly, which you may not know unless you have detailed records and measures of performance.

Figure 1: Absorption of immunoglobin

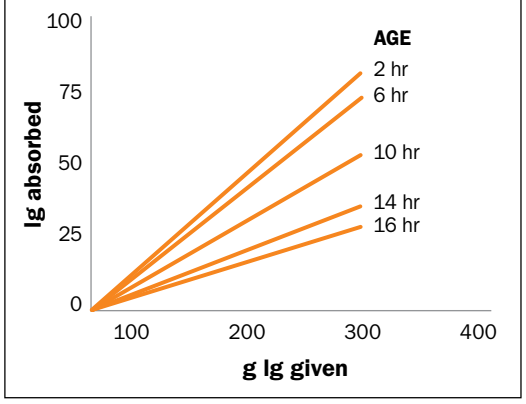

Figure 2: Serum protein duration

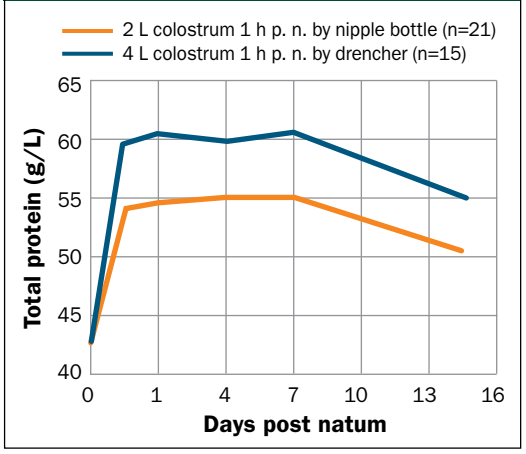

Figure 3: Calf antibody levels