Pasteurization of Colostrum

John H. Kirk, DVM, MPVM
Extension Veterinarian
School of Veterinary Medicine
University of California Davis
Tulare, CA

The virtues of feeding calves pasteurized waste milk from the treated hospital cows have been widely accepted. A variety of effective pasteurizers are now available for use on large dairies and calf ranches. This strategy can be applied to reduce the risk of spreading infectious diseases such as Johnes Disease, Salmonellosis, mycoplasma and generic E coli from older cows to young calves. The next needed and reasonable extension of pasteurization is to colostrum used to protect newborn calves. A recent study reported on the effects of batch pasteurization on the immunoglobulin (IgG) within colostrum and the use of this colostrum in newborn dairy calves.

The study[1] was done on a large commercial Colorado dairy with about 2,700 cows. Cows calved in group pens on bedded packs. Calvings were observed 24 hours a day. Newborn calves were fed either 2 or 4 liters of colostrums within 1-2 hours of birth and second feeding of 2 liters less than 6 hours later or 8-14 hours after birth. Colostrum was fed using bottles. After the second feeding of colostrum, the calves were fed pasteurized waste milk from the hospital. Blood samples for serum IgG measurements were collected from the calves between 24 and 72 hours of age.

The colostrum was pasteurized in batches of 95 and 57 liters. It was heated to 63 C (145 F) and held at that temperature for 30 minutes. It was then cooled to a feeding temperature of 37 to 41 C (98 to 106 F). For each batch of pasteurized colostrum, the batch volume, time to pasteurization and consistency of the pasteurized colostrum was recorded. Consistency after pasteurization was recorded as 1 = normal, 2 = slightly thicken but acceptable to feed, and 3 = very thick/pudding-like, difficult to feed.

The pasteurized colostrum samples had lower IgG concentrations compared to the colostrum prior to pasteurization. The reduction in IgG concentration in the pasteurized colostrum was greater for the large batches (58.5% for 95 liters) than in the small batches (23.6% for 57 liters). Colostrum samples with higher IgG concentrations pre-pasteurization were more likely to contain IgG concentration that exceeded the target post-pasteurization IgG concentration of 50 mg/ml.

For calves fed 2 liters of colostrum at the first feeding, those that got fresh, unpasteurized colostrum had higher IgG serum concentrations that those fed pasteurized colostrum. Calves that received their second colostral feedings at the shorter intervals (<6 hours) also had higher IgG serum concentrations compared to those that had longer intervals. However, when calves were fed 4 liters at the first feeding followed by 2 liters at a second feeding, there was no difference in the IgG serum concentrations regardless of the type of colostrum fed or the interval length between first and second feedings.

The authors pointed out two important issues when pasteurization of colostrum is to be considered as a biosecurity strategy. First, what is the effect of pasteurization on the fluid characteristics of colostrum that might affect its feeding efficiency. In other words, does colostrum become so thicken by heating that it can be fed through a bottle or esophageal feeding tube. The second concern is the effect of heating on the IgG immunoglobulins that needed in passive transfer to protect the calves from infectious diseases. Which is to say, if colostrum is heated high enough for pasteurization will all the IgG proteins be destroyed or denatured? And the final concern not specifically addressed in this study is the effect of heating on the pathogens is the colostrum. It is ultimately beneficial for the pasteurization to kill all the pathogens in the colostrum to be fed to calves.

In this study, all but one batch of pasteurized colostrum was felt to be suitable for feeding to calves. Only one large batch appeared to be coagulated. Of the 25 smaller batches, only one was judged to be slightly thickened. Other reports indicate that HTST pasteurization usually results in congealed colostrum with a thick pudding consistency that renders them unsuitable for feeding. While calves consuming pasteurized colostrum had lower IgG serum levels than calves fed fresh, unpasteurized colostrum, reasonable levels of serum IgG could be achieved by feeding the large volumes of colostrum at the first feeding (4 liters) and giving the second feeding (2 liters) at an interval of less than 6 hours. Selection of colostrum with higher IgG levels (>60mg.ml) for pasteurization will also help to achieve sufficient colostrum immunity in the calves.

The authors suggest that while the results of their study are promising, they should be viewed as preliminary and applied with caution. They conclude with the following suggestions:

1. Use only high quality colostrum measured with a colostrometer.
2. Collect and store colostrum under strict sanitary conditions.
3. Pasteurize in small batches (57 liters or 15 gallons).
4. Monitor pasteurization by culturing samples of the pasteurized product.
5. Pay attention to cleaning and sanitizing of pasteurization equipment.
6. Feed 4 liters of colostrum as soon as possible after birth.
7. Feed 2 additional liters within 6 hours after the first feeding.
8. Monitor IgG serum levels in calves as well as sickness and death.

1. Godden SM, Smith S, Feirtag JM et al. Effect of On-Farm Commercial Batch Pasteurization of Colostrum on Colostrum and Serum Immunoglobulin Concentrations in Dairy Calves. J Dairy Sci 86:1503-1512, 2003.