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Survey on colostrum management practices in New York State

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Producers want the best for each calf born on their farm, and feeding high-quality colostrum soon after birth in adequate amounts is key to raising healthy calves. Although this strategy is undebatable, commercial dairies utilize various colostrum management practices, making it difficult to understand which practices are most effective.

Our goal when feeding colostrum is to provide each calf with essential nutrients, hormones, antibodies, and growth factors for a healthy and productive life. In addition, colostrum is rich in important immunological factors for the newborn´s immune defense. Failure of transfer of passive immunity (FPI), defined as an inadequate concentration of antibodies (immunoglobulins) in the bloodstream at one to seven days of age, is one metric used to evaluate a colostrum feeding program. Failure of transfer of passive immunity comes at a cost due to the increased risk for morbidity, mortality, reduced rate of gain, increased culling rate, and lower future milk production. The USDA's National Animal Health Monitoring System reported in 2014 that 13.5 percent of 1,005 Holstein heifer calves from the eastern half of the U.S. had FPI.

Although we have a good understanding of the value of delivering colostrum to newborn calves, colostrum harvest, storage, and feeding practices vary widely on dairy farms. Given the variability in colostrum management practices used on mid- to large-size dairies, we currently lack evidence to identify best practices. Our group surveyed 18 New York Holstein dairy farms with average (range) milking herd size of 1,409 (540 to 4,150) cows to better understand current colostrum harvest, storage, and feeding practices. A questionnaire was administered in person to farmers who were interested in sharing data and providing information on colostrum harvest procedure, storage, and feeding practices.

COLOSTRUM HARVEST

We know increasing the time from calving to colostrum harvest has a negative association with quality, as immunoglobulin G (IgG) concentration decreases each hour, and drastically declines nine hours after calving. Achieving timely colostrum harvest may be controlled by labor, equipment, and parlor use on farm. The majority of commercial farms included in our survey harvest colostrum into buckets in the parlor (12 farms, 66.7 percent), whereas other locations such as the hospital parlor (2 farms, 11.1 percent) or maternity pen (4 farms, 22.2 percent) are used less frequently. Out of 14 farms that harvest colostrum in a milking parlor, nine collect three times per day and five collect twice per day, with harvest time from calving to first milking ranging from zero to eight and zero to 15 hours, respectively. Out of four farms that harvest colostrum in the maternity pen, three harvest within two hours of calving and one harvests once per day, with time from calving to colostrum harvest ranging from zero to 24 hours. The volume of colostrum harvested from each animal can vary between farms and over the course of a year. Many surveyed farms noted that at some point throughout the year it is challenging to keep adequate amounts of high quality colostrum available for their feeding program even though the number of calves born has not changed. As a part of our survey, we will continue to monitor participating farms throughout the year and evaluate seasonal patterns of colostrum production to identify possible risk factors for this variation in colostrum quantity and quality.

COLOSTRUM STORAGE

Two (11.1 percent) surveyed farms feed each calf their dam's colostrum. Because not all cows produce

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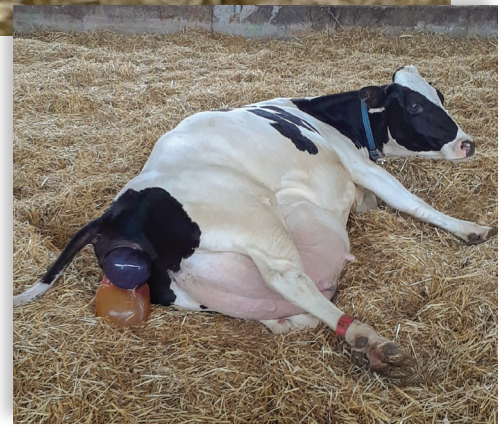
adequate colostrum and some animals are not used as colostrum donors, it becomes necessary to store high-quality colostrum. Given its high nutritive value and risk for contamination, storing colostrum at room temperature for an extended period promotes bacterial growth and risks exposure for the calf. To mitigate this, two (11.1 percent) farms use pre-cooled milking equipment to rapidly cool colostrum during harvest. Fourteen farms (77.8 percent) fill bags or containers first, and then store colostrum in the refrigerator (12 farms, 66.7 percent) or freezer (8 farms, 44.4 percent). Properly harvested colostrum with low bacterial contamination can be stored in the refrigerator for up to one week and in the freezer for up to six months. Colostrum stored beyond a week rapidly declines in quality due to increased bacterial growth. Producers in our survey stored colostrum in the refrigerator for up to 14 days, with an average maximum storage time of six days.



Colostrum consumption is essential for transfer of passive immunity. Feed three to four liters of high-quality colostrum within a few hours of birth.

COLOSTRUM FEEDING

According to Dr. Sandra Godden, a veterinarian and professor at the University of Minnesota College of Veterinary Medicine, successful colostrum feeding can be defined by the Five Q's: Quality, Quickness, Quantity, sQueaky clean, and Quantifying transfer of passive immunity. We examined each of these aspects in our survey:

Quality: While recent work has investigated other biologically relevant factors in colostrum, the amount of antibodies (particularly IgG) is still the gold standard to judge colostrum quality on farm. Refractometers are an accepted and practical on-farm tool to indirectly estimate concentration of IgG in colostrum and serum total protein in calves to determine rate of FPI. Both traditional handheld and digital refractometers are used on farms and previous studies have established cut-off values for Brix refractometer measurements that correlate well with sufficient IgG concentration in colostrum. Based on these data, 22 percent is commonly accepted as a minimum Brix percent for high-quality colostrum. Fourteen (77.7 percent) farms use colostrum Brix refractometers and five (27.8 percent) use refractometers to measure total protein in serum collected from calves during the first week of life. Just over half (10 farms, 55.6 percent) of farms discard colostrum for visual abnormality, oversupply, or not meeting farm-specific minimum Brix percent. Colostrum Brix from all animals was collected on 12 farms.

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Over a nine-day period, median colostrum Brix averaged 24.6 percent, with a range of 21.5 to 26.4 percent.

Quickness: Several researchers have shown that delaying the first colostrum feeding has significant negative consequences on the success of transfer of passive immunity, even when high-quality colostrum is fed. The first feeding occurs within two hours on 17 (94.4 percent) farms and within 12 hours on one (5.6 percent) farm in our survey. The first feeding of colostrum is most often fed via an esophageal feeder (12 farms, 66.7 percent), while fewer farms use a combination of bottle or esophageal feeder (4 farms, 22.2 percent), or only use a bottle (2 farms, 11.1 percent).

Quantity: Current recommendation is to feed three to four liters of high-quality colostrum to achieve successful transfer of passive immunity, as FPI is correlated with lower IgG intakes. Average (range) first feeding of colostrum on surveyed farms is 3.94 (three to four) quarts and 3.70 (two to four) quarts for heifer and bull calves, respectively. Research has started to show benefits, including improved intestinal maturation, from extending colostrum or transition milk feedings beyond the first meal. Fourteen (77.7 percent) and seven (38.9 percent) farms feed heifers and bulls an average (range) volume of 2.11 (two to three) quarts of colostrum in a second feeding.

sQueaky clean: Cleanliness of equipment and proper storage of colostrum minimizes bacterial contamination and allows farmers to manage their inventory. To decrease bacterial contamination, including infectious disease organisms that can be passed to the calf, heating colostrum at 60°C for 60 minutes is recommended. Heat treatment is an effective way to lower bacterial concentration while not destroying all of the important antibodies in colostrum. Although limited work is available that investigates the effects of heat treatment on immunoglobulins and other colostral components, calves fed heat-treated colostrum have improved efficiency of IgG absorption. Only three (16.7 percent) farms in our survey use heat treatment of colostrum.

Quantifying transfer of passive immunity in calves: We collected blood samples from 195 Holstein heifer calves (one to seven days old) between November 2019 and February 2020 once on the 18 surveyed dairies to determine transfer of passive immunity status. Based on their serum total protein (STP) estimates by refractometer, the calves were placed into one of four categories (STP): excellent (≥ 6.2 g/dL), good (5.8 - 6.1 g/dL), fair (5.1 - 5.7 g/dL), or poor (< 5.1 g/dL). Transfer of passive immunity was considered fair or poor in 20.5 percent of calves (16.4 and 4.1 percent, respectively). Excellent and good represented 57.4 and 22.1 percent of calves, respectively.

CONCLUSION

Our results show that a successful colostrum feeding program and adequate transfer of passive immunity can be accomplished through various management practices. Quantifying transfer of passive immunity in calves is one measurement that can be used to evaluate transfer of passive immunity to calves. Based on this metric, dairies can work with their trusted advisers to improve protocols for colostrum harvest, storage, and feeding. ▮

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