

Epidemiology of Colostrum in NY Holsteins

Al Kertz, PhD, PAS, DIPL ACAN

ANDHIL LLC

St. Louis, MO 63122

andhil@swbell.net

www.andhil.com

Sometimes it might seem like we overemphasize the role of colostrum in dairy cattle. But then when you consider it largely determines the young calf's immunity status, ability to ward off the calfhood scourges of diarrhea and respiratory problems, and their ongoing health and productivity as heifers and then cows, it is justified to learn more and do more to insure that calves get the benefits of colostrum. This sets the stage for a study of New York Holstein herds and colostrum epidemiology (Westhoff et al., 2023).

Herds were selected based on participation in previous statewide research projects, and by contacting veterinarians and nutritionists. Inclusion criteria were:

- ability to collect and record individual colostrum weight or volume and a composite sample Brix % reading
- minimum herd size of 500 lactating Holstein cows
- use of dairy management software DairyComp 305
- heifer calves housed on site for at least the first week of life.

A total of 51 farms were contacted from October 2019 to January 2020. After herd owners responded whether to participate or qualify, 19 New York state Holstein herds were enrolled in the study. "The survey was comprised of both open and closed questions related to dry off procedures, pen movement, dry period nutrition strategies, transition cow housing, calving environment, colostrum harvest protocols, colostrum management and feeding, and preweaning calf management."

Colostrum yield was either collected as a volume or as a weight (n = 15). A Brix refractometer was provided to each farm and farm personnel were trained on the correct use of the instrument for composite sample Brix % reading. Colostrum was recorded for cow ID, date and time of colostrum harvest, bucket color, colostrum yield, Brix %, notes, and the initials of the individual responsible for colostrum collection.

Two environmental data loggers measured light intensity and ambient temperature/relative humidity. Light intensity and temperature/relative humidity were recorded in 15- and 30-minute intervals during the entire study period. Temperature-humidity index was calculated from measurements. An extensive description in the paper is provided for how data were analyzed.

Of the 19 herds in the study, 21,374 individual animal colostrum records were collected from 18 herds. Herd sizes ranged from 620 to 4,600 with most in the 1,000 to 2,000 cow herd size. Median colostrum yield was 4.0 liters with 24.6 % Brix for first-calf heifers, and 4.6 liters (highest in 2nd lactation) with 25.7 % Brix for older cows. Colostrum was fed to calves from harvest in 95 % of herds within 2 hours (**Table 1**).

Table 1. Data for heifer calves

Variable	% of herds
Fed colostrum within 2 hours	95

First colostrum fed	
Esophageal tubing	68
Bottle	11
Both	21
Volume of first colostrum fed, quarts	
3	5
4	95
Number of feedings	
1	26
2	58
3	16

That 95% of herds fed colostrum within 2 hours of collection is a testament as to how well these herds do this good management practice. To insure intake, 68% of herds used an esophageal tubing method; and again 95% of herds fed the recommended 4 quarts colostrum at first feeding. And 74% fed colostrum either twice or three times. These are all very good metrics for feeding colostrum.

Calf housing by % of herds was:

- 47% for hutch
- 26% by individual pen
- 32% by group

Milk fed to preweaned calves by % of herds was:

- 21% milk replacer
- 11% acidified waste milk
- 37% pasteurized waste milk
- 11% each for raw waste milk, pasteurized whole milk, and raw whole milk

The colostrum yield (**Table 2**) was lowest for first lactation heifers (traditionally the case), and highest for the second lactation calving. But notice that standard deviation (SD) divided by the mean (coefficient of variation or CV) was quite high ranging from 60 to 70%. That is indicative of the great variation in colostrum yield. Note that the Brix % (an indication of solids concentration and therefore protein IgG level in colostrum) did not have a large difference but did increase from 1-2 parity to 3,4, and 5 parity. Taken together, yield and solids concentration make for a lot of variation in colostrum amount and quality.

Table 2. Colostrum yield and Brix % by parity (lactation).

Variable	Parity	Mean	SD
Colostrum yield, lb			
	1	10.4	6.4
	2	13.3	8.3

	3	12.0	8.7
	4	12.3	9.0
	5+	12.5	8.6
Brix %			
	1	24.6	3.9
	2	24.6	3.0
	3	25.8	4.4
	4	26.7	4.3
	5+	27.6	4.8

At times I have gotten questions as to why cows have no colostrum yield? In this study, that occurred for 3.1 % of first calf heifers and 5.5 % of older cows. So, it does occur, but at a low percentage. In the paper, there is an entire table with factors statistically analyzed for variables measured. Of those found to be related at $P > 0.01$ no colostrum yield is:

- slightly lower for stillbirths
- slightly lower for longer than 47 day dry periods
- slightly higher for > 28,824 lb 305 day ME previous lactation
- higher for > 273 day gestation length
- greater for < 13.2 lb colostrum yield
- greater for > first lactation

Also found were that:

- one-fifth of cows produced colostrum below the industry standard (IgG \geq 50 g/L or Brix % \geq 22%)
- cows with female calves had lowest colostrum yield. Birth weights were not available in this study but in other studies cited it has been associated particularly with male calves which are about 7% greater in body weight (Kertz et al., 1997)
- decreased colostrum yield and Brix % with stillbirths in older cows
- previous lactation > 34,928 lb 305 day ME was associated with lower Brix % and greater colostrum yield but these differences were relatively small

The authors acknowledged some limitations with this study:

- average herd size was 1,545 cows versus 172 cows per herd in New York state
- these 19 herds volunteered to participate in this study while other herds did not. Thus, how representative are these 19 herds of New York State herds?
- small statistically significant differences may not be biologically significant
- cause and effect are difficult to sort out in looking at relationships found

There are 4 figures and 20 tables of data in this paper reflecting extensive data collected and analyzed. In conclusion, the authors stated: Recognition of factors associated with the variation in colostrum production will allow producers to alter their colostrum management programs during periods of low yield or quality for an opportunity to decrease calf morbidity or mortality.

The Bottom Line

This study evaluated many factors related to colostrum yield and quality in large well-managed herds which volunteered for this project. To manage colostrum well, it is imperative that dairy producers consistently carry out standard protocols which involves keeping and maintaining excellent records. Colostrum management has many variables which must be well managed, recorded, and evaluated.

References

Kertz, A. F., L. F. Reutzler, B. A. Barton, and R. L. Ely. 1997. Body weight, body condition score, and wither height of prepartum Holstein cows and body weight and sex of calves by parity. A database and summary. *J. Dairy Sci.* 80:525-529.

Westhoff, T. A., S. J. Womack, T. R. Overton, C. M. Ryan, and S. Mann. 2023. Epidemiology of bovine colostrum production in New York Holstein herds: Cow, management, and environmental factors. *J. Dairy Sci.* 106: