

# Colostrum: Day 1 and beyond

Jennifer Rowntree, DVM  
Fort Atkinson, WI 53538

## Abstract

As dairy farms optimize maternity facilities and early life calf management, proper handling and storage of maternal colostrum become the single point within a dairy system where all animals must flow. The success of this program therefore has a direct impact on calf and cow performance. Research has shown the benefits of feeding high-quality maternal colostrum to newborn calves and the key role it plays in gastrointestinal tract (GIT)<sup>1</sup> and immune system development. Further research has shown benefits of extended colostrum feeding beyond day one to provide a local protective effect in the GIT, food for GIT microbiota,<sup>2</sup> and even as part of therapy for common early life calf illnesses such as scours<sup>3,4</sup> and bovine respiratory disease (BRD).<sup>4</sup> Producers and veterinarians should work together to understand how each dairy can best manage their maternity and colostrum programs to optimize early life calf health and development.

**Key words:** calf, colostrum, health

## Practical management considerations for day 1

### New serum IgG guidelines and how to achieve these expectations

New guidelines<sup>6</sup> for serum IgG levels (Table 1) associated with passive transfer status were proposed in 2019 and incorporated into the Dairy Calf and Heifer Gold Standards as of 2020. Herd veterinarians can help their clients understand the passive transfer status of their calves based on new guidelines by measuring serum total protein levels in calves from 2 to 7 days of age. Results can dictate next steps, such as monitoring BRIX levels of colostrum cow-side and cleanliness of colostrum to ensure they meet industry standards. Recent NAHMS data<sup>7</sup> revealed performance benefits relating to mortality, health, growth and longevity in calves with improved serum IgG levels. As serum IgG increases, there is an incremental reduction in morbidity and mortality in early life of calves.

If herds are not achieving their goals for passive transfer levels, veterinarians can help clients understand options for improving serum IgG levels. Supplementing low-quality colostrum and/or adding a second colostrum feeding 6 to 12 hours later are effective strategies to increase serum IgG<sup>8</sup> and often both practical and manageable by farm labor. In a recent study<sup>9</sup> low-quality colostrum was supplemented with colostrum replacer and fed to calves, resulting in enhanced serum IgG levels

compared to calves fed low-quality colostrum. There is a diminishing return on the impact of supplementing colostrum replacer to maternal colostrum on serum IgG levels; as the initial BRIX level of maternal colostrum increases, the lesser degree of increase in serum IgG that can be obtained by adding colostrum replacer. The Alta Colostrum Calculator app can be used by employees to make real-time decisions on how much colostrum replacer to add to maternal colostrum based on the farm's desired final BRIX status of colostrum to be fed to the calf.

## Managing colostrum supply for day 1 and beyond

### Factors that impact colostrum quality and quantity

Feeding maternal colostrum beyond the first feeding requires optimal colostrum management to ensure there is an adequate supply of high-quality maternal colostrum. For farms that have a low supply of fresh colostrum either from certain cows or during specific times of the year, veterinarians can help clients understand the value of storing, re-heating and feeding maternal colostrum from the herd's own cows. It is important to be aware of factors that have a negative impact on the quality and quantity of maternal colostrum. These include an unbalanced dry cow diet, dry period heat stress,<sup>10</sup> shortened dry period (< 21 days), late vaccination, shortened photoperiod<sup>11</sup> and delayed colostrum harvest.<sup>12</sup> Note that the parity of dam does not impact maternal colostrum quality; colostrum from primiparous dams has been shown to be comparable in quality to multiparous cows and can be fed to calves.<sup>13</sup>

### Pasteurization, storage and reheating

Many options exist for harvesting, storing, thawing, re-heating and feeding maternal colostrum. The goal is to harvest colostrum within 4 hours after calving in a clean manner. Veterinarians can monitor total plate counts and coliform counts of colostrum, along with colostrum IgG content, at different stages of this process. Colostrum should be refrigerated for no more than 3 days and if not used, frozen for use within the next year. Considerations for whether a herd should pasteurize colostrum are multiple: herds unable to ensure the cleanliness of raw colostrum meet industry standards, or herds with disease concerns such as *M. avium* subsp. *paratuberculosis*, *E. coli*, *Salmonella* spp., and *Mycoplasma* spp. to name a few, should be encouraged to invest in a pasteurizer to mitigate disease transfer from dam to calf via maternal colostrum.

**Table 1:** New recommendations for assessing herd-level successful passive transfer rates.

Serum IgG status	IgG conc. (g/L)	Equivalent STP levels (g/dL)	Equivalent Serum BRIX levels (%)	Calves in each category (%)
Excellent	> 25.0	> 6.2	> 9.4	> 40
Good	18.0-24.9	5.8-6.1	8.9-9.3	~ 30
Fair	10.0-17.9	5.1-5.7	8.1-8.8	~ 20
Poor	< 10.0	< 5.1	< 8.1	< 10

## Post-day 1 colostrum considerations

### Research-proven benefits of supplemental colostrum and dose guidelines for targeted approach

Every year a multitude of published studies are added to the current repertoire supporting the use of supplemental colostrum to support gastrointestinal tract health and development in young dairy calves. Providing colostrum after the cessation of IgG absorption in the gut, often referred to as “post-day 1 colostrum” serves to provide a local source of protection against pathogens, growth factors and prebiotics to promote colonization of the GIT by beneficial bacteria. Benefits of post-day 1 colostrum range from reduced morbidity and treatments<sup>14</sup> to improved weight gain.<sup>15</sup> The magnitude of these effects are likely influenced by both dose of IgG and pathogen load to which calves are exposed early in life. This could lend itself well for herd veterinarians to recommend a different dose of supplemental colostrum depending on the health of their clients’ calves. At a minimum, herds should aim to provide 10g of IgG per head per day via stored maternal colostrum or colostrum replacer. This can be given for the first 1 to 3 weeks of life, depending on early life calf health status of the herd.

### Colostrum for scours treatment

Additional benefits of supplemental colostrum continue to be explored. Studies published in the last few years have evaluated the impact of colostrum as part of a scours treatment regimen and its effect on the incidence of bovine respiratory disease. A recently published study<sup>3</sup> fed calves varying durations of colostrum replacer as part of scours treatment. Calves fed the long-term colostrum replacer (85g IgG per day over 4 days) had reduced duration and severity of scours (1.4 days less) along with improved growth (98 g/d) over 56 days following the start of diarrhea compared to control calves. Relating to BRD, a study published in 2020<sup>4</sup> showed a reduction in the number of sick days associated with BRD for calves fed 350 or 700g pasteurized colostrum for the first 14 days of life as part of their milk diet compared to calves fed no colostrum replacer. These calves supplemented colostrum replacer also had a greater final body weight. A 2021 study<sup>16</sup> demonstrated that control calves (no supplemental colostrum) were more likely to have a BRD bout (1.6 times) and associated lobar lung consolidation (1.5 times) as seen on thoracic ultrasound in the 7 days following a deviation in milk intake or drinking speed compared to calves fed 125g of colostrum replacer as part of their milk diet for 3 days following the same event.

## Conclusion

Appropriate colostrum management and feeding is paramount to the success of any farm’s calf program. Veterinarians have an opportunity to work with clients and help them understand the value of colostrum when fed not only at birth, but also early in life and during times of health challenges such as scours. Colostrum collection, storage, and feeding practices can be evaluated by herd veterinarians through measuring colostrum cleanliness, quality and serum IgG values in calves to optimize their clients’ colostrum programs.

## References

1. Pyo J, Hare K, Pletts S, Inabu Y, Haines D, Sugino T, Guan LL, Steele M. Feeding colostrum or a 1:1 colostrum:milk mixture for 3 days postnatal increases small intestinal development and minimally influences plasma glucagon-like peptide-2 and serum insulin-like growth factor-1 concentrations in Holstein bull calves. *J Dairy Sci* 2020. 103(5):4236-4251.

2. Fischer AJ, Song Y, He Z, Haines DM, Guan LL, Steele MA. Effect of delaying colostrum feeding on passive transfer and intestinal bacterial colonization in neonatal male Holstein calves. *J Dairy Sci* 2018 Apr;101(4):3099-3109.
3. Carter HSM, Steele MA, Costa JHC, Renaud DL. 2022. Evaluating the effectiveness of colostrum as a therapy for diarrhea in preweaned calves. *J Dairy Sci* 106.
4. Kargar S, et al., 2020. Extended colostrum feeding for 2 weeks improves growth performance and reduces the susceptibility to diarrhea and pneumonia in neonatal Holstein dairy calves. *J Dairy Sci* 103:8130-8142.
5. Murray C, et al., 2015. The effect of dystocia on physiological and behavioral characteristics related to vitality and passive transfer of immunoglobulins in newborn Holstein calves. *Can J Vet Res* 79:109-119.
6. Godden S, Lombard J, Woolums A, 2019. Colostrum Management for Dairy Calves. *Vet Clin North Am Food Anim Pract* 35:535-556.
7. Urie NJ, Lombard JE, Shivley CB, Kopral CA, Adams AE, Earleywine TJ, Olson JD, Garry FB. Preweaned heifer management on US dairy operations: Part V. Factors associated with morbidity and mortality in preweaned dairy heifer calves. *J Dairy Sci* 2018 Oct;101(10):9229-9244.
8. Hare KS, Pletts S, Pyo J, Haines D, Guan LL, Steele M. Feeding colostrum or a 1:1 colostrum:whole milk mixture for 3 days after birth increases serum immunoglobulin G and apparent immunoglobulin G persistency in Holstein bulls. *J Dairy Sci* 2020 Dec;103(12):11833-11843.
9. Lopez, AJ, Echeverry-Munera J, McCarthy H, Wellboren AC, Pineda A, Nagorske M, Renaud DL, Steele MA. 2022. Effects of enriching maternal colostrum with bovine dried colostrum replacer on IgG absorption in newborn male calves. *J Dairy Sci* Vol. 105, Suppl. 1(Abstr.):323.
10. Dahl GE, Tao S, Monteiro APA. Effects of late-gestation heat stress on immunity and performance of calves. *J Dairy Sci*. 2016 Apr;99(4):3193-3198.
11. Gavin K, Neiberghs H, Hoffman A, Kiser JN, Cornmesser MA, Haredasht SA, Martínez-López B, Wenz JR, Moore DA. Low colostrum yield in Jersey cattle and potential risk factors. *J Dairy Sci* 2018 Jul;101(7):6388-6398.
12. Moore M, Tyler JW, Chigerwe M, Dawes ME, Middleton JR. Effect of delayed colostrum collection on colostrum IgG concentration in dairy cows. *J Am Vet Med Assoc* 2005 Apr 15;226(8):1375-7.
13. Shivley CB, Lombard JE, Urie NJ, et al. Preweaned heifer management on US dairy operations: Part II. Factors associated with colostrum quality and passive transfer status of dairy heifer calves. *J Dairy Sci* 2018; 101:9168-84.
14. Chamorro MF, Cernicchiaro N, Haines DM. Evaluation of the effects of colostrum replacer supplementation of the milk replacer ration on the occurrence of disease, antibiotic therapy, and performance of pre-weaned dairy calves. *J Dairy Sci* 2017 Feb;100(2):1378-1387.
15. Berge et al. 2009. Evaluation of the effects of oral colostrum supplementation during the first fourteen days on the health and performance of pre-weaned calves. *J Dairy Sci* 92:286-295.
16. Cantor MC, et al., 2021. Nutraceutical intervention with colostrum replacer: Can we reduce disease hazard, ameliorate disease severity, and improve performance in preweaned dairy calves? *J Dairy Sci* 104: 7168-7176.

