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TECHNICAL INFORMATION FOR TODAY'S FEED PROFESSIONAL

Basics of Colostrum Replacer Selection

Introduction

Colostrum is undoubtedly one of the most important factors associated with raising a healthy calf; however, having a consistent supply of good quality colostrum is a challenge. Colostrum replacers are designed to be alternatives to feeding maternal colostrum as a means to provide successful passive transfer of immunity to the newborn calf. Instances where a colostrum replacer is logical to use are numerous, and include:

- ***Quality and quantity concerns*** – A shortage of quality maternal colostrum
- ***Convenience*** – Night calvings, labor shortages, lack of time to milk the fresh cow(s) or thaw stored colostrum
- ***Biosecurity*** – Prevent transmission of diseases such as Johne's, *Mycoplasma bovis*, etc.
- ***Cleanliness*** – Concerns with excessive bacterial contamination of maternal colostrum
- ***Consistency*** – Immunoglobulin (Ig) concentration in maternal colostrum varies from cow-to-cow

How Do Colostrum Replacers Differ?

There are several colostrum replacers available on the market, and the primary differences are globulin protein source and concentration per dose.

- ***Globulin protein source*** – There are two primary sources of globulin protein in colostrum replacers; 1) dried bovine colostrum derived from maternal colostrum, and 2) dried bovine serum derived from meat processing plants. Both sources have been shown to support adequate absorption and passive transfer of immunity, although there may be some variation among sources (depending on supplier) with regard to apparent efficiency of absorption (AEA) by the calf.
- ***Globulin protein concentration*** – Among colostrum replacers, globulin protein concentration varies from 100 to 150 grams per feeding with choices in between (~125-130 grams).
- ***Proven efficacy*** – Suppliers of colostrum replacer should be able to provide research data showing proof of successful passive transfer.

How Much Globulin Protein Should Be Fed?

Failure of passive transfer (FPT) of immunity is defined as serum IgG concentrations of less than 10 mg/mL determined 24 hours after colostrum feeding. Current industry benchmarks call for 90% of calves in a given population achieve passive transfer. Godden et al. (2009) conducted a study where calves were fed 3.8 L of maternal colostrum, one dose (100 g globulin protein from dried bovine colostrum) of colostrum replacer, or two doses (200 g globulin protein from dried bovine colostrum) of colostrum replacer within 2 hours of birth. Results of this study are detailed in **Table** 1.

Table 1. Effect of feeding one dose of colostrum replacer (100 g Ig), two doses of colostrum replacer (200 g Ig), or maternal colostrum on 24 hr serum IgG, 24 hr serum total protein, apparent efficiency of IgG absorption, and incidence of failure of passive transfer (FPT) in dairy calves (Godden et al., 2009).

	Colostrum Replacer Treatments		
	One dose – 100 g Ig	**Two doses – 200 g Ig**	**Maternal colostrum**
Amount of Ig fed, g	100[a]	200[b]	271 ± 114[c]
24 hr serum IgG, mg/mL	9.6 (2.7 to 19.5)[a]	19.0 (10.1 to 30.2)[b]	20.7 (1.8 to 37.3)[b]
24 hr serum total protein, g/dL	4.9 (4.4 to 5.7)[a]	5.5 (4.7 to 6.4)[b]	5.7 (4.2 to 6.9)[b]
Apparent efficiency of absorption, %	35.5 (10.7 to 61.3)	36.5 (22.5 to 56.8)	31.8 (4.3 to 62.5)
FPT, % (no. of calves)	45.8 (11/24)[a]	0 (0/23)[b]	9.1 (2/22)[b]

[a,b,c]Values within row with unlike superscripts are significantly different ($P < 0.05$)

These results indicate that calves should receive greater than 100 g globulin protein in order to consistently prevent FPT. Greater globulin protein intake can be accomplished by selecting a colostrum replacer with a higher globulin protein concentration or by feeding more than one package of a less concentrated colostrum replacer.

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Variation in Colostrum Quality

One of the most inherently variable components of a maternal colostrum program is colostrum quality, particularly colostral Ig concentration. As illustrated by the study detailed above, calves on the maternal colostrum treatment had highly variable serum IgG results (1.8 to 37.3 mg/mL) as well as 9.1% FPT. This can be partially explained by the extreme variation in maternal colostrum Ig concentrations. Although the average maternal colostrum Ig concentration was 71.3 g/L, concentrations ranged from 14.5 to 132.2 g/L. This resulted in variable total Ig intake ranging from 55 to 502 g of Ig; therefore, some calves consumed insufficient Ig while most calves consumed more than enough Ig. The observation of variable maternal colostrum Ig concentrations agree with results from a survey conducted with 55 Pennsylvania dairy farms, where colostral Ig concentration averaged 41 g/L but samples varied from 14.5 to 94.8 g/L (Kehoe et al., 2007). Unless colostrum quality is routinely monitored, it is likely that some calves are not receiving adequate Ig intake despite consuming enough colostrum volume. Managing variation in colostrum quality requires routine monitoring (i.e., use of a colostrometer), but this inherent variation is also one of the major reasons to utilize a high quality colostrum replacer.

A New, Highly-Concentrated Source of Dried Bovine Colostrum

Milk Products LLC now has exclusive access to a highly-concentrated source of dried bovine colostrum. The high globulin protein concentration (~50%) of this source allows for improved formulation flexibility of colostrum replacers. To demonstrate efficacy, a field trial was conducted at a Midwest dairy where 20 Holstein bull calves were fed colostrum replacer containing either 130 or 150 g globulin protein in one 500-gram feeding within 2 hours of birth. A blood sample was obtained 24 hours after colostrum replacer feeding and analyzed for serum IgG concentration. Results are shown in **Figure 2 (right).** Serum IgG ranged from 9.2-14.6 mg/mL (1/10 calves with FPT) for the 130 g treatment, whereas feeding 150 g resulted in a serum IgG range of 12.3-17.8 mg/mL (0/10 calves with FPT).

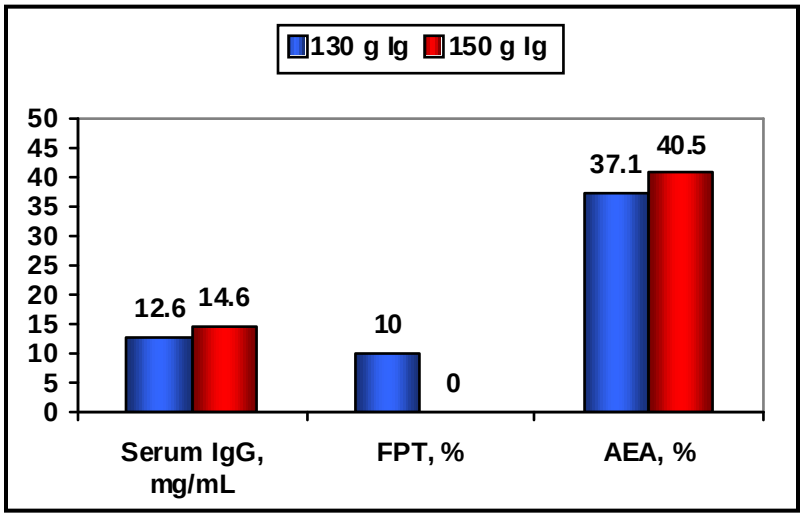

Figure 2. Serum IgG (mg/mL), FPT (%), and AEA (%) for calves fed 130 or 150 g globulin protein. FPT = serum IgG < 10 mg/mL.

There are many colostrum replacers available for purchase, but they are not all created equal. No matter how the desired globulin protein intake is achieved, it is important to evaluate colostrum replacers on total investment/calf needed to reach the globulin protein intake goal, not simply cost per colostrum replacer package.

Conclusions

- There are several instances where a colostrum replacer should be used – quality and quantity concerns, convenience, biosecurity, cleanliness, and consistency.
- Recent research has shown that feeding 100 g globulin protein as a colostrum replacer does not adequately protect against failure of passive transfer.
- Colostrum quality (immunoglobulin concentration) can vary significantly from cow-to-cow. Along with strategies to maximize colostrum quality (see FrontLine T001.72), colostrum replacers should be part of the newborn calf management strategy to ensure every calf is fed adequate amounts of Ig.
- Colostrum replacers should be evaluated by the presence of data, total globulin protein provided per package, and the total investment per calf required to achieve desired globulin protein intake.

References

Godden, S. M., D. M. Haines, D. Hagman. 2009. Improving passive transfer of immunoglobulins in calves. I: Dose effect of feeding a commercial colostrum replacer. J. Dairy Sci. 92:1750.

Kehoe, S. I., B. M. Jayarao, and A. J. Heinrichs. 2007. A survey of bovine colostrum composition and colostrum management practices on Pennsylvania dairy farms. J. Dairy Sci. 90:4108.