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Calf Note #18 – Using colostral supplements

Introduction

Newborn calves are particularly prone to disease. Due to the nature of the cow's placenta, no antibodies (also called immunoglobulins) can reach the calf's bloodstream. Therefore, the calf is essentially defenseless against bacteria, viruses, and other pathogens in the environment. Colostrum (the first secretion from the mammary gland of the cow after parturition) contains a large mass of immunoglobulins (**Ig**). These Ig, but especially the isotypes IgG and IgM, are absorbed into the calf's bloodstream and can provide immunity to the calf for approximately 4 to 8 weeks. This is called passive immunity and is critical to the health and survival of the calf. Many studies have shown that if dairy calves receive too few Ig (particularly IgG) from colostrum, they are at a much greater risk of disease and death than calves that receive colostrum right after birth. During the past several years, companies have offered products that are termed *colostrum supplements*. These products are derived from several sources:

- cheese whey
- colostrum from cows at selected herds
- bovine serum

Serum derived products

A serum-derived colostrum supplement (Life*line*™, American Protein Corp., Ames, IA) has been introduced into the marketplace. This product is derived from USDA food-grade bovine serum. Several published research trials have documented good efficiency of IgG absorption from Life*line*™. At the University of Tennessee, a project was conducted to determine the efficiency of IgG absorption of IgG from Life*line*™. At suggested feeding rates, the efficiency of IgG absorption was better than that of maternal colostrum (38 vs. 25%). However, when large amounts of Life*line*™ were fed (1.5 kg in 24 hours), the efficiency of IgG absorption was quite poor. This suggested that excess protein in the intestine can impair antibody absorption.

Table 1. Plasma IgG and efficiency of absorption in calves fed two levels of Life*line*.

	Block 1			*Block 2*			
Item	MC	CS	SE	MC	CS	SE	P[1]
n	7	7	...	3	3	...	...
BW, kg	36.2	38.7	2.2	44.2	42.8	3.5	NS[2]
IgG intake, g	149.6	150.0	0.0	53.2	53.2	0.0	0.001
Plasma IgG, g/L	10.7	6.5	0.7	3.3	5.0	1.0	0.006
Plasma volume, L	3.5	3.4	0.4	3.6	4.3	0.6	NS
AEA, %[3]	25	15	3	24	38	5	0.008

[1]Probability of a significant block x treatment interaction.
[2]$P > 0.10$.
[3]Apparent efficiency of IgG absorption at 24 h.

Other researchers at Illinois and Colorado have also found acceptable IgG absorption with serum derived products. It is important to remember, however, that maternal colostrum containing at least 50 g of IgG per liter is the optimal feed, and colostral supplements should be used when good quality maternal colostrum is unavailable.

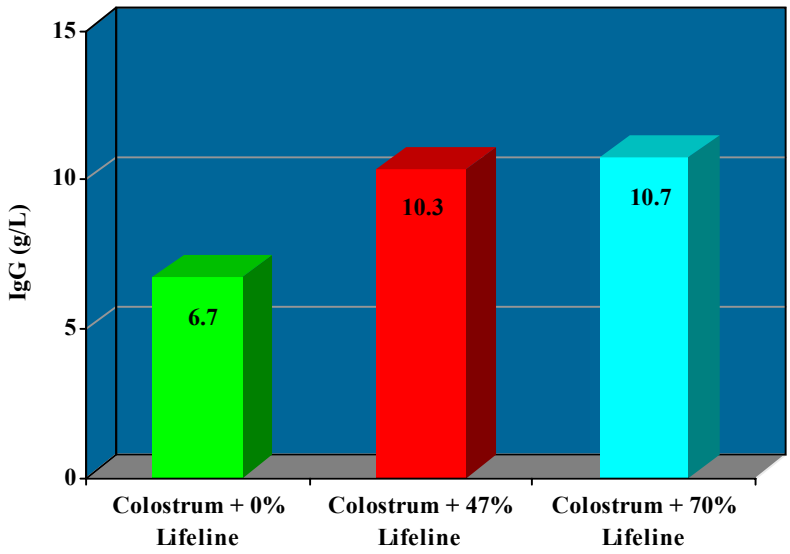

Figure 1. Serum IgG concentration at 24 hr of age in calves fed 95 to 98 g of IgG from colostrum with 47 or 70% of IgG from Life*line* Nutritional Colostrum Supplement. From McCoy et al. 1997 J. Dairy Sci. 80(Suppl. 1):189 (Abstr.).

Produces derived from whey

Whey contains Ig that can be obtain through special processing. These products usually contain 25 to 30 grams of IgG per dose. Most research indicates that absorption of IgG from these products is quite poor (Figure 2), and the serum IgG concentration achieved by feeding these products is much lower than can be achieved by feeding serum derived products or maternal colostrum.

Products derived from colostrum

Commercial companies can collect colostrum from cows and process it for sale. Some of these herds may vaccinate their cows against certain pathogens (e.g., *Escherichia coli*) before collecting colostrum. The use of colostral supplements derived from freeze-dried colostrum has been evaluated at several universities either to replace colostrum or when added to poor quality colostrum. Data from Colorado State University (Figure 2) indicated that colostrum supplements are absorbed poorly and calves will achieve only 2 to 3 g of IgG/L when fed these products. The efficiency of IgG absorption of these products is quite poor.

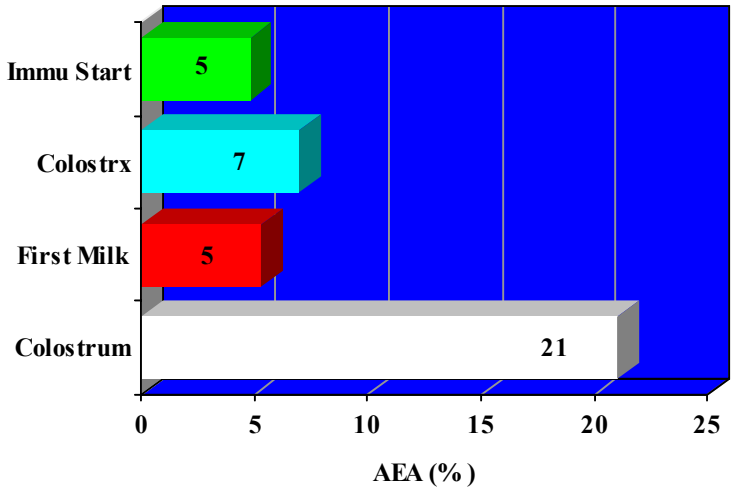

Figure 2. Apparent efficiency of IgG absorption at 24 hr of age in calves fed various colostral supplement products. From Garry et al., JAVMA 208:107. 1996.

When colostral supplements were added to colostrum, there was little change in serum IgG concentrations. No effect of colostral supplement was observed on serum IgG concentrations taken 24 or 48 hours after birth, suggesting that there was no benefit to adding a freeze-dried colostrum

supplement.

Should supplements be used? Maternal colostrum is almost always preferable to a colostrum supplement due to the mass of Ig available and the nature of the IgG in colostrum. The IgG in maternal colostrum are derived from the dam's blood stream and are based on the disease history to which the cow has been exposed. Therefore, maternal colostrum will contain IgG specific for the antigens on the farm. ***However, there are many cases in which maternal colostrum is of poor quality, may be unavailable at the appropriate time for feeding, or is contaminated with disease-causing organisms. In these situations, colostral supplements are very useful to reducing calf morbidity and mortality.***

Colostral supplements - the best product available today is Life*line*™ - can be used under the following situations:

- colostrum is unavailable
- colostrum is of poor quality (Life*line*™ is used as supplement)
- colostrum may be contaminated by pathogens (such as Johne's)
- colostrum cannot be obtained or fed within 2 hours of birth

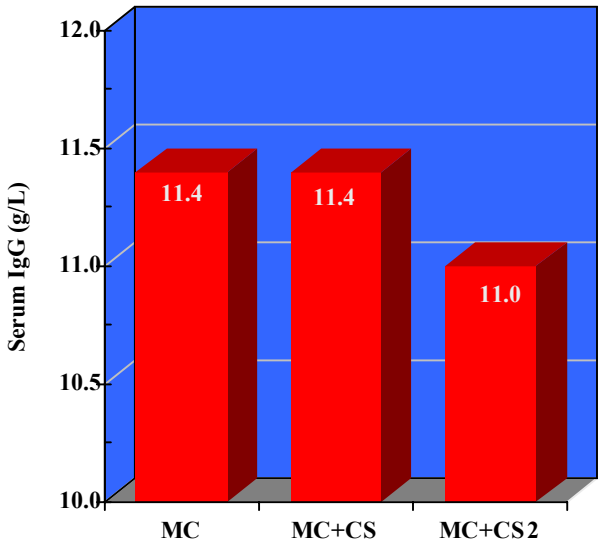

Figure 3. Serum IgG concentration in calves the same amount of IgG from maternal colostrum with added lacteal-based colostral supplement at 2 amounts. From Morin et al., J. Dairy Sci., 80:747-753

Maternal colostrum is usually the feed of choice for newborn calves. However, when properly managed, Life*line*™ can be an important part of a calf management program.

Written by Dr. Jim Quigley (10 July 1997) Updated 10 October 2000.

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