

## Colostrum Management in Newborn Calves<sup>1</sup>

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The immunity a calf attains by consuming colostrum is called passive immunity. Passive immunity is that which is received *passively* from an outside source; conversely, active immunity is derived from the calf's own body. Newborn calves achieve passive immunity by consuming colostrum shortly after birth. Colostrum is concentrated in essential proteins called immunoglobulins (Ig).

Many attempts have been made to manage passive immunity in newborn calves. Nonetheless, many calves fail to achieve the important benefits of this critical first meal. When this occurs, calves are considered to have Failure of Passive Transfer (FPT). A strong correlation exists between the incidence of FPT and calf illness and death. Attainment of adequate passive immunity is often associated with blood IgG concentrations greater than or equal to 10 g/L at 24 hours of age. Calves with FPT typically have blood IgG concentrations below 10 g/L. The incidence of calf death is increased when blood Ig levels fall below this threshold (Figure 1). Absorption of Ig must occur before the calf's intestine becomes impermeable to the large Ig proteins. The development of impermeability is called gut closure. Typically, a healthy calf that has access to liquid feed or has consumed colostrum will undergo complete gut closure by about 24 hours after

birth (Figure 2). The best defense against FPT is good colostrum management, making certain that every newborn calf receives an adequate amount of quality Ig soon after birth.

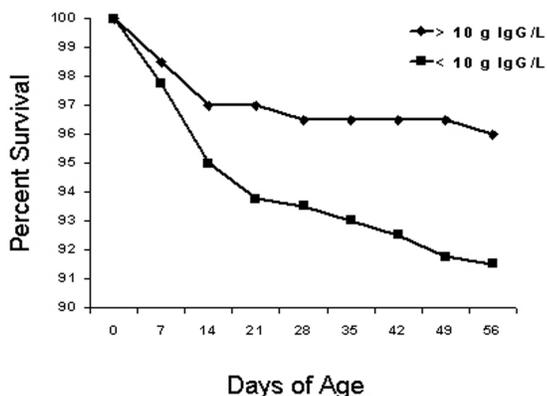
Immunoglobulin may be fed to calves using a nipple bottle or an esophageal feeder. Healthy calves can consume three to four liters of colostrum within a few hours of birth. If a producer wishes to provide a larger volume, or if the calf is unable or unwilling to suckle, an esophageal feeder may be used. The esophageal feeder is a long, narrow, rigid tube that is inserted down the esophagus of the newborn calf. A bottle or bag attached to the other end of the tube contains the fluid, which, upon release, flows into the calf. The use of an esophageal feeder has been associated with a slight decrease in the efficiency of Ig absorption; nevertheless, it provides a quick and simple method for ensuring delivery of Ig to newborn calves.

Producers may wish to have a stored supply of quality colostrum available. This can be achieved by freezing high-quality colostrum collected from the first milking after calving. The concentration of Ig in colostrum is a common indicator of colostrum quality. Colostrum containing greater than 50 g Ig/L is considered to be high quality. Colostrum may be

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stored frozen for up to a year with no significant loss in Ig. Measuring colostrum quality on the farm can be achieved by the use of a colostrometer. The colostrometer is a hydrometer device calibrated to associate specific gravity of colostrum with Ig concentration. When using this instrument, it is critical to control the temperature of the colostrum being tested. Variations in colostrum temperature impact specific gravity. To avoid Ig destruction, it is important not to overheat frozen colostrum during thawing. A good practice to follow is to submerge the sealed, frozen container in a bath of warm (not hot) tap water until it thaws completely. Thawing time will vary depending on container size.



**Figure 1.** Effect of passive immune status (blood immunoglobulin concentrations) on newborn Holstein heifer survival - National Dairy Heifer Evaluation Project. USDA:APHIS:VS. Survey represents 1,811 farms in 28 states with 2,177 heifers sampled between 24 and 48 h after birth.

Alternative Ig sources have been developed commercially and may be used to fortify or replace colostrum. These commercial products are commonly derived from dried colostrum or concentrated whey sources. Historically, these supplements have performed poorly when used to replace quality colostrum. A new source of supplemental Ig, derived from processed bovine serum, has become available commercially. Bovine serum Ig has been shown to absorb much more efficiently than milk-derived counterparts (Figure 3). The use of bovine serum Ig in colostrum fortification or replacement strategies may be effective when colostrum quality or availability is limited.

## Important Considerations in a Colostrum Management Program

### Dairy and Beef Calves

1. All calves must consume colostrum as soon after birth as possible. The ability of calves to absorb Ig falls dramatically as they reach 24 hours of age. Colostrum or colostrum supplement should be fed to calves within 12 hours of age.
2. When feeding colostrum to calves, always attempt to use high quality frozen or fresh colostrum (minimum of 50 g of IgG/L). If colostrum availability is limited, use a bovine-serum based commercial supplement either to fortify an existing colostrum source or to replace colostrum when none is available.

### Dairy Calves

Failure of passive transfer in dairy calves has traditionally been a common problem. A national survey showed that nearly 1/3 of all dairy producers relied on the calf to suckle the dam in order to achieve colostrum consumption. When dairy calves are left to suckle their dams, it is difficult to know when or how much colostrum they are actually consuming. Establish a procedure to ensure that the calves have consumed an adequate amount of colostrum by establishing a process for hand-feeding colostrum to every newborn calf. To ensure adequate Ig intake, administer two feedings of colostrum (2 L each) containing at least 50 g Ig/L. Feed 2 L at birth and another 2 L 12 hours later. Under this management scenario, the consumption of 200 g of Ig within 24 hours of age will usually result in blood Ig levels greater than 10 g/L.

### Beef Calves

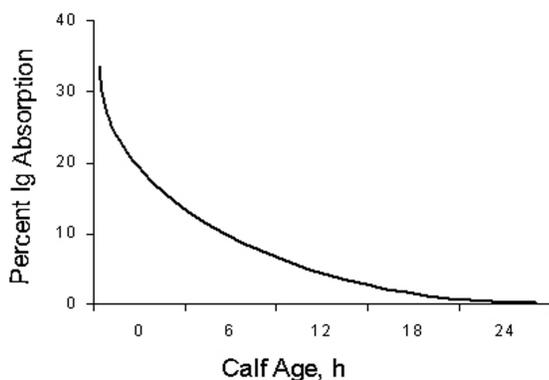
Beef cow/calf managers usually do not separate the calf from the cow after calving, allowing the calf to obtain colostrum through nursing shortly after birth. Compared to dairy cattle, whose breeding does not emphasize a cow's mothering ability, beef cows tend to be good mothers, encouraging newborn calf vigor by licking and nudging. Beef cow colostrum is usually of high quality and concentrated in the critical Ig proteins. Therefore, under most situations,

newborn beef cow/calf pairs can manage colostrum consumption quite well when left unattended.

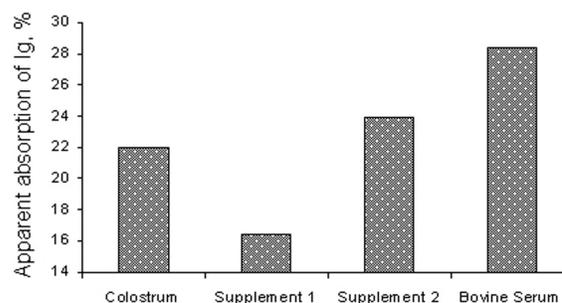
To decide whether or not to hand-feed colostrum to a newborn beef calf, ask yourself the following questions:

- 1) Is the calf too weak to suckle soon after birth?
- 2) Has the cow abandoned the calf or refused the calf access to suckle soon after birth?
- 3) Has the calf experienced a difficult birth or been exposed to bad weather that might interfere with its ability to suckle?

If you answered yes to any of these questions, you may wish to force-feed colostrum to the calf. First, attempt to use colostrum from the calf's mother. If this is not available, use stored dairy colostrum or a colostrum supplement. Under grazing situations, it is best to administer a single fluid feeding so that the calf is handled only once. In this case, it is important to use an esophageal feeder. The esophageal feeder will allow a 3-L volume to be easily administered. This volume is not excessive for the calf, but will allow a large amount of Ig to be administered in a single fluid feeding.



**Figure 2.** Effect of age of calf on the percent absorption of immunoglobulin through the calf intestine.



**Figure 3.** Figure 3. Effect of Ig source on apparent absorption of Ig at 24-h in colostrum-deprived calves. Colostrum treatment delivered 50 g Ig/L. Supplements consisted of a commercial milk-derived supplement (Supplement 1; First Milk Formula, Procor Technologies Inc., Arden Hills, MN), a commercial milk-derived supplement from another company (Supplement 2; Colostrx, Protein Technology Inc., Santa Rosa, CA), and a bovine-serum-based supplement (Bovine Serum; LifeLine, American Protein Corp., Ames, IA).