



Hand-raising a baby calf requires a commitment to providing adequate nutrition, housing, and care to give the calf the best chance to grow into a healthy, productive adult. This information is designed to help provide a better understanding of generally accepted calf management guidelines and how each recommendation benefits the calf. It is not intended to provide treatment recommendations - there is no substitute for sound information from your veterinarian.

**Source of Information for the Following Article:**  
**Feeding, Management Important to Optimize Rumen Development**  
**Feedstuffs, July 1996**

Proper development of the rumen is an important task that can be controlled to benefit both the calf and producer. The process of rumen development does not occur “magically”, and with the right management, the cost of raising a calf can be decreased, according to J.D. Quigley III, an associate professor in the department of animal science at the University of Tennessee. [Dr. Jim Quigley is now the V.P. and Director of Calf Operations for APC, Inc. in Ankeny, IA.]

Depending on the cost of feed and labor, raising a calf can cost anywhere from \$1,000 to \$1,500. Poor management, disease and high feed costs add to this expense. Important considerations in regard to feed costs during the time of rumen development (birth to approximately three months) are the source of the liquid feed and the age of weaning. [Calves fed milk for more than 10 weeks can have double or triple the feed costs of calves fed milk for 4-5 weeks.] Additionally, calves with a well developed rumen at weaning are less susceptible to disease and gain more body weight with lower management and labor costs.

**RUMEN DEVELOPMENT FACTORS**

Dr. Quigley notes five things that are needed to cause rumen development:

- Establishing bacteria in the rumen
- Having liquid in the rumen
- Material flowing from the rumen
- Absorptive ability of the tissue
- Substrate (hay and grain)

**Establishing Bacteria in the Rumen**

Even though the rumen is sterile at birth, by day one of age, there are numerous bacteria, mostly *aerobic* (oxygen-using) in the rumen. The number and types of bacteria change as dry feed intake and the type of substrate change. It has been shown that there is no difference in the total number of bacteria between calves fed only milk to eight weeks of age and of those fed both milk and grain. There was, however, a large decrease in the number of aerobic bacteria in week two in calves that were offered grain from birth. The same decrease happened at week nine when calves fed only milk were first offered grain in week eight.

**Having Liquid in the Rumen**

In order to ferment substrate, bacteria within the rumen must live in an environment that contains water. Without enough water, bacteria cannot grow and rumen fermentation is decreased. This is not a problem if water is offered to calves at an early age, but many producers do not provide free choice water to calves until they reach four or more weeks of age. Milk or milk replacer cannot be considered water because it bypasses the rumen and reticulum until the calf is about 12 weeks old. Feeding water can increase body weight gain, starter intake and reduce scours.

**Material Flowing from the Rumen**

Material begins flowing from the rumen (muscular activity) as early as three weeks in calves that are fed milk and grain shortly after birth. For calves fed only milk, rumen contractions may not be measurable for longer periods.

**Absorptive Ability of the Tissue**

The ability of the rumen to absorb the end products of fermentation is another important development factor. The rumen must have developed *papillae* of the *epithelium layer* [absorptive skin cells on fingerlike projections in the rumen] in order to absorb nutrients. *Volatile fatty acids* [a primary energy source produced by rumen bacteria through fermentation], are believed to contribute to this papillae development. Development of the epithelium is mainly controlled by chemical, not physical means, concluding that rumen development is aided by the availability of dry feed, particularly starter.



### **Substrate (Hay and Grain)**

The availability of substrate is a key factor in developing the rumen. In order to promote early rumen development and allow early weaning, the best option is to make grains available. Dry feed intake, especially starter intake, is needed to maximize rumen development. Producers should follow these recommendations:

- Feed milk or milk replacer at 10% of the birth bodyweight. Only increase the amount of milk as the calf gets older to adjust to environmental conditions such as [cold] winter [temperatures].
- Offer fresh calf starter ad libitum [free choice, as much as the calf will eat] daily. Keep feed buckets clean.
- Make water available to calves from four days of age, keeping the buckets clean.
- Offer hay 1-2 weeks after weaning.
- Careful management can be used to wean calves as early as 4-5 weeks of age, [provided they are consuming 1-2 pounds of calf starter daily, are healthy and growing well].

There are many quality commercially available calf starters on the market that are palatable and provide the necessary nutrients for rumen development. It is important, yet inexpensive, for calf starters to provide vitamin B supplements and a coccidiostat to provide protection against coccidial infection. Palatability of calf starter is generally highest with textured feeds, followed by complete pellets. Calves do not like mashed feeds as well, and palatability and intake are usually lower than the other types of feeds. Fines in pelleted calf starters will also decrease intake.

### **ADDITIONAL RESOURCES**

For an extensive selection of calf management articles by Dr. Jim Quigley, visit [www.calfnotes.com](http://www.calfnotes.com). Your livestock veterinarian and local university extension agent are also excellent resources for calf management information, as well as many online sources. Please visit the Learning and Resource Center at [www.savacaf.com](http://www.savacaf.com) for some helpful online links.