

Why you should hold off on feeding forage to calves

DEVELOPING the rumen of newborns is one of the more important and interesting areas of calf nutrition. From the standpoint of efficiently and economically feeding heifers, developing the rumen to serve as a fermentation chamber for grain and forage is fundamental.

Many of the components of our current calf-raising programs are aimed at fostering rumen development. This involves enabling the calf to become an efficient user of grains, various by-products, and forages as soon as possible. Our goal is giving the calf the ability to satisfy much of its own protein and energy requirements for growth by producing sufficient microbial

protein and volatile fatty acids.

Rumens change two ways . . .

Rumen development involves two different aspects . . . changes in the physical size and changes in the wall thickness and papillae formation of the rumen.

Changes in physical size of the rumen are greatly affected by diet. At birth, the rumen is small and underdeveloped, compared to the other compartments of the stomach system. The rumens of calves fed only milk or milk replacer will remain quite small, even if fed increasing amounts of liquid feeds.

However, the abomasum, or true stomach, will grow while the rumen remains proportionately small. As long as a calf is fed liquid feeds, growth and development of the rumen wall and papillae will be restricted.

The size difference is especially obvious when comparing the rumens of milk-fed calves and calves fed milk supplemented with grain, forage, or both. The interesting aspect is that the calf may appear to be normal and growing rapidly, but the rumen remains underdeveloped.

A calf with an underdeveloped rumen really shows up at weaning when the calf becomes unthrifty and

possibly unhealthy, due to its inability to digest grain and forages. This restricts the calf's growth for two to four weeks after weaning.

Changes in the structural formation of the rumen of the young calf include formation, development, and elongation of papillae and thickening of the rumen walls. Diet can drastically affect structural formation changes. Butyric acid, an end product of rumen microbial digestion of grains but not forages, is the volatile fatty acid believed to stimulate the growth of rumen papillae by providing tissue in the rumen wall with energy.

Figure 1. Rumen development is slow with just milk and hay



THERE IS LITTLE DEVELOPMENT of rumen papillae among calves fed just milk and hay during the first 12 weeks of life. Forage intake is variable, and its limited digestion does not provide the levels and types of rumen acids needed for desirable rumen development.

Figure 2. Feeding grain early stimulates rumens



NOTICE THE PAPILLAE DEVELOPMENT in the tissue of these calves which were fed grain starting at just a few days of age, in addition to their milk. Calves given grain have more developed rumens at 4 weeks than hay-fed calves do at 12 weeks.

To address the issue of feeding forage at a very early age, we have done some studies comparing the rumens of calves fed milk and high-quality alfalfa hay from birth until 4, 8, and 12 weeks of age. In addition to some consumption of hay, these calves were fed large amounts of milk replacer to maintain relatively high growth rates.

As you can see from Figure 1, there was little growth of the rumen papillae over this 12-week period. The papillae are only slightly more developed than the papillae found in milk-only fed calves.

Despite eating moderate amounts of hay, there is minimal papillae development, and the rumen wall is quite thin.

Papillae development and thickening of the rumen walls are limited because the fermentation end product of hay which primarily is acetic acid is not utilized by the rumen wall for growth and development. If these calves were weaned from milk and allowed to eat only grain and forage, at any of the time periods shown in this photograph, you could expect these calves to have little or no overall body growth for two to three weeks. Once rumen development occurs, the calf would be expected to continue to grow at normal rates.

Grain makes difference . . .

Now look at Figure 2, and note the rumen papillae of calves fed moderate amounts of milk (10 percent of body weight) and free-choice grain at 4, 8, and 12 weeks of age. At each stage, as the calf ages, the papillae are larger and the rumen walls are thicker and more developed. Having larger rumen papillae adds surface area of the rumen, enabling greater nutrient absorption.

Another structural change occurring in the rumen wall of grain-fed calves is a greater vascularization or blood capillary growth. This is noticeable visually by a darkening in color of the rumen walls. Greater vascularization allows for more absorption of rumen microbial end products, primarily VFAs, into the blood stream of the calf. In fact, the rumen development of the 4-week-old calf on moderate amounts of milk supplemented with grain (Figure 2) is greater than the 12-week-old calf fed large amounts of milk supplemented with hay.

Feeding a small amount of grain along with water will create a good environment for rumen fermentation and, therefore, butyric acid production in the rumen. This, in turn, develops a more functional rumen that can

better digest grains and, later in life, forages.

The process of developing rumen papillae is self-generating. You can enable a calf fed grain early in life to have a tremendous amount of rumen development by 3 to 4 weeks of age. This is why we recommend feeding grain early, thus stimulating rumen development and enabling you to wean at an earlier age.

Before they get forage, calves should be consuming 5 to 6 pounds of grain. Those that are started on grain late or do not eat a substantial amount of grain early in life are at a definite disadvantage. Rumen development of calves fed milk, grain, and forage will vary, depending on the calf's preference of feeds. Giving this choice also will create a great amount of variability in calf growth within groups.

The bottom line on feeding forage to calves is . . . yes, they need it. But the rumen must be well developed and functional to operate efficiently and to make the best use of the forage for continued growth of the calf. The key to rapid rumen development and a functional rumen in time for weaning is to offer grain to calves early and ensure that grain is consumed early. This gives the calf the opportunity for maximum rumen papillae development early in

life. Prolonged, high levels of milk or replacer will not satisfy this requirement.

Hay after weaning . . .

We recommend feeding moderate amounts of milk and grain until weaning. Offer milk or replacer at 10 to 12 percent of body weight at birth, and remain at that level until weaning.

For a typical Holstein weighing 90 pounds at birth, this would be 9 to 11 pounds of liquid feed (as-fed) per day. After weaning, continue feeding grain until calves are eating 5 to 6 pounds per day. Then add forage free-choice, as calves desire more dry matter intake.

At this time, the calves will have a well-developed rumen and will be able to utilize efficiently the forages and grains that are fed. This program will provide continued growth at rates adequate to get heifers into the milking string by 22 to 24 months with weights of 1,250 pounds or more.



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