

Boosting Rumen Development in Dairy Calves: The Role of Calf Starter

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Introduction:

Calf rearing is the process of raising a calf from birth to 12 weeks of age to ensure it is healthy, strong, and well-grown. The main goal of calf rearing is to transition the calf from a milk-based diet to a solid feed-based diet. When dairy calves are born, they are essentially monogastrics or simple stomached animals with a non-functioning rumen and reticulum. They rely on the nutrients supplied from milk for their nutrition. The nature of solid feed and the amount consumed can influence rumen development. Highly palatable “starter” feeds, containing easily fermentable carbohydrates, are thought to stimulate rumen development, including changes in the epithelium of the forestomach.

Liquid Diets/ Milk Diets:

When milk is consumed by the calf, it empties directly into the omasum, not the rumen or reticulum, and then flows into the abomasum or the calf’s true stomach. This is the result of closure of the esophageal groove. The esophageal groove is a muscle that creates a tube when the calf drinks milk that allows milk to bypass the rumen and enter the omasum and then abomasum. The esophageal groove is stimulated by nerves which may be triggered by the taste of the milk, position of sucking, temperature of the milk, or other possible factors. Therefore, when a calf is on a solely milk or milk replacer diet, nothing enters the rumen. The milk goes directly to the omasum and then abomasum instead. This occurs regardless of how the milk is fed.

Rumen Development

Rumen fermentation starts at a very young age and VFA concentrations increase with

increasing solid feed intake. Rapidly fermentable dietary carbohydrates (e.g., sugars and starch) yield more butyrate and propionate at the expense of acetate in the rumen, whereas the incorporation of slowly degradable carbohydrate (e.g., fiber) reverses this effect. For rumen development, the rumen microbes must have moisture, a fermentable substance, and heat to result in the development of the rumen papillae. Papillae are the finger-like projections on the surface of the rumen that absorb nutrients from the rumen contents. Without papillae, nutrients cannot be absorbed. These absorbed nutrients are used by the ruminant animal for maintenance and growth and milk production later in life. Because milk bypasses the rumen through the esophageal groove, calves need to be fed a fermentable substance and water that will go into the rumen. It is important to start feeding the fermentable substance and water early because the quicker the rumen papillae develop, the more nutrients can be absorbed, the faster the animal grows, and the sooner the calf can be weaned. If water is not provided separately from milk, rumen development will be reduced. There is no need to worry about heat for fermentation since it is provided by the body temperature of the calf.

The Importance of Grain:

The rumen microbes provide nutrients to the calf by fermenting feedstuffs into volatile fatty acids (VFAs) which are absorbed by the papillae and used to make energy for the calf. There are three main VFAs: acetate, butyrate, and propionate. Much research has shown that of these three VFAs, butyrate is the most potent stimulator of rumen papillae development. Therefore, butyrate will allow for the quickest and best rumen development.

Butyrate is made by the breakdown of concentrates by the rumen microbes. Therefore, grains must be fed for butyrate to be absorbed. Forages do not work as well since they are broken down to produce the VFA acetate, which will not result in rumen papillae development as quickly.

Feeding Calf Starter:

Calf starter is a highly nutritious concentrate mixture containing all the nutrients in proper proportion required for optimum growth and is used as a partial substitute for whole milk in the ration of calves. It is as good as a high-quality concentrate mixture having 23-26% protein with, at least 18% DCP and 75% TDN. Since quality of protein is very important to calves until their rumen is fully functional, animal protein supplements such as fish meal should be included in calf starters. Urea should not be included in calf starters. At the age of 7-15 days the feeding of grain mixtures may be started. In order to get calves accustomed to grain mixtures, place a small handful of grain mixture in the used pail. As the calf is finishing its milk it may

consume a portion, or one may offer a little in the hand immediately after feeding milk. Excessive protein rich grain mixture is not desirable as milk is already rich in proteins. A medium protein grain mixture is most suitable when milk is fed freely. A grain mixture of oats - 35 percent, linseed cake - 5 percent, bran - 30 percent, barley - 10 percent, groundnut cake - 20 percent may be fed to the calves. Another good mixture consists of ground maize - 2 parts, wheat bran - 2parts. A good quality calf starter has an easily digestible fiber source that will prevent parakeratosis, or a build-up of dead cells on papillae that block absorption of nutrients. Oats are commonly used as this fiber source. Finally, good calf starters contain a feed additive which helps prevent coccidiosis.

Conclusion:

Calf starter improves calf health, reduces weaning stress, minimizes growth-inhibiting factors, lowers the risk of diarrhea, boosts the immune system, and supports rumen development.