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Ruminant Nutrition

VetTechPrep POWERPREP

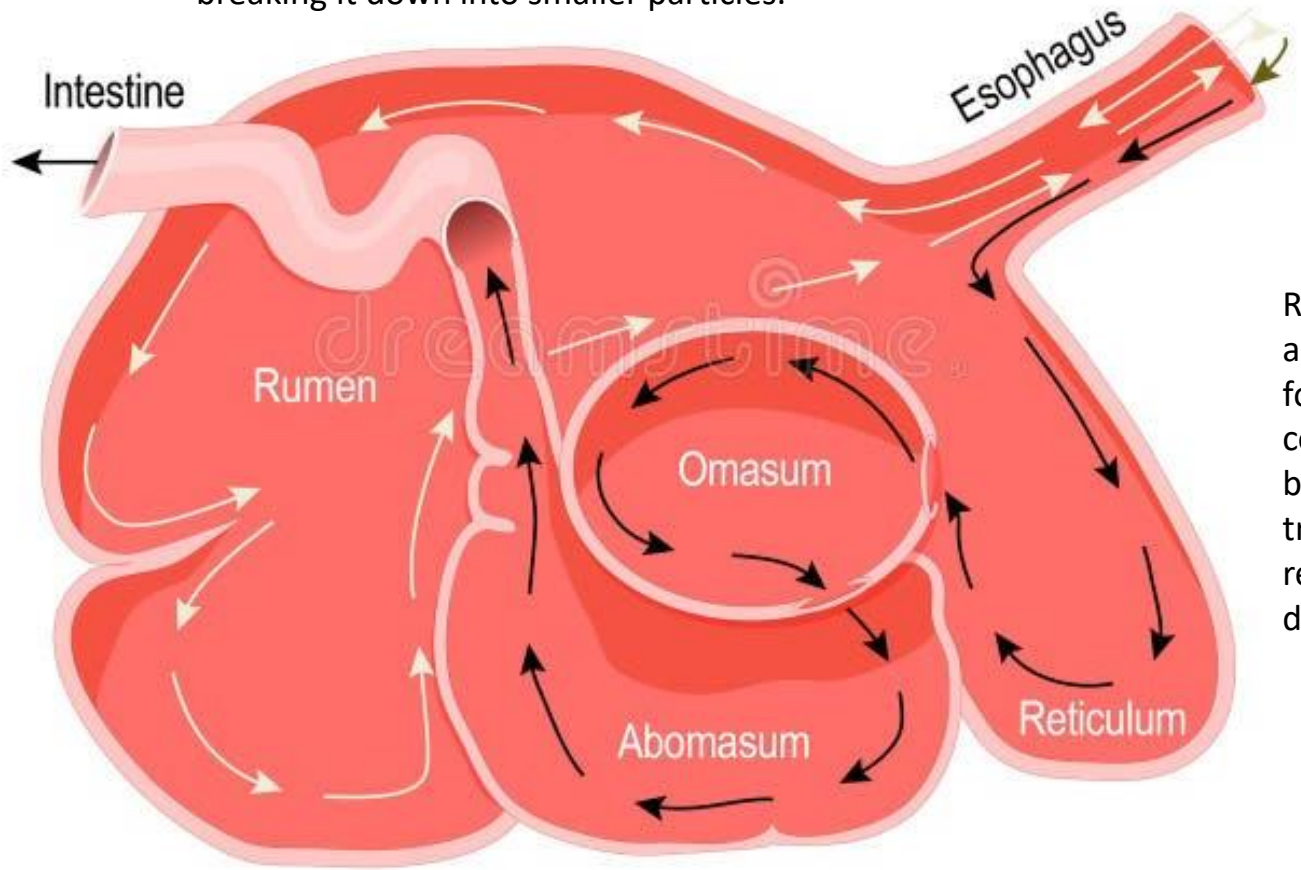
Ruminant Digestive Tract

Rumen-
Microbes in the rumen ferment feed and produce VFA's, Vitamin B, Vitamin K and amino acids.

-In a neonate the esophageal groove allows milk to bypass the rumen and go directly into the abomasum. Rumen development occurs once calves, kids, and lambs begin consuming feed and forage.

Healthy animals have one to two rumen contractions each minute. Poor rumen movement may indicate a sick animal.

Omasum- Absorbs nutrients and removes water from feed breaking it down into smaller particles.



Reticulum- Has a honeycomb appearance and is responsible for microbial digestion. It is a common location for foreign bodies like a piece of wire to get trapped, resulting in traumatic reticuloperitonitis or "hardware disease".

Abomasum- The "true stomach" secretes digestive enzymes and absorbs nutrients. A common location to discover parasitic infections such as Haemonchus contortus during a necropsy. The brown stomach worm Ostertagia can cause lesions to the lining of the abomasum, resulting in a cobblestone or Moroccan leather appearance to the mucosa.

Ruminant Nutrition

- Nutrient requirements for ruminants include protein, energy, vitamins, minerals, and water. Nutrient requirements vary dramatically among these animals and are influenced by age, weight, stage of production, growth rate, environmental conditions, breed, gender, and other factors.

Ruminant Nutrition

- Ruminants have daily requirements for a certain quantity of specific nutrients such as protein, calcium, and vitamin A. The necessary concentration of these nutrients in the diet is then determined by the amount of feed the animal is expected to consume, given free-choice access to feed or forage.
- Dry matter is the dried portion of animal feed after water has evaporated.
- Forage can be hay or grass.
- Dry matter or forage intake can fluctuate for various reasons, including the animal's weight, body condition, stage of production, level of milk production, forage quality, amount and type of supplement or feed provided, and environmental conditions.
- Cold stress increases dry matter intake, while heat stress reduces dry matter intake.

Ruminant Nutrition

- Calves and yearlings are typically fed higher quantities of concentrate feeds to improve weight gain and feed conversion.
- Implants are used to increase the rate of growth and increase feed efficiency. Implants contain natural or synthetic compounds that produce physiological responses in the animal, similar to natural hormones. Implants are typically made of powder compressed into a small pellet. The pellet is inserted, or implanted, under the skin in the animal's ear using a needle. Using implants in beef production poses no safety risk to beef consumers.
- An ionophore is a feed additive that shifts ruminal fermentation patterns, which can improve cattle feed efficiency. These products are also helpful in decreasing the incidence of bloat and acidosis and preventing coccidia infections.
- Growth-promoting implants decrease feed intake by an average of about 6%, whereas ionophores added to feed decrease feed intake by about 3%. Both of these practices improve feed efficiency and daily gain, reducing resource usage.

Ruminant Nutrition

- Proteins are large chemical units made up of hundreds of amino acids. Amino acids, in turn, are organic or carbon-containing compounds that also contain nitrogen, oxygen, and sometimes sulfur. Animals consume proteins in their diets, then utilize the amino acids for synthesis to build muscles, blood proteins, and other body components. In swine, poultry, and other nonruminants, the amino acids must be supplied in definite proportions in the diet. However, in ruminants, microorganisms (bacteria and protozoa) break down most dietary proteins and incorporate the nitrogen and amino acids into their body tissue.
- These microorganisms are digested in the small intestine of the ruminant animal.

Ruminant Nutrition

- Gestation has little effect on the cow's protein requirement until about the seventh month of pregnancy. About two-thirds of the fetal growth occurs during the last one-third of pregnancy and the protein intake of the cow should be increased during the last one-third of pregnancy to ensure the cow will be in good condition at the time of calving.
- The cow is designed to care for the fetus at the expense of her own body. Therefore, loss of body condition can occur during late pregnancy if daily protein or energy is inadequate to meet the cow's and growing fetus's requirements.
- Adequate dietary protein during this period is also essential for the cow to produce abundant, high-quality colostrum or first milk, which will influence the newborn's immune system for the remainder of its life. Lactation is the most nutritionally stressful activity for the cow. The beef cow produces around 25 pounds of milk each day during peak lactation. Milk contains a high concentration of protein. Therefore, lactating cows, particularly during early lactation, require nearly twice the daily protein of dry cows.

Ruminant Nutrition

- Volatile fatty acids (VFA) are produced in large amounts through ruminal fermentation and are vital in that they provide greater than 70% of the ruminant's energy supply.
- Acetic acid is utilized minimally in the liver and is oxidized throughout most of the body to generate ATP.
- Proprionic acid is almost completely removed from portal blood by the liver. Within the liver, proprionate serves as a major substrate for gluconeogenesis, which is critical to the ruminant because almost no glucose reaches the small intestine for absorption.
- Butyric acid, most of which comes out of the rumen as the ketone beta-hydroxybutyric acid, is oxidized in many tissues for energy production.

Ruminant Nutrition

- Replacement heifers need to gain about 1 pound to 1.5 pounds per day to reach 55% to 65% of their expected mature weight and puberty by 15 months of age. They also need to gain around 1 pound per day from the time they are bred until they calve to reach approximately 80% of their mature weight when they calve for the first time.
- Beef heifers should have a body condition score of 6/9 prior to calving.
- Beef cows should have a body condition score of at least 5/9 prior to calving.
- Cows in moderate condition at calving should at least maintain body weight from calving to rebreeding for good conception rates. Failure to consider the increased protein and energy demand from lactation may result in long intervals before rebreeding.
- Beef cattle are body condition scored on a scale of 1-9.
- Dairy cattle and small ruminants are body condition scored using a scale of 1-5.

References

Lalman, D (2023) Nutrient Requirements in Beef Cattle, Oklahoma State University Extension. https://extension.okstate.edu/fact-sheets/print-publications/e/nutrient-requirements-of-beef-cattle-e-974-a.pdf