

Lecture-6

Disturbance of rumen function

The digestive process in the rumen involves the interplay between many species of bacteria and other microbes. The proteins and carbohydrates are fermented to short chain fatty acid, which are the energy sources for ruminants.

Acute rumen Indigestion

- When the animals consuming roughages are overloaded with readily fermentable carbohydrates, high concentrations of lactic acid accumulate in the rumen and subsequently in the blood.
- Rumen bacteria produce mixture of lactic acid, L-lactic acid is absorbed and metabolized but D- lactate cannot be utilized, which contributes to the acid load. This result in metabolic acidosis.
- Lactic acid accumulation in the rumen reduces the pH to 5 or less , which allows the growth of acid producing bacteria. Accumulation of lactate increases the osmolality of the rumen, which results in the absorption of water from the systemic circulation. This causes severe dehydration, which in turn may lead to hypovolemic shock.

Bloat

- The gases (co₂ , methane) produced during the rumen fermentation are removed by the process called eructation. When the process is blocked gas produced by the rumen microbes cannot escape and the pressure is increased, which causes acute tympany, leading to death.
- Two general types of bloats are Simple bloat (Free gas) and frothy bloat (Foamy).
- When cattle consumes legumes, which contains soluble plant proteins a stable froth is formed in which gas is trapped as small bubbles which are eliminated by eructation.
- When cattle are with high concentration diet, formation of extracellular dextran slime by amylolytic bacteria in the rumen is the cause of stable foam.
- A plant enzyme pectin and pectin methyl esterase act on pectin to release pectic and galacturonic acids, which increases the viscosity of the rumen fluid resulting in the formation of stable foam.
- Presence of tannins inhibits microbial activity, hence acts as an antibloat agent.
- Non ionic detergent with surfactant property can be used for treatment eg. Sodium alkyl sulfonate.

Urea poisoning

- Ammonia and other NPN substances metabolized to ammonia are used by microbes to synthesize microbial proteins, which are subsequently utilized by the ruminants for the synthesis of body proteins.
- Urea poisoning develops when urea is fed at more than 3% level as urea is hydrolysed to CO_2 and NH_3 by urease enzyme of ruminal bacteria. (excess urea result in release of excess of ammonia in excess of what the liver can tolerate). The free ammonia crosses the cell membrane thereby producing harmful effects.

When acetic acid is given orally, the proton of acetic acid converts free ammonia to ammonium ion, which reduces the absorption of NH_3 . The NH_3 , which has no charge, will diffuse freely, whereas ammonium ion is charged, diffusion is prevented.