CHAPTER-8

Metabolic Disorders and Deficiency Diseases in Dairy Animals-Bloat, mineral and vitamin deficiency diseases

Objective

To study the causes and possible line of control and treatment of various metabolic and deficiency diseases in dairy animals.

Introduction

Diseases of metabolic origin are commonly known as metabolic disease viz., bloat, acidosis, milk fever, hypomagnesimia. However, few common metabolic diseases encountered in herd/ flock management are discussed in the chapter. In addition to these disorders, deficiency of one or more nutrients are also causes huge economic loss to the farmers. In the rumen, microbial fermentation occurs due to unique structures and environment. Microbes converts fibrous feeds which are of no use for human beings to important product viz., milk meat, hair and fibre etc. Some bacteria and protozoa have isolated from rumen with their fermented products and pathways. Name of the fermented products with the products is presented in the following table.

Organism	Nature	Fermented end products
Bacteroides succinogenes	Cellulose (fibre of forages) fermenting bacteria	Acetate, butyrate, succinate, formate, lactate
Butyrovibrio fibrisolvens		
Ruminnococcus flavifaciens		
Bacteroides amylophilus	Starch and sugar fermenting bacteria	Acetate, formate, propionate, lactate
Succinomonus dextrinosolvens		
Selenomonus ruminantium		
Streptococcus bovis		

Common species of rumen bacteria, protozoa and their fermented products

Pepostrepcoccus elococci	Protein degrading bacteria	Acetate, propionate, butyrate, valerate etc.
Bacteroides ruminicola		
Methanobacterium ruminantium	Methanogenic bacteria	Methane
Isotricha prostoma	Wide variety of sugars and bacteria	Store starch, H⁺
Isotricha intestinalis		Volatile fatty acids
Dasytricha ruminantium	Many sugars, cellobiose	
Entodinium caudatum	Starch and bacteria	
Entodinium bursa		
Diplodinium dsitaceum	Starch, bacteria, cellulose and hemicellulose	-
Diplodinium dentatum		
Diplodinium cristagalli		

Any irregularity like sudden change of feed ingredients, roughage to concentrate ratio, specific physiological change or disease may lead to ruminal dysfunction or system, resulting in metabolic disorder in ruminants.

Bloat

The condition is also known as tympany or hoven and results in either due to excessive production of gas or physical obstruction in the process of eructation gas from rumen. It is a clinical condition where rumen and reticulum are filled with gasses of fermentation due to excessive highly fermentable feeds, fodders like lucerne, berseem, clover etc, some time gas bubbles remains intimately adhered with the ingesta, the condition called frothy bloat. Symptoms of generalized enlargement of rumen (left side of the animal), extension head, protrusion of tongue, restlessness, anorexia, ruminal motolity goes high initially followed by hypo- motility and later atony may be observed. If the animals not treated in time, animal may die.

Treatment: Trocarization to remove the gas, carminative mixtures and mineral or vegetable oil for immediate treatment. Dimethicone suspension (bloatosil, bloatonil) may also be the drug of choice for bloat to rumen directly through syringe or orally.

Acidosis

Accidental ingestion of excessive carbohydrate containing grains like maize, rice, wheat, barley, potato etc there is formation of lactic acid in huge quantities in rumen, resulting in lowering pH from 6.8 to about 5.0 or so. This results in accumulation of more fluid form rumen wall and circulatory system due to high osmolarity of lactate. This may lead to dehydration, oligourea and anurea causing ruminal stasis and laminitis.

Treatment: Sodium bicarbonate 2.5-5.0 percent solution 500 ml to 1 lit through i/v route, 7 percent solution 200-500 ml. pH correction by $MgCO_3$, MgO, $Mg(OH)_2$ or $NaHCO_3$. Corticosteroid may be injected to prevent shock.

Ketosis

It is a condition of relative or absolute lack of carbohydrate in the hepatic cells leading to oxidation of fats, resulting in production of ketone bodies i.e., acetoacetic acid, β - hydroxyl butyrate and acetone. All carbohydrate feeds in the rumen on fermentation produces VFAs i.e, acetate, propionate and butyrate along with some branched chain fatty acids. Among which, acetate and butyrate are ketogenic whereas propionate (glycogenic) are the major one and produced in the ratio of 65:25:10. The ratio if changed due to feeding or any other reason caused ketosis. It may be primary where starvation/ underfed for longer period and secondary where any disease or syndrome causes starvation to the animal. But clinically ketosis may be of four type i.e., alimentary, spontaneous, nervous and milk fever type.

Treatment: 1. 500- 800 ml of 40-50 percent dextrose solution through i/v route.

- 2. Glycerine of glycerol @100 gm twice daily for 2-3 days.
- 3. Sodium propionate@ 100-200 g once daily for 3 days.

Milk fever

It is also known as parturient peresis, is a metabolic disease occurring mostly within 72 hrs of parturition in adult female and is characterized by hypocalcaemia, changes in neuromuscular tone ranging from fine tremor in early stages to peresis, recumbancy, circulatory collapse and ultimately diminution of conciseness. Temperature is generally subnormal in advance stages. There is muscle weakness and flaccidity of muscles. Hypocalcaemia may be termed as deficiency disease but since the deficiency of Ca in feed is not the main factor of disease and there are other causal factors, the disease termed as metabolic disease rather than a deficiency disease. In case of low intake of Ca and excretion through milk in high producing animals leads to the disease.



Treatment: Effort should be to supplement Ca to the infected animals. If it is not done in proper stage, lateral incumbency for longer time may cause death of the animal.

- 1. Ca borogluconate through i/v route @ 250-500 ml
- 2. Ca Mg borogluconate-same dose.
- 3. Vitamin D_3 or cholecalcipherol single dose i/m route @ 8mg prior to 3 4 days calving in high producing animals.

Grass tetany

Metabolic disease of cattle, sheep, goat and even horse characterized by hyper- aesthesia, in coordination and convulsion as a result of altered Mg homeostasis. Young green pasture is generally poor in Mg than mature grass. Low soil Mg or heavy application of K rich fertilizers in pasture may lead to Mg deficiency in grass and subsequently to the animal lead to grass tetany. Other factors like excessive production of ammonia in rumen prevents absorption of Mg, reduction of dry feed intake etc may lead to grass tetany among the livestock.

Treatment:

- 1. Administration of Mg salt like MgSO4 (10-20%) @ 200-300 ml (s/c route).
- 2. Mifex @ 1 bottle (500 ml through i/v route and 500 ml through s/c route).
- 3. Mg gluconate 15% solution @ 200-300 ml s/c route.

Fatty cow syndrome

Recently the milk production has increased few folds with the demand and improved feeding system, but the dairy cows or small ruminants found to be associated with an increase in the incidence of some emerging diseases like fatty cow syndrome or pregnancy toxaemia. The diseases occurs sporadically depending on feeding and management practices. Mobilization of excessive fat from body depots to liver due to in appetence either because of deprivation of feed or sudden demand for energy in the immediate post partum period leads to this disease. Symptoms like inappetance, dull and depression etc. may be seen but its always associated with other metabolic diseases.

Treatment: Glucose, Ca and Mg to be supplemented through i/v route. Propylene glycol orally @ 100 mg daily for 10 days. Choline chloride may be tried @ 50 g (50 percent solution) in a single dose. Mild exercise and fresh green fodder feeding may also be beneficial.

Rickets and osteomalcia

A deficiency of vitamin D in the young animals results, a disease of growing bone in which the deposition of calcium and phosphorus is disturbed. Normal calcification can not occur in the absence of adequate Ca and P. therefore either a deficiency of vitamin D which impaired utilization of Ca or a deficiency of Ca and or P will produce the abnormalities in the skeleton. As a result of this, bones are weak and easily broken. In most of the cases legs may become bowed. In young animals symptoms like swollen knees, hock joints and arching of back. In growing animals bone ash reduced and weight gain may be depressed. Vitamin D deficiency can be prevented by only a few moments exposure to sunlight, although skin pigmentation affects the amount of sunlight required to prevent rickets. Injection of vitamin D also needed to prevent to this deficiency symptoms. In adults the symptoms called as osteomalacia. In elderly humans, this also causes osteoporosis which characterized by reduction of bone mass, resulting in tendency to fracture. Adequate supply of vitamin D or Ca and P in 2:1 ratio may give beneficial effect.

Pica

Deficiency of Ca and P causes rickets in youg animals and as the deficiency progresses appetite reduced and growth is retarded. Deficient animals often have depraved appetite and may chew on wood and rods and other inappropriate objects. This abnormal behaviour of eating called pica. Adults fed low P diets may exhibit pica and bone density decreased as in rickets. Impaired fertility may also be observed.

Anaemia

Iron, copper and cobalt deficiency may lead of anaemia which is characterized by change in size of red cells and quantity of hemoglobin.

Review Questions

- 1. Differentiate metabolic diseases and deficiency diseases.
- 2. What is acidosis and how it differs from bloat?
- 3. Why milk fever occurs in high producing dairy animals?
- 4. What is pica and how it is to be prevented?
- 5. What are the ketone bodies and how it is formed in dairy cows and buffaloes?