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Popular Article

Pregnancy toxemia/Twin lamb disease/Pregnancy ketosis in small ruminants

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Introduction

The pregnancy toxemia in ewes is a nutritional metabolic disorder towards end of the gestation period which is caused by poor carbohydrate and fatty acid metabolism. The predisposing factors for the illness are nutritional deficit in sheep during late pregnancy, which is brought on by a diet low in energy or a reduction in rumen capacity due to fetal growth. Ewes must consume enough food during pregnancy to maintain their bodies' normal metabolism and also for proper development of fetus. Toxemia specifically manifests in the final 5–6 weeks of pregnancy, when the fetuses have developed to around two-thirds of their gestational potential. In the last six weeks of pregnancy, about 80% of fetal growth occurs, with the fetal-placental unit utilizing 30–40% of the mother's glucose supply (Rook, 2000). Fat stores are mobilized in considerable amounts if ewes do not obtain at least half of the necessary energy at this time (Firat and O'zpinar, 2002) and in consequent to excessive fat mobilization the ketone bodies like Beta Hydroxybutyric (β -HB) acid accumulate. Hypoglycemia and hyperketonemia are symptoms of pregnancy toxemia.

Etiology

The most important reason for pregnancy toxemia is negative energy balance in last 6 weeks of gestation because during this time there is rapid fetal growth which demands higher energy requirement. However, the negative energy balance predisposes the ewe for pregnancy toxemia. This condition can be classified under 5 categories as mentioned below:



1. *Primary pregnancy toxemia*: this is most common condition and mainly due to deprivation of nutrition owing to some routine management practices like shearing, dipping etc. Furthermore, reduction in feed intake due to mould and fungus ultimately results in negative energy balance.
2. *Fat ewe pregnancy toxemia*: this condition occurs when there is excessive feeding in late gestation resulting in excessive accumulation of fat in animal body. As a consequence, the animal shows less interest for feed intake during last weeks of gestation resulting in mobilization of excessive fat from body reserve.
3. *Starvation pregnancy toxemia*: this is mainly seen in emaciated animals due to lack of proper nutrition.
4. *Secondary pregnancy toxemia*: this condition usually occurs when there are any concurrent health complications which results in reduced feed intake, excessive drainage of glucose and other nutrients.
5. *Stress induced pregnancy toxemia*: this is rare cause for occurrence of this condition.

Incidence and prevalence

This disease mainly occurs in intensive farms because in these farms animals usually carry twins or triplets. It is more common in last 6 weeks of gestation and the risk factors include poor quality ingested energy, multiple fetuses, drop in dietary energy level, hereditary variables, obesity, unhealthy low parasite load, lack of activity, and ewes bearing many pregnancies (Rook, 2000). Olfati and Moghaddam (2013) found that crossbred ewes carrying multiple pregnancies are considerably more prone to go into ketosis. Additionally, this condition has been noted in ewes that are malnourished and have only one big fetus (Bani Isail et al., 2008). The intensity and kind of nutritional restriction, as well as the percentage of the flock that is at risk, all influence the occurrence in a flock. Incidence of starvation pregnancy toxemia is high whereas it is lesser for fat pregnancy toxemia. Unless therapy is started early in the clinical course, the case fatality rate is significant. If left untreated, it results in 100% ewe death and high neonatal mortality. Case fatality rates can still be significant even with early treatment (Radostits,2006).

Factors influencing disease condition

There are multiple factors which directly and indirectly affects the pregnancy toxemia. Some of the factors are discussed as follows:

1. **Pregnancy**: The disease only affects ewes in the final six weeks of pregnancy, usually during the last month, with the last two weeks of pregnancy seeing the highest incidence. This is due to a sharp increase in the need for metabolizable energy during the final six weeks of pregnancy. Because twin



pregnancy enhances an ewe's sensitivity to hypoglycemia stress and pregnancy toxemia, it mostly affects ewes carrying twin lambs. (Kelay, A. and Assefa, A., 2018).

2. **Body condition:** Other risk factors for the disease's commence include poor physical condition, advanced age, obesity, and low body weight. In situations that involve obesity during late gestation, the abdominal cavity is occupied by a developing uterus and deposited fat. These females struggle to consume enough feed to fulfil their requirements for energy due to a lack of rumen area (Pugh, D. 2002). Ewes in low physical condition are also unable to consume enough food to meet both their own nutritional demands and their fetuses' energy requirements. This is because weak, susceptible ewes are frequently given insufficient feed, and when there is not enough energy to satisfy growing fetal demands. The ewe mobilizes more body fat, which leads to the formation of ketone bodies and hepatic lipidosis (Kahn, C. 2005).
3. **Diseases:** Pregnancy toxemia may develop sooner or later depending on the presence of other illnesses such foot rot, foot abscess, and parasites. Since these circumstances severely restrict feeding, the animal experiences a negative energy balance.
4. **Environmental conditions:** Environmental stressors like rain and cold temperatures make pregnant sheep need more energy, which causes stress (acute) syndrome. Transportation, shearing, using crutches, or being soaked all result in stress and can hasten the condition.
5. **Parity:** condition more common in older ewes.
6. **Breed:** this condition more common in breeds which are with high fecundity.

Pathogenesis

The liver enhances gluconeogenesis in late gestation to improve the fetuses' availability of glucose. In late gestation, each fetus needs 30–40 g of glucose per day, which is a significant amount of the ewe's glucose output and is preferentially used to maintain the fetuses rather than the ewe (Kelay, A. and Assefa, A., 2018). This is because the final six weeks of pregnancy are when the fetus grows by about 70%. In order to ensure adequate energy in the face of rising demands of the developing fetuses and impending lactation, mobilization of fat stores is accelerated in late gestation. However, in a negative energy balance, this increased mobilization may be too much for the liver to handle, leading to hepatic lipidosis and consequent function degradation. Hepatic lipidosis causes inadequate gluconeogenic responses in ewes, which results in hypoglycemia, increased lipid mobilization, and an accumulation of ketone bodies and cortisol in response to the expanding fetuses' continuing, preferred demands for glucose. Sargison claims that ketone bodies (BHBA and



acetoacetate), that are strong acids, build up in the blood and cause metabolic acidosis. It appears that the impairment of ketone bodies removal in late pregnancy promotes the development of pregnancy toxemia, especially in ewes carrying twins, since hyperketonemia has various negative consequences, especially on energy balance and glucose metabolism (Schlumbohm, et al 2003). This disease also shows encephalopathy which is mainly due to hypoglycemia.

Clinical finding

Separation from the group, failure to rise for feeding in pastoral animals or standing close to the trough with the sheep but not eating in housed animals, altered mental state, and apparent blindness, which is manifested by an alert bearing but a disinclination to move, are the earliest signs of pregnancy toxemia. Affected animal become dull, sluggish, anorectic, and appear blind. As the disease progresses the lips twitch, the jaws clench, and salivation are brought on by tremors of the head muscles. These are followed by a cog-wheel-like clonic contraction of the cervical muscles that results in the head bending forward or sideways and then circling. There is noticeable fatigue between convulsions, which may be followed by head pressing, the adoption of bizarre postures like the "stargazing" posture where the chin is raised, as well as a lack of coordination and falling when attempting to move around. There will be usual constipation with dry and scanty faces. Affected sheep typically become recumbent in 3–4 days and then experience a 3–4-day period of extreme depression or coma and die if left untreated.

Diagnosis

There will be hypoglycemia, ketonemia, and ketonuria. However, hypocalcemia and hyperkalemia may be seen as a result of severe ketoacidosis. Serum BHB concentration in sub-clinical condition will be ≥ 0.8 mmol/L and in case of clinical disease it will be ≥ 3 mmol/L.

Differential diagnosis

1. Hypocalcemia: it is mainly followed by some kind of stress and at one time many animals from one flock will be affected along with this animal will show recovery with calcium therapy.
2. Listeriosis: fever will be there along with history of silage feeding
3. Acidosis and rabies: history of accidental overfeeding of grains and dog bite respectively.

Treatment

This condition can be treated by parenteral therapy using 50% dextrose intravascular in conjunction with 20-40 Unit zinc Protamine Insulin intramuscularly for 3 days. However, if the animal is in standing condition, the condition may be favorable and if it is in recumbent then the



prognosis is poor. Fluid therapy should be done along with glucose therapy for fluid, electrolyte and acid-base balance. For supplementing parenteral glucose therapy, oral propylene glycol or glycerin with dose of 110gm/day can be given. In early cases when ewes (with more than 135 days of gestation) are in lesser severe condition cesarean or parturition can be induced with 16-25 mg of dexamethasone.

Prevention

Provision of enough energy in rations, particularly during the last 4-6 weeks of pregnancy reduces the chances of its occurrence. However, there are many factors which need to be taken care of like sudden feed changes, stress, parasitism and provision of enough feeders spacing to prevent this condition. Furthermore, at lambing, a body condition score of 3 to 3+ will greatly help towards its prevention (Gordan, 2012). Grain is a good source of readily available energy. Around the last 4-6 weeks of pregnancy, feeding 0.5-1 kg of grain per day together with high quality hay will help reduce pregnancy toxemia in sheep.

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