PREGNANCY TOXEMIA IN SHEEP AND GOATS

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Pregnancy toxemia is most common in the pregnant ewes or does in the last 6 weeks of gestation who are carrying multiple fetuses. It is also called twin lamb disease, lambing or kidding sickness or lambing paralysis. It is uncommon in dams carrying singletons or in maiden animals. Although uncommon, it can also occur in beef cattle, usually in underconditioned heifers that are still growing. In does and ewes it can affect both under and overconditioned animals.

The root cause of pregnancy toxemia is negative energy balance due to increased fetal energy demands late in gestation; 80% of fetal growth occurs in the last 6 weeks. Ewes carrying twins or triplets require 200-250% more dietary energy than those carrying single lambs. The growing fetus not only demands a large amount of energy, but the enlarged uterus takes up progressively more abdominal space reducing rumen capacity. The growing fetus relies on glucose for development. Glucose is produced in the dam's liver from volatile fatty acids produced in the rumen or from fat mobilized from the dam's fat stores. Late gestation animals have decreased insulin levels which spare glucose for the fetuses and stimulate the adipose tissue to mobilize fat and the liver to manufacture glucose. This is a delicate balance and failure to take in adequate nutrition leads to inability of the liver to synthesize sufficient amounts of glucose and mobilized fat impairs liver function leading to ketone production which further suppresses appetite, exacerbating the condition.

Risk factors for development of pregnancy toxemia are multiple fetuses, improper, declining or interrupted nutrition and stress from management, weather, transport, shearing, predators, or concurrent disease. There are also individual animal factors such as insulin resistance, which render susceptible animals less efficient at responding to fluctuations in blood glucose.

There are four clinical syndromes that can lead to pregnancy toxemia. The first is primary pregnancy toxemia which is precipitated by any brief decline in nutrition, most commonly a management factor that leads to a brief fasting such as transport. Secondary pregnancy toxemia is precipitated by a concurrent illness that decreases feed intake in the affected animals. If over-conditioned animals are affected the syndrome is termed "estate" ketosis. Abdominal fat accumulation decreases the ability of the rumen to fill appropriately and leads to inadequate feed intake. Starvation associated pregnancy toxemia is generally caused by mismanagement or unavailability of feed resources.

Clinical signs and diagnosis

Pregnancy toxemia should be suspected whenever a late pregnant ewe or doe appears sick, and if you have any history of late-pregnant animals exhibiting signs of weakness followed by death in 3-10 days. Clinical sings include anorexia, weakness, neurologic signs (depressed mental status, incoordination, impaired vision, head pressing, muscle tremors, subtle convulsions, lip twitching, and star gazing), constipation, teeth grinding, recumbency and death. Animals that become recumbent have a grave prognosis. Clinical pathologic findings include ketonuria and ketonemia, hypo or hyperglycemic (hyperglycemia does not rule out pregnancy toxemia), metabolic acidosis, hypocalcemia, and hypokalemia. At the end stages of disease, animals can develop an azotemia. Changes on a CBC often include a nonspecific neutrophilia. Serum beta-hydroxybutyrate (BHB) levels can be useful for diagnosis and also for herd level monitoring. In a well fed ewe, serum BHB concentrations should be less than 0.5 mmol/L, whereas when ketonuria develops BHB concentrations exceed 0.7 mmol/L. At the flock/herd

level an average of less than 0.8 mmol/L is normal, 0.8-1.6 mmol/L indicates malnutrition and BHB concentrations above 1.6 mmol/L indicate severe malnutrition. For postmortem diagnosis, BHB can be measured in aqueous humor and a concentration of over 2.0 mmol/L is considered diagnostic.

Treatment

Once an animal is showing clinical signs, she requires swift treatment as symptoms can progress quickly. In some cases an animal can go from seemingly normal to recumbent within a few hours. Once an animal is recumbent their prognosis worsens substantially. An important consideration in deciding on a treatment strategy is the value of the dam vs the offspring. If the value of the dam is of utmost importance, removing the fetuses via emergency Caesarean section or induced kidding/lambing should be considered. This approach gives the best prognosis for the dam. If the offspring are valuable and a reliable breeding date exists it is possible to induce parturition and get live lambs/kids if you are within a week of their due date. The closer the due date, the better the chances of live offspring. Does can be induced with a combination of dexamethasone and prostaglandin, whereas ewes can be induced with dexamethasone alone. Due to the debilitated condition of the dam she may not be able to give birth on her own. It is common for birthing assistance or Caesarian to be required even after induction of parturition. This can be due to generalized weakness from toxemia and metabolic acidosis or specifically due to hypocalcemia and decreased uterine contractility. The risk of retained fetal membranes is also higher in these animals.

Regardless of whether a Caesarean section is performed, supportive care for the dam is of utmost importance. For animals in very early stages of pregnancy toxemia oral electrolyte solutions containing bicarbonate and oral propylene glycol may help if the doe or ewe is still eating. However once the animal is off feed, propylene glycol is not effective and its bitter taste may cause animals who are eating small amounts to go off feed altogether. The cornerstone of supportive care is providing energy to correct the negative energy balance. This is most effectively done in the form of intravenous dextrose. These animals are also often in mild to severe metabolic acidosis and this should also be addressed and corrected with intravenous or oral sodium bicarbonate solution. Hypocalcemia is a common finding and is most easily addressed by subcutaneous or oral administration of 50 ml 23% calcium borogluconate solution. Note that administering calcium and sodium bicarbonate in the same solution will cause precipitation of calcium carbonate and is thus contraindicated. Animals may be placed on systemic antimicrobials if secondary septicemia is suspected.

Encouraging affected animals to eat is important and transfaunation with rumen fluid from a healthy donor animal may help stimulate appetite, rejuvenate a “sick” rumen, and deliver energy substrates and glucose precursors. Clients should be counselled however to avoid syringe feeding large amounts of simple sugars such as Karo syrup as this can lead to rumen acidosis which can compound the animal’s metabolic acidosis and compromise rumen health.

For recumbent animals, care must be taken to avoid problems caused by the recumbency itself. Small ruminants tend to develop limb contracture when recumbent, so daily movement and stretching of limbs can help increase recovery times and outcomes.

Prevention

Providing appropriate types and amount of feed for late gestation dams is the key to prevention of pregnancy toxemia. Animals carrying multiple fetuses should be provided extra supplementation. An

effective method for accomplishing this is to perform pregnancy diagnosis and fetal counts with ultrasound at 40-90 days of gestation. This allows separation of the herd into groups and appropriate feeding of those animals carrying 2 or more fetuses. It also allows the producer to know if any of the dams are carrying high numbers fetuses, and to monitor these animals more closely for any signs of pregnancy toxemia in the third trimester of gestation. It is important to provide high quality feed to multiparous dams as their rumen has less space to fill. Concentrate feeds including grains or pelleted rations are ideal, but high protein forages such as alfalfa can also be used for this purpose. Separating animals based on numbers of fetuses also helps dams carrying singletons not to become over-conditioned.

Reduce any management related stressors in the third trimester. Avoid transporting animals or movement to new pens. Avoiding changes in pen-mates is especially important for goats that will often fight to re-establish the hierarchy after new additions. These dominance issues may keep animals from eating appropriately and abdominal trauma from fighting could injure the fetuses or cause abortions. Appropriate preparations for inclement weather should also be made to assure that animals have adequate access to feed. Dam should be healthy and free of chronic diseases, have good teeth, and free lameness. Herd level monitoring of blood BHB concentrations can also be helpful. As discussed above, BHB concentrations > 0.7 mmol/L suggests a negative energy balance.