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Pregnancy Toxemia (Ketosis) in Goats

Introduction

Pregnancy toxemia is a metabolic disorder that occurs in does during the late stage of gestation. Does that have low energy levels are more susceptible to toxemia. This low energy level is caused by a sudden increase in nutritional demands as a result of rapid fetus development. Under these conditions, the doe's body is depleted of carbohydrates that are used to produce glucose or sugar. When this condition occurs, rumen capacity decreases as the uterus expands to handle the growth of one or more fetuses.

Pregnancy toxemia can occur in young and old does with good or poor body condition. Studies have shown, however, susceptibility to pregnancy toxemia to be higher in older, fatty animals carrying multiple fetuses.

During pregnancy, the doe's body resorts to another source of energy when carbohydrates are in low supply. This alternative source involves the production of glucose from other noncarbohydrate substances to facilitate glucose availability to the fetuses. These events often coincide with the beginning of milk production. During late gestation, an average of 30 to 40 grams of glucose a day per fetus is required to meet metabolic demand. If the doe's body does not meet this demand, its body will store use fat as an energy source. This mechanism of breaking down stored fats will consequently overwhelm the liver's capacity, result in hepatic lipidosis or fatty liver, and ultimately, impair liver function. As the doe's body progresses in mobilizing more body fatty tissue, it will produce highly toxic byproducts or ketone bodies that are released into the blood circulation, causing an increase in hepatic fat accumulation.

Signs

Pregnancy toxemia occurs frequently within 1 to 3 weeks from kidding, and it is associated with prepartum mortality in a doe herd. The first signs of pregnancy toxemia are:

- Little or no appetite
- Depression
- Lethargy or sluggishness
- Muscular imbalance or poor coordination, known as ataxia
- Grinding of teeth
- Blindness

Does become so weak they are forced to lie down and, in most cases, will not be able to rise again; legs are usually tucked underneath the body. They also have sweet or foul-smelling breath when there is a high level of ketones or toxins in the blood. These symptoms may occur within a few hours to 2 days from the onset of signs. If symptoms persist, does could progress to coma or even death. A doe's death is attributed to reduced liver and kidney function. When the doe dies, the fetus or fetuses also die. However, if a fetus dies and is not removed quickly, septicemia will occur, carrying the pathogen throughout the doe's bloodstream.

Diagnosis

For an accurate diagnosis of pregnancy toxemia, a differential diagnosis is important to determine this metabolic disorder from other disorders with similar signs such as hypocalcemia or hypomagnesemia, resulting from low calcium or magnesium levels in the blood. Other disorders with similar symptoms include diseases that affect the nervous system such as polioencephalomalacia, enterotoxemia, rabies, listeriosis, and lead poisoning. When possible, a quick laboratory analysis is important to diagnose and treat pregnancy toxemia.

As with many diseases, a prompt diagnosis and proper care leads to successful treatment. A clinical diagnosis is fundamental and consists of the histories of the animal and herd, the identification of the clinical signs, and detection of high levels of ketone bodies in the urine. Ketone bodies can be determined by using commercial, quantitative tests (e.g., Ketostick). Prognosis is given by the levels of acidosis, dehydration, and hepatic and renal failure that occur.

At necropsy, does present fatty infiltration of the liver, enlargement of adrenal glands, and atrophy of the kidneys.

When available, laboratory analyses can be useful tools for diagnosis; however, producers must be mindful of associated costs. In most cases of pregnancy toxemia, the levels of glucose in the blood are normal, and some affected does have shown hyperglycemia (higher levels of glucose in the blood). Thus, the levels of glucose in the blood are not a good indicator for the diagnosis of pregnancy toxemia.

Treatment

The success of the treatment depends upon the diagnosis of pregnancy toxemia in its early stages. Does can be successfully treated with 60 to 90 ml of propylene glycol administered orally 2 to 3 times per day, along with the administration of insulin. Administer 20 to 40 IU protamine zinc insulin intramuscularly every other day to help restore glucose uptake.

- Administering electrolyte solutions containing 5 percent dextrose orally, intravenously, or subcutaneously is also recommended.

If the doe is in a comatose state, the treatment is frequently costly and prognosis is poor. Treatment methods include:

- Administer orally propylene glycol, 4 ounces/4 times a day. Alternatively, Nutri-Drench can be substituted for propylene glycol. Administration of sodium bicarbonate solution intravenously or orally is also used to treat ketoacidosis.
- If possible, consider an ultrasound to determine the number of viable fetus(es) the doe is carrying.
- Consider the induction of labor in a doe that is near term or parturition using 15 to 20 mg dexamethasone intravenously or intramuscularly. Consult your local veterinarian if a Cesarean section is needed.
- In the case of fetal death, a fetotomy, which is the removal of fetal tissues and placenta, is recommended, followed by the administration of an antibiotic such as procaine penicillin G at 20,000 IU/kg, to prevent infection.
- Consider the administration of vitamin B complex intramuscularly and probiotics orally.

Treatment should be discontinued when the doe presents signs of improvement.

Prevention

A good feeding management practice is needed at the late stage of pregnancy. During the last 6 weeks of gestation, provide grain as it is an essential source of carbohydrates. Does carrying multiple fetuses should be fed adequate energy-TDN levels (Tables 1 and 2). Producers should be mindful that the levels of energy in the diet might vary depending on forage quality and availability, doe body weight and condition score, and the number of fetuses the doe is carrying. It is important to balance the levels of protein in the concentrate because protein must be available for ruminal microbial function. The primary sources of energy found in forages are the large and complex carbohydrate molecules, cellulose, hemicelluloses, and pectin. The doe's body cannot digest these components of the forages, but the rumen microbial population can. The bacteria and protozoa of the rumen will degrade cellulose and hemi-cellulose and, consequently, supply energy to the doe.

Consider supplying concentrated rations with ionophores. Ionophores increase the ruminal utilization of volatile fatty acid propionic acid, which, in turn, will be used in the production of energy. Also, avoid stress and sudden dietary changes at late pregnancy.

NOTE:
Some products mentioned in this article are considered extra-label products for use in meat and dairy goats. Consult a veterinarian before using extra-label products and for disease treatment and prevention.

Tables adapted from *Meeting the Daily Nutrient Requirements of Goats* (NRC, 1981) from document presented by J. Marcos Fernandez, Ph.D., Department of Animal Science, Louisiana State University, Baton Rouge, Louisiana.

Table 1. Meeting the Daily TDN (Energy) Requirements for Goats

Criteria	BW (lb)	BW (Kg)	Protein (gram)	Energy-TDN (gram)
Maintenance --under confinement	22	10	22	159
With little to no grazing	44	20	38	267
	66	30	51	362
	88	40	63	448
	110	50	75	530
	132	60	86	608
	154	70	96	682
	176	80	106	754
Maintenance-low grazing	22	10	27	199
	44	20	46	334
	66	30	62	452
	88	40	77	560
	110	50	91	662
	132	60	105	760
	154	70	118	852
	176	80	130	942
Growing 0.11lb/day			14	100
Growing 0.22lb/day			28	200
Growing 0.33 lb/day			42	300
Late pregnancy			82	397
Lactation (per lb 3% fat milk)			29	153
Lactation (per lb 4% fat milk)			33	157

Table 2. A Pregnant Doe (130 lb) in Late Pregnancy, Kept in Backyard

Production function	Nutrient requirements (gram)			
	CP, g	TDN, g	Ca, g	P, g
Maintenance only	105	760	4.0	2.8
Late pregnancy	82	397	2.0	1.4
TOTAL daily requirements	187	1,157	6.0	4.2

References

Bickhardt, K., Grocholl, G, and König G. (1989). Glucose metabolism in sheep in different reproductive stages and with ketosis using the intravenous glucose tolerance test. *Zentralbl Veterinarmed A, 36*(7), 514-529.

Drackley J. K., Kim, Y. K., Strang, B. D., and Young, J. W. (1989). Metabolic responses of lactating goats to feed restriction and dietary 1,3-butanediol. *Journal of Dairy Science, 72*(12), 3204-3211.

Freetly, H. C. and Ferrell, C. L. (1998). Net flux of glucose, lactate, volatile fatty acids, and nitrogen metabolites across the portal-drained viscera and liver of pregnant ewes. *Journal of Animal Science, 76*(12), 3133-3145.

Harmeyer, J. and Schlumbohm, C. (2006). Pregnancy impairs ketone body disposal in late gestating ewes: Implications for onset of pregnancy toxaemia. *Research Veterinary Science, 81*(2), 254-264.

Marteniuk, J. V. and Herdt, T. H. (1988). Pregnancy toxemia and ketosis of ewes and does. *The Veterinary Clinics of North America: Food Animal Practice, 4*(2), 307-315.

National Research Council. (1981). *Nutrient requirements of goats.* Washington, DC: National Academies Press.

Merck & Company, Inc. (2006). Pregnancy toxemia in ewes: Twin lamb disease, pregnancy ketosis, sleeping ewe disease. In: *The Merck Veterinarian Manual.* New Jersey: Merck & Company, Incorporated.

Rook, J. S. (2000). Pregnancy toxemia of ewes, does, and beef cows. *Veterinary Clinics of North America: Food Animal Practice, 16*(2), 293-317.

Schlumbohm, C. and Harmeyer, J. (2004). Hyperketonemia impairs glucose metabolism in pregnant and nonpregnant ewes. *Journal of Dairy Science, 87*(2), 350-358.

Van Saun, R. J. (2000). Pregnancy toxemia in a flock of sheep. In: *Journal of American Veterinary Medical Association.* Retrieved December 1, 2008, from http://avmajournals.avma.org/doi/pdf/10.2460/javma.2000.217.1536.

West, H. J. (1996). Maternal undernutrition during late pregnancy in sheep: Its relationship to maternal condition, gestation length, hepatic physiology and glucose metabolism. *British Journal of Nutrition, 75*(4), 593-605.

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