

Teaching goat clients to prevent pregnancy toxemia

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Abstract

Pregnancy toxemia is a frequent and important disease of prolific does in late gestation, resulting in high mortality of does and loss of valuable kids. Veterinarians can play an important role in preventing losses from pregnancy toxemia by training owners to recognize management factors predisposing to disease, and by teaching them to prioritize observations and develop management strategies to decrease the risk of pregnancy toxemia in the herd. Utilization of ultrasound pregnancy diagnosis, including staging and enumeration, accurate identification and recordkeeping, are the cornerstones of these strategies. Monitoring of body condition, adjusting timing and amount of lead-feeding according to risk, and adapting penning or identification strategies to appropriately feed and closely monitor the highest-risk animals, while providing a system for early detection and treatment of clinical disease, are key to minimizing the impact of pregnancy toxemia in the goat herd.

Key words: caprine, goats, pregnancy toxemia, ketosis

Résumé

La toxémie de gestation est une maladie fréquente et importante chez les chevrettes prolifiques tard en gestation. Elle entraîne une forte mortalité et la perte de précieux chevreaux. Les vétérinaires peuvent jouer un rôle important dans la prévention des pertes reliées à la toxémie de gestation en formant les producteurs pour qu'ils puissent reconnaître les facteurs de régie qui prédisposent à la maladie et en leur montrant comment prioriser les observations et développer des stratégies de régie pour décroître le risque de toxémie de gestation dans le troupeau. Au cœur de ces stratégies, on retrouve l'utilisation du diagnostic de gestation par échographie, incluant le stade et le dénombrement, une identification adéquate et une bonne tenue de dossiers. Afin de minimiser l'impact de la toxémie de gestation dans le troupeau, on suggère fortement de surveiller la condition corporelle, d'ajuster selon le risque le moment et la quantité d'aliments offerts en consommation libre, d'adapter les stratégies pour loger les animaux et les identifier afin de nourrir adéquatement et de surveiller les animaux les plus à risque tout en mettant en œuvre un système pour la détection précoce et le traitement des maladies cliniques.

Introduction

Pregnancy toxemia or pregnancy ketosis is a disease of goats in late gestation where the doe's energy intake is unable to keep up with the rapidly increasing nutritional demands of her fetuses, resulting in a ketoacidotic condition. Signs of ketosis span the range from subclinical ketosis, with ketones detectable on breath or demonstrable in urine ketone tests, or by changes in blood chemistry without noticeable changes in behavior, to severe clinical signs with recumbency, coma, and death. Does with mild clinical ketosis are mildly depressed and have depressed appetite, but few other signs. Does developing severe clinical ketosis are severely depressed, may show neurological signs, or are found down and unresponsive. Treatment for severe ketosis takes aggressive medical intervention, and is often unsuccessful in saving the life of the doe and her kids, so the key to managing ketosis in the dairy or meat goat herd is to have intensive management and observation of pregnant does, employing feeding and social management strategies to maximize energy intake, minimize stress, and reduce the likelihood of clinical disease. Training owners to recognize management factors that contribute to pregnancy toxemia, and helping owners to adopt strategies that optimize observations and practices that minimize risk factors, can significantly reduce the incidence and mortality from this economically important disease.

Subclinical ketosis can be treated by identifying ways to increase energy density and overall energy intake in the face of decreasing rumen capacity and increased selectiveness in feed preferences of late-gestating does. Early pregnancy toxemia cases can be treated with nutritional supplementation (for example, propylene glycol) which provides an energy source utilizable by the rumen. Cases quickly advance to become complex metabolic disease with acidosis/ketosis, hypocalcemia, and other secondary metabolic disorders requiring intravenous fluids, correction of the acid/base status, and restoration of blood electrolytes. Induction of kidding or emergency Cesarean-section may be needed to save the life of the doe or the kids. Close monitoring of late-gestating does, with early detection and treatment, are critical to achieving the best response to treatment of pregnancy toxemia.

Predisposing Risk Factors and Management Strategies to Minimize Risk

Protein and energy demands due to fetal growth and development increase exponentially during the last month of gestation. As the number of kids increases, the demands obviously increase. Unfortunately, the doe's ability to meet these increasing needs is compromised. As pregnancy advances, the capacity of the rumen to ingest high volumes of feed is decreased by the increasing size of the uterus. In overconditioned does, the mass created by large omental fat stores further limits feed intake. In sheep, ewes with 2 or more fetuses are thought to be at higher risk of pregnancy toxemia (hence the term "twin lamb disease"). In goats, twins would be the "norm", and risk of pregnancy toxemia is more commonly associated with pregnancies of 3 or more kids in otherwise healthy does. Older does, does with concurrent disease or musculoskeletal problems limiting mobility and feed intake, and other factors limiting energy balance in late gestation increase a doe's risk of ketosis.

Body condition (degree of fleshing or fat/muscle reserves) is an important indicator of does' nutritional status and ability to withstand increased energy demands. Ideally, does should dry-off and freshen with a body condition score of 3.5 to 4.0 (on a 5-point scale). Late-gestational does with minimal body stores (2.5 or below) are at increased risk of clinical ketosis due to insufficient energy reserves to meet the late gestational mismatch between energy demands and dry matter intake. Does with excessive body fat (4.5 or greater) have increased risk of compromise from hepatic lipidosis (fatty liver disease) as well as the reduced potential abdominal capacity (limiting feed intake) from accumulation of omental fat.

Accurate Animal Identification, Breeding and Pregnancy/Ultrasound Records

Unique permanent individual doe identification and easily observed visual identification are critical to any disease prevention and control program. Record-keeping systems that assure best compliance so that the information gathered is complete and can be trusted when herd and animal decisions are being made is essential. A detailed record system with incomplete or incorrect information is less useful and sometimes more dangerous than a simple "barn friendly" system. Oftentimes greater compliance and accuracy can be achieved using a simplified approach. Mistaken identification/ultrasound results may result in erroneous group assignments, or worse, iatrogenic abortion from inappropriate prostaglandin administration or other errors in treatment or management. Attention to detail will maximize

the usefulness of records data. Accurate breeding dates, confirmed conception dates, and kidding due-dates are critical to making accurate assessments of body condition, clinical status, and understanding time of greatest risk for pregnancy toxemia. Accurate knowledge of due-dates, for example, can be used to plan induction of kidding, either as a herd kidding management strategy or to minimize terminal pregnancy complications in a high-risk doe.

Impact of Concurrent Disease on Risk of Pregnancy Toxemia

Diseases which Cause Weight Loss or Generalized Disease

Does compensating for existing diseases may develop more severe disease and potentially death from these diseases in late gestation or soon after kidding. Further, these diseases may contribute to a doe's weight loss and inability to maintain energy balance in late gestation, increasing the likelihood of pregnancy toxemia in an otherwise low-risk animal. Older does should be examined for dental disease conditions (e.g. loose teeth, infected tooth roots), and appropriate treatment and/or dietary adjustments made. Maintaining optimal control of internal and external parasites by monitoring fecal egg counts and utilizing appropriate deworming strategies can decrease risk of pregnancy toxemia and optimize transition of does to successful lactation. Does with infectious diseases like Johnes disease (*Mycobacterium avium* ssp *paratuberculosis*) or caprine arthritis-encephalitis are more likely to show clinical disease, including weight loss, in the "peripartum" period. Animals with caseous lymphadenitis (*Corynebacterium pseudotuberculosis*) may also have chronic weight loss; internal abscesses of the liver may compromise a doe's liver function, making an otherwise survivable case of pregnancy ketosis a fatal one.

Diseases or Conditions which Decrease Mobility

Routine hoof trimming before late gestation will help does maintain the agility and mobility needed to maximize time eating, prevent tendon injuries, and maintain social standing in the herd. Caprine arthritis-encephalitis, mycoplasmosis, and other infectious causes of arthritis cause debilitating loss of mobility as well as the many other problems arising from these infections. Proper selenium and copper nutrition and supplementation where needed will optimize skeletal and cardiac muscle soundness and support proper immune function.

Confirm by Ultrasound Breeding Dates and Litter Size

Confirmation of pregnancy to a specific breeding date is critical for managing the dry period, late gestation, and kidding. The doe should be ultrasounded

(or other confirmatory test used) to confirm pregnancy status and stage of gestation; her body condition score (1 to 5) should be determined; and a dairy doe should be dried-off 60 days before her expected due date. Accurate prediction of the 60-day dry period is needed to avoid an antibiotic residue when intramammary dry-treatment is used; proper dry-treatment is necessary for adequate colostrum secretion and optimal milk production in the ensuing lactation. Blood tests for pregnancy (e.g. pregnancy-specific protein B, Biopryn®; estrone sulfate) may be used to confirm pregnancy; ultrasonography may allow determination of gestational stage, fetal number, and fetal well-being (or impending/recent abortion), as well as provide an opportunity for the veterinarian to detect risk factors or early signs of disease. Ultrasound staging of pregnancy is used to confirm gestation dates in hand-mated herds and to estimate conception dates (to plan kidding management) in pasture/pen-bred herds or groups. Staging of pregnancy is most accurate early in gestation (35 to 75 days). Pregnancies greater than 95 days gestation are too advanced to allow accurate staging, and are categorized as “advanced.” Gestational age can be subjectively assessed based on size of fetus and placentomes, or the size of the amniotic vesicle in early gestation. Parietal diameter measurements can be used if indicated. Accurate determination of conception date is essential for herds using induction of parturition.

Fetal enumeration (counting) is most accurate when performed early in gestation (40 to 75 days). Pregnancies greater than 90 days allow reporting of multiple fetuses when observed, but are too advanced to provide consistent results. Enumeration exams are usually categorized as single, twin, and triplets-or-greater pregnancies; pregnancies with more than 4 fetuses are reported when detected, but cannot be consistently determined. If expected litter size (fetal enumeration) has been determined, does can be grouped by fetal number (and dam body condition) and fed appropriately in late gestation to maximize energy intake and minimize risk of pregnancy toxemia. Disparity between ultrasound predictions of litter size and number of kids actually born may help to define embryonic death and presumed abortion losses. Does with triplet-or-greater expected litters and problem does (age, mobility) can be supplemented or started on lead feed at 4 to 6 weeks before kidding instead of the more usual 2 to 4 weeks before kidding, or can be provided increased supplementation and frequency of feeding, depending on their age, health status, and body condition.

Add Visual Identification to High-Risk Does and other Does Requiring Closer Observation

Does may be grouped according to parity and gestational stage in order to assess well-being by risk group; use the other does as cohorts for evaluating feeding be-

havior and body condition. Within groups, it is helpful to identify high-risk does, does with special needs, and does with a previous history of problems for closer observation during feeding and for detection of early signs of ketosis. For example, does expecting triplets (or more) could receive a red plastic collar at time of vaccination 1 month before the expected due date. In herds where does are not broken into groups by due date, additional collars could be used to indicate month due. So a doe due to kid in March might wear a red and a white collar, and so on. This gives the observer added information to assess does by direct visual exam, and can serve as a reminder of overdue management events when no collars have been applied.

Monitor for Changes in Body Condition

The importance of body condition (degree of fleshing or fat/muscle reserves) as an important indicator of does' nutritional status and ability to withstand increased energy demands was discussed earlier in these proceedings. An important distinction should be made between body weight and body condition. Gestating does will increase in body weight during late gestation due to rapid growth of the fetus, placental fluids, and placenta, even if her body stores are being depleted (loss of body condition). Does should dry-off (assuming a 60-day dry period) in optimal body condition and should freshen in the same body condition (degree of fleshing)—assessment of body condition should be employed as a normal part of lactating doe management, and should be continued through the dry period. Body condition can be assessed at the individual level, and records kept for changes in status. A more practical approach to using body condition information in management of gestating does is to monitor the pen/group, look at the overall status, and then identify does that stand out as below or above the optimum. Decreased body condition in 1 or 2 individuals could be addressed by increasing supplementation of those individuals; decreased body condition in more than 1 or 2 individuals reflects a group problem with energy balance and should be addressed by increasing supplementation for the entire group in order to prevent loss of condition in additional does. To utilize this strategy, the “group” needs to be defined as animals in similar stage of gestation, either by pen assignment or visible ID (such as color-coded collar).

Feed Does in Early Gestation Appropriate for Litter Size to Maintain Healthy Condition

During lactation, feed does at maintenance and to support milk production, and use the late lactational period as a time to achieve optimal body condition for does going dry. In the early dry period, avoid overfeeding does with single fetuses and over-conditioned does, such as those with prolonged dry periods or tendency to

accumulate flesh. For older does (> 7 yrs), watch body condition carefully, as many older does (with and without concurrent health problems) require more supplementation of feeds with high energy density to maintain their body condition. Particular attention should be paid to older does with long hair coats and all does during adverse weather conditions; these conditions may reduce the owner's ability to observe actual body condition in the face of increasing maintenance energy demands.

Feed Does in Late Gestation Appropriate for Litter Size and Body Condition to Adjust to Changing Conditions

All does require optimal nutrition to meet the increasing energy and protein requirements in the last month of gestation to support optimal fetal growth, maintain health, and encourage mammary development for successful lactation after kidding. Owners are sometimes tempted to use the dry period to reduce fleshing in overweight does. This should be avoided in late gestation. Poor nutrition of otherwise healthy does during late gestation impacts birth weight of kids, colostrum quality, lactation performance, and risk of postpartum metabolic disease.

Older pregnant does may have greater difficulty maintaining adequate body condition. Conversely, does previously having single births or does previously aborting or having extended non-lactating periods are more likely to be overconditioned. Does at both extremes of body condition that are carrying multiple fetuses are at increased risk of pregnancy ketosis in late gestation. The herd should have a normal transitional feeding (lead feeding) program to allow supplementation of energy in late lactation and transition of the rumen flora to a concentrate (grain) feeding to avoid acidosis in early lactation. Strategies to prevent pregnancy toxemia involve identifying high-risk does and maximizing their energy intake. These include increasing frequency of feeding (maximize total dry matter intake per day), start lead-feeding sooner (increase energy intake), and providing feeding systems that enable does with reduced mobility and ability to compete with the maximal opportunity to eat the best-quality feed. By identifying high-risk animals, owners can target supplemental feeding toward does with the highest needs, and avoid over-supplementing does without exceptional need.

Feeding Facilities and Practices to Prevent and Aid in Early Detection of Pregnancy Toxemia

Avoid Changes in Social Grouping and Prevent Injuries

Does in late gestation, especially those carrying 3 or more kids, are increasingly predisposed to tendon injuries and to accidents from slipping or falling as pregnancy advances. Examine the housing and handling areas to assure even and stable footing for awkward does

in late gestation. Check for unstable paneling, projecting objects, and other environmental factors which could increase risk of injury directly or as a result of herdmate contact. Group does with consideration of social order and avoid mixing new groups late in gestation. Subordinate does or does with reduced mobility can be separated within a pen by paneling to allow unimpeded access to feed bunks, and to avoid rib fractures and other injuries that may result from herdmate interaction.

Increase Feeder Space or Partition Pens to Allow High-Risk Does Unlimited Access to Fresh Feed

The increasing abdominal mass of does in late gestation increases the feedbunk space needed to feed the same number of does. As the doe's agility declines in later gestation, her ability to maintain feeder access is compromised, so the does most in need of uninterrupted access to the best or freshest feed are often the least able to compete for it. Adding extra feeders or dividing pens can improve feed access for high-risk does.

Observe Feeding Behavior

When hay or grain is placed in feeders, every doe should be observed to move to the feeders. This should be the time that every animal is observed for appetite, mobility, and attitude. Does that remain down should be gotten up and observed to eat; this encourages those with limited mobility to exercise and assures that they have access to fresh feed. Aggressive does may be removed from the group and restrained while other does eat. While does are at the feeder, care should be taken to observe the amount of feed actually consumed, as many does with partial anorexia will be observed as eating while their actual intake may be very small. Again, segregated feeding for problem animals may be the only way to assure access and maximize feed intake in high-risk animals.

Fully Utilize Management Information

Owners should make a calendar schedule to start lead-feeding and other management events. Especially early in the kidding season, errors like missed vaccinations, delayed start of lead-feeding, and unexpected kiddings are more likely to occur because elements of annual routines are forgotten or slip by unnoticed. Scheduling events in advance can help to keep herd practices in step with herd management policies.

Keep lists of due dates and expected litter sizes (if known) posted in the barn and other places where information is easily accessed by those who are observing the does during late gestation and at the time of kidding. Quick access to this information allows owners to make better decisions about when to intervene and how to interpret changing behavior, possible dystocia or retained kids at parturition, and early signs of clinical disease.

Induction of parturition before the due date is an option for high-risk does (e.g. older does with large litters or mobility problems) or as a part of a treatment plan for does with early signs of pregnancy toxemia. Elective induction of parturition is not recommended unless there is a high level of confidence in the accuracy of doe identification, records, and confirmed gestation dates, as errors in any of these can result in the unintended abortion of a normal pregnancy.

Additional Tools that Owners Can Use to Detect Pregnancy Toxemia

Urine ketone test-strips and beta-hydroxybutyrate test kits can help the owner monitor for ketosis. Does cannot be stimulated to urinate in the way one would obtain urine from a cow, so owners must be prepared to take advantage of opportunities to catch a sample. Have urine cups or other clean containers available in doe housing areas or after transport. Does usually urinate soon after standing up (when resting), or during transport soon after unloading from the truck or trailer. Owners transporting does to the veterinary clinic should have a urine cup ready during loading and unloading and collect a sample as opportunity arises. Owners should keep a stethoscope and thermometer in the barn to facilitate complete examination of any doe with decreased appetite, depression, abnormal respiratory pattern, diarrhea or possible signs of normal or premature labor. Early recognition and prompt treatment of pneumonia or other disease, as well as pregnancy toxemia, is critical to maintaining doe health and preventing death

loss. Keep plastic trash bags and plastic gloves in the barn to remove products of abortion or to retrieve and dispose of placentas. Necropsy of does lost during late gestation or after kidding is important so that prevention or treatment strategies can be implemented to address the primary and contributing causes of death and prevent future losses. Vigilance in detecting abortion and submitting samples for diagnosis of contagious and potentially zoonotic causes of abortion are important for protecting the herd and the humans caring for them.

Conclusions

Pregnancy toxemia is a frequent and important disease of prolific does in late gestation, resulting in high mortality of does and loss of valuable kids. Prognosis for successful treatment of does with clinical disease is at best guarded, so the key to preventing losses from pregnancy ketosis is to adopt every potential management strategy possible that will decrease the risk of disease in the herd. Many strategies presented here require accurate observations and a high degree of attention to detail, but can be adopted with relatively low cost in relation to the benefits achieved. Monitoring of body condition, adjusting timing and amount of lead-feeding according to risk, adapting penning or identification strategies to appropriately feed the does, and closely monitoring the highest risk animals while providing a system for early detection and treatment of clinical disease are key to minimizing the impact of pregnancy toxemia in the goat herd.