

# Use of reproductive ultrasound for goat herd management

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## Abstract

Routine reproductive ultrasound examinations in dairy and meat goat herds provide the veterinarian with the ability to view the entire female herd on a routine basis, establish a valid veterinary-client-patient relationship, measure reproductive performance, and plan strategies for the breeding, dry period, transitional period, and kidding management. Diagnosis of pregnancy, early detection and treatment of hydrometra or other pathologic conditions, fetal enumeration, gestational staging, fetal well-being, and fetal death can all be used to make management decisions and evaluate herd performance.

**Key words:** caprine, goats, reproduction, ultrasound

## Résumé

L'examen échographique routinier du système reproducteur dans les troupeaux laitiers et de boucherie de chèvres permet au vétérinaire d'avoir une vue complète de toutes les femelles du troupeau sur une base régulière, d'établir une relation de confiance entre le vétérinaire, le client et le patient, de mesurer la performance de reproduction et de planifier des stratégies de régie de la reproduction, du tarissement, de la période de transition et de la mise bas. Le diagnostic de gestation, la détection précoce et le traitement de l'hydrométrie ou d'autres conditions pathologiques, le dénombrement des fœtus, le stade gestationnel, le bien-être du fœtus et la mortalité fœtale peuvent tous être utilisés pour prendre des décisions de régie et évaluer la performance du troupeau.

## Introduction

The routine use of ultrasonography in goat herds can allow the producer to plan more than just the reproductive program. Confirmation of pregnancy, detection of open or abnormal animals (for treatment or elimination from breeding schemes), and enumeration of fetuses enable the producer to optimize breeding strategies and properly plan for kidding management. Knowledge of doe and litter status also allows planning for proper

dry-period management and prevention of pregnancy toxemia, and provides sufficient knowledge of the dry-period to enable an intramammary dry-treatment program. For meat does, stage and litter status afford the time for advanced planning for fostering kids from large litters and managing parturition for optimal kid survival. Intensively managed, pasteurized kid-rearing programs depend on precise knowledge of due dates for planned induction of parturition or other means of attending all deliveries in order to assure interruption of infectious disease transmission in the herd. For these reasons and more, a comprehensive reproductive ultrasound program can be the cornerstone of successful goat herd health management planning.

## Producer-Operator Ultrasound Examinations

Inexpensive A-mode ultrasound units (and more recently portable real-time ultrasound units) are marketed directly to producers for their own use. A-mode units are most accurate in the window between 45 and 90 days gestation; however, in goats the incidence of hydrometra is high relative to other species, limiting the usefulness of A-mode units for goats, since hydrometras would be interpreted as pregnancies. Regardless of unit used, the ability to assess the well-being of pregnancy and diagnose reproductive pathology justify the veterinarian conducting ultrasound exams, even in herds where producer-owned units are used. Also, the time devoted to ultrasound examinations is frequently used for consultation and for developing knowledge of the herd needed to form a valid veterinarian-client-patient relationship. Infectious disease, nutrition, and herd management problems are often observed during routine ultrasound visits to the goat herd.

## Routine Reproductive Ultrasonography

Real-time transabdominal ultrasonography is the most efficient way to detect pregnancy and determine fetal viability in large numbers. Efficiency of the method depends on accuracy of breeding records provided by owner, pregnancy rates, facilities, and support staff handling the ewes or does, and experience of the clinician performing the ultrasound examination. Owners of

small flocks and youth project groups can improve the affordability of ultrasonography by making appointments for multiple flocks or herds at a single site. Does and ewes are examined in the right inguinal area just below the flank fold. Examination with the aid of ultrasound coupling gel is performed, looking for definitive signs of pregnancy, stage of gestation, evidence of fetal viability, or evidence of pathology. A 3.5 sector (preferred) or 5 MHz linear transducer may be used for routine transabdominal ultrasonography of pregnancies >30 days; a 5 or 7.5 MHz linear array transducer may be used for occasional transrectal examinations of pregnancies from 24 to 30 days. Transrectal ultrasonography may be achieved by use of a rigid guide to support and allow positioning of the ultrasound probe. Ovarian structures are more difficult to visualize in does and ewes compared to species where manual positioning of the probe is possible; transrectal ultrasonography may be helpful in diagnosing ovarian cysts.

Does may be restrained in milking parlor stanchions, moved through a livestock chute (most common method for sheep and meat goats), led beside a seated operator or individually restrained for examination. For best resolution in goats, a small square of hair should be clipped in the right inguinal area; sheep are scanned without preparation using the sparsely-haired area in the inguinal region. A reliable power supply or generator is essential to prevent damage to the ultrasound unit and minimize electrical interference. Battery-operated ultrasound units work well for short periods of examination; additional batteries are needed for large herd work. Efficiency is increased by planning facilities to be used, organizing, and documenting the system for marking the results and any treatment on the animal, and organizing a plan for recording the animal's identification and results of examination (records; marking system) are critical to maintaining an accurate medical record and assuring correct classification of the animals after the examination. Mistaken identification/ultrasound results may result in erroneous group assignment or worse, such as iatrogenic abortion from inappropriate prostaglandin administration. Attention to detail will maximize the usefulness of the data generated.

### **Prescreening Does Before Breeding**

In goats, routine examination of does before assignment to breeding groups allows detection and treatment of abnormal does, and identification of does for potential culling. Abnormal findings by ultrasound can be followed by a vaginal speculum exam or other diagnostic procedures. Especially in herds with out-of-season breeding programs, prompt detection by ultrasound and treatment of hydrometras allows animals to return to appropriate breeding groups quickly and

prevents enrollment of animals that would not respond to synchronization. Non-responding does and does with other health issues, such as abnormal mammary glands, poor body condition or soundness problems, can be identified during prescreening and recommended for removal from the herd.

### **Pregnancy Determination**

Pregnancy is determined by visualization of the amniotic vesicle, the fetus, or the characteristic "C" shaped concave placentomes. The amniotic vesicle, comprised of the fetus surrounded by anechoic fluid and bordered by an hyperechoic circular membrane, is the most prominent feature of pregnancy from days 35 to 45. After 40 to 45 days, the size of densely echogenic placentomes sufficiently increases so that fetus (also echogenic, with recognizable structural features) and placentomes are the most prominent features of pregnancy. After 100 to 120 days, the large size of the fetus(es) relative to the fluid in the uterus reduces the contrast and ability to outline entire fetuses. The diagnosis of nonpregnancy (open) is made based on the failure to identify definitive signs of pregnancy. Systematic examination techniques are needed to prevent missing a pregnancy, especially in obese animals and lactating does with large udders or exceptionally deep-bodied ewes or does. Reconfirmation of pregnancy, especially prior to dry-off of lactating does, may be indicated if embryonic death or abortions are of concern in the herd.

### **Fetal Enumeration (Counting)**

Wide-angle transducers allow the best simultaneous estimation of fetal numbers. Fetal numbers can be most efficiently estimated between 45 and 85 days gestation. Care must be taken to avoid missing fetuses in hard-to-visualize positions or to overestimate fetal count by counting a more distant fetal head as originating from another litter mate. Ewes and does can be grouped by fetal number (and dam body condition) and fed appropriately in late gestation to minimize risk of pregnancy toxemia. Early determination of litter size can be used to adjust gonadotropin dosage in estrus synchronization programs, and to assess embryo survival rates in embryo transfer programs. Under natural breeding conditions, disparity between ultrasound predictions of litter size and number of lambs or kids born may help to define embryonic death and presumed abortion losses.

### **Stage of Gestation**

Staging of pregnancy is needed to accurately determine the conception date for herds using induction of parturition, for quickly assessing the outcome of an

artificial insemination or embryo transfer program, or to plan kidding management in pasture- and pen-bred herds. Accurate knowledge of fetal stage is a prerequisite to implementing any dry-doe intramammary treatment program. Staging of pregnancy is most accurately assessed early in gestation. Gestational age can be subjectively assessed based on size of fetus and placentomes, or the size of the amniotic vesicle in early gestation. If precise fetal gestational stage is needed, it can be quite accurately estimated by measurement of the biparietal diameter of the fetus or measurement of the fetal crown-rump length; however, the time required to take these measurements will decrease the efficiency of examination. In herds where significant numbers of animals are examined in a single visit, qualitative assessment of gestational stage would be most commonly used.

### **Pregnancy Well-Being**

The fetal heartbeat may be recognized after day 35 by transabdominal ultrasonography, earlier by transrectal ultrasonography. Lack of echogenicity of amniotic fluid, proper amount of fluid for gestational stage, normal fetal posture and movement, and crisp placentome margins are all signs of a healthy fetus. Increased fluid echogenicity, "floating" membranes, collapsed fetal posture, and failure to detect a heartbeat or fetal movement are abnormal findings suggestive of loss of fetal viability. Hyperechogenicity of the placentomes is a common finding in the nonviable pregnancy. It may be necessary to confirm fetal viability in late gestation, such as in does with pregnancy ketosis. In cases where expected udder development or pelvic changes in late-gestational does fails to develop, ultrasonography for fetal well-being or viability is indicated.

### **Abnormal Findings**

Abnormal findings include evidence of recent abortion, hydrometra, pyometra, fetal mummy or macerated fetus. Recently aborted ewes and does can be identified by the observable margins of the enlarged uterus, with caruncles often visible but with no fetus or fluid present. Hydrometra would appear as an anechoic, fluid-filled uterus, often with membranous strands visualized in the lumen of the uterus. A pyometra would also have a fluid-filled uterus, but the fluid would be increased in echodensity, and often has a swirling appearance. In the case of a retained fetal mummy or macerated fetus, hyperechoic bone shadows may be visualized in the absence of fluid contrast, either in an organized (mummy) or disorganized (macerated fetus) pattern.

Hydrometra, defined here as the presence of an anechoic fluid-filled uterus in the presence of a corpus

luteum, is relatively common in goats, but infrequently reported in sheep. Hydrometra would be characterized by variable degrees of anechoic or hypoechoic fluid distension of the uterus, often with a "floating" membranous line or apparent septae within the lumen of the uterine horn. While the exact etiology and mechanisms remain unclear, hydrometra has been associated with out of season kidding, fetal death, and sheep-goat hybrid pregnancy, but is often seen in does with apparently normal reproductive history. Most does detected and treated with prostaglandin early in the breeding season will successfully return to fertility during the same breeding season; however, hydrometra does tend to reoccur in some animals. Does should be rechecked in several weeks, as some does require a second prostaglandin treatment. Does intended for synchronized breeding programs should be screened by ultrasonography for hydrometra. Prescreening does avoids enrolling nonresponsive does in synchronization groups, and allows prompt detection and prostaglandin treatment of hydrometra cases.

Mummified fetuses are often detected in "late gestational" does presented for failure to demonstrate mammary development. The lack of fluid contrast, dense bony shadows of the cranium or ribs in an organized fetal mass, and usually smaller than expected fetal mass with no sign of viability are characteristic of fetal mummification. Macerated fetuses are manifested as overriding bony densities, usually linear or curvilinear images, with no sign of normal fetal architecture. A vaginal examination of these does reveals a fetid discharge, and often the presence of bone(s) protruding from the cervix.

### **Fetal Gender Determination**

Attempts at fetal gender determination by transabdominal ultrasonography, as determined by visualization of the male or female genital tubercle or male scrotum, have met with varying success. Accuracy can only be assessed in single births or where litters are exclusively male or female kids, as one can never be sure which kid born was visualized in utero. Transabdominal technique and spontaneous repositioning of the fetuses during examination prevent the precise control of visualization of fetuses; nonetheless, owners may request recording of fetal gender if determined during the course of an ultrasound exam.

### **Conclusion**

Transabdominal reproductive ultrasonography is a tool which provides the veterinarian with the ability to view the entire female herd on a routine basis, detect disturbances in reproductive performance at the earliest time, and plan for other health management events

in the herd. Placing visual “flags” on animals to alert caretakers to kidding group, large litters or risk status can aid in the early detection of pregnancy toxemia, help prevent retained fetuses at kidding, and avoid drying-off

nonpregnant does. Owners can use the information in planning all aspects of dry-doe management, kidding and kid rearing management, and overall expected herd production.