Troubleshooting reproductive failures in small ruminants

Charles T. Estill, VMD, PhD, Diplomate American College of Theriogenologists
Carlson College of Veterinary Medicine, Oregon State University, Corvallis, OR 97331

Abstract

As a service to our commercial clients, and with the popularity of "urban agriculture", large and mixed animal practitioners are frequently called upon to evaluate and treat reproductive disorders of small ruminants. Often, these animals are owned by clients with no or very little previous exposure to animal agriculture. In many cases, it is the practitioner's goal to simply educate these neophyte owners on normal reproductive physiology and basic animal husbandry.

Both sheep and goats are inherently very fertile when infectious diseases are controlled, proper nutrition provided, and environmental extremes mitigated. Both species typically reproduce very efficiently with little human intervention. However, as practitioners, we are called upon to investigate reproductive maladies that may be commonplace or, especially as "pet" sheep and goats are kept well past traditional reproductive ages, disorders with which we may be unfamiliar.

This presentation will use a problem list as the basis for discussion of how to troubleshoot a wide range of reproductive disorders of small ruminants. Because of the large depth and breadth of disorders one may encounter, a full discussion of each malady and its treatment is beyond the scope of this presentation. Rather, a series of common client complaints will be listed followed by a discussion of a systematic approach to establishing a diagnosis or etiology. The specifics of treatment will not be discussed.

Key words: sheep, goats, fertility, diagnostics, abortion

Common presenting complaints – females

Failure to cycle

It is important to bear in mind that for most small ruminant breeds there are 2 superimposed reproductive cycles. Since they are seasonal breeders (short day), establishment of pregnancy is likely only during the months of August through early March in the northern hemisphere. Within a breeding season, interovulatory interval for does is about 21 days and 16-17 days for ewes. Pygmy goats may have 18-24-day cycles. For expression of behavioral estrus, progesterone priming is required. This means that the first ovulation of the breeding season is generally silent (no behavioral signs of estrus) and followed by a short (5-7 day) interestrous interval.

A thorough history will help rule in or out several etiological possibilities for failure to cycle. One should first rule out pregnancy even if the owner states there was no possible male exposure. If the ewe or doe has or lambed or kidded in previous years, one can rule out conditions such as intersex or segmental aplasia.

Those skilled at transrectal ultrasonography can readily identify ovarian structures to determine cyclicity. Alternatively, analysis of blood progesterone concentration at 10-day intervals can be used to determine whether ovulation is occurring. If intersex in either sheep or goats (or freemartinism, UC Davis Genetics Lab) is suspected, karyotyping can be performed.

When naturally polled goats are encountered, the polled intersex syndrome is likely in females homozygous for the polled trait. These animals are genetic females (XX) but may have testicular tissue and varying degrees of masculinization. They are always sterile. Male pseudohermaphrodites (XY with varying degrees of feminization) are also commonly encountered. Potentially, assay of anti-Mullerian hormone can be used to determine if ovarian tissue is present (ELISA kits available from MyBioSource[a]).

Pseudopregnancy is more common in goats than in sheep. The cause can be a prolonged luteal lifespan or a progesterone secreting ovarian tumor. Either cause results in anestrus and in many cases hydro- or mucometra develops that may be accompanied by udder development. Transabdominal ultrasonography is often diagnostic for hydro- or mucometras.

Failure to conceive

These cases can be very challenging and practitioners are often at a loss as to where to begin. But, as with most any case, a thorough reproductive history can guide further diagnostics. Pertinent questions include: does she cycle regularly, has she been pregnant before, and has the ram/buck impregnated herdmates in the same time period? A female that cycles regularly is likely to have normal ovarian structures and one that has been pregnant in the past can be presumed to have a complete and functional female reproductive tract. If the male was successful in impregnating contemporary herdmates, he is not likely to be the reason for failure to establish pregnancy. Appropriate diagnostics include physical exam with particular attention given to perineal/external genital conformation, vaginoscopy, transabdominal ultrasonography, genetic testing, advance diagnostic imaging, and even exploratory laparotomy with uterine biopsy and culture.

Vaginal discharge

Observation of a vaginal discharge is a common presenting complaint. As with other reproductive cases, the history and signalment can be used to narrow the differential diagnosis list and perform appropriate diagnostics. The cycling history, breeding history and pregnancy status are all important bits of information. The length of time the discharge has been observed and character and volume of the discharge should also be ascertained. Vaginal speculum examination, ultrasonography, vaginal cytology and advanced diagnostic imaging can all be useful in establishing a diagnosis.

Uterine tumors are frequently accompanied by a vaginal discharge. In both ewes and does, the most frequently reported clinical signs reported to be associated with genital tract neoplasia include weight loss, pyometra, hydrometra, vaginal bleeding, abnormal vaginal discharges, straining, pollakiuria, ascites and abdominal distension.[1] In the aforementioned study, the most commonly diagnosed tumors of the reproductive tract were leiomyoma, adenocarcinoma, leiomyosarcoma, adenoma, squamous cell carcinoma and metastatic signet ring cell carcinoma. The most common sites of tumor formation were the uterus,

vulva/vagina, ovaries, cervix and Bartholin's gland. All affected animals were aged females (older than 3 years of age). In the author's experience, any aged doe or ewe with a bloody or necrotic vaginal discharge should be fully evaluated for neoplasia.

Abortion

Both sheep and goats may experience either sporadic or epidemic outbreaks of abortion. Most cases are caused by infectious organisms. It is important to bear in mind that many small ruminant abortifacient agents have zoonotic potential, so appropriate precautions should be exercised when dealing with these cases, especially for women of childbearing age. Examples include Q-fever, toxoploasmosis, camplybacteriosis, chlamydophilosis and listeriosis. When investigating small ruminant abortions, the history may give a clue as to the etiology, but laboratory diagnosis is essential. Determination of the stage of gestation at which abortion occurs, asking if is the dam sick, and the demographics (new herd/flock additions, younger females) of aborting animals will help narrow the differential list. For laboratory diagnostics to be reliable, sample collection and preparation is important. In many cases, entire fetuses can be submitted along with placental tissue (cotyledonary and intercotyledonary sections), maternal blood and maternal urine. Most veterinary diagnostic labs run abortion panels to screen for a variety of common abortifacient organisms using PCR at reasonable cost. If field necropsies are performed, it is prudent to follow a consistent protocol with a checklist and take photos to assist the pathologist. Of course, not all abortions are attributed to infectious organisms. One must consider toxic plants, sheep-goat hybrids, habitual abortion of Angora goats, stress (dog worry) and severe nutritional deficiencies.

Gestational problems

Late gestation does/ewes that are lethargic, have a poor appetite, separate themselves from the herd or are reluctant to rise are likely suffering from pregnancy toxemia. Diagnosis is based on history, notation of body condition, documentation of multiple fetuses, and evidence of hyperketonemia (elevated NEFAs and beta-hydroxybutyrate) in blood and/or urine. Many females will also have low calcium, phosphorus and magnesium concentrations while blood glucose concentration is variable. Pregnancy toxemia is probably the most devastating disorder of the late gestation ewe/doe. It typically occurs in late gestation in females carrying multiple fetuses. There are basically 2 different scenarios with the same outcome. The first is due to negative energy balance, i.e. the fetuses require more energy than the dam can provide without mobilizing her body fat, and hence she becomes quite thin. The second involves over conditioned dams that have insulin resistance and a poor appetite and in turn mobilize body fat to meet fetal energy requirements. While supportive medical treatment (oral propylene glycol, intravenous glucose infusion, insulin) may be successful in mild cases, the more severe cases will not survive unless the fetuses are removed either pharmacologically (PGF, dexamethasone) or surgically. In many cases, one must prioritize saving either the fetuses or the dam. Treatment of the dam with dexamethasone will speed lung surfactant development and give the fetuses an improved prognosis once delivered.

Common presenting complaints – males

Poor libido

Domestic rams display a naturally occurring variation in sexual partner preference, such that 6-10% of range-bred populations prefer male sexual partners in contrast to the majority of rams that prefer female sexual partners. These homosexual rams are "hard-wired" prenatally and endocrine therapy does not alter their behavior.[2] It is unknown if the same phenomenon occurs in goats.

Poor pregnancy rates

Unfortunately, the majority of small ruminant breeders do not subject their male animals to breeding soundness examinations until a problem occurs and the male side of the equation is suspected. Without proper restraint facilities such as a small chute or tilt table, I find performing BSEs on small ruminants problematic due to excessive movement and vocalization (goats). About 2 years ago we started sedating all of our small ruminant BSE cases using IV ketamine (4.4 mg/kg) + midazolam (1.1 mg/kg). The animals go down very smoothly, hold still for 15 minutes or so, then get up and walk away. In the several hundred we have done with sedation, there have been no complications. Another tip you may find useful if using the Programmable Lane Pulsator V[b] electroejeculator is to just let it run on a bull (usually Angus) setting. It is not necessary to do the manual massage with the probe in between stimulations as is reported in most texts on the subject. Be sure to collect blood on each ram and submit for *Brucella ovis* testing. Cull animals that test positive.

Be sure to evaluate the scrotum and its contents with particular attention to the epididymides. If there is palpable evidence of epididymitis with a negative *Brucella ovis* test, treatment with antibiotics (parenteral oxytetracycline) may be attempted.

Other causes of male infertility include testicular hypoplasia, testicular degeneration, varicocoele, sperm granuloma, spermatocoele, fibrosis due to injury, testicular tumors, scrotal hernia and scrotal abscess. Many of these abnormalities can be diagnosed by careful palpation and ultrasonographic examination. Finally, when all else fails in cases of azoospermia, testicular biopsy can be performed.

Rarely, abnormalities of the penis are the cause of infertility. Persistent frenulum is occasionally seen and readily treated, but owners should be advised of the heritable nature of this condition. We occasionally see cases of hypospadias, pizzle rot and congenitally short penis.

Endnotes

[a] Mullerian Inhibiting Substance/Mullerian Hormone (MIS/AMH), ELISA Kit, MyBioSource, SanDiego, CA.

[b] Lane Pulsator V, Lane Manufacturing, Inc., Denver, CO.

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