

## **INVESTIGATION OF FLOCK INFERTILITY**

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Infectious causes seldom result in infertility in small ruminants. Non-infectious causes are relatively more common resulting reproductive failure, and to some extent are the result of their seasonal breeding pattern. Age, puberty, season of the year, the male, hormone therapy and nutritional status affect fertility.

### **Season**

Sheep and goats are considered short-day breeders because their breeding season is regulated by the length of the day or more specifically, by the increased duration of night. However, much variation occurs among breeds with respect to the occurrence and length of breeding season. From a pure physiologic standpoint, they have great similarities. The length of estrus cycle is 21 days (with a range of 18-22 days) in the doe and 17 days (with a range of 14-19 days) in the ewe. Aberrations of estrous cycle length adversely affect fertility through early involution of *CL* in cases of short cycles. Aberrant cycle length also occurs at the end of the breeding season. These cycles typically have an extended length, and some animals enter an anestrus period after late breeding and may be mistakenly assumed to be pregnant.

Young does and ewes reach sexual maturity and begin to cycle at 6-8 months of age. Breeding should be delayed until they reach 60% to 70% of their predicted adult weight. Restricted feed intakes around the time of puberty may slow development and result in an anestrus. Young, lightweight does and ewes have an increased frequency of abnormal first cycles, either short or long. Although mating may occur during these first cycles, pregnancy is not expected to be established. Young animals may be allowed to cycle 2-3 times prior to breeding for the first time.

### **Nutritional factors**

A poor body condition, depressed energy intake, and decreased mineral and vitamin intakes all suppress reproduction activity in ewes and does. Lower overall nutritional intake results in poor or weak signs of estrus, decreased ovulation, abnormal estrus cycle length, and delayed puberty. Parasitism, deficiencies in energy, protein, vitamin A and E, phosphorus, and many trace minerals are most commonly seen as causes of an anestrus. Deficiencies in vitamin A, copper, manganese, and iodine are associated with irregular estrus cycle. In many cases, it is difficult to differentiate between lower conception rate and early embryonic death resulting in infertility. Many toxic plants such as fescue infected with fungus and estrogen producing plants, are associated with reproductive failure.

## Heat Stress

Heat stress depresses reproductive ability in male by lowering sperm quality, and causing abnormal ova production in the female. Both very young and very old animals are susceptible. Unsheared Angora goats and heavily woolled sheep, particularly young sheep, are especially susceptible to heat stress.

## Natural Breeding Systems

Natural breeding is more commonly used in meat and fiber sheep or goat production systems, whereas AI or hand mating is the most common means of breeding in dairy goats or sheep and the method most commonly used by purebred breeders. In a meat production system, productivity is largely a function of the number of off-spring born and weaned and the frequency with which they are produced. The desired date of parturition in a given farm dictates the breeding date and the management of the breeding male. Females are usually bred in the fall for spring kidding or lambing. Bucks should be kept separate from the does until they are to be used for breeding. After establishing a mating time, the producer should leave the bucks with the does for 32 days ( $1\frac{1}{2}$  reproductive cycles), and the rams with the ewes for 27 days. This ensures that all kids or lambs are born within about 1 month of one another, reducing the amount of supervision required at kidding time. The male-to-female mating ratio depends on the age and SC of the male, the size of the mating area, and whether one or more rams or bucks are to be used. Meat goat production systems should have 1 buck per 30 does. A buck may breed 50 to 200 does in a single breeding season, but 3 to 4 bucks should be put with 100 does. Most sheep producers should keep 3 to 5.5 adult rams per 100 ewes. A Marking harness should be used on the males to identify which females have been bred. In commercial flocks, males should be changed at least every 2 years to prevent inbreeding. Bucks or rams of high libido and good semen quality can be used in a staggered breeding program in which seven or eight synchronized ewes or does exhibiting estrus at the same time are placed with the male for breeding. Hand mating of males can be used as a modification of staggered breeding, with the same female ratio of 7:1 to 8:1.

Recommended male-to-female ratios for rams and bucks during the breeding season is 1:20 to 1:50 depending on the age of the animal and type of housing. This ratio should be changed to 1:5 to 1:10 for out-of-season breeding and with synchronized females. Adjustment should be made for multiple size breeding units. It is desirable to always have more than three males to a multiple size unit, because this tend to alleviate some of the territorial fighting among rams and bucks.

## Female Abnormalities

### *Pseudopregnancy*

Pseudopregnancy (mucometra, hydrometra, cloud burst) is a term used to describe a common occurrence in goats characterized by persistent CL, anestrus, and a variable accumulation of fluid within the uterus. The incidence in dairy goats may be as high as 3:1 to 5:1 on some

farms, with the highest incidence occurring in November through December. It is less common in fiber or meat breeds of goats and sheep. The cause of the disease is poorly understood, but possible modes of action include out-of-season breeding, sheep and goat hybrid pregnancy, and the overuse of hormonal manipulation of the reproductive cycle. Some cases probably occur as sequella to abortion or early embryonic loss with a retained CL. The most common treatment is injection of Prostaglandins (10-20 mg).

### ***Vaginitis***

Vaginitis may cause reduced fertility in ewes and does. Causes include caprine herpes vulvovaginitis, contagious ectyma, granular vaginitis, and in some ewes mated with *B.ovis* infected rams. Lavaging the vagina with mild antiseptic solution may help in recovery process.

### ***Ovarian Disorders***

Cystic follicles are a significant cause of infertility in women, dairy cattle, and sheep. It appears to be more common in goats than in sheep. Owners often make the diagnosis based on short cycles or nymphomania. The use of some superovulation protocols (eCG), possibly phosphorus deficiency, and the feeding of estrogenic compounds may be associated with the formation of cystic ovaries. Sheep is used as a model to identify factors that may elicit formation of cystic follicles. Treatment with hCG (750-1000 IV) or GNRH (50-100 µg) may be effective.

Ovarian tumors are rare in sheep and goats. Granulosa theta cell tumor has been reported showing signs of nymphomania, and inappropriate lactation.

### ***Sheep-Goat Hybrid***

Goats have 60 chromosomes, while sheep have only 54. The two species readily mate, and the resulting embryo has 57 chromosomes. Does bred to rams have greater fertility than is shown by ewes bred by bucks. The initial embryonic development is apparently normal, but the hybrid embryos generally die before 60 days of gestation. Occasionally the hybrid fetus dies between 30-40 days of gestation and the dead fetus become mummified, often rendering the female unable to ovulate or conceive.

### ***Male Abnormalities***

Infectious causes of infertility are rare, but significant problems do result from genetically determined intersexuality, testicular hypoplasia, cryptorchidism, sperm granulomas, and testicular degeneration.

### ***Epididymitis and Orchitis***

Epididymitis is a rare condition in the buck, but a clinically important disease in rams. In rams, epididymitis should be considered to be caused by *B. ovis* until proven otherwise. This is especially true of older rams that have been actively breeding in multiple sire units. Swelling of the epididymis is the primary presenting sign, occurring about three weeks after the initial exposure. Grossly, there is localized inflammation followed by hyperplasia and obstruction of the epididymal duct. This obstruction causes a backup of spermatozoa, the development of sperm granulomas, and pressure necrosis. Herd infectious with *B. ovis* can result in a 15% to 30% reduction in lambing rate. This decrease in reproductive efficiency results from lowered fertility in the rams, failure of the ewes to conceive, reabsorption of embryos, abortions, stillbirths, and weak lambs.

In younger rams, and less commonly in bucks, epididymitis can be caused by a number of organisms such as *Actinobacillus*, *Staph. pyogenes*, and *Corynebacterium pseudotuberculosis*. All these organisms can also cause orchitis. Orchitis is a common occurrence in the ram and is occasionally seen in the buck. The signs include a hot, swollen scrotum, and pain on manipulation. Some animals may show signs of systemic disease, pain on walking, and decrease in libido.

### ***Sperm Granulomas***

Although testicular tumors are rare in rams and bucks, granulomatous swelling are occasionally encountered. Sperm granulomas are more common in bucks than in rams, and unlike abscess or other forms of orchitis, they usually occur bilaterally. Sperm granulomas are often caused by a partial or complete blockage of the efferent ducts draining into the epididymis. As pressure builds, the ducts become distended and may rupture, resulting in a severe inflammation. Some animals are initially fertile, but lose fertility after the efferent duct becomes completely occluded. In these cases, spermatozoa will be absent from the ejaculate.

As with intersexuality, sperm granulomas are frequently associated with the polled condition. Control of sperm granulomas as a cause of infertility in the buck should include selection of horned, or at least heterozygous bucks, and careful palpation. Affected animals should be eliminated from the herd or castrated.

### ***Testicular Hypoplasia and Degeneration***

Testicular hypoplasia and degeneration are difficult to differentiate during an initial examination. In rams and bucks out of season, testicular size and palpation characteristics may be difficult to differentiate from subtle cases of testicular atrophy. More extreme differences are encountered in rams than in goats, but in general the testicle in the non-breeding season is smaller and lacks normal resiliency. True hypoplasia can be associated with the intersex condition in bucks and a specific chromosomal abnormality in rams.

Other causes of testicular atrophy include zinc deficiency, hypothyroidism (iodine deficiency, ingestion of goitrogenous plants), starvation diets, systemic disease, and heat and cold stress. Iodine-induced hypothyroidism has been associated with decreased testicular weight, depressed spermatogenesis, and decreased libido. Atrophic or degenerated testicles become elongated, small, and either softer or harder. Normal testicles usually have a homogenous echogenicity on ultrasound. Atrophic or degenerative testicles tend to have a heterogenous pattern and more hyperechoic areas. Testicular biopsy can be of value in diagnosis. Many cases of atrophy and degeneration are not treatable; the exceptions are cases caused by diet or certain disease. In treating diet-related atrophy, ensuring adequate protein-energy intake and free access to a good-quality trace mineral supplement is essential. If zinc deficiency is suspected, reducing the legume content of the diet and adding a chelated form of zinc (zinc methionine) to the diet or trace mineral mixture is useful. If iodine-induced hypothyroidism is diagnosed, the inclusion of iodine in a trace mineral mixture and the removal of goitrogenous plants from the diet should be undertaken; male should be kept off pastures with goitrogenous plants before and during breeding.

### ***Intersex***

Caprine intersexes are common causes of infertility in polled does, and are referred to as male pseudohermaphrodites because a majority of them have testes. True hermaphrodites have testicular and ovarian structures and generally constitute a much smaller proportion of intersexes. Intersex is more prevalent in polled dairy goats. If one parent is horned, the offspring will almost never be intersexes. The use of a horned buck is the standard method of avoiding such condition. The affected animals are genetically female, but may exhibit male, female, or mixed external characteristics. Generally, they are female-appearing at birth, but as they reach sexual maturity, they become larger than normal females, with masculine heads and erect hair on their necks. An enlarged clitoris in a doe-like animal or a decreased anogenital distance in a more masculine individual is typical of intersex. Hypospadias, sperm granulomas, and hypoplastic testicles should all be considered part of the intersex complex.