



Introduction to Goat Reproduction

David Fernandez
Extension Livestock
Specialist

Reproductive failure is the most costly problem facing goat producers, whether they are producing meat or milk. Meat goat producers whose herds exhibit poor reproductive success earn less and have higher costs of production per kid produced than those whose herds reproduce successfully. Dairy producers with longer dry periods have higher feed costs because of increased periods of feeding without production in return. The reproductive system of the goat is complex, but having a basic understanding of it will help you better manage the reproductive success of your goats.

Female Anatomy

The basic structures of the doe's reproductive system are shown in Figure 1. The vulva is the exterior segment of the reproductive tract. When the doe is in estrus, or in "heat," the vulva will often appear swollen and reddened. The vagina is directly in front of the vulva and is where the buck will deposit semen during mating. The vagina is part of the birth canal and also serves as a barrier to bacteria and foreign objects. The cervix creates a more significant barrier to bacterial and foreign objects to keep them out of the uterus, or "womb." The cervix secretes mucus to create a physical barrier that traps bacteria and flushes them out of the

reproductive tract. However, during estrus, sperm must be allowed to pass through the cervix for conception to occur. When the doe is in estrus, the consistency of the cervical mucus changes, becoming more fluid so the sperm can pass through. This can sometimes be seen during estrus when the vulva appears to be wet or the area around the vulva appears to be dirtier or muddier than usual because the mucus flows out of the doe's vagina and vulva.

The uterus is the organ that will house the growing fetuses during pregnancy. The uterus has three important layers – an inner glandular layer that nourishes the fetuses, a middle muscular layer that will push the fetuses out of the uterus during birth and an outer encapsulating layer that provides support and attachment to the body of the doe. The oviducts project from the uterus and are the location where fertilization will occur. They provide a pathway for the sperm to travel toward the ova that pass down the oviduct toward the uterus. They serve to catch the ova as they are released from the ovaries and direct them into the rest of the reproductive tract. The ovaries are the final structure of the reproductive tract. They house the developing ova and produce the hormones that are responsible for estrus and maintaining pregnancy.

DOE (female)

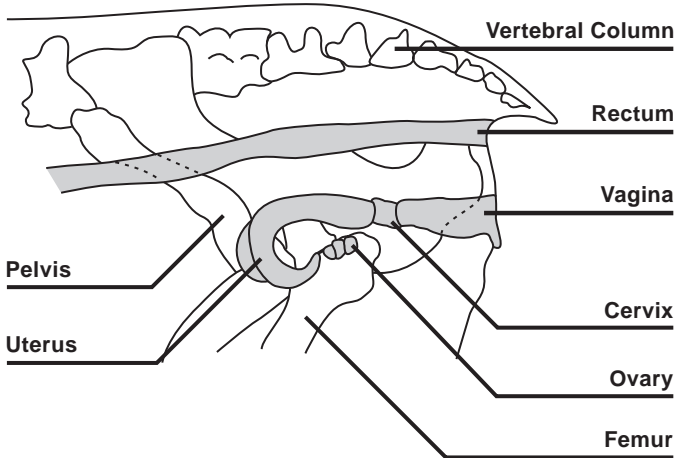


FIGURE 1. Anatomy of the Doe's reproductive tract, & Investment,

Henein Anatomy Goat, Agfact A7.0.3, 2004, 2nd

BUCK (male)

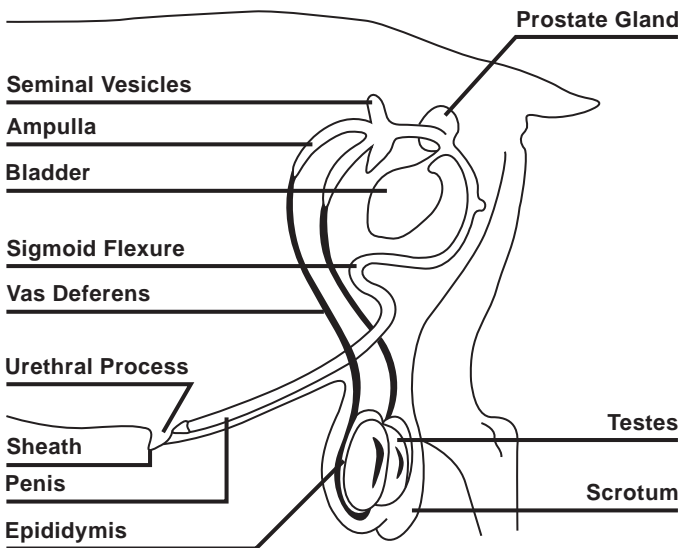


FIGURE 2. Anatomy of the Buck's reproductive tract, & Investment,

Henein Anatomy Goat, Agfact A7.0.3, 2004, 2nd

Male Anatomy

The buck's reproductive anatomy is shown in Figure 2. Bucks possess a structure called a filiform appendage which is an extension of the urethra beyond the end of the penis. The urethra is the duct which carries urine or sperm out of the buck's body. The penis is the organ of copulation which allows the buck to deposit semen into the vagina of the doe. It is covered by the prepuce, a fold of skin that protects the penis. The accessory sex glands, including the ampullae, seminal vesicles, prostate and bulbo-urethral glands, secrete fluids into the urethra during ejaculation. These fluids contain sugars to nourish the sperm, buffers to prevent rapid changes in pH and other chemicals that serve to protect and propel the sperm out of the urethra and into the vagina.

The ampullae are found at the terminus of the vas deferens. The vas deferens is the duct that leads from the testis to the urethra. When the veterinarian performs a vasectomy, the vas deferens are the ducts he cuts to make a "teaser buck" infertile. The vas deferens is connected to the tail of the epididymis. The epididymis is a large, winding tubule that can be felt on the side of the testis. Sperm cells that have been produced in the testis undergo a series of maturational steps as they pass from the head of the epididymis and through the body of the epididymis to the tail of the epididymis where they are stored. The testis (plural testes) is the site where sperm are manufactured and male steroids, especially testosterone, are produced. The scrotum is the pouch of skin that houses and protects the testes. The scrotum helps regulate the temperature of the testes by raising them closer to the body or lowering them away from the body. Sperm production cannot occur in the buck at or above normal internal body temperature. This is of special concern to goat producers who live in hotter climates if the external temperature rises above 103 degrees F for extended periods and the goats cannot cool themselves.

Puberty

Puberty is defined in myriad ways by researchers, but for the purposes of most producers puberty can be thought of as the time at which a goat, male or female, is capable of initiating a pregnancy. Puberty in goats can be affected by nutrition, season of birth and breed. Poor nutrition delays puberty. Kids born in the spring will be younger at puberty than kids born in the fall. In general, however, puberty in goats occurs between 4 and 6 months of age. Does should not be bred until they have reached at least 60 to 70 percent of their mature weight to avoid problems at kidding. Young bucks should be used sparingly since they have not finished growing. Bucks often lose weight during the breeding season, and young bucks could become infertile if they are overused.

Seasonality

Goats are seasonal breeders. This can be a disadvantage when trying to produce kids for specific holiday markets as it can be difficult to breed goats when you must. For goats, the breeding season occurs during the period of the year when the days are short, fall and winter. As the days grow longer in the spring, then throughout the summer, reproductive activity slows or halts. Seasonality is not absolute. Some breeds, like Savannas and Myotonic goats, are less responsive to seasonal patterns and will breed throughout the year. Others are highly seasonal and exhibit little reproductive activity when the days lengthen. There can also be quite a bit of variability in response to season among individuals within a breed. Latitude also plays a role in seasonality. The farther north you are, the less likely your goats are to breed when days lengthen. The farther south you are, the more likely your goats will exhibit at least some reproductive activity during the summer months.

Estrus and Male Mating Behavior

Does in estrus exhibit a number of characteristic behaviors. Does may become quite vocal when they are in estrus. They have been reported to bleat very loudly or moan. Does will wag their tails frequently, stop eating or at least reduce their feed intake and attempt to find a buck. They may attempt to mount other does and will stand to be mounted by does that attempt to ride them. Does may not exhibit all of the behaviors listed, and under adverse conditions, such as extreme heat or at the beginning of the breeding season, may not exhibit any signs at all. The vulva may become swollen, reddened and may appear moist, dirty or muddy because of vaginal discharge. In the presence of a buck, the doe in estrus will stand to be mounted. Does that are not in estrus will attempt to escape mounting attempts by the buck or other does. Standing estrus in does usually lasts for 24 hours, and ovulation occurs during the latter portion of estrus or soon afterward.

Bucks will sniff and lick the vulva of does in an attempt to determine their breeding status. The buck will often raise his head and curl his lip in a behavior called the Flehmen (pronounced FLAY-men, Figure 3) response. Bucks will often test a doe's receptivity by kicking at her side with his foreleg and licking or biting across her back and shoulders. The buck will attempt to mount the doe, and if she stands, copulation will occur very quickly. Copulation in goats usually lasts less than two minutes, but they will often mate several times while the doe is in estrus. Bucks must be carefully monitored during the breeding season, especially young bucks, because they spend so much of their time mating that they fail to eat. Bucks can lose up to 25 pounds over the course of the breeding season.



FIGURE 3. Buck exhibiting the curled lip and wrinkled nose typical of the Flehmen response.

Pregnancy

Does typically release more than one ovum during or shortly after estrus. What causes twinning in does is not completely clear, but good nutrition, age of the doe and breed are a few of the factors that are thought to contribute to twinning. There is a genetic component to twinning, and does that do not produce twins should be culled from the herd. The ova are fertilized by sperm cells and begin dividing as they continue down the oviduct to the uterus. The developing embryos implant in the uterus by the eighteenth day after mating. This is the period during which the vast majority of failed pregnancies occur. Miscommunication between the doe and embryos causes the doe to terminate the pregnancy and return to estrus, giving the appearance that conception never occurred.

Pregnancy in goats tends to be a quiet period during which you may not feel you have much to do. But does entering the last third of pregnancy face high nutritional demands because of rapid fetal growth. This is a critical time for you to manage your does' nutrition because their nutritional needs nearly double. However, they are often unable to consume large quantities of feed because there is not enough space in their abdomens for both developing fetuses and more feed. For this reason, the quality of the feed must be higher. Unfortunately, the increased nutritional demand usually occurs during winter when the cost of feeding your does is higher.

The udder is also preparing for milk production. Udder growth and fluid production in the udder begins about seven to ten weeks before birth. Proper nutrition and good health care during pregnancy will result in heavier kids at birth and improved milk production. Heavier kids survive better than light-weight kids at birth, and better milk production will help your kids to grow rapidly.

Late pregnancy is an excellent time to prepare for the upcoming kidding season. One of the most overlooked preparations is contacting your veterinarian. Spring tends to be a busy period for vets, and taking the time now to establish plans with your vet for your kidding season will pay dividends when the kids start to arrive. Check your kidding kit and replace items that are damaged, contaminated, expired or used up. Check to see if you have any frozen colostrum in your freezer and be prepared to collect fresh colostrum for freezing if needed. Clean out the kidding shed, check heating lamps and put down fresh bedding.

Kidding

Kidding will begin about 150 days after mating. You can observe changes in your does as their due dates near. The ligaments connecting the hip bones will begin to become more pliant and stretch. This will create hollowing of the hips. The udder will begin to swell and fill with fluid. The color of the fluid will change from honey-colored to milky, and it may drip from the teats as birth becomes imminent. The vulva may swell and have a mucus discharge. The doe may become restless, kick or butt her sides and stop eating.

Kidding, or parturition, begins with dilation of the cervix and contractions of the uterus. The doe's water will usually break during this period, which can last for several hours. The next phase of parturition is fetal expulsion. The kids enter the birth canal and are quickly pushed through. If the doe has not managed to expel the kids within an hour after hooves become visible, she will need your assistance or the help of a veterinarian. If something other than hooves appear in the birth canal, you should call your veterinarian immediately. Finally, the fetal membranes, or afterbirth, will be expelled. This can require several hours as well. The entire process from start to finish can take up to 12 hours. In most cases, does will not require assistance and kidding will happen naturally.

Lactation

Whether you are raising dairy goats or meat goats, milk production by your does is critically important to your herd's productivity. The udder begins secreting colostrum when the kids are born, but converts to milk production within a few days

after birth. Colostrum is critically important to newborn kids, and you should make sure your kids suckle and receive colostrum within the first 24 hours after birth, preferably the first two to four hours. Colostrum is high in immunoglobulins, or antibodies. Colostrum provides kids with a temporary immune system that will protect your kids against disease until their own immune system is capable of making antibodies. Vaccinating your does 30 days before kidding will boost the production of antibodies in the colostrum and better protect your kids against disease. Milk production increases until about the fifth week after kidding, then declines until about week eight. Milk production will usually decline gradually and modestly from week eight until weaning.

Summary

Reproductive failure is the single most costly problem facing livestock producers today. The goat's reproductive system is a complex biological system designed to produce and nourish the next generation of goats. While there are many points at which successful reproduction can be impaired, proper management of your goats will reduce or eliminate the likelihood of failure. Good nutrition, adequate facilities, health and veterinary care, and knowledge of the reproductive system are the initial criteria for successful reproduction on your goat farm.

References

- Fleet, I. R., J. A. Goode, M. H. Hamon, M. S. Laurie, J. L. Linzell and M. Peaker. 1975. Secretory activity of goat mammary tissue during pregnancy and the onset of lactation. *J. Physiol.* 251:763-773.
- Goat reproduction, puberty and sexual maturity, www.extension.org. Accessed December 13, 2011.
- Guillomot, M., P. Reinaud, C. La Bonnardière and G. Charpigny. 1998. Characterization of conceptus-produced goat interferon tau and analysis of its temporal and cellular distribution during early pregnancy. *J. Reprod. Fert.* 112:149-156.
- Imwalle, D. B., and L. S. Katz. 2004. Development of sexual behavior over several serving capacity tests in male goats. *Appl. Anim. Behavior Sci.* 89:315-319.
- Luginbuhl, J-M. Heat detection and breeding in meat goats. NCSU Animal Science Facts Publication number ANS 00-607MG.
- Reproduction in farm animals, 7th ed. B. Hafez, E. S. E. Hafez. 2000. Lippincott, Williams & Wilkins, Baltimore, MD.
- Sheep and goat medicine. David G. Pugh ed. 2002. Saunders, Philadelphia, PA.
- Wilde, C. J., A. J. Henderson and C. H. Knight. 1986. Metabolic adaptations in goat mammary tissue during pregnancy and lactation. *J. Reprod. Fert.* 76:289-298.

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DR. DAVID FERNANDEZ is Extension livestock specialist with the 1890 Cooperative Extension Program and is located at the University of Arkansas at Pine Bluff.

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