

Ram Reproduction

Seasonality

Unlike ewes, rams do not generally go through a period when their reproductive system becomes completely inactive. However, changes in day length do affect rams and their sexual activity is highest in the fall, decreasing in late winter, spring, and summer. Testicular size, testosterone levels, sperm production, and libido increase with short days.



Sperm Development and Fertility

The sperm cells that will eventually join with the egg are formed in the testes of the ram. As with other mammalian species, the testes are contained within a muscular pouch called the scrotum, which hangs outside of the body cavity. As sperm cells are sensitive to temperature changes, the scrotum will retract and relax in proximity to the body to help maintain testicular temperature at approximately 4°C below the body temperature. If the sperm cells are exposed to very hot or very cold ambient temperatures, which are beyond the ability of the scrotum to control, sperm will die and the ram will have decreased fertility.

Sperm development occurs within the testes. Sperm go through several stages, with full maturation and fertility taking approximately 50 days in the ram. Management of the ram during the 50 days before breeding season will have a direct effect on the quality of the sperm and therefore the fertility of the ram. During ejaculation, mature sperm are transported from the testes to the internal portion of the reproductive tract through a tube called the vas deferens. In a vasectomized ram, sperm production occurs but the vas deferens is cut to prevent the release of sperm from the testes. The male accessory glands within the internal portion of the tract, contribute ~90% of the semen. This portion of the semen includes various components that help increase the viability of the sperm once it is within the female tract.

Testis size is often used as a judge of fertility and scrotal measurement is used as a basis for choosing breeding rams. Scrotal measurements on the same ram will vary depending on the time of year, with the smallest measurement seen in the spring and the largest in the fall. If scrotal size does not increase significantly (at least ~5cm) between spring and fall, there is a good chance the ram will have fertility problems. Although the change in size is an indication that the reproductive system is functioning, it is not a direct reflection of the quality of the sperm. Short of having his lambs on the ground, measuring the percent motility and the morphology of the sperm is the only way to concretely assess a ram's fertility.

Hormonal Control of Reproduction in the Ram

Although many hormones are at work, testosterone is the predominant hormone produced by the ram. Testosterone is produced by the testes and helps regulate sperm production. As with the ovarian hormones, testosterone production is controlled by a regulatory feedback system to the brain centres. This means that when a certain level of testosterone in the blood system is reached, the brain will send a signal to the testes to decrease production. Therefore, the blood level remains relatively constant.

As with ewes, the hours of daylight affect melatonin production. In turn the level of melatonin produced acts on the regulatory centres of the brain, causing the seasonal changes in reproductive activity in the ram.

Libido

Testosterone is, in part, responsible for the mating behaviour or libido in the ram. As the breeding season approaches and testosterone production increases, the ram will generally become more sexually active. As the testosterone level increases, rams that were relatively passive during the off-season may display aggressive behaviour not only towards other rams but also towards handlers.

The testosterone level is not the only influence on libido and various other factors will affect a ram's willingness to breed.

- **Ambient temperature:** As well as a decrease in fertility, rams often will be much less willing to breed during periods of high temperatures.
- **Preferential breeders:** Some rams choose to stay with one ewe throughout her estrus period, rather than breeding other ewes that are in heat at the same time. There have been cases of rams showing preferential homosexual behaviour, even when exposed to receptive ewes.
- **Injury:** Injuries to the reproductive tract or to the feet/legs of the ram may limit breeding.
- **Past Experience:** Even if the ram is not currently injured, past memories of breeding being painful or causing injury may result in a long-term decrease the libido.
- **Nutritional:** Rams should be in good condition but not overly fat as the breeding season approaches. Especially when they are first placed with the ewes, ram will exert a great deal of energy and will spend a limited amount of time feeding. Poor nutrition leading up to and during breeding will decrease energy reserves and libido in the ram.
- **Age:** Libido may be lower in rams older than six years of age.

Puberty

Puberty in rams is marked by an increase in blood testosterone, production of sperm, and mating behaviour. An increase in testis size and the beginning of sperm production occurs in ram lambs at around 8 to 10 weeks of age (body weight of 16 to 20kg). Ram lambs produce viable sperm and can successfully breed by ~4 to 6 months of age (40 to 60% body weight). As with ewes, the breed, season of birth, environment, and nutritional status will affect the exact timing of puberty. Do not house young rams with mature rams, as older, more dominant rams may injure the lambs.

The Breeding Season

Length of the Breeding Season

The breeding season should be managed to tailor the length of lambing season to your management system. For example, if you are lambing once per year, you may wish to limit the breeding season (the time the ewes are exposed to the ram(s)) to six or eight weeks. This will allow ewes to have two complete estrous cycles, and therefore two opportunities to conceive. Maintaining a controlled breeding season will help shorten the length of time spent lambing, to decrease the labour involved and will increase to uniformity of the lamb crop for easier management. For large flocks or if you have limited lambing facilities, you may wish to extend or stagger the breeding season. You may also wish to stagger the breeding period to take advantage of various lamb markets. With accelerated lambing systems, ewes are generally exposed to rams for a single estrous cycle. The ewes that have not conceived are put into the next breeding group.

Breeding

As mentioned earlier, ewes will be receptive to the ram for a period of ~10 hours during estrus. It has been found that optimum conception rates occur when the ewe is bred a number of times during this period. If there are a number of ewes in heat at the same time, this will require the ram to be able to breed multiple times within a short period. Rams are capable of legendary feats regarding the number of ewes bred within a short time period (up to 50 matings on the first day with the ewes have been reported). As a result, courtship behaviour, ejaculation, and the refractory period (time between ejaculations) are relatively brief in sheep.

Marking harnesses can be used to help determine if rams are being effective during the breeding season. Rams may be fitted with a special harness, which holds a marking device under the animal's brisket. Alternatively, crayon or paint can be applied directly to the brisket of the ram. The marker should be reapplied often to prevent it from fading. As the ram is mounting the ewe, she will be marked by the crayon or paint. Using different colours for each ram will help determine parentage if you are using more than one ram in a group of ewes. If the breeding season is longer than one estrous cycle, changing the colour of the marker every 17 days will help give an estimate of the number of ewes bred on each cycle. If you use this technique be sure to use a light colour during the first cycle.

Using markers is not a guarantee that the ram is breeding. It is advisable to spend some time watching the flock during breeding season, as the ram may be mounting but not actually breeding. It is especially important to watch young, unproven rams for breeding behaviour and to ensure they are not becoming fatigued. Even with older proven rams, recent injuries or other problems may interfere with breeding. Spending some time during the breeding season to ensure that the rams are working will save disappointment at lambing time.

Ewe: Ram Ratio

The number of ewes that one ram will be able to breed will vary with the production system. For example, if you are synchronizing a large group of ewes, they will be in heat at the same time and more rams will be needed. As fertility and libido are affected by the season, out of season breeding requires a lower ewe:ram ratio. Generally speaking, ram lambs will be able to breed ~25 ewes in their first year and mature rams can typically breed 40-50 ewes within a two month breeding season in autumn.

