

= Domestic sheep reproduction =

As with other mammals , domestic sheep reproduction occurs sexually . Their reproductive strategy is very similar to other domestic herd animals . A flock of sheep is generally mated by a single ram , which has either been chosen by a farmer or has established dominance through physical contest with other rams (in feral populations) . Most sheep have a breeding season (tugging) in the autumn , though some are able to breed year @-@ round .

Largely as a result of the influence of humans in sheep breeding , ewes often produce multiple lambs . This increase in the lamb births , both in number and birth weight , may cause problems in delivery and lamb survival , requiring the intervention of shepherds .

= Sexual behavior =

Ewes generally reach sexual maturity at six to eight months of age , and rams generally at four to six (ram lambs have occasionally been known to impregnate their mothers at two months) . Ewes enter into estrus cycles about every 17 days , which last for approximately 30 hours . In addition to emitting a scent , they indicate readiness through physical displays towards rams . Sheep may display homosexuality , which occurs in about eight percent of rams . Its occurrence does not seem to be related to flock hierarchy (as some homosexual behavior is in mammals) , rather the ram 's typical motor pattern for intercourse is directed at rams instead of ewes . The phenomenon of the freemartin , a female bovine that is behaviorally masculine and lacks functioning ovaries , is commonly associated with cattle , but does occur to some extent in sheep . The instance of freemartins in sheep may be increasing in concert with the rise in twinning (freemartins are the result of male @-@ female twin combinations) .

= Rutting =

Without human intervention , rams may fight during the rut to determine which individuals may mate with ewes . Rams , especially unfamiliar ones , will also fight outside the breeding period to establish dominance ; rams can kill one another if allowed to mix freely . During the rut , even normally friendly rams may become aggressive towards humans due to increases in their hormone levels .

Historically , especially aggressive rams were sometimes blindfolded or hobbled . Today , those who keep rams typically prefer softer preventative measures , such as moving within a clear line to an exit , never turning their back on a ram , and possibly dousing with water or a diluted solution of bleach or vinegar to dissuade charges .

= Pregnancy =

Without ultrasound or other special tools , determining if a sheep is pregnant is difficult . Ewes only begin to visibly show a pregnancy about six weeks before giving birth , so shepherds often rely on the assumption that a ram will impregnate all the ewes in a flock . However , by fitting a ram with a chest harness called a marking harness that holds a special crayon (or raddle , sometimes spelled reddle) , ewes that have been mounted are marked with a color . Dye may also be directly applied to the ram 's brisket . This measure is not used in flocks where wool is important , since the color of a raddle contaminates it .

After mating , sheep have a gestation period of around five months . Within a few days of the impending birth , ewes begin to behave differently . They may lie down and stand erratically , paw the ground , or otherwise act out of sync with normal flock patterns . A ewe 's udder will quickly fill out , and her vulva will swell . Vaginal , uterine or anal prolapse may also occur , in which case either stitching or a physical retainer can be used to hold the orifice in if the problem persists .

= Artificial insemination and embryo transfer =

In addition to natural insemination by rams , artificial insemination and embryo transfers have been used in sheep breeding programs for many years in Australia and New Zealand . These programs have become more commonplace in the United States during the 2000s as the number of veterinarians qualified to perform these types of procedures with proficiency have grown . However , ovine AI is a relatively complicated procedure compared to other livestock . Unlike cattle or goats , which have straight cervixes that can be vaginally inseminated , ewes have a curved cervix which is more difficult to access . Additionally , breeders were until recently unable to control their ewe 's estrus cycles . The ability to control the estrus cycle is much easier today because of products that safely assist in aligning heat cycles . Some examples of products are PG600 , CIDRs , Estrumate and Folltropin V. These products contain progesterone which will bring on the induction of estrus in ewes (sheep) during seasonal anestrus . Seasonal anestrus is when ewes do not have regular estrous cycles outside the natural breeding season .

Historically , vaginal insemination of sheep only produced 40 %-60 % success rates , and was thus called a " shot in the dark " (SID) . In the 1980s , Australian researchers developed a laparoscopic insemination procedure which , combined with the use of progestogen and pregnant mare 's serum gonadotropin (PMSG) , yielded much higher success rates (50 %-80 % or more) , and has become the standard for artificial insemination of sheep in the 21st century .

Semen collection is naturally an integral component of this entire process . Once semen has been collected it can be used immediately for insemination or slowly frozen for use at a later date . Fresh semen is recognized as the method of choice as it lives longer and yields higher conception rates . Frozen semen will work but it must be the highest quality of semen and the ewes must be inseminated twice in the same day . The marketing of ram semen is a major part of this industry . Producers owning prize winning rams have found this to be a good avenue to leverage the accolades of their most famous animals .

During embryo transfer (ET) a minor surgical procedure with almost no risk of injury or infection when performed properly , sheep laparoscopy allows the importation of improved genetics , even of breeds which may otherwise be non-existent in certain countries due to the regulation of live animal imports . Embryo transfer procedures are used to allow producers to maximize those females that produce the best lambs / kids either for retention into the flock or for sale to other producers . ET also allows producers to continue to utilize a ewe / doe that may not physically be able to carry or feed a set of lambs . ET can allow a producer to grow his flock quickly with above average individuals of similar bloodlines . The primary industry to utilize this technology in the United States is the club lamb breeders and exhibitors . It is a common practice in the commercial sheep industries of Australia , New Zealand , and South America .

Average success rates in Embryo Transfer in terms of embryos recovered can vary widely . Each breed will respond differently to the ET process . Typically white faced ewes and does are more fertile than black faced ewes . A range of zero to the mid 20 % s in terms of viable embryos recovered from a flush procedure can be expected . Over the course of a year the average is 6 %-8 % transferrable eggs per donor with a 75 % conception rate for those eggs .

A big part of modern sheep reproduction is overall breeding animal health . In an effort to help improve animal health and ultimately performance many progressive breeders rely on PROGEN . Evidence based research substantiated by reliable field trials have shown improved performance in sheep . The name comes from the progenitor cells of the body . The progenitor cells are differentiated stem cells with specific direction and purpose to become the future building blocks of the body . The goal for PROGEN is to support the body at the most fundamental levels encouraging efficient development of the progenitor cells . This approach is to impact the entire animal starting with immune function , gastrointestinal health , vascular system , and importantly reproduction efficiency .

= = Lambing = =

When birth is imminent , contractions begin to take place , and the fitful behavior of the ewe may increase . A normal labor may take one to several hours , depending on how many lambs are

present , the age of the ewe , and her physical and nutritional condition prior to the birth . Though some breeds may regularly produce larger litters of lambs (records stand around nine lambs at once) , most produce either single or twin lambs . At some point , usually at the beginning of labor or soon after the births have occurred , ewes and lambs may be confined to small lambing jugs . These pens , which are generally two to eight feet (0 @. @ 6 to 2 @. @ 4 m) in length and width , are designed to aid both careful observation of ewes and to cement the bond between them and their lambs .

Ovine obstetrics can be problematic . By selectively breeding ewes that produce multiple offspring with higher birth weights for generations , sheep producers have inadvertently caused some domestic sheep to have difficulty lambing . However , it is a myth that sheep cannot lamb without human assistance ; many ewes give birth directly in pasture without aid. this can be proven by the fact that they give birth in the wild . Balancing ease of lambing with high productivity is one of the dilemmas of sheep breeding . While the majority of births are relatively normal and do not require intervention , many complications may arise . A lamb may present in the normal fashion (with both legs and head forward) , but may simply be too large to slide out of the birth canal . This often happens when large rams are crossed with diminutive ewes (this is related to breed , rams are naturally larger than ewes by comparison) . Lambs may also present themselves with one shoulder to the side , completely backward , or with only some of their limbs protruding . Lambs may also be spontaneously aborted or stillborn . Reproductive failure is a common consequence of infections such as toxoplasmosis and foot @-@ and @-@ mouth disease . Some types of abortion in sheep are preventable by vaccinations against these infections .

In the case of any such problems , those present at lambing (who may or may not include a veterinarian , most shepherds become accomplished at lambing to some degree) may assist the ewe in extracting or repositioning lambs . After the birth , ewes ideally break the amniotic sac (if it is not broken during labor) , and begin licking clean the lamb . The licking clears the nose and mouth , dries the lamb , and stimulates it . Lambs that are breathing and healthy at this point begin trying to stand , and ideally do so between a half and full hour , with help from the mother . Generally after lambs stand , the umbilical cord is trimmed to about an inch (2 @. @ 5 centimeters) . Once trimmed , a small container (such as a film canister) of iodine is held against the lamb 's belly over the remainder of the cord to prevent infection .

= = Postnatal care = =

In normal situations , lambs nurse after standing , receiving vital colostrum milk . Lambs that either fail to nurse or are prevented from doing so by the ewe require aid in order to live . If coaxing the pair to accept nursing does not work , one of several steps may then be taken . Ewes may be held or tied to force them to accept a nursing lamb . If a lamb is not eating , a stomach tube may also be used to force feed the lamb in order to save its life . In the case of a permanently rejected lamb , a shepherd may then attempt to foster an orphaned lamb onto another ewe . Lambs are also sometimes fostered after the death of their mother , either from the birth or other event .

Scent plays a large factor in ewes recognizing their lambs , so disrupting the scent of a newborn lamb with washing or over @-@ handling may cause a ewe to reject it . Conversely , various methods of imparting the scent of a ewe 's own lamb to an orphaned one may be useful in fostering . If an orphaned lamb cannot be fostered , then it usually becomes what is known as a bottle lamb ? a lamb raised by people and fed via bottle .

After lambs are stabilized , lamb marking is carried out ? this includes ear tagging , docking , castration and usually vaccination . Ear tags with numbers are the primary mode of identification when sheep are not named ; it is also the legal manner of animal identification in the European Union : the number may identify the individual sheep or only its flock . When performed at an early age , ear tagging seems to cause little or no discomfort to lambs . However , using tags improperly or using tags not designed for sheep may cause discomfort , largely due to excess weight of tags for other animals .

Ram lambs not intended for breeding are castrated , though some shepherds choose to avoid the

procedure for ethical , economic or practical reasons . Ram lambs that will be slaughtered or separated from ewes before sexual maturity are not usually castrated . In most breeds , lambs ' tails are docked for health reasons . The tail may be removed just below the lamb 's caudal tail flaps (docking shorter than this may cause health problems such as rectal prolapse) , but in some breeds the tail is left longer , or is not docked at all . Docking is not necessary in short @-@ tailed breeds , and it is not usually done in breeds in which a long tail is valued , such as Zwartbles . Though docking is often considered cruel and unnatural by animal rights activists , it is considered by sheep producers large and small alike to be a critical step in maintaining the health of sheep . Long , wooly tails make shearing more difficult , interfere with mating , and make sheep extremely susceptible to parasites , especially those that cause flystrike . Both castration and docking can be performed with several instruments . An elastrator places a tight band of rubber around an area , causing it to atrophy and fall off in a number of weeks . This process is bloodless and does not seem to cause extended suffering to lambs , who tend to ignore it after several hours . In addition to the elastrator , a Burdizzo , emasculator , heated chisel or knife are sometimes used . After one to three days in the lambing jugs , ewes and lambs are usually sufficiently stabilized to allow reintroduction to the rest of the flock .

= = Commercial sheep breeding = =

In the large sheep producing nations of South America , Australia and New Zealand sheep are usually bred on large tracts of land with much less intervention from the graziers or breeders . Merinos , and much of the land in these countries does not lend itself to the mob intervention that is found in smaller flock breeding countries . In these countries there is little need , and no option but for ewes to lamb outdoors as there are insufficient structures to handle the large flocks of ewes there . New Zealand ewes produce 36 million lambs each spring time , which is an average of 2 @,@ 250 lambs per farm . Australian graziers , too , do not receive the financial support that governments in other countries provide to sheep breeders . Low @-@ cost sheep breeding is based on large numbers of sheep per labour unit and having ewes that are capable of unsupervised lambing to produce hardy , active lambs .

= = Managerial aspects = =

For breeders intent on strict improvements to their flocks , ewes are classed and inferior sheep are removed prior to mating in order to maintain or improve the quality of the flock . Muffled (wooly) faces have long been associated with lower fertility rates . Stud or specially selected rams are chosen with aid of objective measurements , genetic information and evaluation services that are now available in Australia and New Zealand . The choice of mating time is governed by many factors including climate , market requirements and feed availability . Rams are typically mated at about 2 @.@ 5 % depending on the age of the sheep , plus consideration as to the size and type of mating paddocks . The mating period ranges from about 6 to 8 weeks in commercial flocks . Longer mating times result in management problems with lamb marking and shearing etc .

Good nutrition is vital to ewes during the last 6 weeks of pregnancy in order to prevent pregnancy toxemia , especially in twin bearing ewes . Overfeeding , however , may result in over large single lambs and dystocia . Shearing ewes before lambing reduces the number of ewes that are cast (i.e. unable to rise unassisted) , and the number of lambs and ewes that are lost . Lambs , too , are aided in finding the udder and suckling a shorn ewe .

After shearing ewes are typically placed in well sheltered paddocks that have good feed and water . Attention to ewes that are lambing varies according to the breed , size and locations of properties . Unless they are stud ewes it unlikely that they will receive intensive care . On stations with large paddocks there is a policy of non @-@ interference . On other properties the mobs are inspected by stockmen at varying intervals to stand cast ewes and deal with dystocia . Producers also sometimes quietly drift pregnant ewes away from ewes that have already lambed , in order to prevent mis @-@ mothering .

Lambs are usually marked at three to six weeks of age , but a protracted lambing season may necessitate two markings .

= = = Inbreeding depression = = =

Inbreeding tends to occur in flocks of limited size and where only a single or a few rams are used . Associated with inbreeding is a decline in progeny performance usually referred to as inbreeding depression . Inbreeding depression has been found for lamb birthweight , average daily weight gain from birth until two months , and litter size .

= = Other countries = =

In the major sheep countries of Argentina , Uruguay , Brazil , Peru and Chile , breeders are also utilizing fleece testing and performance recording schemes as a means of improving their flocks .

= = New research = =

In 2008 , for the first time in history , researchers at Chiswick CSIRO research station , between Uralla and Armidale , New South Wales have used stem cells to develop surrogate rams and bulls . These males then produce the viable semen of another male .

The approach in these sheep experiments involves irradiating a ram ' s testes while placing stem cells from a second ram into the testes of the first , ram A. In the following weeks ram A produces semen the usual way , but is using the stem cells of ram B and therefore producing semen carrying the genetics of ram B rather than those of his own . Ram A therefore has effectively become a surrogate ram .

The viable semen is then implanted in the ewe and the many lambs born through this process are proving to be normal and healthy . DNA tests have proved that up to 10 % of the lambs are sired by the surrogate ram and carry the genetics of the donor ram .