# Introduction

This manual has been developed as a study guide for the Florida State Fair Skilathon which is part of the Champion Youth Program. The topic for this year's Skilathon is **Reproductive Management**.

The Florida State Fair recognized that agricultural education instructors, 4H agents, parents, and leaders provide the traditional and logical instructional link between youth, their livestock projects, and current trends in the animal agriculture industry. **PLEASE NOTE:** This manual is provided as a **study guide** for the Skillathon competition and should be used as an additional aid to ongoing educational programs.

Sections are labeled **Junior**, **Intermediate & Senior**; **Intermediate & Senior**, **or Senior** to help exhibitors identify the material that is relevant to their age level.

#### Juniors (age 8-10 as of September 1, 2023)

Overview of Camelid Reproduction Knot Tying

#### Intermediates (age 11-13 as of September 1, 2023)

-all of the above plus Camelid Male and Female Anatomy Reproduction Functions of Camelids Preparation for Birthing

#### Seniors (age 14 and over as of September 1, 2023)

-All of the above plus... -Labor and Delivery Cria Care, Breeding Management Pregnancy Diagnosis

Only Senior exhibitors will be eligible to qualify for the top 4 Champion Youth Awards. Intermediate and Junior exhibitors will only complete the Skilathon and Record Book Test segments designated for their age level.

### **GOOD LUCK!**

### **Overview of Camelid Reproduction**

Llama and alpaca are in the camelid subfamily of lamoids (llamas, guanacos, alpaca, vicuna) the South American camelid (SAC) family. All have similar reproductive characteristics that enable them to survive and flourish in the Andean countries. Intact males are referred to as sires, while castrated males are referred to as geldings. Females are referred to as dams. Babies are called crias and are nursed by the dam until at least 6 months old.

Female and male selection should consider both sexual and emotional maturity (not necessarily related to age). Males as young as four (4) months have been known to impregnate a female; females as young as eight (8) months have gotten pregnant. These 'accidents' are harmful to the mother and Cria, due to nutritional requirements, and should be avoided. Selecting a female of adequate size to carry a Cria might mean that she is 2-3 years of age, with adequate conformation, body size, and sexual maturity. Male sexual maturity expresses from 12-36 months. Males should be selected based on size in comparison to the females to prevent harm during breeding and birthing. Male testicle size is correlated with fertility levels.

Llamas and alpacas are induced ovulators which means that the act of breeding, known as copulation, stimulates the hormones that promote the release of the egg to be fertilized. Breeding can take place any time of the year, so climate must be considered when deciding to breed and birth (too hot normally in Florida is the concern). Avoiding extreme heat and cold during certain trimesters of the pregnancy often influences the success of the pregnancy and the health of the Cria. Breeding takes place in the sternal position, with the male on top. This usually takes about 20 minutes.

Gestation (length of the pregnancy) on average lasts 350 days +/- 30 days with varied reports of 'normal' length of time. The variation is based on genetic, physical, and environmental factors. Examples that might result in varied length of pregnancy include:

-babies born in the fall often have a longer gestation -genetic influence of the sire and dam -stress such as extreme heat, cold, or medical procedures

Birthing often occurs in the daytime. From the onset of normal presentation of both feet and head to birth, the average time is 20-30 minutes. Babies are born with a membrane covering their body which is often absent after birth on the mouth and anus. Unlike most mammals, the mothers do not lick the Cria or eat the afterbirth. The first milk is colostrum which is rich in nutrients and vital for passive transfer of immunity. The lamoids do not produce large quantities of milk. The weight of a normal newborn llama ranges from 18-30 pounds. A newborn alpaca ranges in weight from 12-18 pounds. A single Cria is most often produced, as twins are very rare and usually not successful. The placenta is usually passed within 2 hours but can take up to 6 hours to pass.

Junior, Intermediate, and Senior

Llamas, guanacos, alpacas, and vicunas can interbreed and should therefore be pastured separately. Males not intended for breeding are castrated at 2 years old, sooner if bottle fed or displaying abnormal, aggressive behavior.

### **Knots for Livestock Handling**

Knots are used to join ropes together, to attach ropes to a post or rail, or to attach ropes to an animal.

**Hitches** are used to attach a rope to a post or rail – the only thing securing the rope to the post is the pressure of one rope coil wrapping upon the others.

**Splices** are used to permanently join ropes to one another - individual strands from each rope are interwoven with strands from the other.

Junior, Intermediate, and Senior



# **Female Functional Anatomy**

Vulva	External opening of the female reproductive tract.	
Vagina	The passageway from the vulva to the cervix produces lubricating mucus during receptivity. It serves as the birth canal during birthing. The vagina of the mature female measures 20-25 cm in length approximately 3 cm in diameter with the external cervical O's protruding slightly into the vagina.	
Cervix	The opening into the uterus. Two to three cervical rings are found within the cervix which are not normally distinctly palpable during a routine rectal exam. The cervical opening appears to follow a clockwise course through the cartilaginous rings.	
Uterus	Supports, nourishes, and protects the embryo as it develops; expels the fetus at birth.	
Uterine horns	The uterus consists of a body and two uterine horns – right and left. Compared to other mammals, the horns of llamas and alpacas are short. The egg travels to a horn (usually left) before moving to the uterus for development.	
Fallopian Tubes (Ov	iduct) Two tubes that connect the ovaries to the uterine horns. The oviducts or fallopian tubes carry the eggs from the ovaries to the uterus and are the site of fertilization.	
Ovaries	The paired female gonads that release follicles and hormones.	
Follicles	Blister-like structures that develop on the ovary every 12-14 days. They produce estrogen and release the egg at ovulation (rupture of the follicle). Without ovulation. follicles shrink down in size or disappear within 2 days.	
Corpus luteum	Formed after ovulation by a change in the remaining cells; produces progesterone.	

## **Female Anatomy**



# Figure 2. Female Camelid Anatomy

Where:	ft=fallopian tube
s=sacrum of pelvis	0=0vary
r=rectum	ub=urinary bladder
v=vagina	sud=sub-urethral diverticulum
c=cervix	bp=bony pelvis
ut=utcrus	m=mammary gland

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# Male Functional Anatomy

Prepuce	The sac holding the penis. It normally points backward and can be observed when the male urinates.
Testicles	Paired male gonads that produce the sperm cells and the male sex hormone, testosterone.
Vas deferens	Long tube that connects the epididymis to the urethra near the bladder and transports sperm. The ampulla is the section that dumps into the urethra.
Prostate gland	Found near the urethra and the E. bladder. It adds fluid to the semen.
Bulbourethral Gland	Secrets a fluid similar to that of the seminal fluid that flushes urine residue from the urethra.
Urethra	The tube that passes through the penis and is the common passageway for semen and urine.
Penis	Organ used for copulation that deposits sperm into the female reproductive tract. Is a cartilaginous lip that dilates the cervix.
Glans Penis	The free end of the penis containing sensory nerves and the opening of the urethra.

### **Male Anatomy**



### Figure 1. Male Camelid Anatomy

Where: s=sacrum of pelvis r=rectum vd=vas deferens ub=urinary bladder a=ampullae p=prostate

b=bullbourethral gland s=sigmoid flexure of penis bp=bony pelvis t=testicle rp=retractor penis muscle pp=prepuce pu=pelvic urethra ur=urethral recess u=urethra pr=prepuce gp=glans penis cp=cartilaginous process uo=urethral opening

### **Reproduction Functions of Camelids**

South American camelids (SAC) are the only large domestic species that are induced ovulators; they are reproductively different than cows, sheep, goats, or horses. Unlike those species, female camelids do not present a constant estrus cycle. Ovulation is induced at the time of successful breeding. Eggs are present in the ovaries at birth and cannot be produced throughout the lifetime of the animal. Each egg is stimulated to develop once and then is not used again.

Since the female carries the baby and plays a significant part in the process of reproduction, it is discussed in detail. The male role and behaviors, maturity, and anatomy should be understood for a successful outcome.

Male camelids present different behaviors, mannerisms, and actions than other species so they also demonstrate unique breeding characteristics. Males are generally showing signs of puberty at 12-36 months of age. They require sex drive and size to accomplish breeding because the male uses those traits to accomplish copulation. The usual behavior is for the male to pursue the female. Some females become sternal recumbent immediately while others move away and run from the male. If the female is not willingly receptive to the male (i.e., assumes the sternal recumbent position without pressure) the male rears up and puts pressure on the female hindquarters until she assumes a sternal recumbent position. This behavior during breeding is the reason for selecting a size of animal that can accomplish this task while not harming the female.

A receptive female will cush (go down into a sternal recumbent position) within 30 seconds of introduction. Once the female is sternal recumbent the male positions himself at the rear in a half-sitting position and begins intromission. There is not a pelvic thrust as demonstrated in other species. The male adjusts positions and uses his penis to find the vulva. An important feature to recognize in the male is that the penis has a corkscrew presentation which allows penetration through the cervix. That corkscrew is a reason that a female should not be bred repeatedly – it can damage the female reproductive system causing unnecessary inflammation and trauma.

The act of breeding with the male, including vocalizing, penetration, and dilation of the cervix, and deposit of semen into both uterine horns stimulates.

- $\cdot$  the release of follicle-stimulating hormone (FSH) which
- · induces the luteinizing hormone to be released from the pituitary gland and
- chemically signals for the female to ovulate.

A normal ovary contains 2-3 small follicles in varying stages – growing, maturing, and regressing. Breeding stimulates hormone release. Between 24-36 hours after breeding the mature follicle is stimulated to release the egg that is carried into the oviduct (fallopian tube) where it meets the sperm for conception. Once the egg is fertilized and becomes an embryo it continues to travel down the oviduct towards the horn of the uterus. It takes approximately 4-6 days from the time of ovulation for the embryo to reach the uterus in most ruminants. Once the embryo has

reached the uterus, it spends about 14 days moving freely around the uterus before it completely attaches around day 21-30 of pregnancy.

The follicle that ovulates turns into a corpus leuteum (CL), is the structure on the ovary that produces progesterone and maintains the pregnancy. It also causes the female to demonstrate nonreceptive behavior such as running from the male and spitting.

Gestation is  $10\frac{1}{2}-12\frac{1}{2}$  months with the average being 350 days + or - 14 days. Llamas usually have a slightly longer gestation. The majority of fetal growth occurs in the last trimester. The nutritional requirements of the female can be maintained during the pregnancy but should increase protein and some mineral levels at the beginning of the third trimester (or about 4 months before her due date). Feeding the female more than maintenance amounts before the third trimester can result in weight gain and increased risk of dystocia (difficult birth) due to fat deposits forming and causing pressure on the pelvic canal to become smaller.

### **Preparation for birthing**

Birthing supplies should be kept in a location that is together and easy to access. Sometimes these supplies are organized into a birthing kit so that they can easily be obtained when Cria is about to arrive.

- · Halter and lead
- · Waterless hand cleaner
- $\cdot$  Towels (5-6)
- Sterile lubricant (gallon size or 5-7 tubes K-Y jelly)
- · Long rubber gloves (length past the elbow, OB exam gloves)
- · Latex gloves (exam gloves)
- · Rectal thermometer
- Red rubber French tubes size 8 and 14
- $\cdot$  60 cc syringe
- Umbilical clamp or clean shoelace
- · Chlorhexidine diluted 1:4 and small cup
- · Stethoscope
- Oxygen tank with nasal tubing
- Hair dryer and/or large heating pad

Other medications and supplies that might be necessary include:

- · Colostrum
- · Fleet enema
- Pedialyte (without flavor)
- · Cria coat
- · Baby bottle with nipple Prichard is small and accepted by Cria
- · Flashlight
- Plastic garbage bags
- Oxytocin (may be necessary to stimulate the passing of the placenta)

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- · Banamine (not to be given until after the placenta is passed)
- 3 cc syringes with <sup>3</sup>/<sub>4</sub>-1in 20 G needles

Senior

### Labor and Delivery

Labor can be divided into three phases: 1. Preparatory phase, 2. Fetal Expulsion, 3. Placental Expulsion.

During the **preparatory phase**, the female may not show any signs. If they do show signs of impending birth, they might include one or some or none of the following:

- · Behavior changes; restlessness and possible irritability
- · Vocalizing (humming, groaning)
- · Perineal relaxation (appears as a puffed-out vulva)
- · Lack of interest in food
- · Dam's udders might 'bag up' because of milk production
- · Isolation from the rest of the herd
- · Frequent trips to the poop pile ( usually closer to delivery; sometimes without results)
- · Changing position
- Sacrotuberal ligament relaxation (runs from the base of the tail to the tip of the pelvis on both sides of the pelvis)

### **Birthing**

The preparatory phase can last 1-6 hours but normally 2-3 hours is common. This is the phase when the dam might show signs of discomfort. Long labor usually indicates that there isn't progress of the baby into the birth canal for some reason and requires a veterinary consult if unsure how to check the dam.

**Fetal expulsion** can take typically 20-60 minutes with continual progression. Babies deliver head and front feet first with the feet in front of the head; the head may be above or below the feet. The amniotic sac might break before the baby presents or it might present first in which case it can be broken after it is obvious the baby is ready to breathe. A normal delivery is relatively bloodless. The dam might take a 20–30-minute rest after the head and legs are out, which allows the birth canal to continue to dilate to allow shoulders to pass.



**Placental expulsion** typically will be complete within 2 hours but might take longer. The placenta should be allowed to <u>expel without pulling</u>. If it is not passed within 24 hours, it is considered retained and requires *professional intervention*.

### Cria (Baby) care

- 1. Be sure that the airway is open and Cria has regular, comfortable breathing (20-30 per minute). If necessary, it might be required to remove the membrane from the nose and mouth. If required to remove fluids that might have been inhaled during birth, hang the Cria to open the airway and expel fluid, but if the labor and rest period were normal, Cria will often breathe rapidly and wiggle around trying to get on all four feet. Check membranes and tongue for pink color which indicates Cria is getting enough oxygen. If the Cria is having difficulty breathing, apply a nasal cannula and adjust oxygen to 0.5-1 L per minute until you can see that the Cria is breathing normally, and the membranes are pink.
- 2. Check that your eyes aren't irritated and are bright and clear.
- 3. Allow the Cria to adjust to their environment. A healthy Cria will be sitting sternal (crushed) within 5-15 minutes and standing within the hour. Letting Mom and Cria bond rather than intervening helps with a healthy adjustment. Usually, the herd will gather to check the newborn and the dam might not seem interested, but once they leave, the dam will show interest. Cria usually nurse in 2-4 hours but it might be less. Some dams are ready for Cria to nurse immediately while others might take time to adjust.
- 4. Take the temperature with the rectal thermometer well lubricated. Depending on the environment, the Cria might have a temp of less than 100 degrees. Towel drying not only helps to remove the fluid and the membrane but stimulates the Cria. A blow dryer or heating pad can also be used to raise the temp. In worse case scenarios when the temp is very low, the Cria can be placed in a garbage bag with his head out and the body immersed in warm water. Babies do not temperature regulate (i.e., they don't maintain the same temp easily) for the first 24-72 hours so it is important to check every 2 hours if they are not active and aim for a temperature of 100-101 degrees. If they are active (i.e., up trying to nurse) it won't be necessary to check the temperature frequently unless they are exposed to extreme heat or cold.
- 5. Dip the umbilicus with chlorhexidine (dilute 4:1 with water). Do not spray or pour onto the umbilicus as this is not effective in reducing bacteria. This should be repeated at least 3 times within the next 12 hours.
- 6. A strong, healthy Cria will have a strong suckle reflex and try to nurse as soon as they are on their feet. Before nursing, it is helpful to remove the wax plug from the dam's teats. If the dam doesn't produce milk immediately it might be necessary to offer Oxytocin or use a warm cloth to massage the teats. A weak Cria might have difficulty standing, and finding the teats and might show signs that need to be addressed before nursing. The first and only fluid that should be introduced to the Cria is colostrum, which is the rich 'milk' first produced by the dam. Colostrum contains nutrients needed for the Cria to develop a healthy immune system and if other fluids are introduced before colostrum, the gut closes

down to accept those nutrients. If the Cria can't nurse (or the dam doesn't allow nursing) colostrum can be milked from the dam and offered per bottle within the first 6 hours. Usually, 2 ounces per hour (alpaca) and up to 3 ounces per hour (llama) is an adequate amount to offer; larger quantities cannot be handled by babies. A Cria with a temperature less than 99 degrees should not be fed until the temp can be elevated.

- 7. Weight the Cria after drying and seems to be adjusting. Weight is an indicator of the dam's milk supply, and a healthy gain is 0.5 lb per day. In the first few days, the weight might drop slightly but should begin a steady gain within 3-4 days.
- 8. Watch for urination within 6-8 hours and defection (pooping). The first poop is meconium which is usually a dark color, but sometimes white, or orange, and is somewhat slimy. It should be passed within the first 12- 24 hours. If it is not passed, several options to encourage pooping can be used including a fleet enema, a partial suppository or simply using a gloved finger with plenty of lube to encourage passage.
- 9. Throughout the process always encourage bonding between the baby and the dam. Although intervention might be necessary, they must adjust to their roles without relying on human intervention.

Throughout the next few days and months, a Cria watch is important, because a healthy start is critical to growth and thriving. Initially, they nurse 2-4 times per hour then once per hour as they regulate. Their system receives immunities from the dam to help them until they can develop their immunities. They can have blood drawn to check the passive transfer of immunities from the dam. Vaccination plans, vitamin supplements, and other measures to help them thrive should be developed with a veterinarian's input.

### **Breeding Management**

Breeding practices vary depending on the owner's choices. Three common methods are hand breeding, pen breeding, or pasture breeding. All three require that the owner evaluate the preparedness of the male and female, their physical condition, and the environment.

The <u>physical preparation</u> includes checking that the male and female nails are trimmed to ensure that the animal doesn't injure the other. The female's tail is trimmed on the bottom side or wrapped to prevent hairs from getting caught on the male's penis and causing strangulation. A sock, nylon, or vet wrap can be used to wrap the tail. Be sure if vet wrap is used it is not so tight that blood circulation to the tail is reduced. The breeding environment should be in weather that is not hot or cold, surfaces that allow traction, and a location that doesn't disrupt the male and female. Depending on the type of breeding that is the best option, the environmental characteristics will change.

### A. Hand Breeding

This method allows total control by the owner of the breeding activity, including length of time. The male and female are brought together, and the owner can monitor the willingness and ability of the male and female. In circumstances when the female is nonreceptive (i.e., resistant to male breeding) the female can be removed. The owner can observe penetration if there is a need to verify breeding and should evaluate when to remove the male if needed. An average of 20 minutes is known to allow the semen to be deposited and to prevent harm to the female.

#### B. Pen Breeding

This is a moderately supervised method where one or more females are placed in a confined pen with one male for a short period (example: 1-2 days). A smaller pen allows relatively close supervision of the male and female(s). It is more natural than hand breeding because the alpaca can determine when it is time to breed. The exact breeding date is determined based on the first and last days the males and females were together.

#### C. Pasture Breeding

This is close to the most natural breeding situation. One or more females are in a pasture with one male for a longer period (for example: 30 days). In this scenario, it is helpful if the males and females are experienced breeders to prevent risk from injury caused by overbreeding or aggression. There must be adequate pasture space to give females space if they want to get away from the male, especially after the female is impregnated and rejects the male. It is efficient because the animals select their breeding time and handlers are not involved. Specific breeding dates are undetermined so pregnancy diagnosis must be done regularly. Due to the possible risk of trauma to the male's penis, the female's tail can be loosely wrapped while in the pasture.

### **Pregnancy Diagnosis**

Three methods are used to diagnose pregnancy, and each has pros and cons. These include behavior testing, progesterone assay testing, and ultrasound. Ballottement can be used in lateterm females to determine fetal presence. A combination of detection methods results in the greatest accuracy. Each owner will be able to find the methods that work best for their breeding management.

#### A. Behavior Testing

The benefit of behavior testing is that it is simple – it only requires that a male and female are exposed to each other. The disadvantage is that it is variable to the extent that it can be misleading. A veterinarian or invasive procedures are not required. Any male can be used for testing, not necessarily the breeding male for that female. Females that have a successful breeding will produce progesterone which results in the female rejecting the male. This is sometimes displayed as spitting at the male and/or running from the male. It can be a subtle behavior such as putting their ears back. A nonpregnant female will often tolerate the male's advances without moving away or lying down to accept breeding.

Males experienced as breeders are often very aware if they are approaching and smelling a pregnant female and won't wait for the female to spit or run away. The male will walk away before the female has a chance to react. They are also very aware if she isn't pregnant and will begin to vocalize (i.e., orgle) and try to breed if allowed.

One cause of inaccuracy in this method is that all animals do not behave the same. Judging the behavior of animals under similar circumstances varies and sometimes causes difficulty in verifying pregnancy. One of the common situations is when a pregnant female willingly allows the male to breed each time exposed to the male, leading one to believe she isn't pregnant. Without other testing, this is an example of why behavior testing can be inconclusive.

#### **B.** Progesterone Assay Testing

A blood test to check the progesterone level determines the presence of progesterone. At 7 days after breeding, a progesterone level greater than 2 ng/ml indicates ovulation and the presence of a corpus luteum (CL). A 2 ng/ml level at 21-24 days after breeding is an indirect indication of the presence of a CL, but may also be due to other factors. Although 2 ng/ml is usually the cutoff to determine pregnancy, some females maintain normal pregnancies with a progesterone level between 1-2 ng/ml. Daily variation in progesterone levels also occurs.

Progesterone testing is one of the more accurate pregnancy tests. Blood serum is sent to a diagnostic lab. Some owners can draw blood, or it might require a veterinarian. Progesterone testing therefore is more costly than behavioral testing. It does require correct interpretation as it might not indicate pregnancy if other factors are involved, but results are more objective, and accurate and provide a greater level of accuracy than behavior testing.

#### C. Ultrasound

The two types of ultrasounds are rectal and transabdominal. Both types require equipment and experienced persons to restrain and/or interpret the results. Restraint is critical to prevent injury to the animal and to accurately visualize. Both are relatively noninvasive methods. The choice of method is determined by the owner's experience, the preferences of the veterinarian, and the determined length of pregnancy.

A pregnancy can be detected as early as 15-18 days with rectal ultrasound. At 25 days embryonic implantation and fetal heartbeat are visible. At 6-9 months the uterus drops into the abdominal cavity and the amniotic fluid, Cria or placenta cannot be visualized via rectal ultrasound. Transabdominal ultrasound can detect pregnancy 35 - 90 days. After 90 days a right or ventral approach is more likely to be successful because of how the uterus moves relative to other organs.

#### D. Rectal Palpation

Rectal palpation is more difficult because of the size of llamas and alpacas but can be done safely if certain precautions are observed. Adequate restraint is critical and sometimes sedation or an epidural is required. The hand size of the examiner makes a difference in successful entry and palpation. A female who has had at least one Cria is usually easier than a maiden. The procedure requires that considerable lubricant be used to successfully dilate and palpate. Pregnancy can be determined preferably at 40-45 days. Beyond 90 days the uterus is positioned in a manner that it is difficult to reach the uterus for evaluation.

Although llamas and alpacas are moderately susceptible to rectal trauma because of their size, if done gently with proper restraint of the female and a considerable amount of lubricant, the risks are minimized to make the procedure worthwhile.

<u>E. Ballottement (feeling for a movable object in the body to confirm pregnancy by feeling the</u> rebound of the fetus)

This technique is successful in the later stages of pregnancy, requires no equipment, and can provide peace of mind when in doubt about the viability of the Cria. Because external signs are often absent in alpacas and llamas, ballottement can indicate the presence of the fetus. By 10-11 months the fetus can be balloted. Compartment one of the stomach occupies the left side causing the pregnant uterus to be diverted to the right in the late stages of pregnancy. In a standing animal, a clenched fist is pressed up against the abdominal wall and a short vigorous push is exerted while the fist is held in place. If the female is pregnant, the push will cause the fetus to bounce away from the push. It then drifts back and bumps the fist and sometimes Cria movement is present. The procedure should be repeated in several locations before it is concluded that the female is pregnant.

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Rocky Mountain Llama and Alpaca Association https://rmla.com/basic-camelid-reproduction-and-birthing

Australian Alpaca Association Ltd. (03) 9873 7700 www.alpaca.asn.au



FIGURE 17.1 Diagram of lateral view of male camelid genitalia: (A) spinal column, (B) ilium, (C) rectum, (D) acetabulum, (E) bladder, (F) prostate gland, (G) bulbourethral gland, (H) ischiatic tuberosity, (I) dorsal urethral recess, (I<sub>4</sub>) pelvic urethra, (J) brim of pelvis, (K) puble bone, (L) ischiatic arch, (M) ductus deferens, (N) corpus cavernosum penis, (O) penile urethra, (P) sigmoid flexure of the penis, (Q) testicle, (R) scrotum, (S) urethral orifice, (T) cartilaginous tip of the penis, (U) prepucial orifice, (V) scrotal ligament, (W) tail of epididymis, (X) head of epididymis, (Y) tunica vaginalis communis, (Z) pampiniform plexus.

Male anatomy reference



Female anatomy reference

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