

Lesson 4: Genetics and Reproduction

Genetics determines the type of foal that will be produced. Understanding genetic influences will help a breeder select the highest quality animals possible for mating. Also, ensuring healthy births is critical to a productive operation since a horse's gestation period is 11 months long.

Genetic Characteristics

The characteristics that a breeder looks for in a horse, such as color, muscling, stamina, and speed, are somewhat breed specific. The field of study that explains this is genetics. Genetics deals with gene combinations and how genes are passed on from generation to generation (inheritance). With horses, it is somewhat difficult to advance genetic material because only one foal a year is produced.

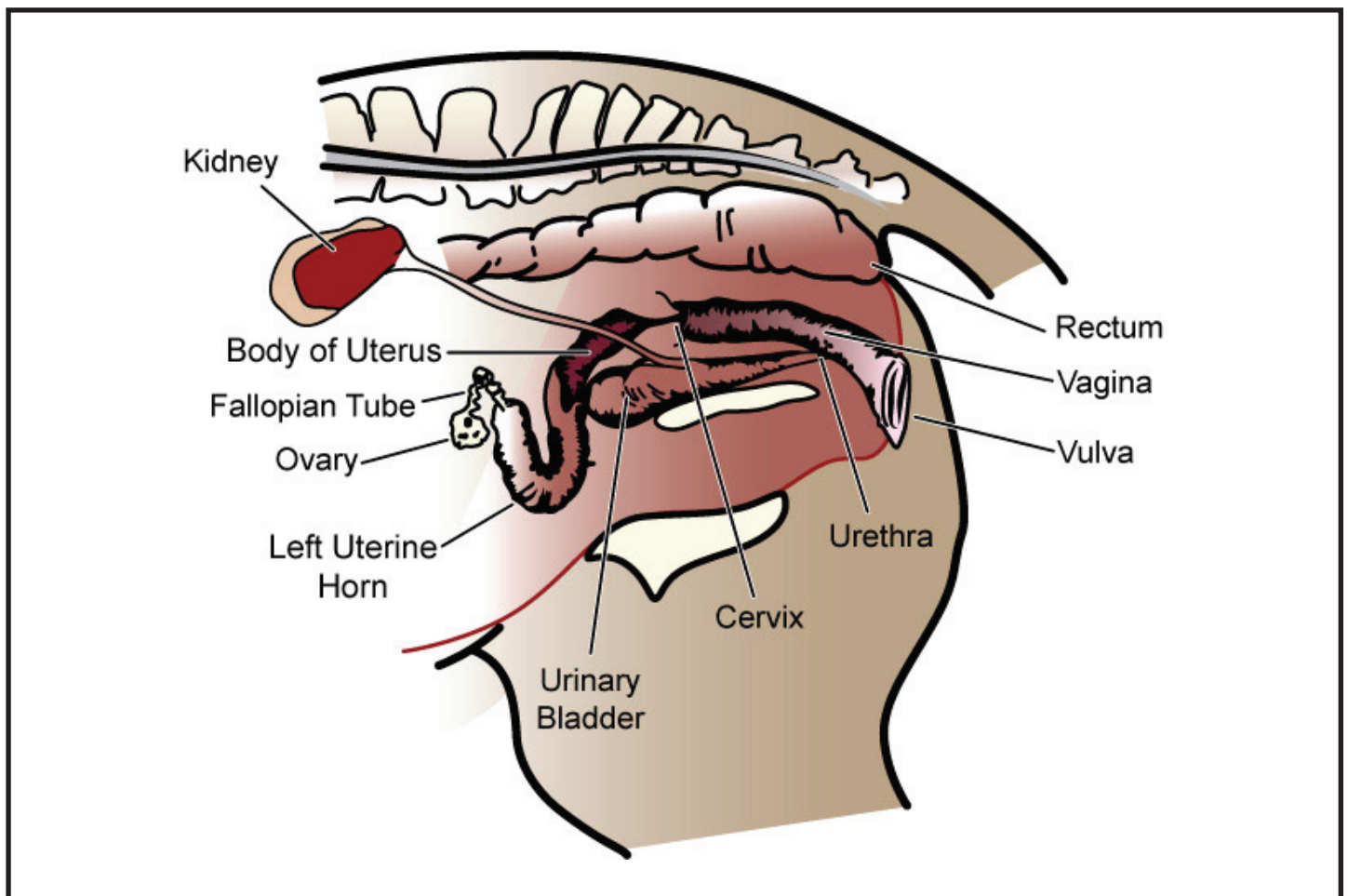
Breeders have been selecting for different characteristics for hundreds of years by breeding the best to the best. However, sometimes the foal is less desirable than the parents. The mare and stallion may have recessive genes that, when linked together, produce weak or lethal genes. This combination will cause severe defects and even death in foals. One lethal gene combination results in albinism, which causes the all-white foals to die, usually before birth.

The horse has a total of 32 chromosome pairs. When a mare is mated to a jack (the male of the ass family), it produces a mule. Mules are usually infertile because of the difference in parental chromosome numbers. This crossing of two different families produces a hybrid.

Reproductive Tract of the Mare

The reproductive tract of the mare is designed to produce the eggs (ova) and to provide a safe environment for the embryo to develop. After the embryo has fully developed,

Figure 4.1 - Mare Reproductive Organs



Equine Science

the mare expels it to the outside world and provides it with nourishment until the foal has grown to sufficient size.

The ova (eggs) are produced in the ovary and are expelled from a blisterlike sac that forms on the outside of the ovary. Ova travel from the ovary to the fallopian tubes, which carry them down through the uterine horn to the uterus. (See Figure 4.1.)

After fertilization, the embryo attaches to the lining of the uterus by the umbilical cord. Before the embryo gets to the uterus, the uterus develops a thick lining of blood vessels. This lining supports the embryonic sac, which makes up the afterbirth. At the end of the uterus is a strong muscle called the cervix, which keeps foreign matter out of the uterus. The cervix leads to the vagina (birth canal), which is where semen is deposited by the male and, after gestation, where the newborn exits to the outside world.

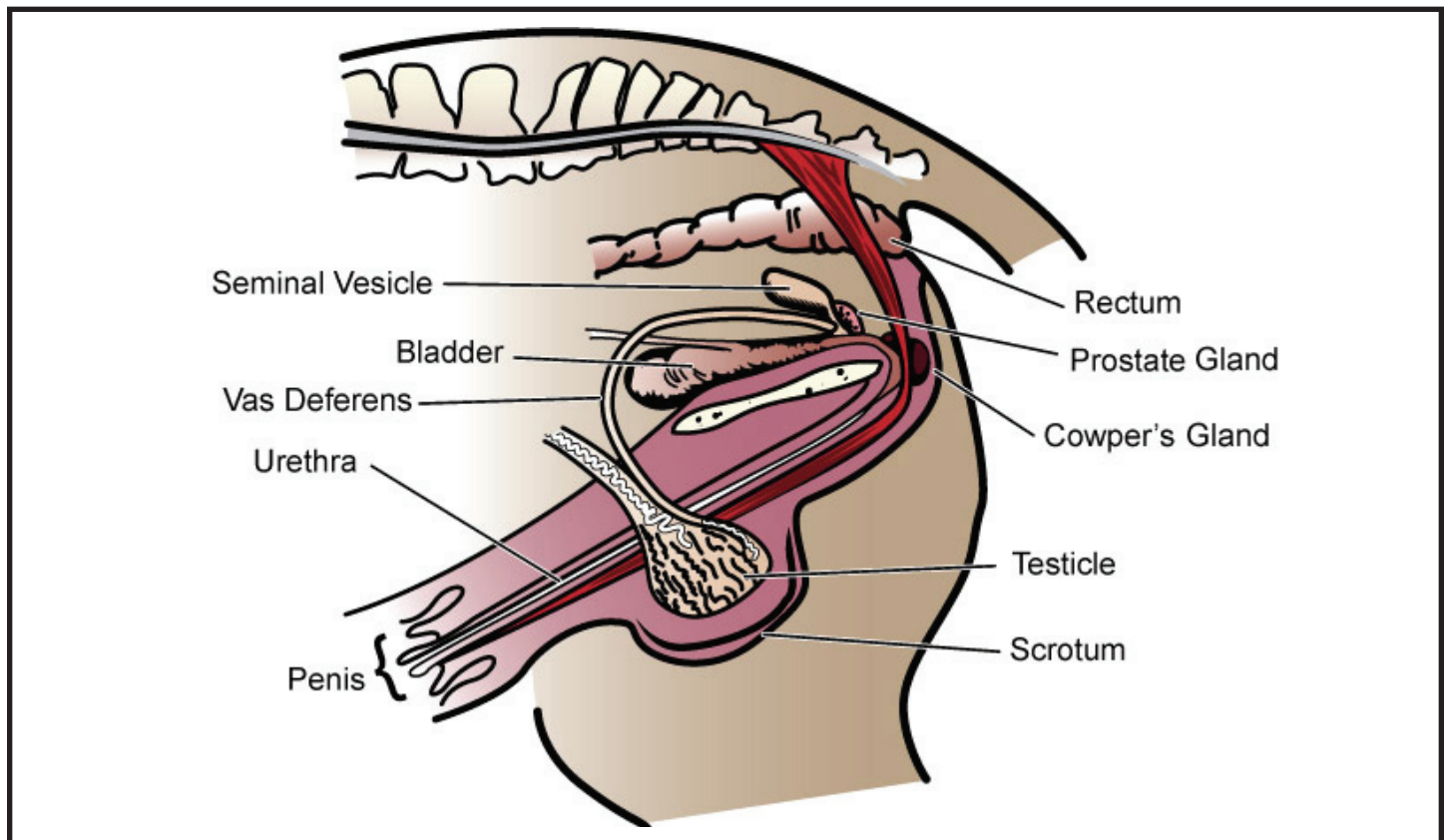
The mare is receptive to the stallion only during parts of her estrous period. The breeding season varies from mare to mare, but on the average runs from mid-April to

mid-October. The mare goes through a series of cycles that are about 21 days long. An ovum from the mare can become fertilized during a seven-day period in the middle of her 21-day estrous cycle. If the mare has not been bred successfully at that time, the cycle will repeat. In terms of handling, mares are frequently more temperamental during heat.

Reproductive Organs of the Stallion

The stallion's reproductive tract is designed to produce sperm cells and to transmit the sperm cells to the female's tract to fertilize the ovum. Sperm is produced in the testicles and is transmitted down a tube called the vas deferens. The vas deferens connects to the urethra just behind the bladder. The urethra acts as a common transportation tube for both urine and sperm cells. Along the urethra are three accessory glands: the seminal vesicles, the prostate gland, and the Cowper's gland. These glands produce fluids that help nourish the sperm and provide a transportation medium through the urethra in the penis. (See Figure 4.2.)

Figure 4.2 - Stallion Reproductive Organs



Genetics and Reproduction

Methods of Reproduction

Nature needs no help to reproduce in the wild, but since domestication has changed the life of the horse, people have had to develop ways to assure that reproduction takes place at convenient times. In *natural (pasture) breeding*, the mare and stallion are allowed to run in the pasture and bred naturally. With this method, the breeder probably will not know when the mare is due to foal.

Many breeders want to know when the mare will foal, so the method of hand breeding is used. This method involves taking the mare to the stallion, which is tied to a rail, fence, or post. (See Figure 4.3.) When teasing the mare, the stallion is allowed to check the mare to see if she is in the appropriate part of the estrous cycle and will allow the stallion to service (breed) her. A mare that is not in estrous will aggressively kick and paw the stallion and not allow him to approach her. A mare that is in estrous will go through several gestures, such as winking. Winking is when she lowers her pelvis and raises her tail in a submissive manner, allowing the stallion to breed her.

Artificial insemination (AI) is not used very much in horse breeding because some breed registries will not register the foal if breeding is done in that manner. Another

problem is that the semen does not freeze as well as it does in other animals, such as cattle. AI does have several advantages. One advantage is that it will allow one stallion to breed as many as 500 mares in one season, as compared to 80 in natural breeding or hand breeding.

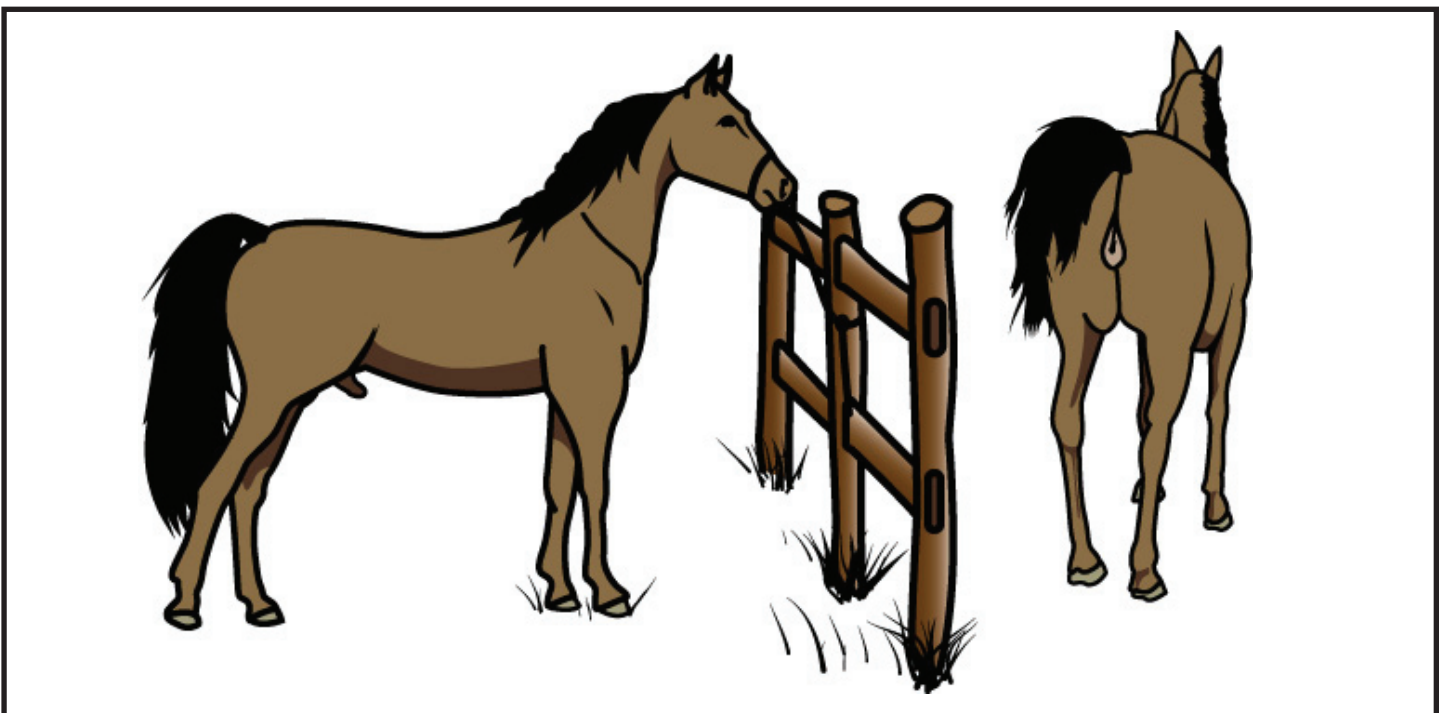
There are three steps to using AI. The first step is the collection of the semen. The next step is the evaluation of the semen. The last step in AI is insemination of the mare.

Parturition

Parturition is the process of giving birth. Waxing, the first sign that a mare is going to foal, takes place 2-4 days before foaling. The mare's teats secrete a waxy substance. However, not all mares do this. The next sign is when the mare's udder begins to get hard and full-looking. The mare's vagina muscles begin to relax, getting ready for the birth. The mare might also show signs of irritability and wish to stay in the quietest area.

During the actual birth, there are three stages. In the first stage, the mare might sweat, be agitated, paw the ground, or lie down and get up several times. She will not show signs of straining, but the water might break. During stage two, the mare will show visible signs of straining, and she

Figure 4.3 - Teasing the Mare



Equine Science

will either lie on her side or sit. Fetal membranes will appear from the vagina as she strains. As she progresses, the foal's feet appear first, followed by the nose, which is the start of stage three. After the foal's head appears, the shoulders follow, and the rest of the birth is fairly rapid. After the foal has been delivered, the afterbirth will be expelled in 2-3 hours.

Dystocia

Dystocia refers to anytime a mare has difficulty giving birth to the foal. This can be caused by several things, such as the foal being too large for the birth canal, one or both of the legs being caught inside, the foal coming out rump first (breech), or if twins are present. Any time a mare strains or has contractions for longer than normal, a veterinarian should be called to assist.

| Table 4.1 - Normal Delivery Stages | |
|------------------------------------|--------------------|
| 1. Preparatory | 30 min. to 4 hours |
| 2. Delivery | 20-30 minutes |
| 3. Delivery of placenta | 30 min. to 3 hours |

Dystocia can be caused by many things, such as age, proportion of the mare to the foal, breech births, or a foal tangled in the umbilical cord. Other possible causes of dystocia can be disease or improper diet.

Afterbirth

It is important to check the afterbirth as soon as it has been expelled to make sure it all came out. (The placenta should be in the same basic shape as the foal.) If there are holes or unusual tears in the placenta, part of the placenta might have been retained in the uterus. Call a veterinarian to assist.

A retained placenta causes inflammation/infection of the uterus, which can trigger laminitis (founder). In foaling founder, the uterus becomes inflamed from some type of abrasion during parturition. This inflammation can also trigger founder (laminitis).

Colostrum

Colostrum is the first milk that the mare produces. It is thick and yellowish and contains antibodies that give the foal immunities against infections and diseases. Colostrum is higher in protein and antibodies than regular milk. The colostrum lasts only for a few days, and it is very important that the foal gets this first milk, as it is sometimes referred to, to help ward off disease or infection. As with other species, it is critical that the foal nurses within the first two hours.

Summary

The process of life is the most remarkable process in all of nature, and the birth of a new foal is a wonderful thing to see. Considerable care must be taken from breeding to birth to ensure that the foal has every chance of surviving and thriving.

Credits

Ensminger, M. Eugene. *Horses and Horsemanship*. 6th ed. Danville, IL: Interstate Publishers, Inc., 1990.

Hawcroft, Tim. *The Complete Book of Horse Care*. New York: Howell Book House, Inc., 1994.

University of Missouri-Columbia Extension Division
agricultural publications

- a. G2790: Horse Breeding Arithmetic: $2 + 2 = 1$
- b. G2791: Genetics of Coat Color of Horses