Anatomy and Physiology of Animal Reproductive Systems

(Courtesy, Agricultural Research Service, USDA)

EVERY LIVING THING has a number of organ systems operating to perform specific functions. If you were to examine one of these systems, you would observe a number of parts working for distinct purposes. An organ system resembles a running machine. Like a machine with gears and gadgets working like clockwork to do a single task, an organ system comprises organs working together to carry out a particular function. A reproductive system is an organ system for the creation of offspring. Explore this E-unit to learn more about each part of a reproductive system and the role it plays in the reproduction of life.

Objective:

Identify and describe the male and female reproductive organs in mammals.

Key Terms:

bladder
cervix
clitoris
copulation
Cowper's gland
epididymis
fallopian tubes
follicles
gestation
glans penis
infundibulum
labia majora
labia minora
mucosal cells
ova
ovaries
oviducts
parturition
penis
prostate gland
retractor muscle
scrotum
semen
seminal vesicles
sheath
sigmoid flexure
sperm
spermatozoa
testicles
testosterone
urethra
urine
uterine horns
uterus
vagina
vas deferens
vulva
zygote

The Male Reproductive System

A successful livestock producer needs a complete understanding of the male reproductive organs. Usually, a livestock farm will have only a limited number of males available for breeding purposes.

The male reproductive system has several interconnected working parts that must function together for successful mating to occur. In the reproductive system of a male mammal, the major organs are the testicles, epididymis, scrotum, vas deferens, urethra, seminal vesicles, prostate gland, Cowper's gland, and penis.

The **testicles** play a major role in animal reproduction by producing **sperm**, or the male sex cells, also called **spermatozoa**. Testicles also produce a hormone, **testosterone**, which causes the appearance and behavior of the animal to have masculine traits. Every male animal has two testicles.

Sperm cells enter the **epididymis** attached to each testicle. They are stored there while they mature.

The **scrotum** is a two-lobed sac that contains and protects the two testicles. It also regulates the temperature of the testicles, which must be maintained below body temperature. When the environmental temperature is lower than the desired temperature, the scrotum contracts, pulling the testicles toward the body for warmth. When the environmental temperature is higher than the desired temperature, the scrotum relaxes, permitting the testicles to drop

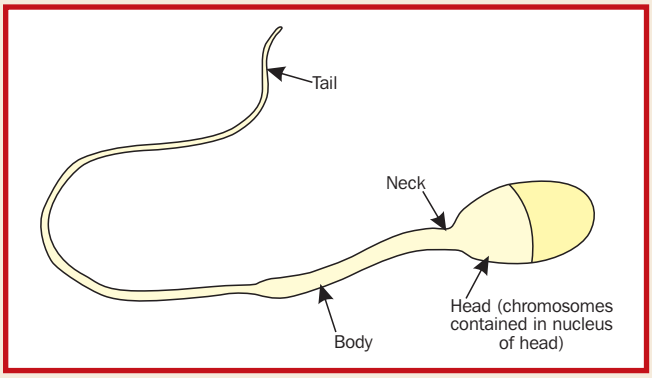
UNDER INVESTIGATION...

LAB CONNECTION: Semen Samples

Find out what semen looks like under a microscope. Have a beef, dairy, or swine producer supply you and your classmates with a few samples of semen. Be sure to ask how to handle the samples properly so that the sperm cells will be viable when examined.

Put some of the semen on a clean microscope slide and use a cover slip. Look at the semen through the microscope and identify the sperm cells. Use the accompanying drawing to learn the parts of a sperm cell. See if you can find the parts in your sample sperm cells.

Determine how long the sperm cells stay viable under the microscope. Also, think about how the environment you are exposing the sperm cells to affects their viability. Was the slide cold, wet, or unclean when you placed the sample on it? Try to relate these factors to the environment of the vagina when semen has been deposited in it.



The anatomy of a sperm cell.

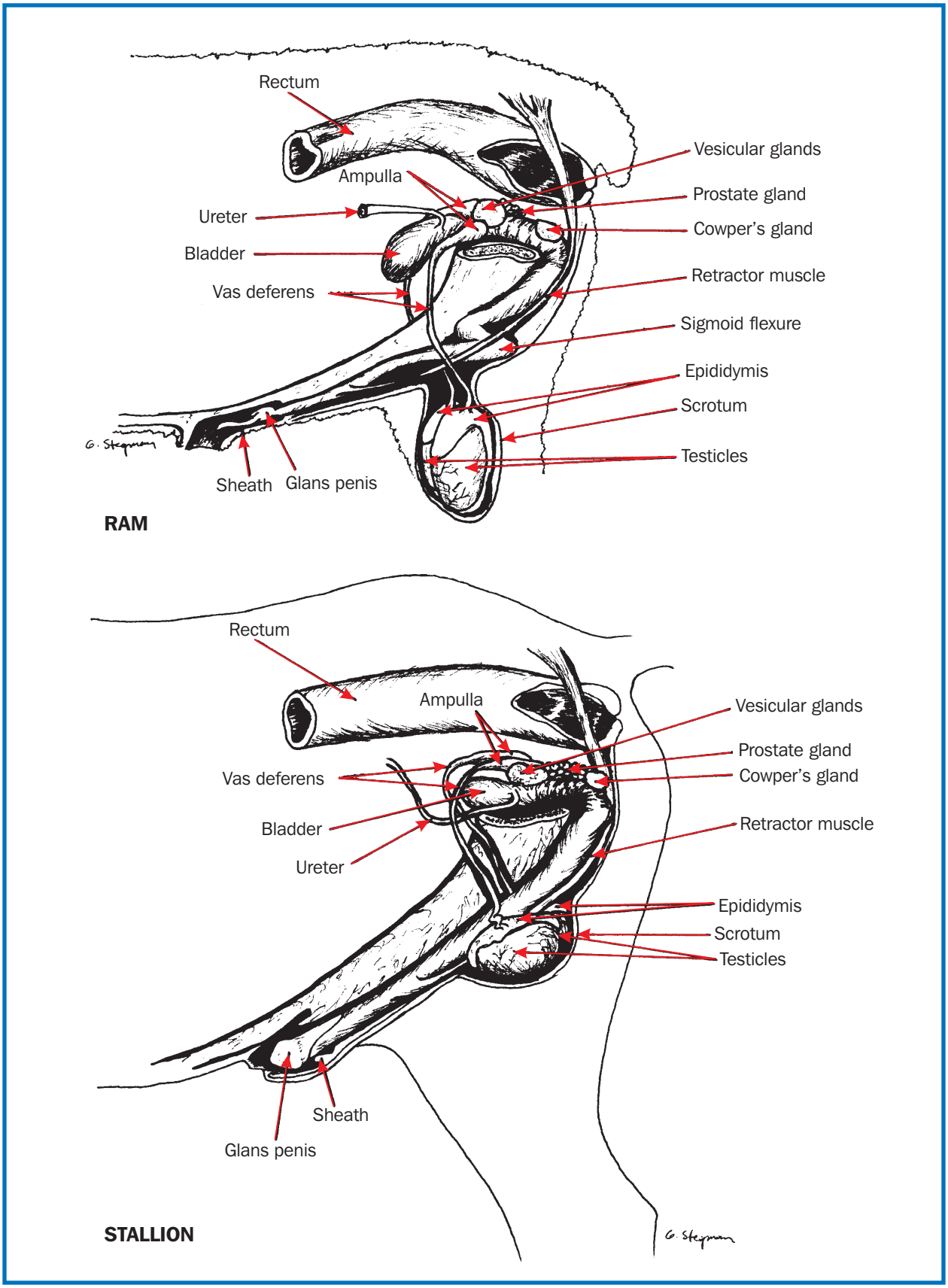


FIGURE 1. The reproductive organs of a ram and a stallion.

away from the body. This temperature regulation is greatly important to the reproductive process because of its effect on the production and vitality of sperm.

Another important organ of the male reproductive system is the **vas deferens**, which serves as a transportation tube that carries the sperm-containing fluid from each epididymis to the urethra. The **urethra** is the large, muscular canal extending from the urinary bladder to the end of the penis.

Several glands add volume and nutrients to the sperm-rich fluid coming from the epididymis. They are known as the accessory sex glands. The **seminal vesicles** open into the urethra to produce a fluid that protects and transports sperm. The **prostate gland** is near the urethra and the bladder. It produces a fluid that mixes with the seminal fluid throughout animal reproduction. The mixture of seminal and prostate fluids and sperm is called **semen**. The **Cowper's gland** produces a fluid that moves down the urethra ahead of the seminal fluid. This fluid cleans and neutralizes the urethra, helping protect the sperm as they move through.

The **penis** deposits the semen within the female reproductive system. The urethra in the penis is surrounded by spongy tissue that fills with blood when the male is sexually aroused. This causes an erection, which is necessary for **copulation**, or mating, to occur. The **sigmoid flexure**, commonly found in bulls, rams, and boars, and the **retractor muscle** extend the penis from the **sheath**, a tubular fold of skin. The **glans penis** at the tip of the penis acts as a sensory organ.

The Female Reproductive System

Like the male, the female mammal has a complex system of organs that compose the reproductive system. Producers must be familiar with these various organs and their functions to ensure successful reproductive development of their livestock. Some major organs that make up the female reproductive tract are the ovaries, oviducts, uterus, vulva, bladder, clitoris, and vagina.

A female mammal typically has two **ovaries**. Within each ovary are hundreds of tiny **follicles**, or cavities, where the ova are produced. The **ova**, or eggs, are the female sex cells. Each ovum is the largest single cell in the body. The ovaries also produce the female sex hormones, estrogen and progesterone.

Two tubes carry the ova from the ovaries to the uterus. These are called the **oviducts** or **fallopian tubes**. They reside close to the ovaries but are not attached to them. The funnel-shaped end of each oviduct nearest an ovary is called the **infundibulum**. At ovulation a follicle ruptures, releasing an ovum that is caught by the infundibulum.

After copulation, sperm move through the uterus to the oviduct. Fertilization of the ovum occurs in the upper end of the oviduct. The fertilized egg, known as a **zygote**, moves to the uterus about three days after fertilization.

The **uterus** of a mammal is a Y-shaped structure consisting of the body, two uterine horns, and the cervix. The size and shape of the uterus vary with the species. The upper part of the

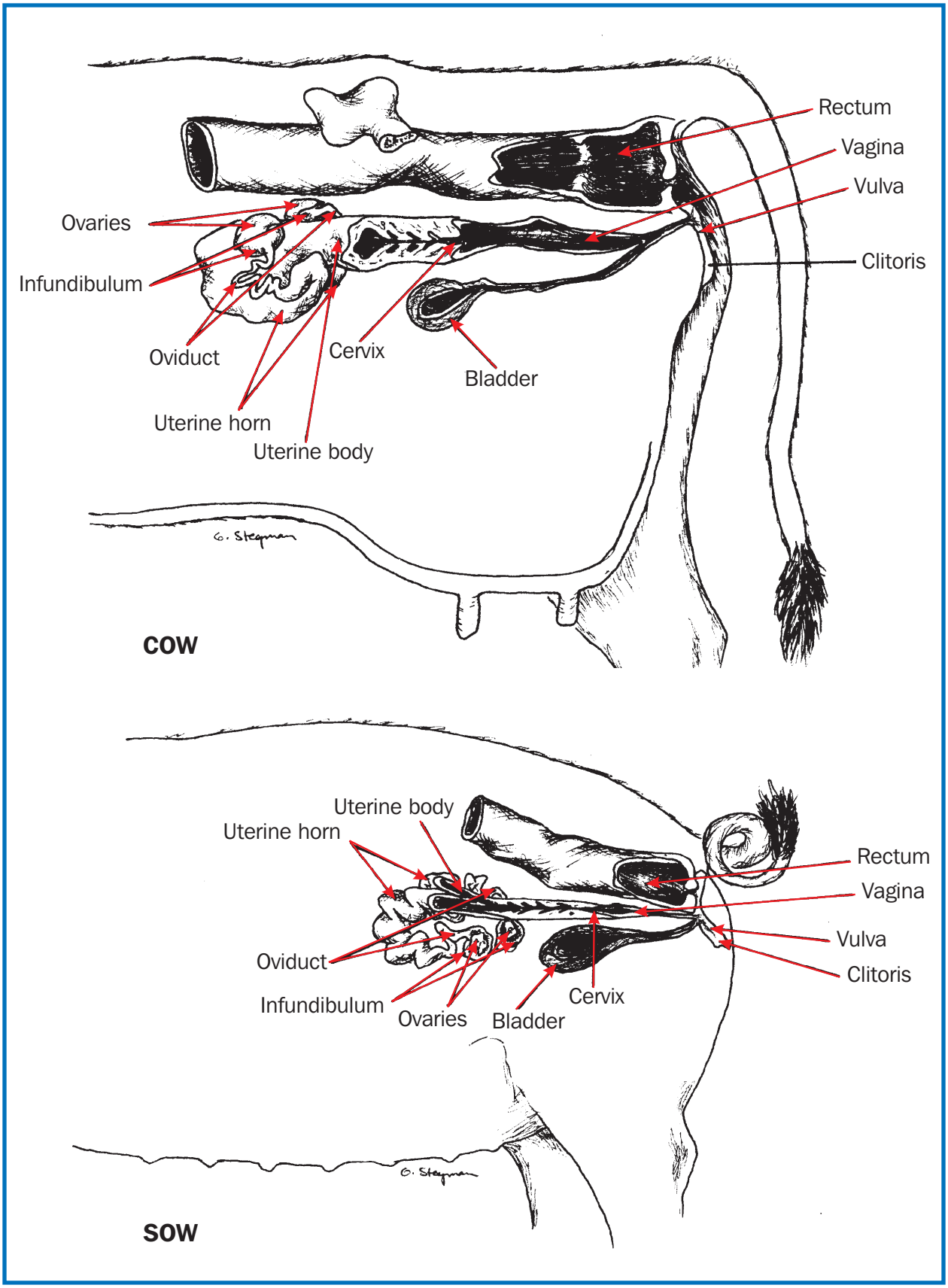


FIGURE 2. The reproductive organs of a cow and a sow.

uterus consists of two **uterine horns** that progress to the oviducts, or fallopian tubes. In most species, except the horse, pregnancy occurs in the uterine horns. In the horse, however, pregnancy occurs in the body of the uterus. The uterus is the site where the fetus grows until **parturition**, or birth. The uterus of a mammal that normally produces a large number of offspring at each breeding cycle has relatively large horns and a small body. In contrast, the uterus of a mammal that normally produces a single offspring or twins has smaller horns and a larger body. The **cervix** is the lower outlet of the uterus. It is composed primarily of connective tissue and constitutes the gateway between the uterus and the vagina. Like the rest of the reproductive tract, the cervix is lined with **mucosal cells**, which make significant changes as the animal goes from one estrous cycle to another during pregnancy, or **gestation**.

The **vulva** is the external opening of the reproductive and urinary systems. The exterior, or the visible parts of the vulva, consists of two folds called the **labia majora**. Inside the labia majora are two folds called the **labia minora**. The **bladder** collects all liquid waste, or **urine**. The urine passes through the urethra to the vagina. The urethra attaches to the floor of the vagina between the cervix and the vulva. The **clitoris** is the sensory and erectile organ of the female. It is just inside the vulva. The clitoris develops from the same embryonic tissue as the penis in the male and produces sexual stimulation during copulation. Lastly, the **vagina** serves as the female organ of copulation at mating and as the birth canal at parturition. It is the passage between the cervix and the vulva. The lining is moist during estrus and dry when the animal is not experiencing estrus.

Summary:

To have a successful livestock operation, a producer must understand animal reproduction. To gain complete understanding, a producer must be familiar with the parts of both the male and female reproductive systems. In the male reproductive system, the major organs are the testicles, epididymis, scrotum, vas deferens, urethra, seminal vesicles, prostate gland, Cowper's gland, and the penis. In a female reproductive system, the major organs are the ovaries, oviducts, uterus, vulva, bladder, clitoris, and vagina.

Checking Your Knowledge:

1. At what male reproductive site are sperm cells stored?
2. How does the male's scrotum maintain the testicles below body temperature?
3. What produces a fluid that moves down the urethra ahead of the seminal fluid to clean and neutralize the urethra?
4. Name the parts of a female mammal's uterus.
5. What is the sensory and erectile organ of the female?
6. What is external opening of the female reproductive system?

Expanding Your Knowledge:

Explore this E-unit and the Internet for diagrams of the reproductive systems of male and female animals of various species. How do the reproductive systems differ between species? How are male and female reproductive systems similar? Can you name some comparable organs in male and female reproductive systems?

Web Links:

Male Reproductive System

http://www.kidshealth.org/parent/medical/body_basics/male_reproductive.html

Female Reproductive System

http://www.kidshealth.org/parent/medical/body_basics/female_reproductive_system.html

Animal Reproduction

http://www.saburchill.com/chapters/chap0031.html