

Unit B: Understanding Animal Reproduction

Lesson 1: Anatomy and Physiology of Animal Reproductive Systems

Student Learning Objectives:

Instruction in this lesson should result in students achieving the following objectives:

1. Identify and describe the male reproductive organs in cattle.
2. Identify and describe the female reproductive organs in cattle.

Recommended Teaching Time: 1 hour

Recommended Resources: The following resources may be useful in teaching this lesson:

- Baker, M & Mikesell, R.E. *Animal Science Biology and Technology*. Danville, IL: Interstate Publishers, Inc. 1996.
- Gillespie, J.R. *Modern Livestock and Poultry Production, 6th Edition*. Albany, NY: Delmar. 2002.
- Lee, Jasper S., Hutter, J., Rudd R., Westrom, L., Bull, A.M., Embry Mohr, C. & Pollock, J. *Introduction to Livestock and Companion Animals 2nd Edition*. Danville, Illinois: Interstate Publishers, Inc., 2000.
- Taylor, R.E. *Scientific Farm Animal Production: An Introduction to Animal Science, 4th Edition*. New York: MacMillian Publishers Co. 1992.

List of Equipment, Tools, Supplies, and Facilities:

- Writing surface
- PowerPoint Projector
- PowerPoint Slides
- Transparency Masters

Terms: The following terms are presented in this lesson (shown in bold italics and on PowerPoint Slides 2 and 3):

- | | |
|-------------------|--------------------|
| • Bladder | • Ova |
| • Cervix | • Ovary |
| • Clitoris | • Oviducts |
| • Copulation | • Parturition |
| • Cowper's gland | • Penis |
| • Epididymis | • Prostate gland |
| • Fallopian tubes | • Scrotum |
| • Follicles | • Semen |
| • Gamete | • Seminal vesicles |
| • Gestation | • Sheath |
| • Infundibulum | • Sperm |
| • Labia majora | • Spermatozoa |
| • Labia minora | • Testicles |
| • Mucosal cells | • Testosterone |

- Urethra
 - Urine
 - Uterine horns
 - Uterus
- Vagina
 - Vas deferens
 - Vulva
 - Zygote

Interest Approach:

Ask students to name a part on a car. Make a list of five to eight on the chalkboard. Ask students to briefly explain each part's function in the operation of the car. Then ask students, "Why is it important for a car mechanic to be able to identify and know the function of these parts?" After a brief discussion, ask students, "Is it important for a livestock producer to know the parts of an animal? If so, why?"

SUMMARY OF CONTENT AND TEACHING STRATEGIES

Objective 1: Identify and describe the male reproductive organs in cattle.

Anticipated Problem: What are the male reproductive organs in cattle?

(PowerPoint Slide 4)

- I. To have a successful livestock operation, a producer must have an understanding of the functions of the various reproductive organs. In most cases, a livestock operation will have only a limited number of males available for breeding. The male reproductive system contains several interconnected parts that must all work together in order to have successful mating. Some of the major organs found in the male reproductive system are:

(PowerPoint Slides 5 and 6)

- A. Testicles—The **testicles** produce **sperm**, the male sex cells also called **spermatozoa**. They also produce a hormone called **testosterone** that causes the appearance and behavior of the animal to be masculine. There are two testicles present in male animals.

(PowerPoint Slide 7)

- B. Epididymis—The **epididymis** is the storage site for sperm cells. These cells enter the epididymis from the testicle to mature. Sperm become able to fertilize a female's **ova** or female sex cell, as it travels through the epididymis. There is a separate epididymis attached to each testicle.

(PowerPoint Slide 8)

- C. Scrotum—The **scrotum** is a two-lobed sac that contains and protects the two testicles. It also regulates the temperature of the testicles, maintaining them at a temperature lower than body temperature. When the environment temperature is low, the scrotum contracts, pulling the testicles toward the body and its warmth. When the environmental temperature is high, the scrotum relaxes, permitting the testicles to drop away from the body. Maintaining the correct temperature is critical in that being too hot or too cold can affect the production and vitality of sperm.

(PowerPoint Slide 9)

- D. Vas Deferens—The **vas deferens** is essentially a transportation tube that carries the sperm-containing fluid from each epididymis to the urethra.
- E. Urethra—The **urethra** is a large, muscular canal extending from urinary bladder. Both semen and urine move through the urethra to the end of the penis.
- F. Accessory Sex Glands—There are several glands that add volume and nutrition to the sperm-rich fluid coming from the epididymis.

(PowerPoint Slide 10)

- G. Seminal vesicles—The **seminal vesicles** open into the urethra. They produce a fluid that protects and transports the sperm.
- H. Prostate gland—The **prostate gland** is near the urethra and the bladder. It produces a fluid that is mixed with the seminal fluid.
- I. Cowper's gland—The **cowper's gland** produces a fluid that moves down the urethra ahead of the seminal fluid. This fluid cleans and neutralizes the urethra. This helps protect the sperm as they move through the urethra. The mixture of the seminal and prostate fluid and the sperm is called **semen**.

(PowerPoint Slide 11)

- J. Penis—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 that is necessary for **copulation**, or mating to occur. The sigmoid flexure and the retractor muscle extend the penis from the **sheath**, a tubular fold of skin. Horses and other mammals do not have a sigmoid flexure. The blood that fills the spongy tissue when sexual arousal occurs causes erection.

Use TM: 1-1 (PowerPoint Slide 12) and TM: 1-2 to aid in the discussion on this topic.

Objective 2: Identify and describe the female reproductive organs in cattle.

Anticipated Problem: What are the female reproductive organs in cattle?

(PowerPoint Slides 13 and 14)

- II. Like males, female cattle have a complex system of organs that make up the reproductive system. It is important that those interested in animal production be familiar with these various organs and their functions. Some of the major organs that make up the female reproductive tract are:

(PowerPoint Slide 15)

- A. Ovary—the **ovary** produces female gametes. A **gamete** is a sex cell that can unite with other sex cells. These are called **ova** or eggs. A female will typically have two ovaries. The ovaries also produce the female sex hormones estrogen and progesterone. Within each ovary there are hundreds of tiny **follicles** or cavities. The ova are produced in the follicles. Each ovum is the largest single cell in the body.

(PowerPoint Slide 16)

- B. Oviducts—The **oviducts** are two tubes that carry ova from the ovaries to the uterus. The oviducts are also called the **fallopian tubes**. The oviducts are close, but not attached to the ovaries. The funnel-shaped end of each oviduct that is close to the ovary is called the **infundibulum**. At ovulation the 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 **zygote**, or fertilized egg cell, moves to the uterus about two to four days after fertilization.

(PowerPoint Slides 17 and 18)

- C. Uterus—The **uterus** is a Y-shaped structure consisting of the body, two uterine horns, and the cervix. The size and shape of the uterus varies among the various species. The upper part of the uterus consists of the two **uterine horns** that develop into the oviducts or Fallopian tubes. Cattle normally produce single offspring or twins have smaller horns and a larger body. In most species pregnancy normally occurs in the uterine horns. The fetus grows within the uterus, where it remains until **parturition** or birth. The **cervix** is the lower outlet of the uterus. It is composed primarily of connective tissue that constitutes the gateway between the uterus and the vagina. Like the rest of the reproductive tract, the cervix is lined with **mucosal cells**. These cells make significant changes as the animal goes from one estrous cycle to another and during **gestation** or pregnancy.

(PowerPoint Slide 19)

- D. Vagina—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 in estrus.
- E. Bladder—The **bladder** collects the liquid waste, which is called **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 bladder is not considered part of the reproductive tract in females.

(PowerPoint Slide 20)

- F. Vulva—The **vulva** is the external opening of the reproductive and urinary systems. The exterior, and visible part of the vulva, consists of two folds called the **labia majora**. The **labia minora** are two folds located just inside the labia majora.
- G. Clitoris—The **clitoris** is the sensory and erectile organ of the female. It is located just inside the vulva. The clitoris develops from the same embryonic tissue as the penis in the male and produces sexual stimulation during copulation.

Use TM: 1-3 and TM: 1-4 (PowerPoint Slide 21) to aid in the discussion on this topic.

Review/Summary: Focus the review and summary of the lesson around the student learning objectives (**PowerPoint Slide 22**). Call on students to explain the content associated with the objectives.

Application: Application can involve the securing of actual reproductive organs from a local slaughter facility so students can see the actual reproductive organs in cattle or search the internet for actual pictures of the parts:

Evaluation: Evaluation should focus on student achievement of the objectives for the lesson. Various techniques can be used, such as student performance on their understanding of the anatomy and physiology of animal reproductive systems. A sample written test is included.

Answers to Sample Test:

Matching

1. D
2. B
3. F
4. C
5. A
6. E

Fill-in-the-blank

1. Cowper's gland
2. Vulva
3. Scrotum
4. Vagina

Short Answer

See lesson content for scoring this question.

Sample Test

Anatomy and Physiology of Animal Reproductive Systems

Name: _____

Matching: Match each word with the correct definition.

- | | |
|--------------------|--------------|
| a. Vans deferens | d. Ovary |
| b. Fallopian tubes | e. Follicles |
| c. Uterus | f. Testicles |

- _____ 1. Produces female gametes.
- _____ 2. Two tubes that carry the ova from the ovaries to the uterus.
- _____ 3. Produces sperm and a hormone called testosterone.
- _____ 4. A Y-shaped structure consisting of the body, two uterine horns, and the cervix.
- _____ 5. A transportation tube that carries the sperm-containing fluid from each epididymis to the urethra.
- _____ 6. Tiny cavities found in the ovaries.

Fill-in-the-blank: Complete the following statements.

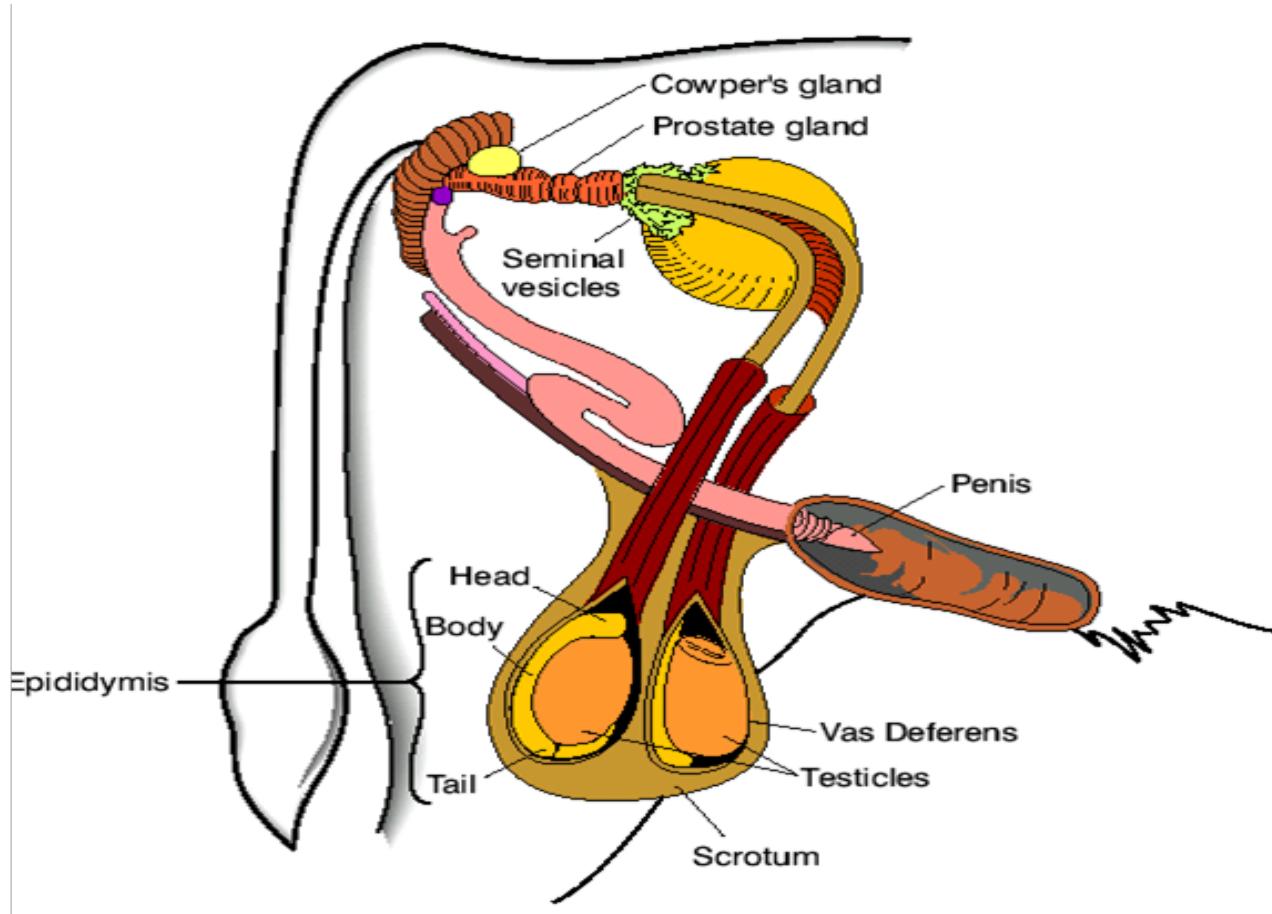
1. The _____ produces a fluid that moves down the urethra ahead of the seminal fluid that cleans and neutralizes the urethra.
2. The _____ is the external opening of the reproductive and urinary systems.
3. The _____ is a two-lobed sac that contains and protects the two testicles.
4. The _____ serves as the female organ of copulation at mating and as the birth canal at parturition.

Short Answer: Answer the following question.

Discuss the differences between the male and female reproductive systems.

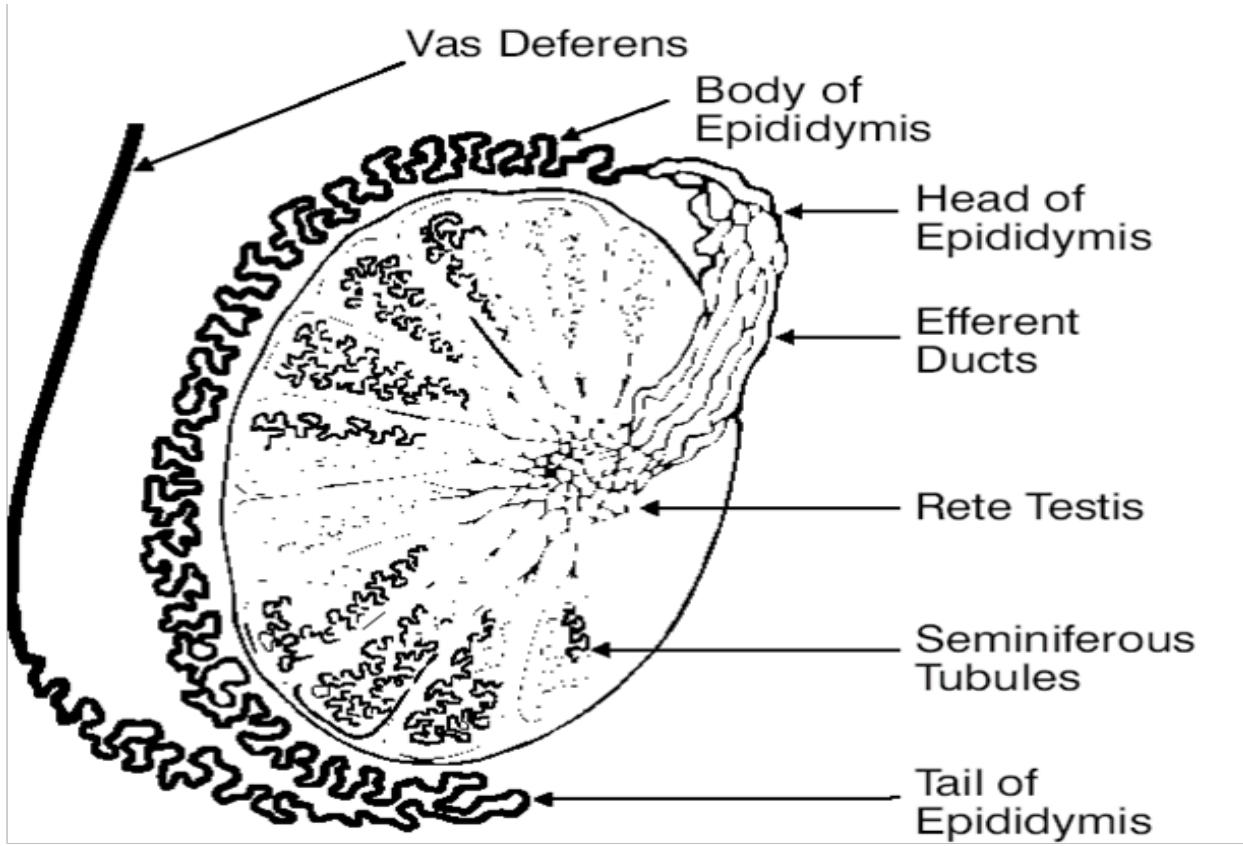
TM: 1-1

REPRODUCTIVE ORGANS OF THE BULL



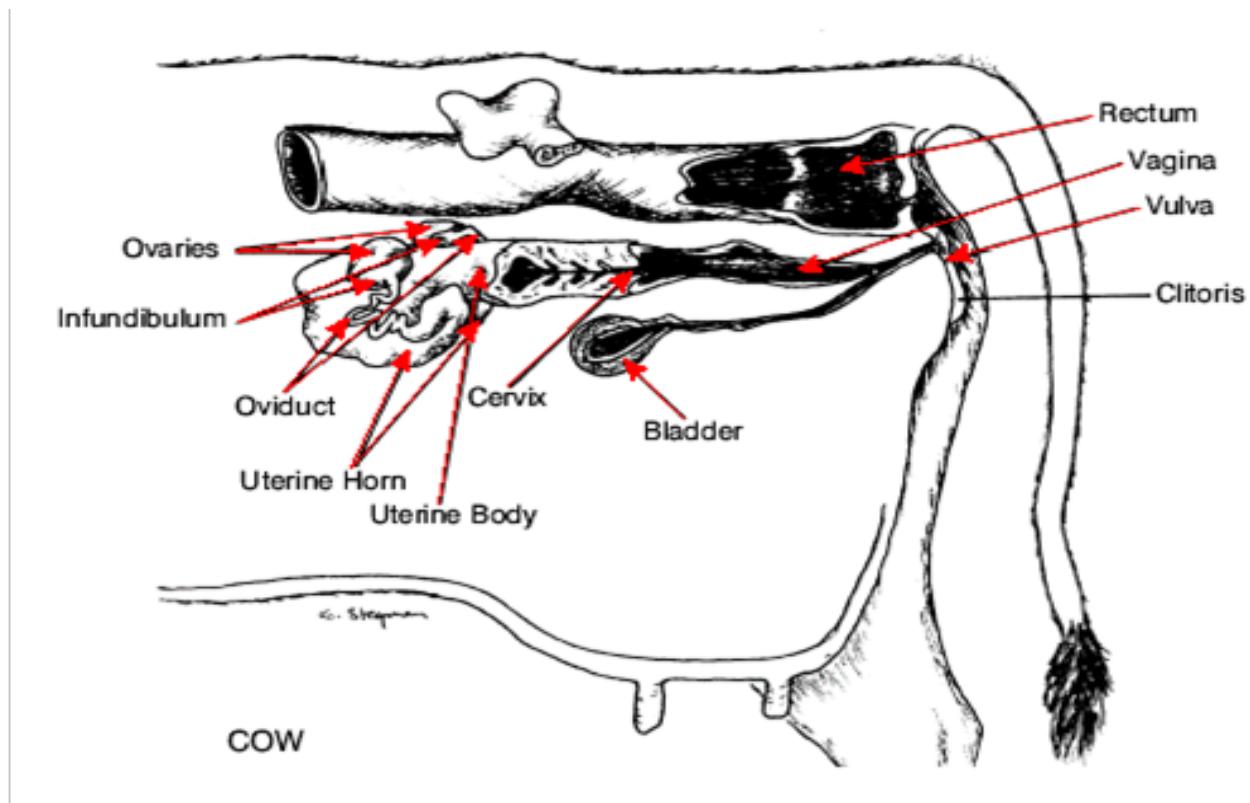
TM: 1-2

TESTES—PRIMARY REPRODUCTIVE ORGAN OF THE BULL



TM: 1-3

FEMALE REPRODUCTIVE ORGANS OF A COW



DORSAL VIEW OF THE REPRODUCTIVE SYSTEM OF A FEMALE COW

