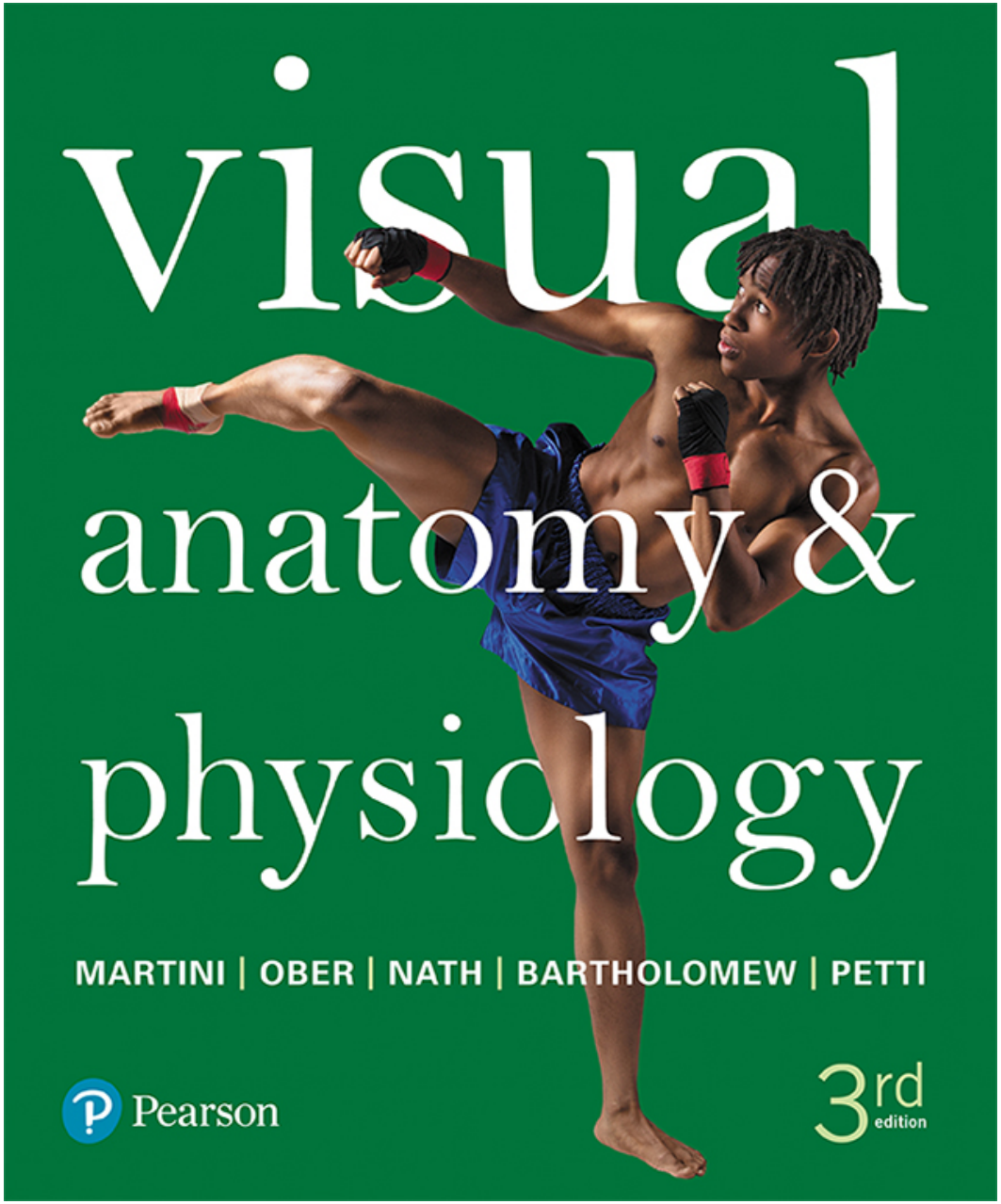

26

The Reproductive System

Lecture Presentation by
Lori Garrett

Note to the Instructor:

For the third edition of *Visual Anatomy & Physiology*, we have updated our PowerPoints to fully integrate text and art. The pedagogy now more closely matches that of the textbook. The goal of this revised formatting is to help your students learn from the art more effectively. However, you will notice that the labels on the embedded PowerPoint art are not editable. You can easily import editable art by doing the following:

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Section 1: Male Reproductive System

Learning Outcomes

26.1 Identify the structures and functions of the male external genitalia and internal genitalia.

26.2 Outline fetal descent of the testes, and describe the structures related to the scrotum and testes.

26.3 Summarize the events of spermatogenesis, and describe the functional anatomy of a mature sperm.

26.4 Explain meiosis and early spermiogenesis within the seminiferous tubules.

Section 1: Male Reproductive System

Learning Outcomes (continued)

26.5 Explain the roles played by the male reproductive tract and accessory glands in the functional maturation, nourishment, storage, and transport of sperm.

26.6 Describe the structure and function of the penis.

26.7 Explain the roles of testosterone and other regulatory hormones in the establishing and maintaining male sexual function.

Module 26.1: Male reproductive structures include the external genitalia and internal genitalia

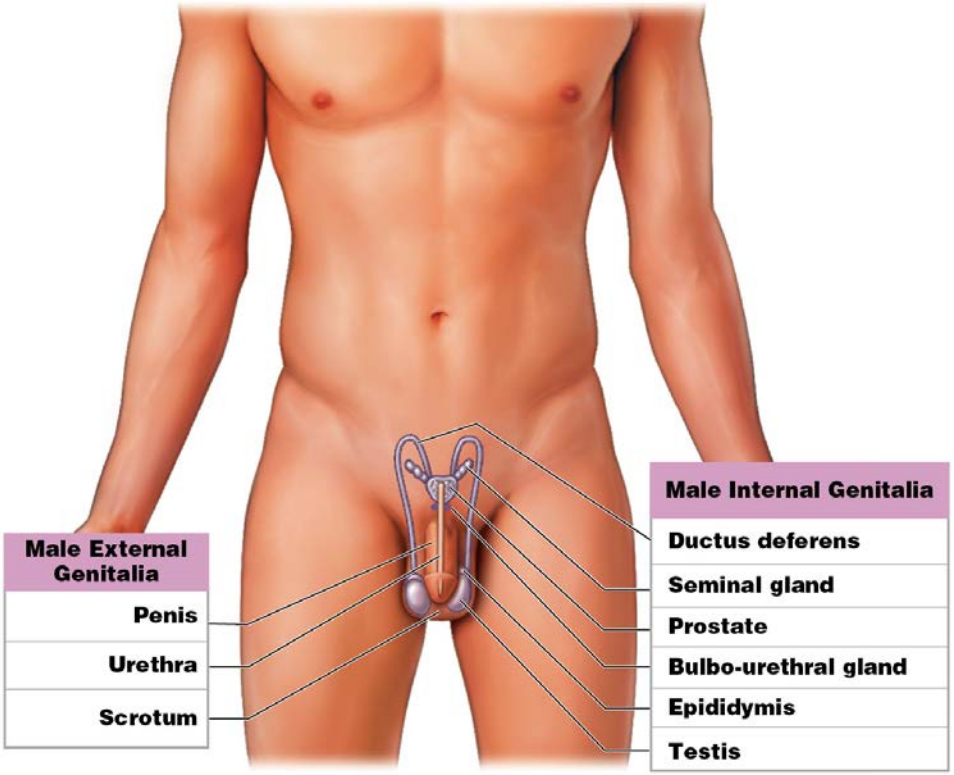
Reproductive system

- Only system not essential to sustaining life
- **Gonads** produce **gametes**
  - Male gametes are **sperm**

Module 26.1: Male reproductive structures

External genitalia

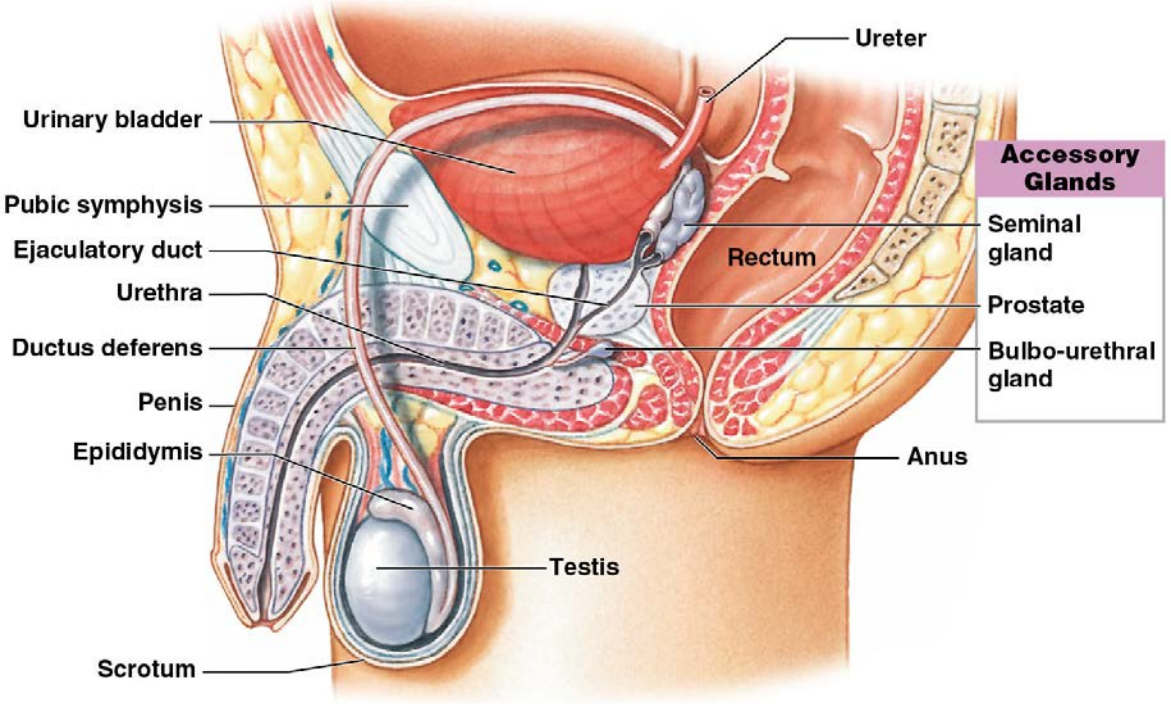
- **Penis** contains erectile tissue, deposits sperm into vagina of female
- **Urethra** conducts semen to exterior
- **Scrotum** surrounds testes



Module 26.1: Male reproductive structures

Internal genitalia

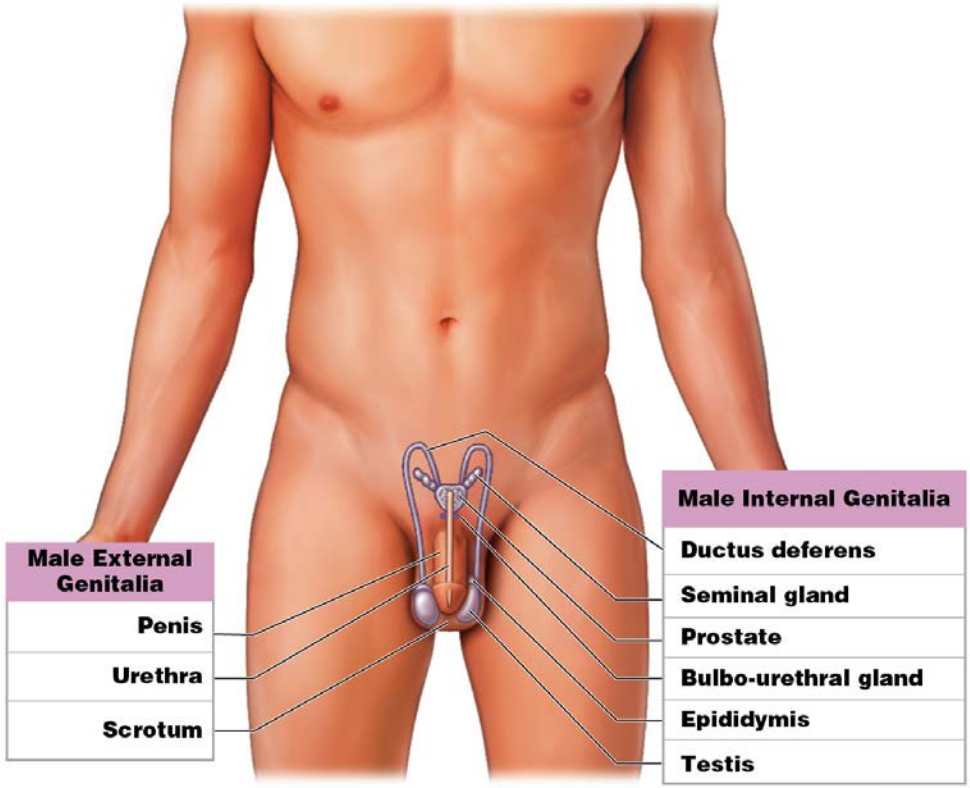
- **Ductus deferens** conduct sperm between epididymis and prostate
- **Seminal gland** secretes fluid making up much volume of semen



Module 26.1: Male reproductive structures

Internal genitalia (continued)

- **Prostate** secretes fluid and enzymes
- **Bulbo-urethral gland** secretes fluids that lubricate tip of penis
- **Epididymis** is the site of sperm maturation
- **Testis** produces sperm and hormones



Module 26.1: Review

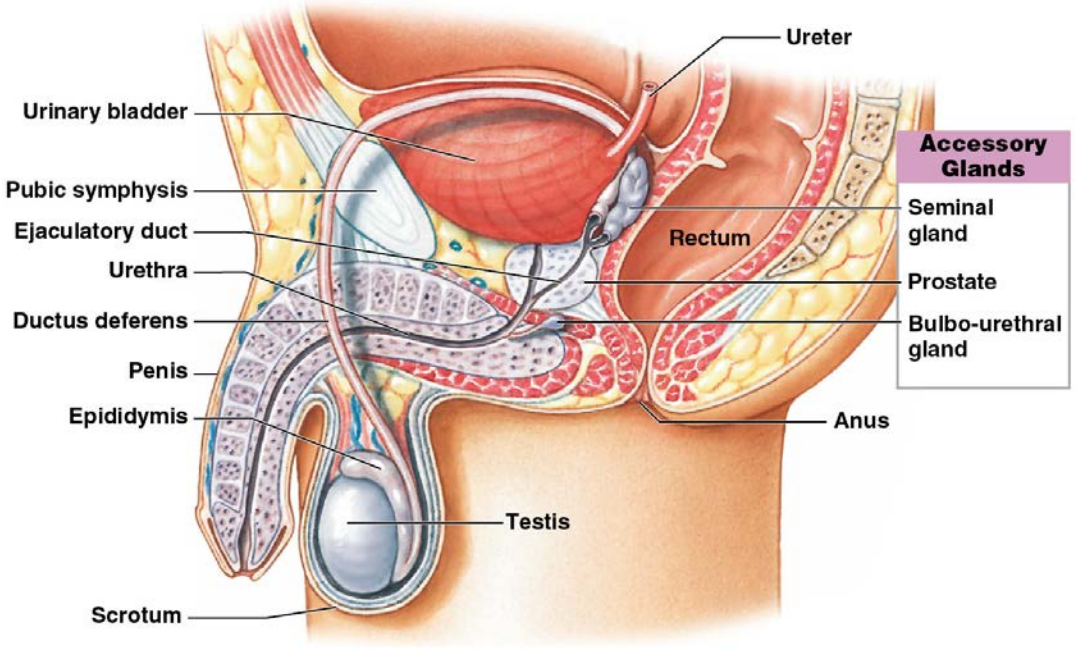
A. What are the functions of the gonads?
B. Name the structures of the male external genitalia.
C. Name the structures of the male internal genitalia.

Learning Outcome: Identify the structures and functions of the male external genitalia and internal genitalia.

Module 26.2: Sperm transport relies on ducts, glands, and related structures of the scrotum and testes

Path of sperm

- Testis to the **epididymis**, along the **ductus deferens**, then along the **ejaculatory duct** to the urethra



Module 26.2: Main structures of the male reproductive system

Accessory organs secrete various fluids into the reproductive tract

- **Seminal glands, prostate,** and **bulbo-urethral glands** secrete various fluids into ejaculatory duct and urethra
- Urethra passes through the penis to exit the body

Module 26.2: Main structures of the male reproductive system

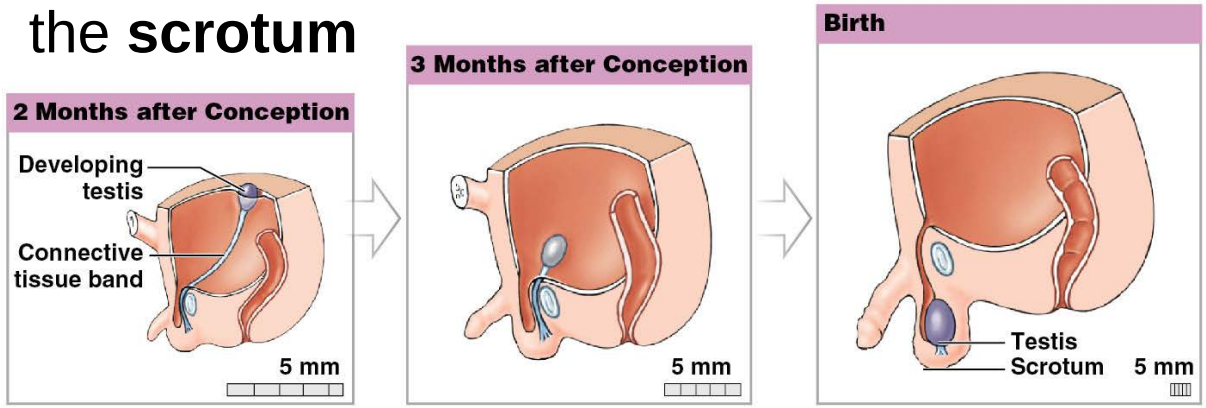
The testes

- 5 cm long; 3 cm wide; 2.5 cm thick
- Each weighs 10–15 g

Module 26.2: Main structures of the male reproductive system

The testes

- Form inside the body cavity adjacent to the kidneys
  - Connective tissue bands do not elongate as fetus grows
    - Relative position of testes changes as body enlarges
  - Late in fetal development, connective tissue band contracts
    - Pulls each testis through abdominal musculature into the **scrotum**



Module 26.2: Main structures of the male reproductive system

Scrotum and associated structures

- **Scrotal cavities**
  - House the testes
  - **Scrotal septum** separates right and left cavities
    - Marked by a raised thickening (**raphe of scrotum**) in the scrotal surface
- **Dartos muscle**
  - Smooth muscle in the skin of the scrotum
  - Elevates testes and wrinkles scrotal surface
- **Cremaster muscle**
  - Contracts to pull testes closer to body during sexual arousal or when exposed to cold temperature

Module 26.2: Main structures of the male reproductive system

Scrotum and associated structures (continued)

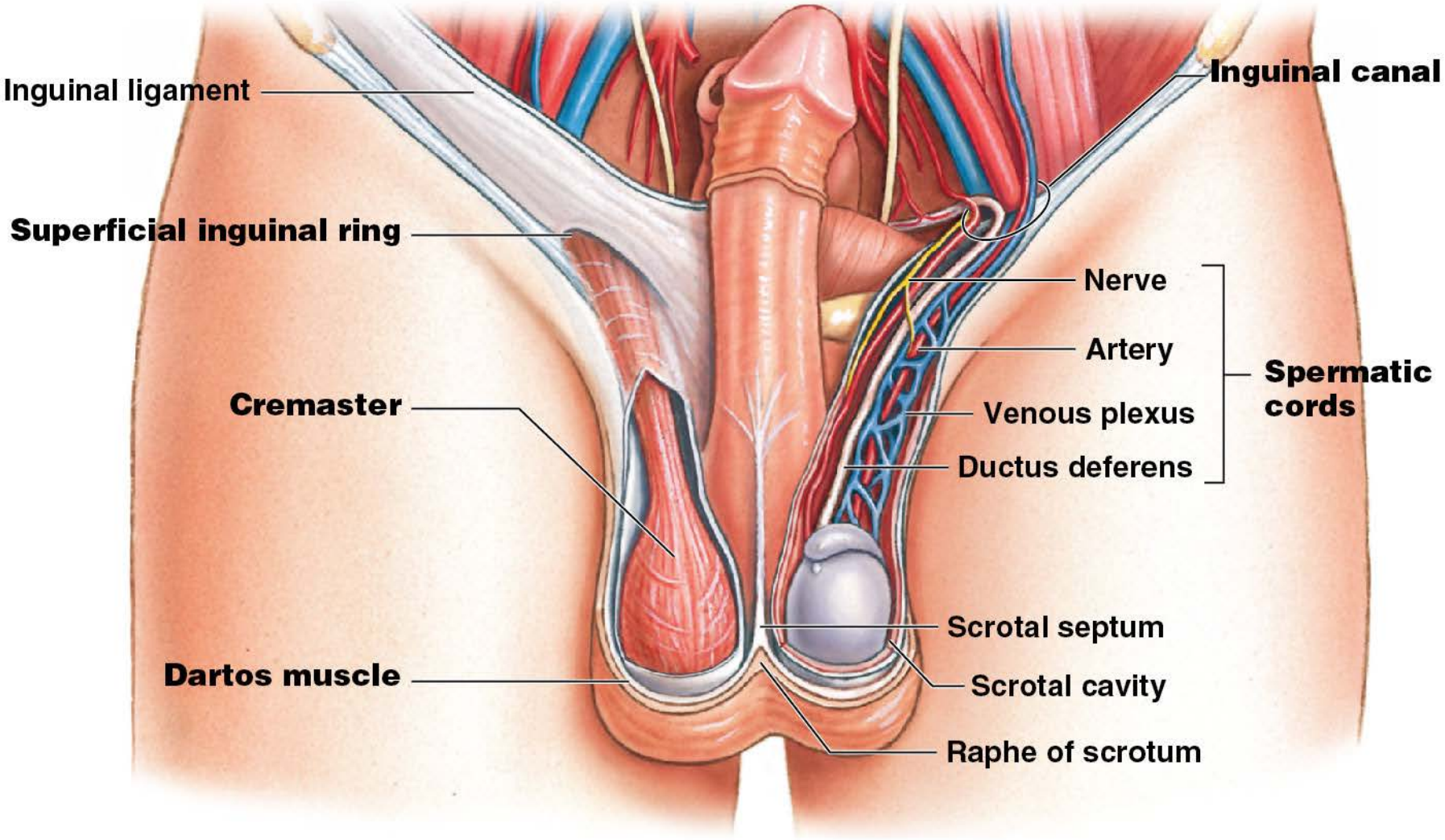
- **Spermatic cords**
  - Extend through the inguinal canals between testes and abdominopelvic cavity
  - Each contains layers of fascia and muscle
    - Layers enclose the ductus deferens, blood vessels, nerves, and lymphatic vessels
- **Superficial inguinal ring**
  - Entrance to the inguinal canal

Module 26.2: Main structures of the male reproductive system

Scrotum and associated structures (continued)

- **Inguinal canal**
  - Extends from the inguinal ring to the scrotal cavity
  - Presence of spermatic cords creates weak points in the abdominal wall
    - **Inguinal hernias**
      - Protrusions of visceral tissue or organs into the inguinal canal
      - Fairly common in males

Superficial and deeper features of male reproductive system



Module 26.2: Main structures of the male reproductive system

Internal organization of the testes

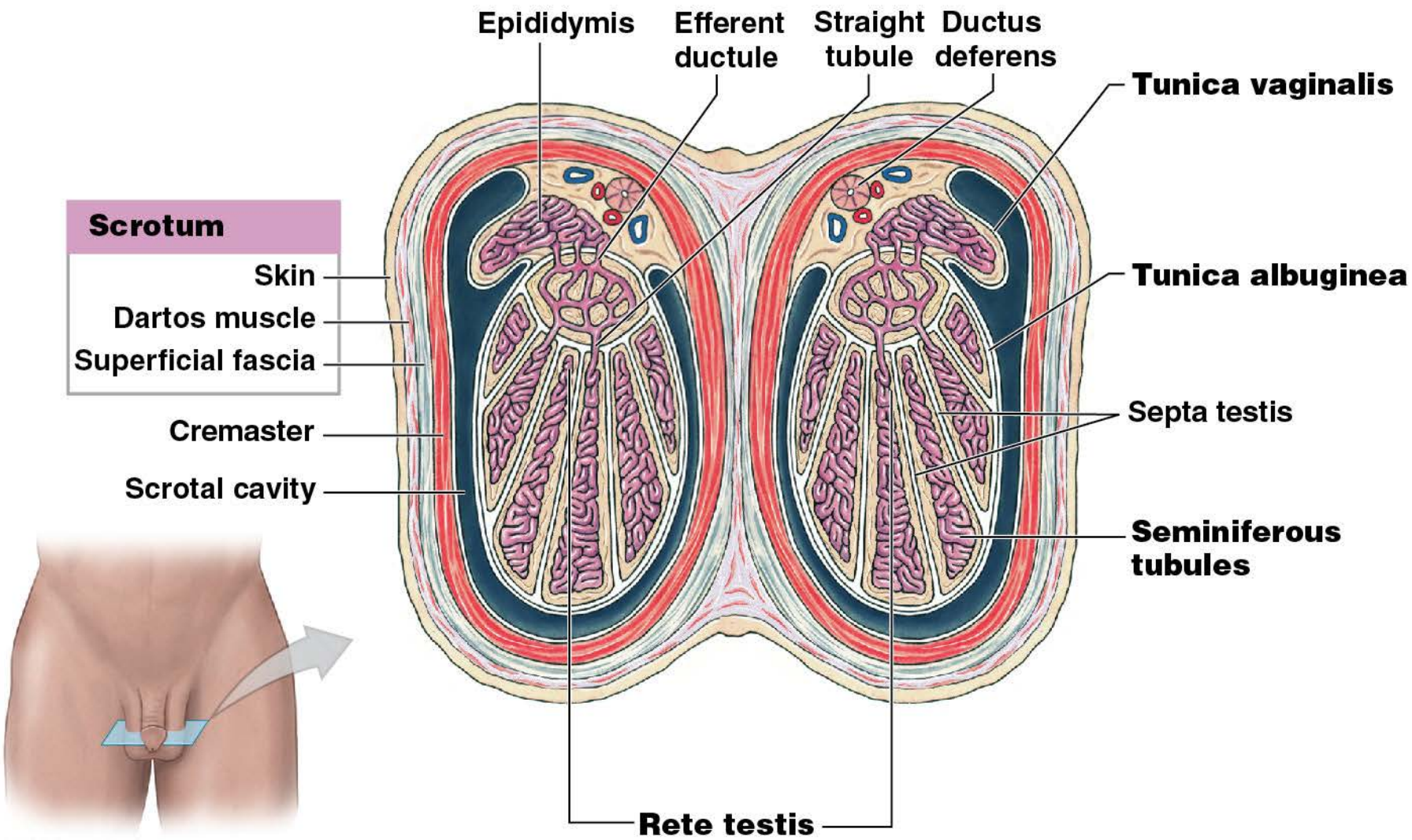
- **Tunica vaginalis**
  - Serous membrane; lines scrotal cavity
  - Reduces friction
- **Tunica albuginea**
  - Tough, fibrous capsule; covers testis
  - Continuous with septa subdividing testes into **lobules**

Module 26.2: Main structures of the male reproductive system

Internal organization of the testes (continued)

- **Seminiferous tubules**
  - Coiled tubules within lobules
  - Site of sperm production
  - *Myoid cells* contract to transport sperm through tubule
  - **Rete testis** (*rete*, a net)
    - Maze of passageways
    - Seminiferous tubules merge into straight tubules then rete testes
  - **Efferent ductules**
    - 15–20 tubes connecting the rete testis to the epididymis

Internal organization of the testes



Module 26.2: Review

A. Identify the complex network of channels that is connected to the seminiferous tubules.
B. On a warm day, would the cremaster muscle be contracted or relaxed? Why?

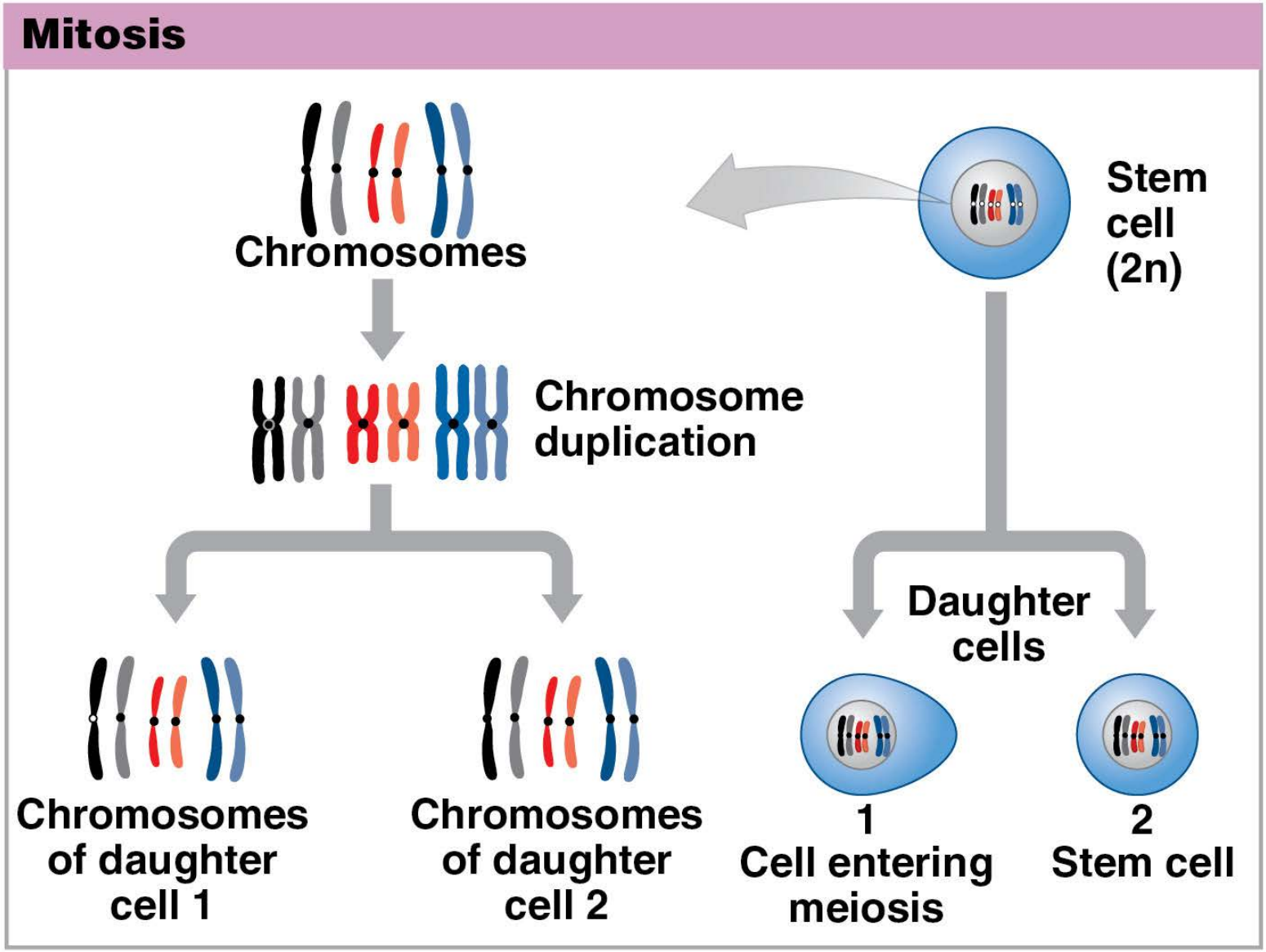
Learning Outcome: Outline fetal descent of the testes, and describe the structures related to the scrotum and testes.

Module 26.3: Spermatogenesis occurs in the testes and produces mature sperm

Spermatogenesis (sperm production)

- Involves three processes
  1. **Mitosis** and cell division (cytokinesis)
     - Process producing two identical daughter cells
     - Since daughter cells contain 23 pairs of chromosomes (or two sets of chromosomes), they are called **diploid**
     - In seminiferous tubules, stem cells undergo mitosis

Mitosis

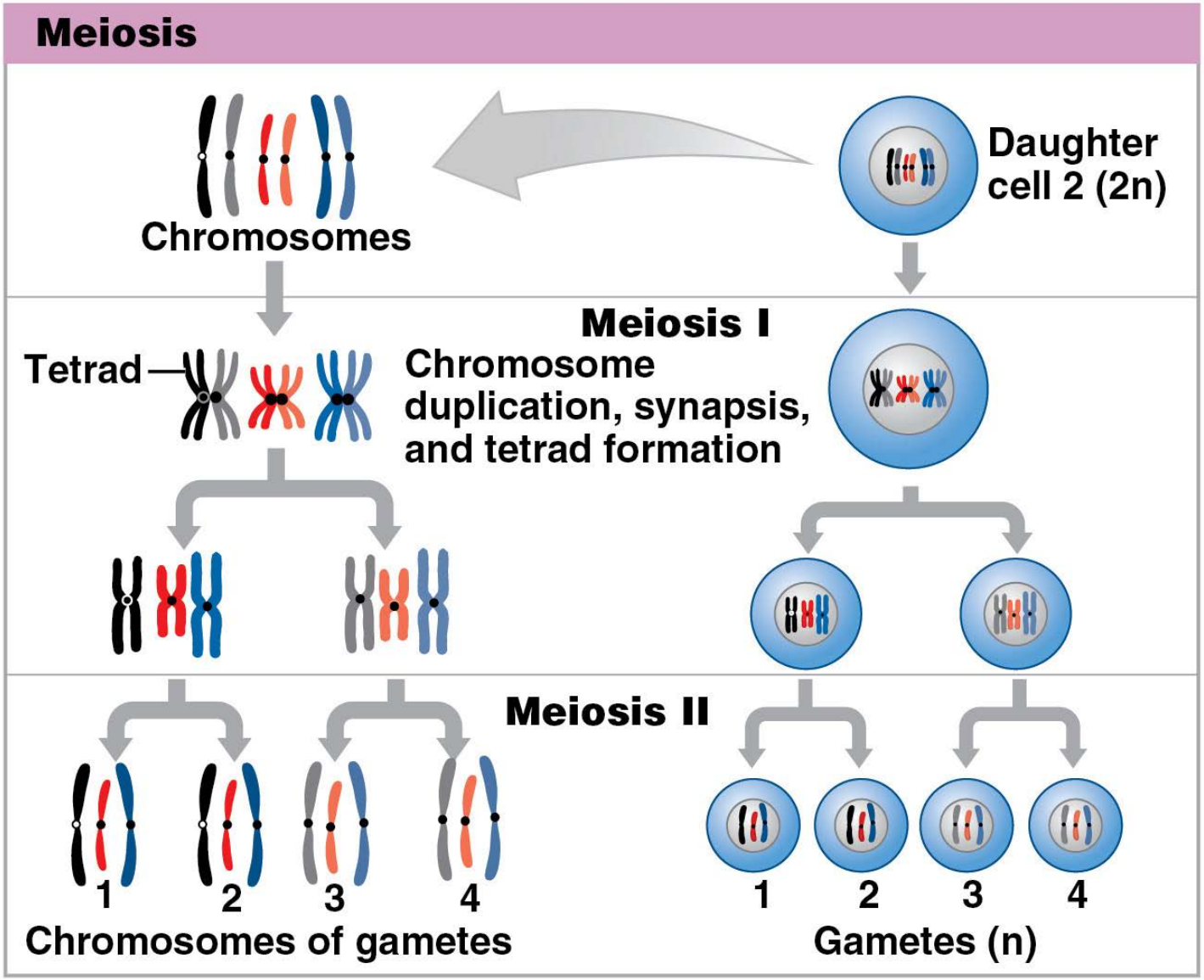


Module 26.3: Sperm formation and structure

Spermatogenesis (continued)

- Involves three processes (continued)
  2. **Meiosis**
     - Special form of cell division involved in gamete production
     - Two cycles of cell division (**meiosis I** and **II**)
     - Produces four **haploid** (*haplo*, single) cells, each with 23 individual chromosomes
     - **Synapsis**
       - Corresponding material and paternal chromosomes associate to form 23 chromosome pairs
       - Set of four chromatids is called a **tetrad**

Meiosis



Module 26.3: Sperm formation and structure

Spermatogenesis (continued)

- Involves three processes (continued)
  3. **Spermiogenesis**
     - Differentiation of immature male gametes into physically mature spermatozoa

Module 26.3: Sperm formation and structure

Mitosis of spermatogonium

- Spermatogonia (singular, *spermatogonium*)
  - Stem cells in the seminiferous tubules
  - Go through mitosis to form two daughter cells
    - One cell remains in contact with the tubule basement membrane
    - The other is a **primary spermatocyte**
      - 16 days from spermatogonium to primary spermatocyte

Module 26.3: Sperm formation and structure

Process of spermatogenesis (continued)

- **Meiosis I**
  - Each primary spermatocyte begins with 46 chromosomes diploid
  - Daughter cells produced are called **secondary spermatocytes**
    - Each contains 23 chromosomes haploid
    - Each chromosome has pair of duplicate chromatids
  - 24 days from primary spermatocyte to secondary spermatocyte

Module 26.3: Sperm formation and structure

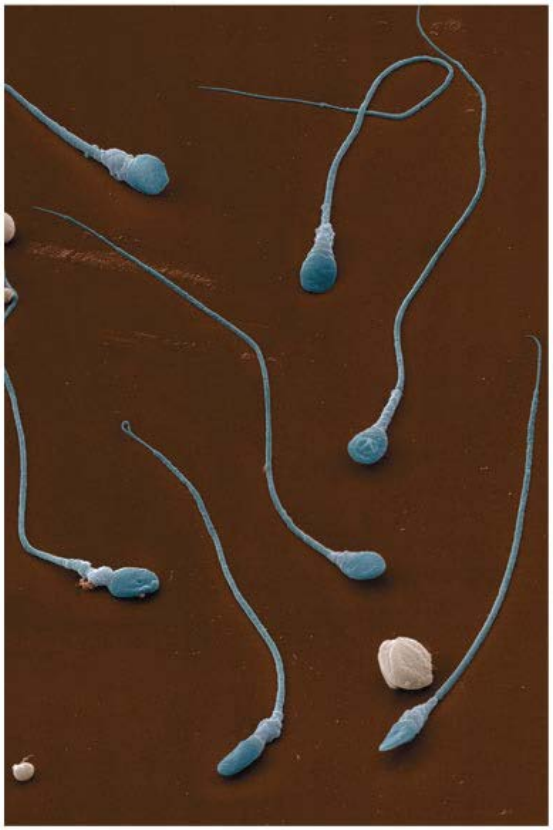
Process of spermatogenesis (continued)

- **Meiosis II**
  - Secondary spermatocytes divide to produce **spermatids**
    - Each spermatid contains 23 chromosomes
    - Each primary spermatocyte produces four spermatids
  - Only a few hours from secondary spermatocyte to spermatid

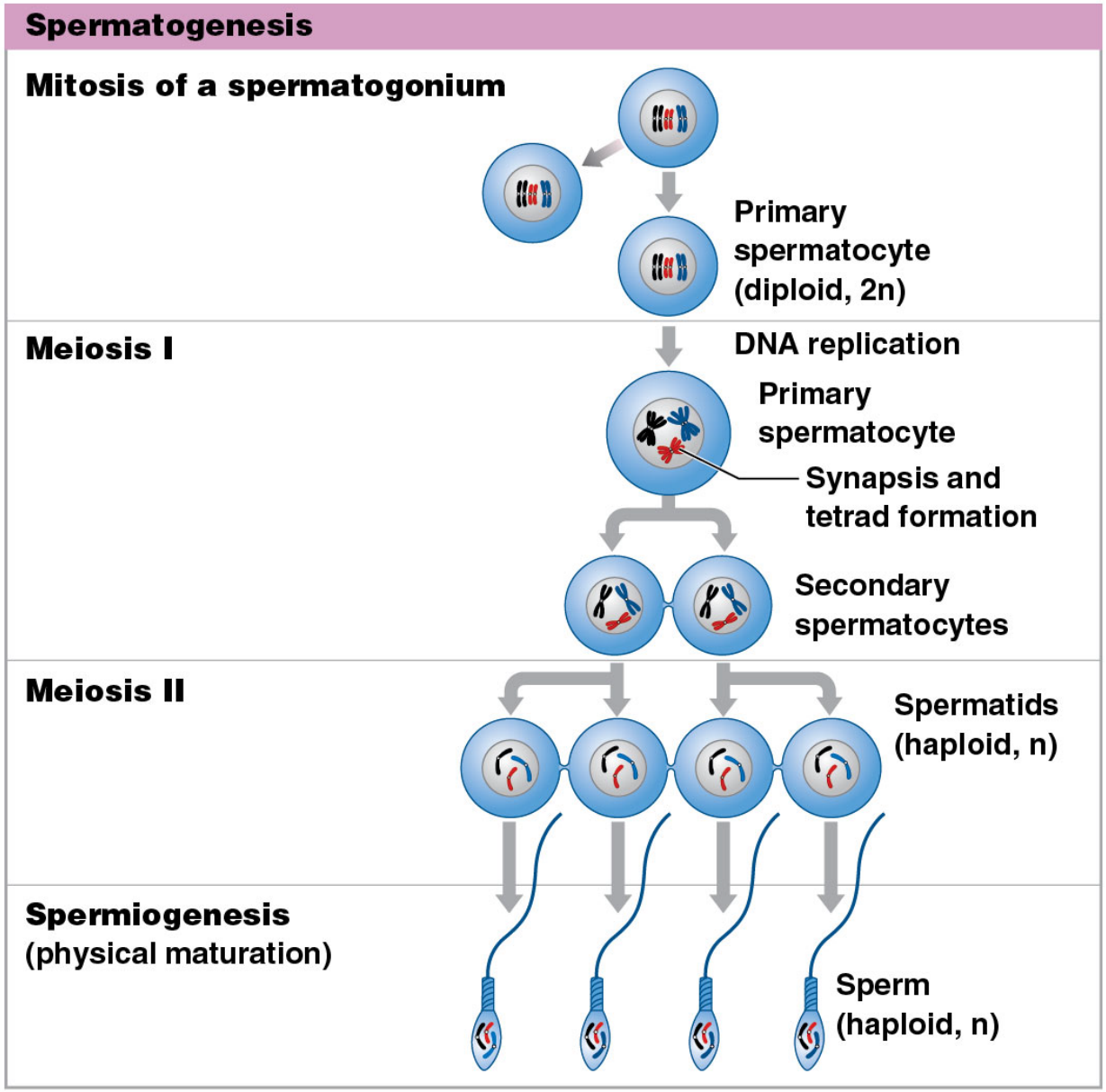
Module 26.3: Sperm formation and structure

Process of spermatogenesis (continued)

- **Spermiogenesis**
  - Physical maturation of sperm
  - Each spermatid matures into a single sperm
  - 24 days from spermatid to sperm



Spermatagonia to sperm



Module 26.3: Sperm formation and structure

Structure of a sperm

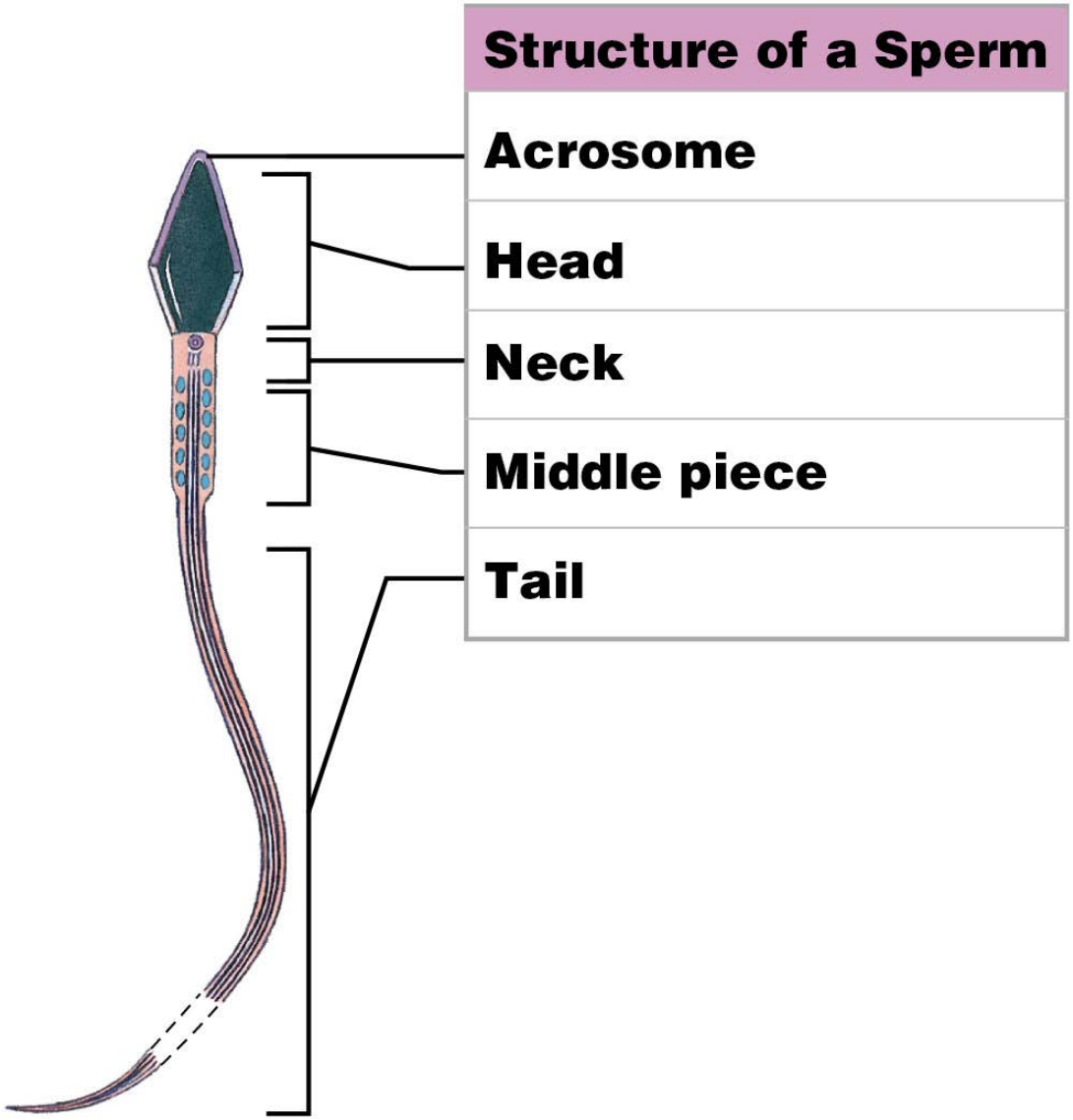
- Specialized to deliver chromosomes to female gamete
  - Lacks most organelles and intracellular structures in order to reduce size and mass
- **Acrosome**
  - Membranous compartment containing enzymes essential to fertilization
- **Head**
  - Contains nucleus with densely packed chromosomes

Module 26.3: Sperm formation and structure

Structure of a sperm (continued)

- **Neck**
  - Contains both centrioles of the original spermatid
  - Microtubules of distal centriole are continuous with those of the middle piece and tail
- **Middle piece**
  - Contains mitochondria to provide ATP for tail movement
- **Tail** (**flagellum**)
  - Whiplike organelle that moves the sperm

Structure of a sperm



Module 26.3: Review

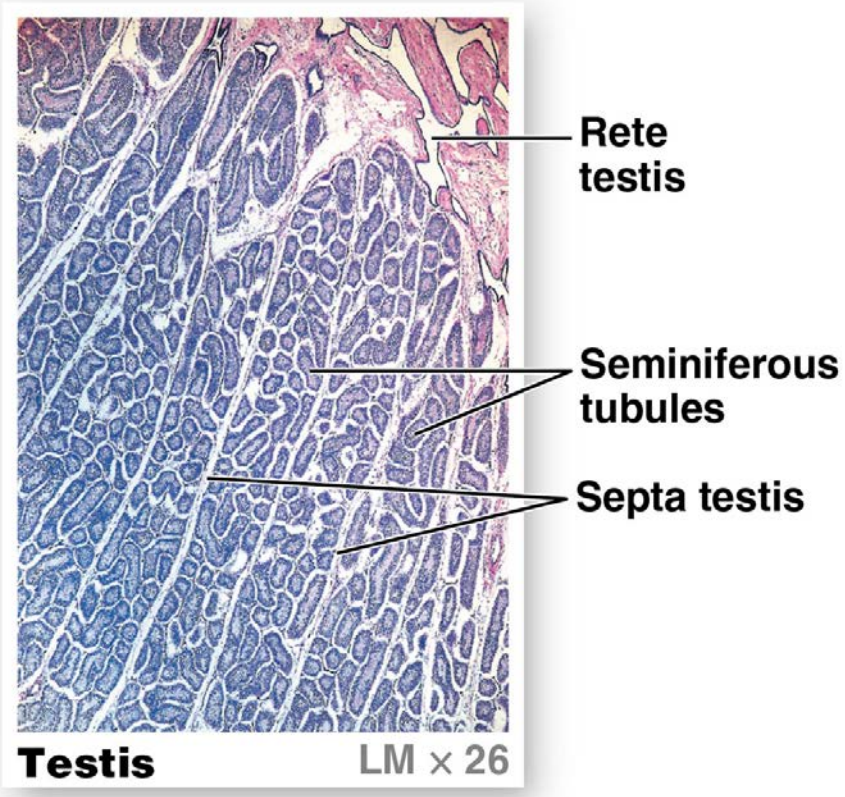
A. Define *spermatogenesis*.
B. How many sperm will eventually be produced from each primary spermatocyte?
C. List the structures of a sperm.

Learning Outcome: Summarize the events of spermatogenesis, and describe the functional anatomy of a mature sperm.

Module 26.4: Meiosis and early spermiogenesis occur within the seminiferous tubules

Seminiferous tubules

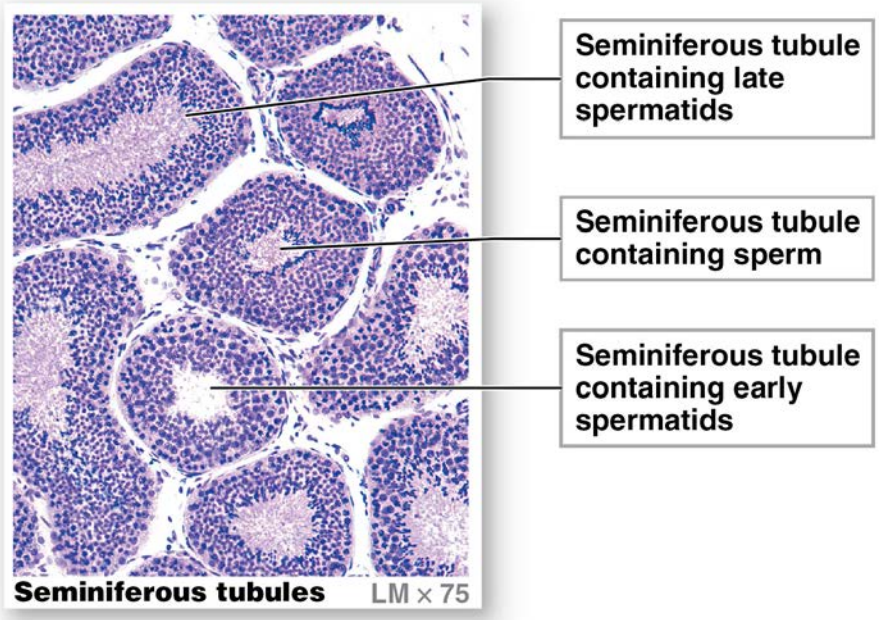
- Tightly coiled within lobules
  - Often seen in cross section in micrographs
- Sites of spermatogenesis



Module 26.4: Seminiferous tubules

Seminiferous tubules (continued)

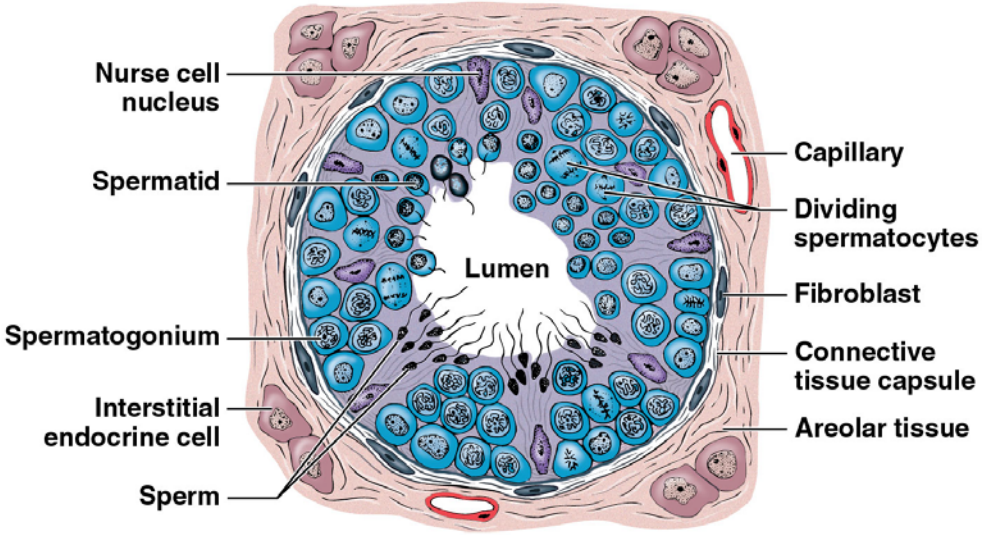
- Spermatogenesis and spermiogenesis together take 9 weeks
- Each segment of seminiferous tubule is at different phase of spermatogenesis
- Surrounded by a delicate connective tissue capsule



Module 26.4: Seminiferous tubules

Seminiferous tubules (continued)

- Spaces between tubules contain:
  - Areolar tissue
  - Blood vessels
  - Large **interstitial endocrine cells** (Leydig cells)
    - Produce androgens, such as testosterone and androstenedione (dominant sex hormones in males)

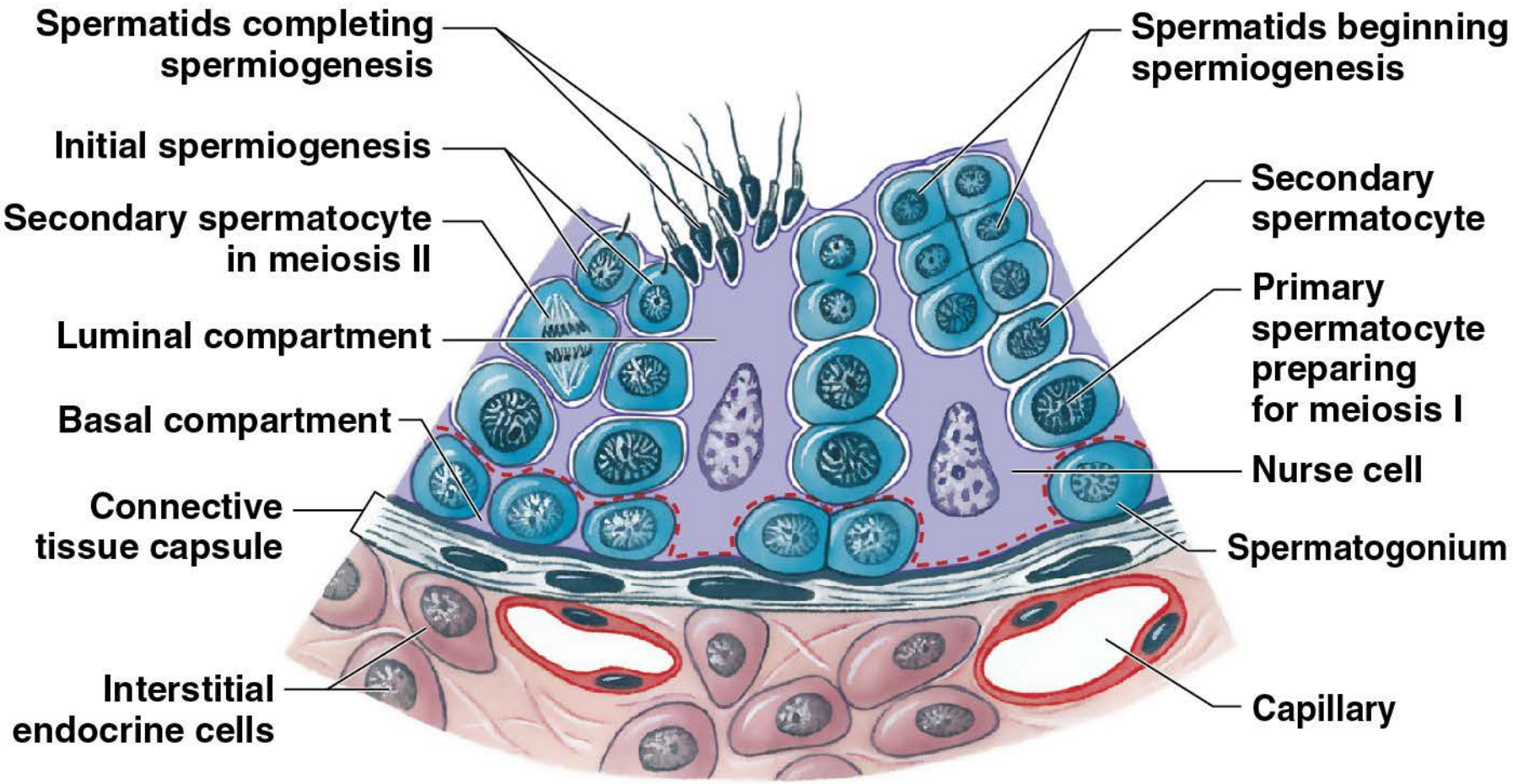


Module 26.4: Seminiferous tubules

Cells in the wall of the seminiferous tubule

- Spermatogonia (stem cells)
- Spermatocytes (undergoing meiosis)
- Spermatids (undergoing spermiogenesis)
  - Develop into mature sperm
- **Nurse cells** (Sertoli cells)
  - Extend from the tubular capsule to the lumen
  - Located between other types of cells
    - Nurse cell cytoplasm surrounds those other cells
- **Spermiation**
  - Process in which a sperm loses attachment to the nurse cell and enters the tubule lumen

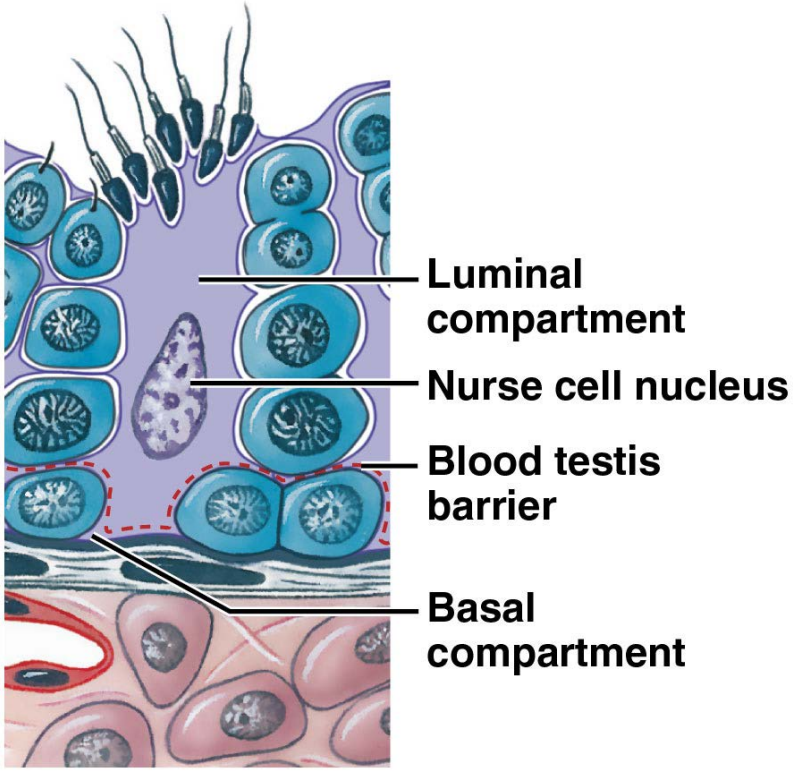
Cells of the seminiferous tubule



Module 26.4: Seminiferous tubules

Compartments of the seminiferous tubule

- Nurse cells are joined by tight junctions
  - Form a **blood testis barrier** protecting developing sperm cells from the body's immune system
  - This layer of nurse cells divides the seminiferous tubule into two compartments
    - **Basal compartment**
      - Contains spermatogonia
    - **Luminal compartment**
      - Where meiosis and spermatogenesis occur



Module 26.4: Review

A. What is the function of interstitial endocrine cells?
B. Describe the process of spermiation.
C. What is the role of nurse cells?

Learning Outcome: Explain meiosis and early spermiogenesis within the seminiferous tubules.

Module 26.5: The male reproductive tract receives secretions from the seminal, prostate, and bulbo-urethral glands

Activation of sperm

- Sperm released from testes are physically mature
  - But immobile and incapable of fertilizing an oocyte
- Other parts of male reproductive system are responsible for functional maturation, nourishment, storage, and transport of spermatozoa

Module 26.5: Male reproductive tract and glands

Activation of sperm (continued)

- **Capacitation**
  - Process enabling sperm to become motile and fully functional
  - Usually occurs in two steps
  1. Sperm become motile when mixed with seminal gland secretions
  2. Sperm become capable of fertilization when exposed to the female reproductive tract

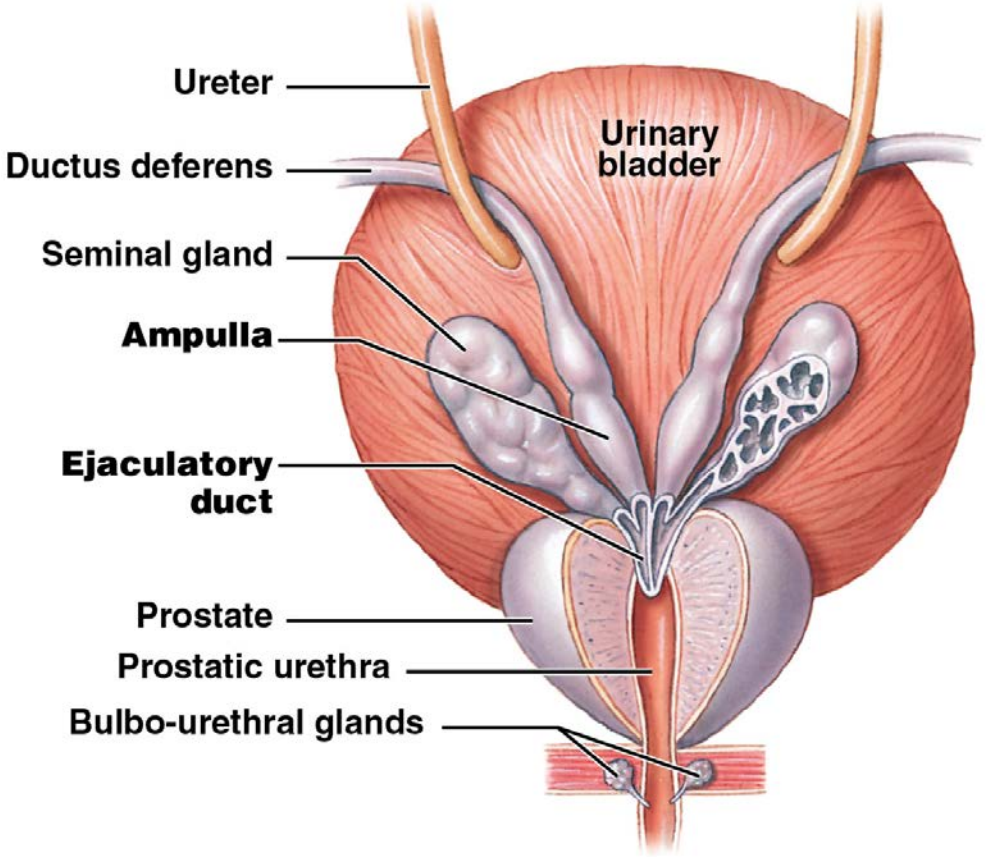
Module 26.5: Male reproductive tract and glands

Ampulla

- Expanded distal portion of ductus deferens

Ejaculatory duct

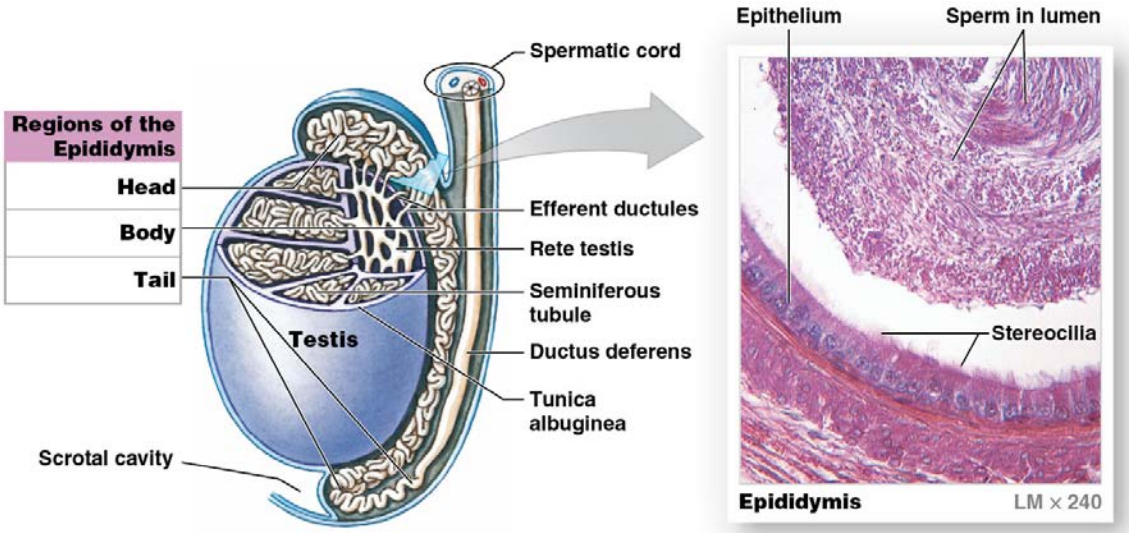
- Carries fluid from seminal gland and ampulla to urethra



Module 26.5: Male reproductive tract and glands

Epididymis (*epi,* on, + *didymos,* twin)

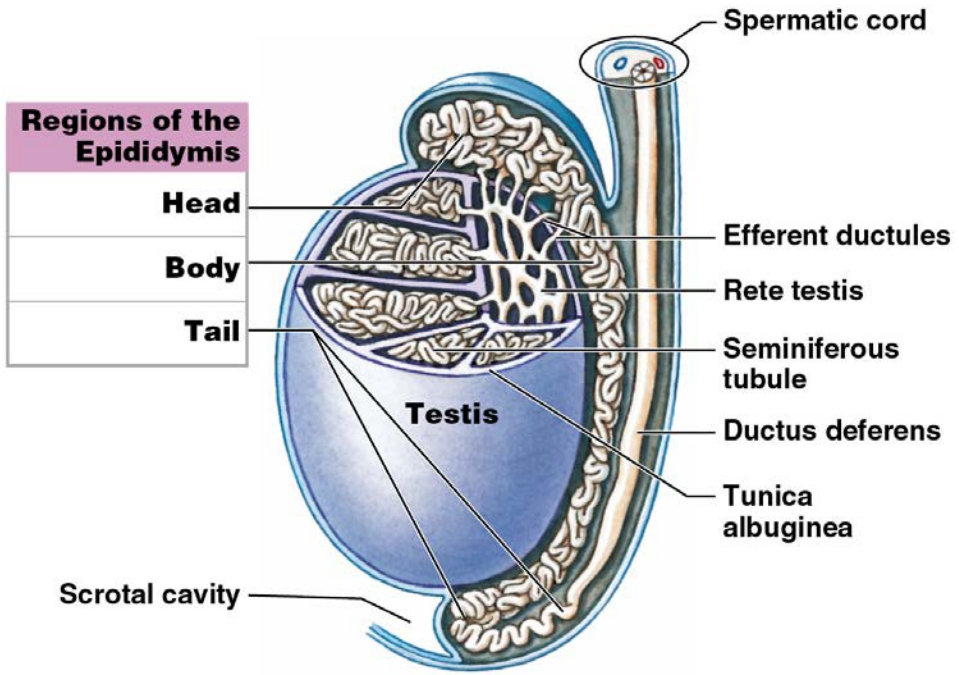
- Start of the male reproductive tract
- Coiled tube bound to posterior border of each testis
- Lined with pseudostratified columnar epithelium
  - Has long **stereocilia** that increase surface area
- Sperm undergo functional maturation here



Module 26.5: Male reproductive tract and glands

Epididymis (continued)

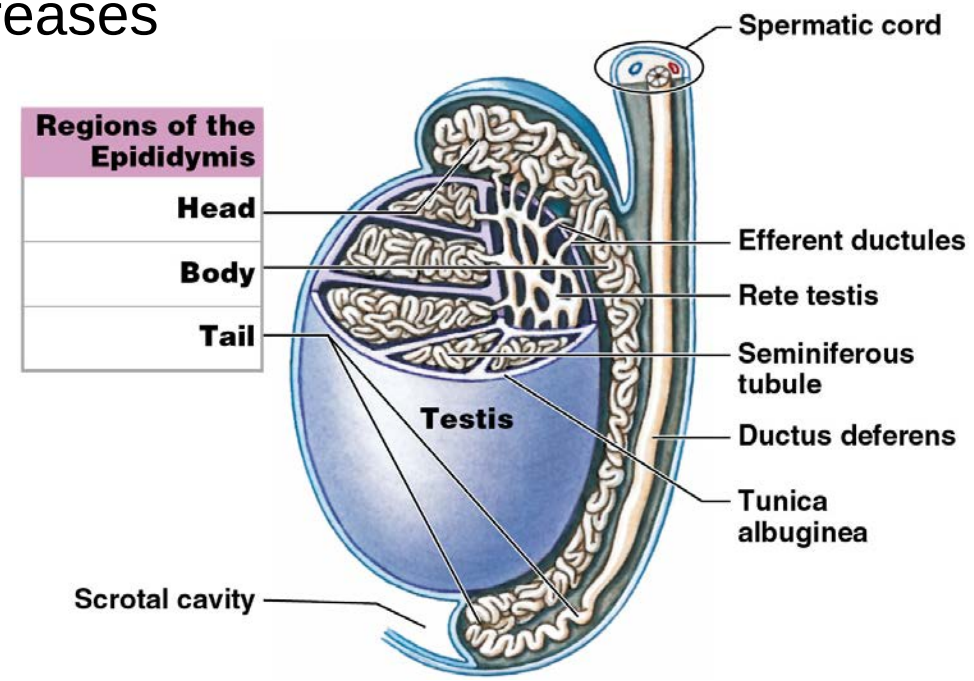
- Regions of the epididymis
  - **Head**
    - Receives spermatozoa from efferent ductules
  - **Body**
    - Extends inferiorly along the posterior surface of the testis



Module 26.5: Male reproductive tract and glands

Epididymis (continued)

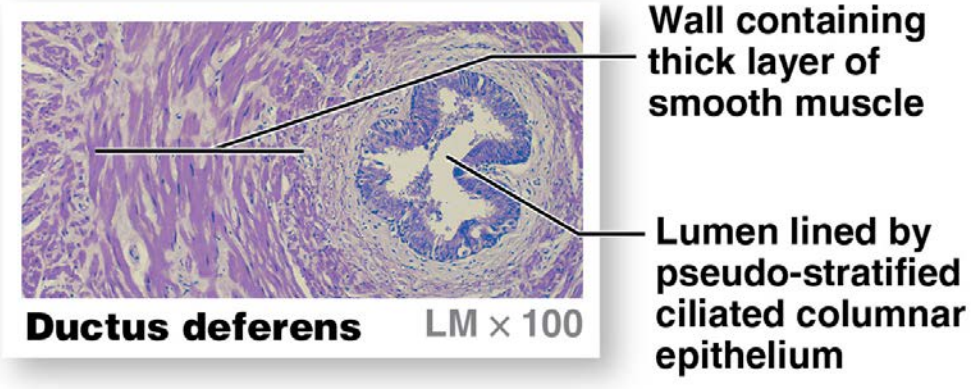
- Regions of the epididymis (continued)
  - **Tail**
    - Starts near the inferior border of the testis
    - Number of coils decreases
    - Connects with the ductus deferens



Module 26.5: Male reproductive tract and glands

Male reproductive tract (continued)

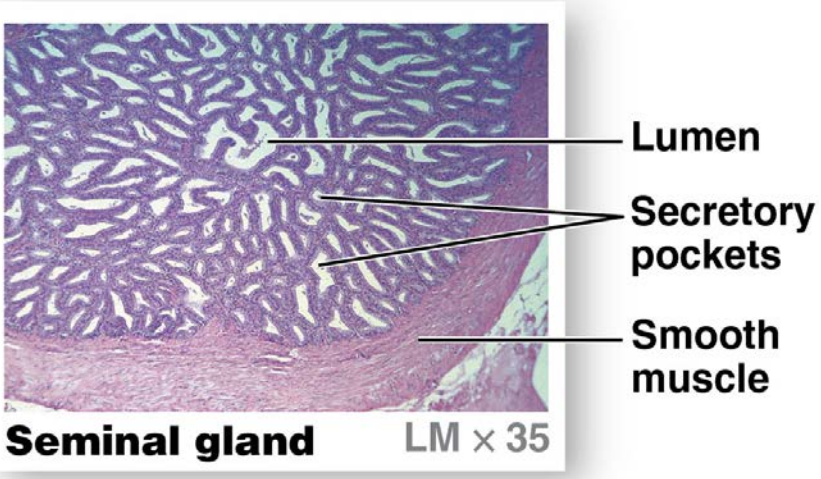
- **Ductus deferens** (or *vas deferens*)
  - 40–45 cm (160–16 in.) long
  - Passes through inguinal canal as part of spermatic cord
  - Transports sperm from the epididymis
  - Can store sperm for several months in a state of suspended animation



Module 26.5: Male reproductive tract and glands

Seminal glands (also called *seminal vesicles*)

- Sandwiched between the posterior wall of the urinary bladder and the rectum
- Secretion ejected by smooth muscle lining gland
  - Stimulates flagellum movement in sperm
  - First step of capacitation
- Produce ~60 percent of **semen** volume



Module 26.5: Male reproductive tract and glands

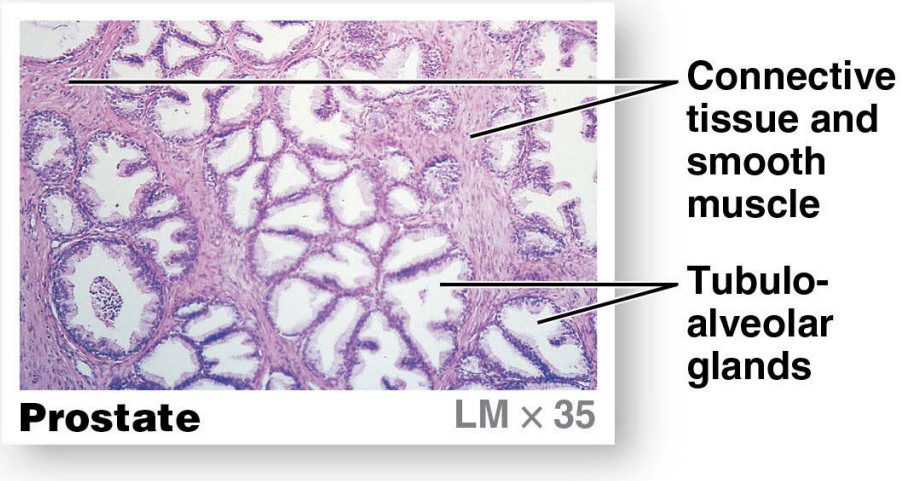
Semen

- Contains sperm and **seminal fluid**
- Fluid is a combination of secretions from:
  - Seminal glands
  - Nurse cells
  - Epididymis
  - Prostate
  - Bulbo-urethral glands
- ~2–5 mL of semen are released in a typical ejaculation

Module 26.5: Male reproductive tract and glands

Prostate

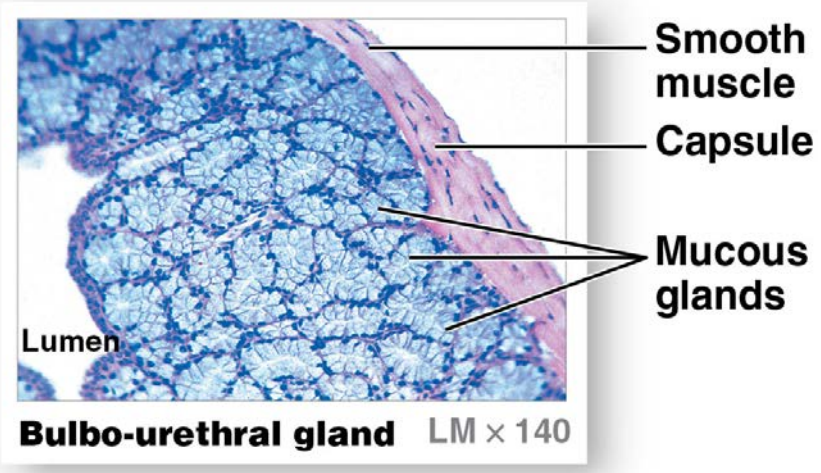
- Encircles the proximal urethra as it leaves the bladder
- Produces 20–30 percent of semen volume
- Secretions contain **seminalplasmin**
  - Antibiotic that may help prevent urinary tract infections in males



Module 26.5: Male reproductive tract and glands

Bulbo-urethral glands (Cowper's glands)

- Located at the base of the penis
- Duct of each gland empties into the urethra
- Secrete thick, alkaline mucus
  - Helps neutralize acids in the urethra
  - Also lubricates the tip of the penis



Module 26.5: Review

A. What is the function of the ductus deferens?
B. What are the functions of the bulbo-urethral glands?
C. Trace the ductal pathway from the epididymis to the urethra.

Learning Outcome: Explain the roles played by the male reproductive tract and accessory glands in the functional maturation, nourishment, storage, and transport of sperm.

Module 26.6: The penis conducts urine and semen to the exterior

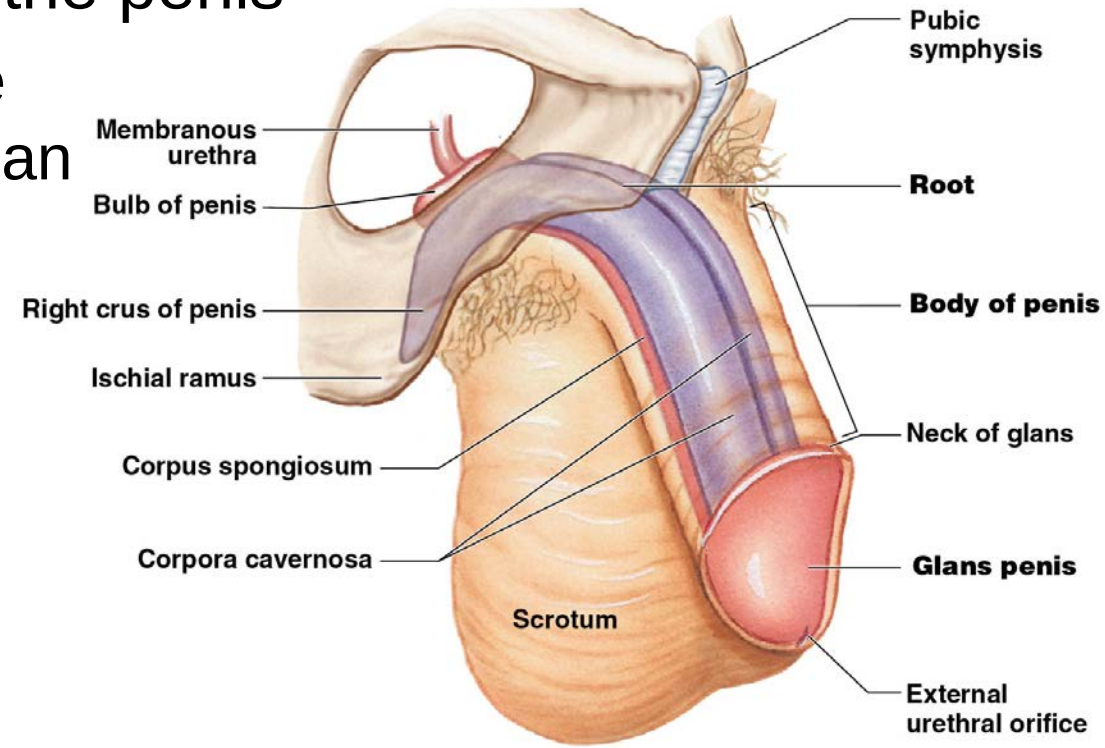
Functions of the penis

- Two functions
  1. Conducts urine to the exterior
  2. Introduces semen into the female's vagina during sexual intercourse

Module 26.6: Penis

Regions and structures of the penis

- **Root** of the penis
  - Fixed portion that attaches the penis to the body wall just inferior to the pubic symphysis
- **Body** (or shaft) of the penis
  - Tubular, movable portion of the organ

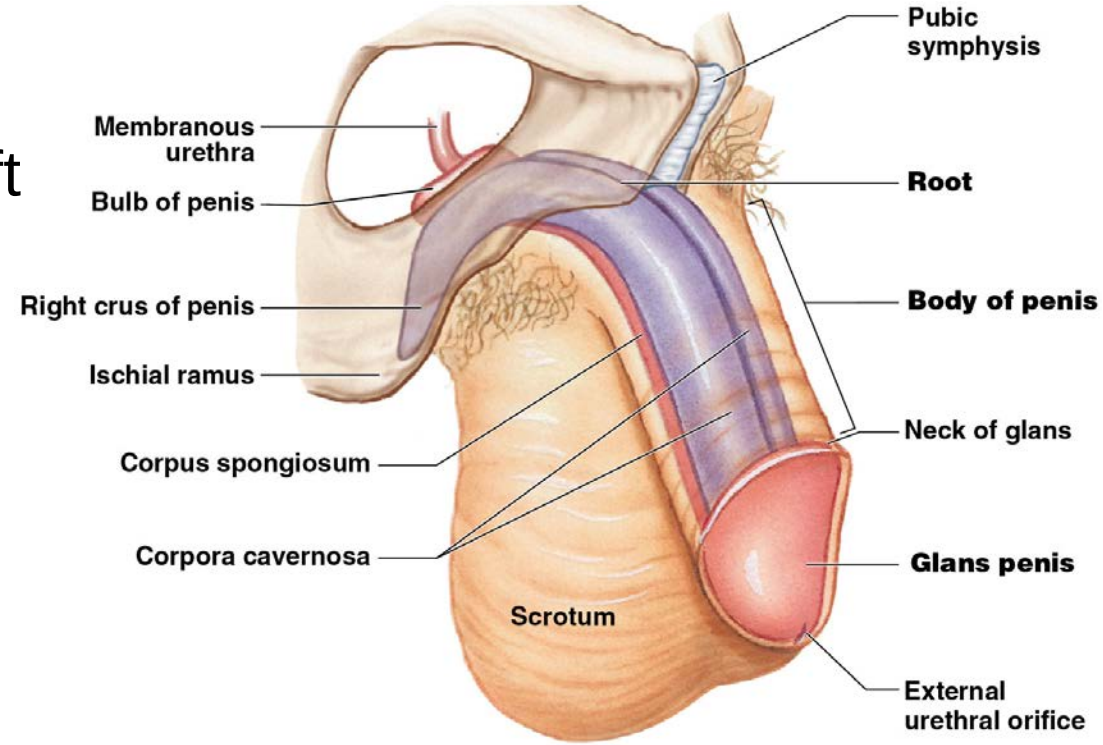


Module 26.6: Penis

Regions and structures of the penis (continued)

Glans penis (head)

- Expanded distal end that surrounds the external urethral orifice
- **Neck of glans**
  - Narrow portion between the shaft and the glans



Module 26.6: Penis

Erectile tissue

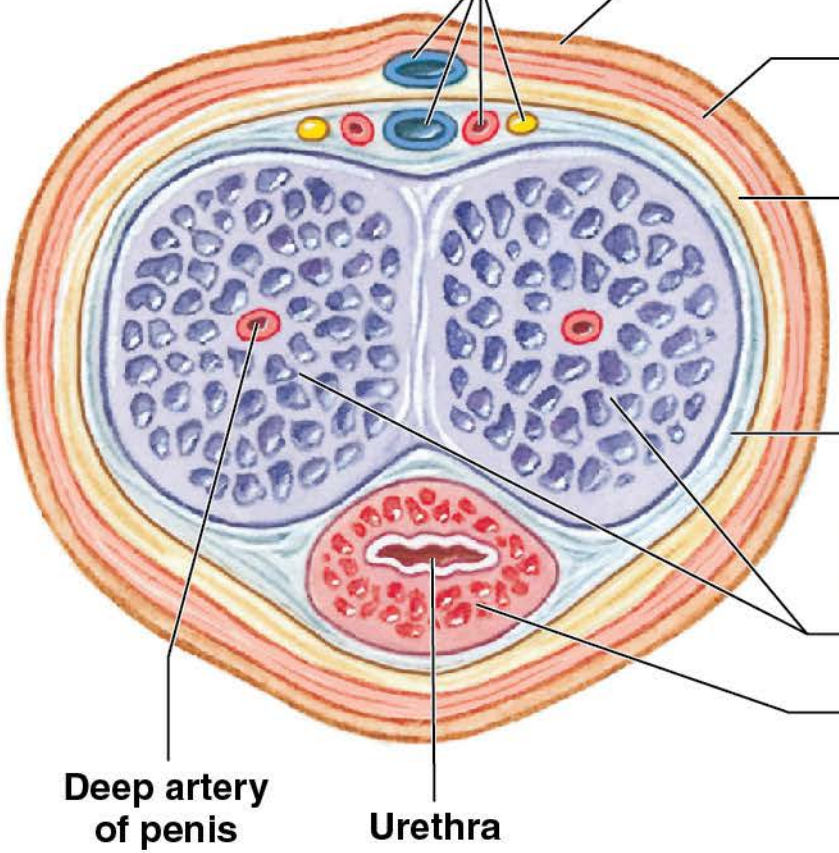
- Three-dimensional network with vascular spaces
- In the resting state, arterial branches are constricted, and muscular partitions are tense (restricts blood flow into the erectile tissue)
- **Corpora cavernosa** (singular, *corpus cavernosum*)
  - Two cylindrical masses on the anterior/dorsal surface of the penis
- **Corpus spongiosum**
  - Surrounds the penile urethra
  - Expands at the tip of the penis to form the glans

Module 26.6: Penis

Tissue layers of the penis

- Outer skin
  - Resembles thin skin of the scrotum
  - Dermis has smooth muscle continuous with the dartos muscle of the scrotum
- Underlying areolar tissue allows skin to move without distorting deeper structures
- Elastic tissue
  - Deep to the areolar tissue
  - Encircling internal structures

Tissue layers of the penis



Tissue Layers of the Penis
The skin overlying the penis resembles that of the skin on the scrotum.
The dermis has a layer of smooth muscle that is a continuation of the dartos muscle of the scrotum.
Areolar tissue containing superficial arteries, veins, and lymphatic vessels
Dense network of elastic fibers
Erectile Tissues
Corpora cavernosa
Corpus spongiosum

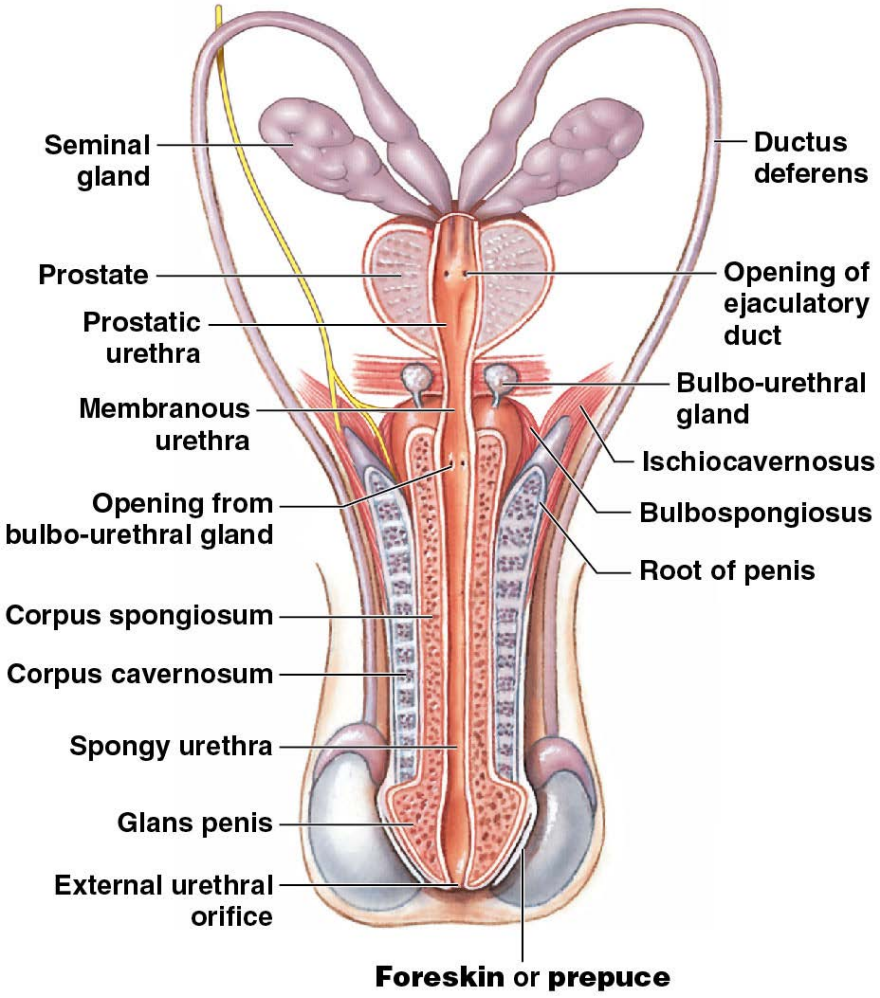
Module 26.6: Penis

Foreskin (prepuce)

- Surrounds tip of penis

Smegma

- Waxy material secreted by *preputial glands*



Module 26.6: Penis

Phases in the male sexual response

- **Arousal**
  - Erotic thoughts or stimulation of sensory nerves in the genital region increase parasympathetic stimulation through pelvic nerves
  - Release of **nitric oxide** causes arterial dilation
    - Blood flow increases, engorging vascular channels
    - **Erection** of the penis occurs
  - Secretion of bulbo-urethral glands lubricates the tip of the penis

Module 26.6: Penis

Phases in the male sexual response (continued)

- **Emission**
  - Caused by sympathetic activation
  - Begins with peristaltic contractions in the ampullae of the ductus deferens
    - Pushes sperm into the prostatic urethra
  - Contractions continue in the seminal glands and prostate
  - Secretions from these glands mix with sperm to form **semen**

Module 26.6: Penis

Phases in the male sexual response (continued)

- **Ejaculation**
  - Powerful, rhythmic muscular contractions
    - Bulbocavernosus muscles (at base) push semen toward external urethral orifice
    - Ischiocavernosus muscles (along sides) stiffen erect penis
  - Controlled by somatic motor neurons in the lower lumbar and upper sacral segments of the spinal cord
  - Contractions associated with pleasurable sensations known as **male orgasm**

Module 26.6: Penis

Impotence, or **erectile dysfunction** (**ED**)

- Inability to achieve or maintain an erection
- Various causes
  - Vascular changes (e.g., low blood pressure)
  - Interference with neural commands
  - Psychological factors (depression, anxiety)
- Medications (e.g.,Viagra and Cialis) temporarily inactivate enzymes that oppose nitric oxide (NO)
  - Small amounts of NO can then produce erection

Module 26.6: Review

A. Name the three columns of erectile tissue in the penis.
B. An inability to contract the ischiocavernosus and bulbospongiosus muscles would interfere with which phase of the male sexual response?

Learning Outcome: Describe the structure and function of the penis.

Module 26.7: Testosterone plays a key role in establishing and maintaining male sexual function

Hormonal interactions

- Hypothalamus
  - Secretes gonadotropin-releasing hormone (GnRH)
    - Released at a steady rate and pace
  - Targets the anterior lobe of the pituitary gland
- Anterior lobe of the pituitary
  - Responds by producing two gonadotropins
    - Luteinizing hormone (LH)
    - Follicle-stimulating hormone (FSH)

Module 26.7: Hormonal interactions regulating male reproductive function

Hormonal interactions (continued)

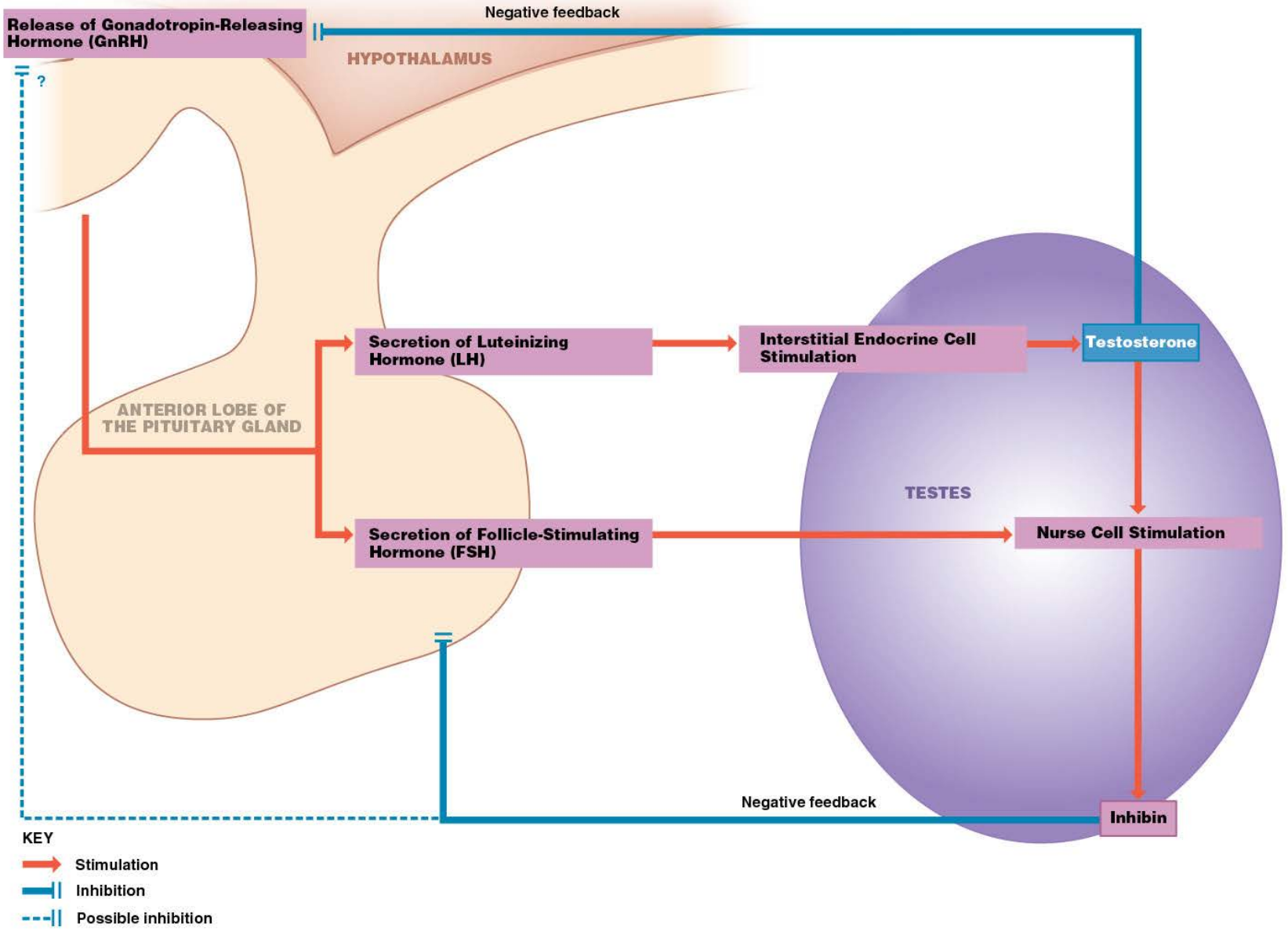
- **Luteinizing hormone** (**LH**)
  - Targets the interstitial cells of the testes
    - Interstitial cells secrete testosterone and other androgens
  - Testosterone levels are regulated by negative feedback
    - High testosterone level inhibits release of GnRH

Module 26.7: Hormonal interactions regulating male reproductive function

Hormonal interactions (continued)

- **Follicle-stimulating hormone** (**FSH**)
  - Targets nurse cells of seminiferous tubules
  - Nurse cells
    - Promote spermatogenesis and spermiogenesis
    - Secrete **androgen-binding protein** (**ABP**)
      - Stimulates maturation of spermatids
    - Secrete **inhibin**
      - Inhibits FSH
      - Provides feedback control of spermatogenesis

Hormonal control of male sexual function

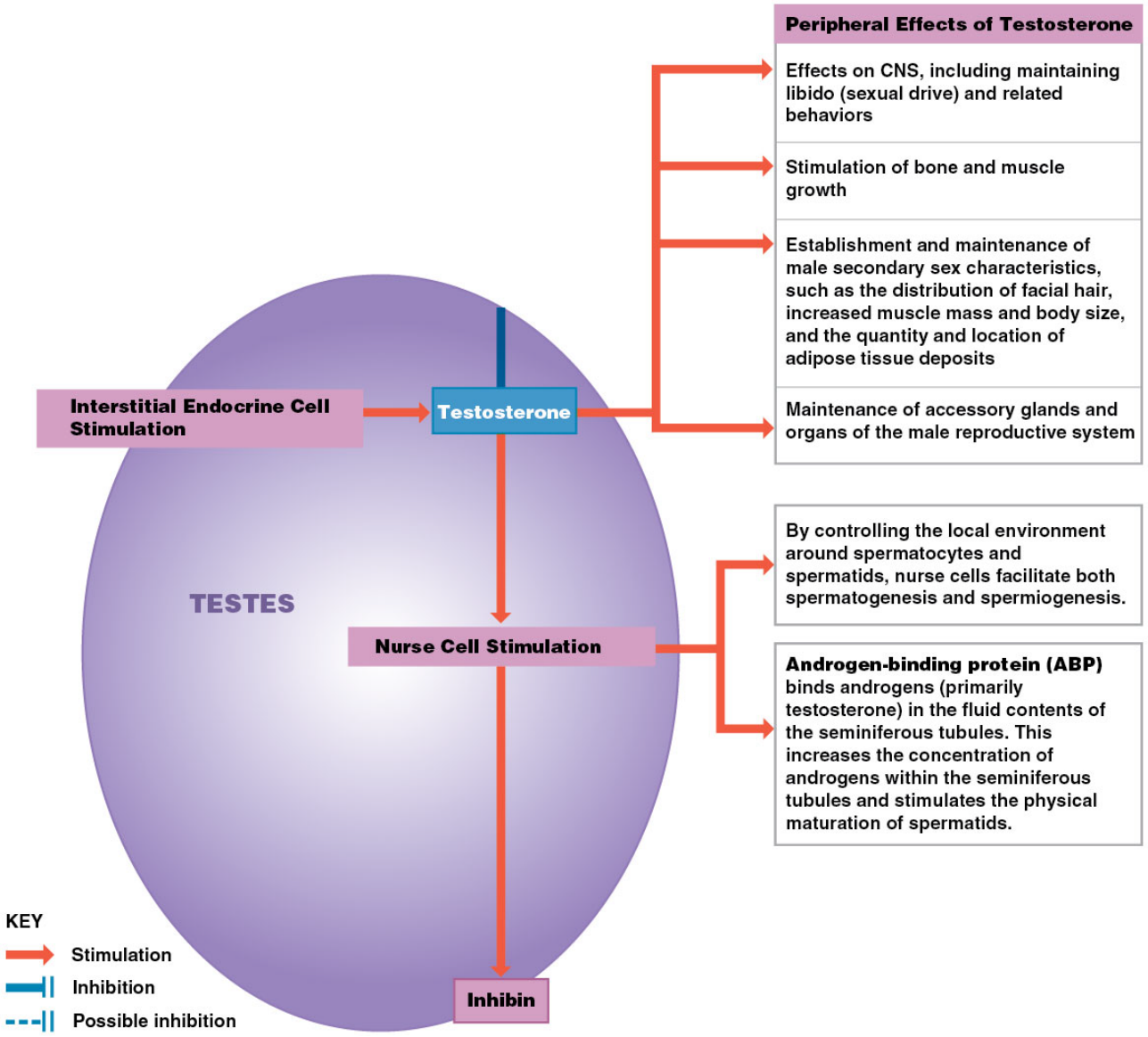


Module 26.7: Hormonal interactions regulating male reproductive function

Peripheral effects of testosterone

- Maintains libido (sexual drive) and related behaviors
- Stimulates bone and muscle growth
- Establishes and maintains male secondary sexual characteristics
- Maintains accessory glands and organs of the male reproductive system

Peripheral effects of testosterone



Module 26.7: Hormonal interactions regulating male reproductive function

Dihydrotestosterone (DHT)

- Testosterone is converted to DHT in some tissues
- Comprises ~10 percent circulating levels of testosterone
- Can bind to same receptors as testosterone
- Some tissues respond to DHT instead of testosterone
  - External genitalia
- Other tissues are more sensitive to DHT than testosterone
  - Prostate

Module 26.7: Review

A. Identify important regulatory hormones that establish and maintain male sexual function.
B. Identify the sources of hormones that control male reproductive functions.
C. What effect would low FSH levels have on sperm production?

Learning Outcome: Explain the roles of testosterone and other regulatory hormones in establishing and maintaining male sexual function.

Section 2: Female Reproductive System

Learning Outcomes

26.8 Identify the structures and functions of the female external genitalia, internal genitalia, and mammary glands.

26.9 Describe the anatomy of the ovaries, uterus, and associated structures.

26.10 Outline the processes of meiosis and oogenesis in the ovaries.

26.11 Describe the structure, histology, and functions of the uterine tubes and uterus.

Section 2: Female Reproductive System

Learning Outcomes (continued)

26.12 Identify the phases and events of the uterine cycle.

26.13 Describe the structure, histology, and functions of the vagina.

26.14 Discuss the structure and function of the breasts and mammary glands.

Section 2: Female Reproductive System

Learning Outcomes (continued)

26.15 Summarize the hormonal regulation of the female reproductive cycles.

26.16 **Clinical Module:** Discuss various birth control strategies and their associated risks.

26.17 **Clinical Module:** Discuss several common reproductive system disorders.

Module 26.8: Female reproductive structures include the external genitalia and internal genitalia

Overall functions of the female reproductive system

- Produces sex hormones
- Produces functional gametes
- Protects and supports developing embryo
- Maintains growing fetus
- Nourishes newborn infant

Module 26.8: Female reproductive structures

Female external genitalia

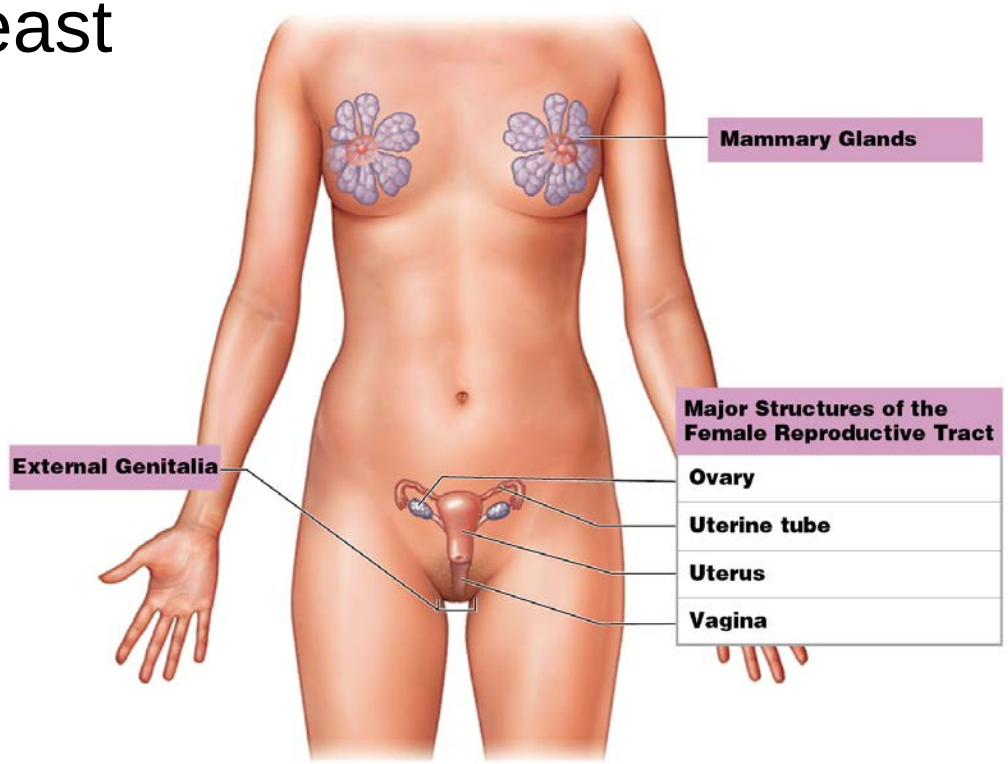
- Vulva—outer genitals and urethra

Female internal genitalia

- Ovaries, uterine tubes, uterus, and vagina

Mammary gland of breast

- Produces milk to nourish infant



Module 26.8: Female reproductive structures

Female gonads are the ovaries

- Produce gametes (**oocytes** that mature into **ova**)
- Produce hormones

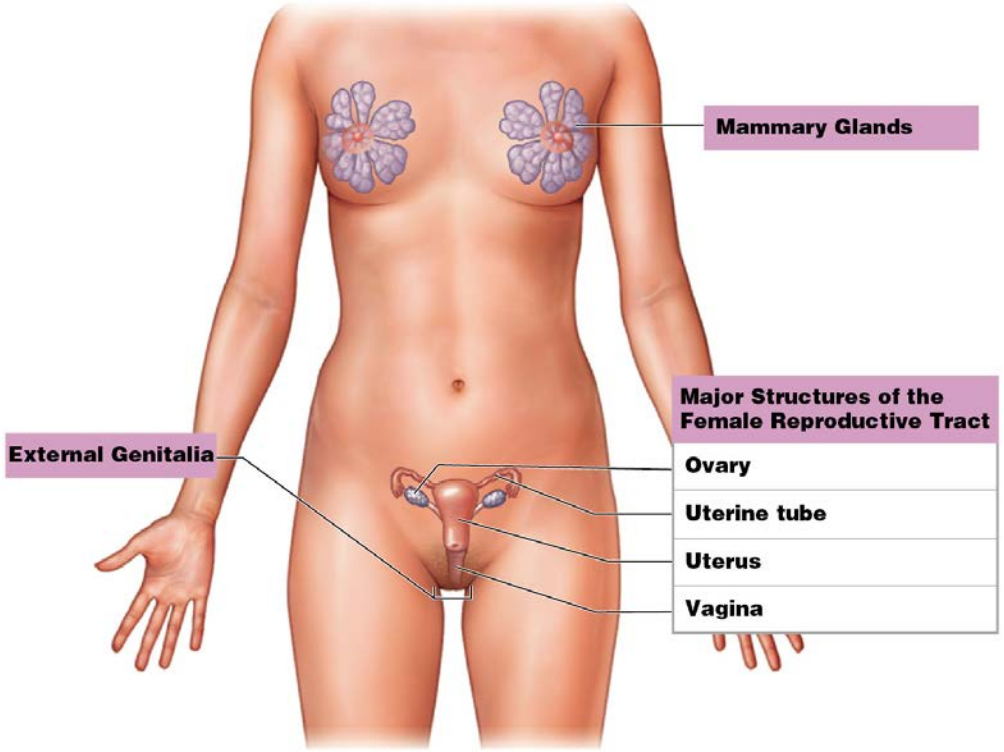
Female reproductive tract

- **Uterine tubes** (deliver oocyte or embryo to the uterus)
  - Normal sites of fertilization
- **Uterus** (site of embryonic and fetal development)
  - Also site of exchange between maternal and embryonic/fetal bloodstream

Module 26.8: Female reproductive structures

Female reproductive tract (continued)

- **Vagina** (site of sperm deposition)
  - Birth canal during delivery
  - Passageway for fluids during menstruation



Module 26.8: Female reproductive structures

External genitalia

- **Mons pubis**
  - Pad of fatty tissue overlapping symphysis pubis
- **Clitoris**
  - Contains erectile tissue
- **Labia**
  - Contain glands that lubricate the entrance to the vagina

Mammary glands

- Produce milk to nourish newborn infant

Module 26.8: Review

A. Identify the main organs of the female reproductive system.
B. Name the structures of the female external genitalia.
C. Where does fertilization normally occur?

Learning Outcome: Identify the structures and functions of the female external genitalia, internal genitalia, and mammary glands.

Module 26.9: Major female reproductive organs are the ovaries, uterus, and their associated structures

Ovary

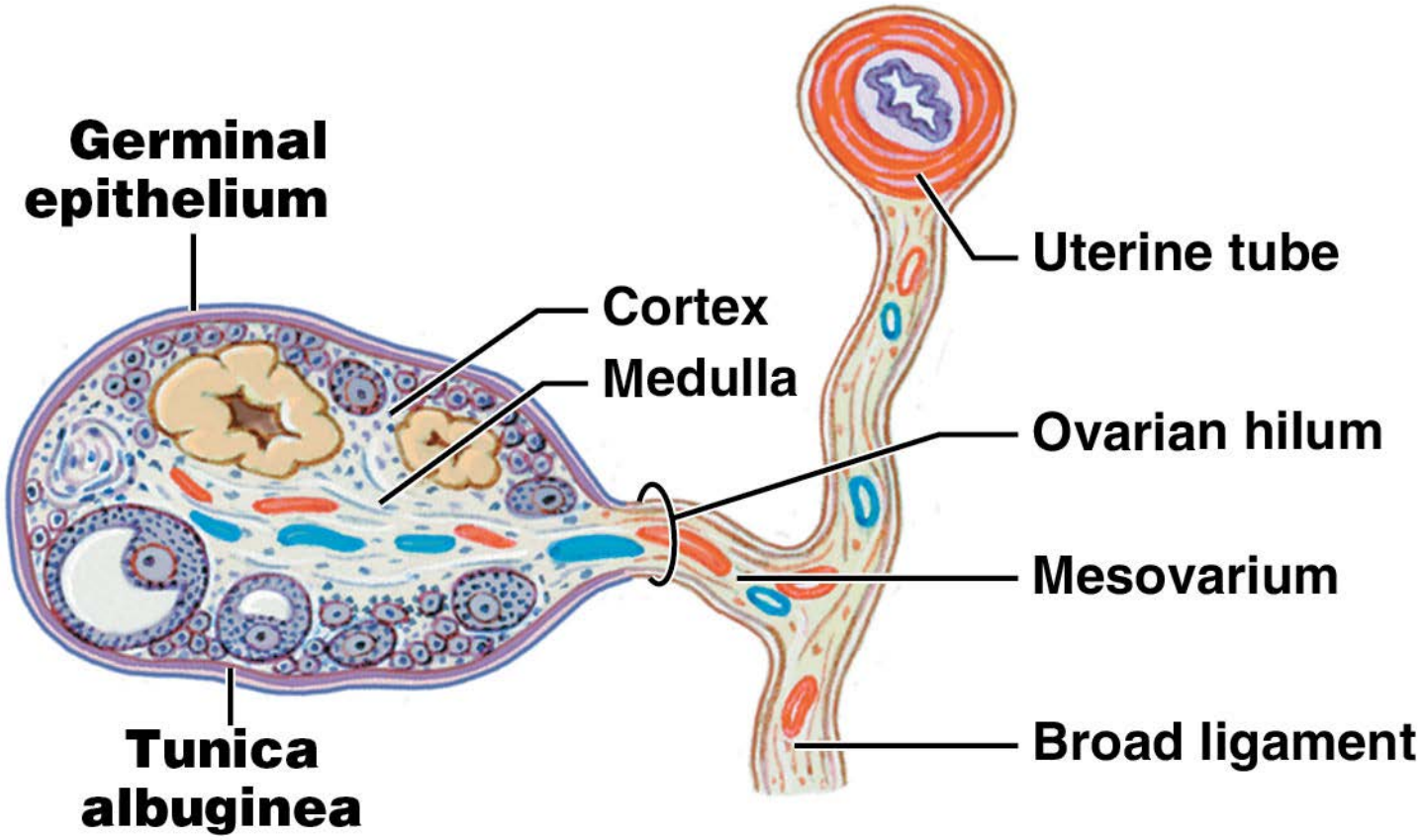
- Paired almond-shaped organs near the lateral wall of the pelvic cavity
- Three main functions
  1. Production of immature female gametes (**oocytes**)
  2. Secretion of female sex hormones (**estrogens** and **progesterone**)
  3. Secretion of **inhibin** (inhibits FSH production in the anterior pituitary gland)

Module 26.9: Female reproductive organs

Layers of the ovaries

- **Germinal epithelium**
  - Layer of squamous or cuboidal cells covering the ovary
  - Continuous with the visceral peritoneum
- **Tunica albuginea**
  - Dense connective tissue layer just deep to the germinal epithelium
- Interior of the ovary
  - **Cortex** (superficial layer where oocytes are produced)
  - **Medulla** (deep to the cortex)

The ovary



Module 26.9: Female reproductive organs

Female reproductive system structures

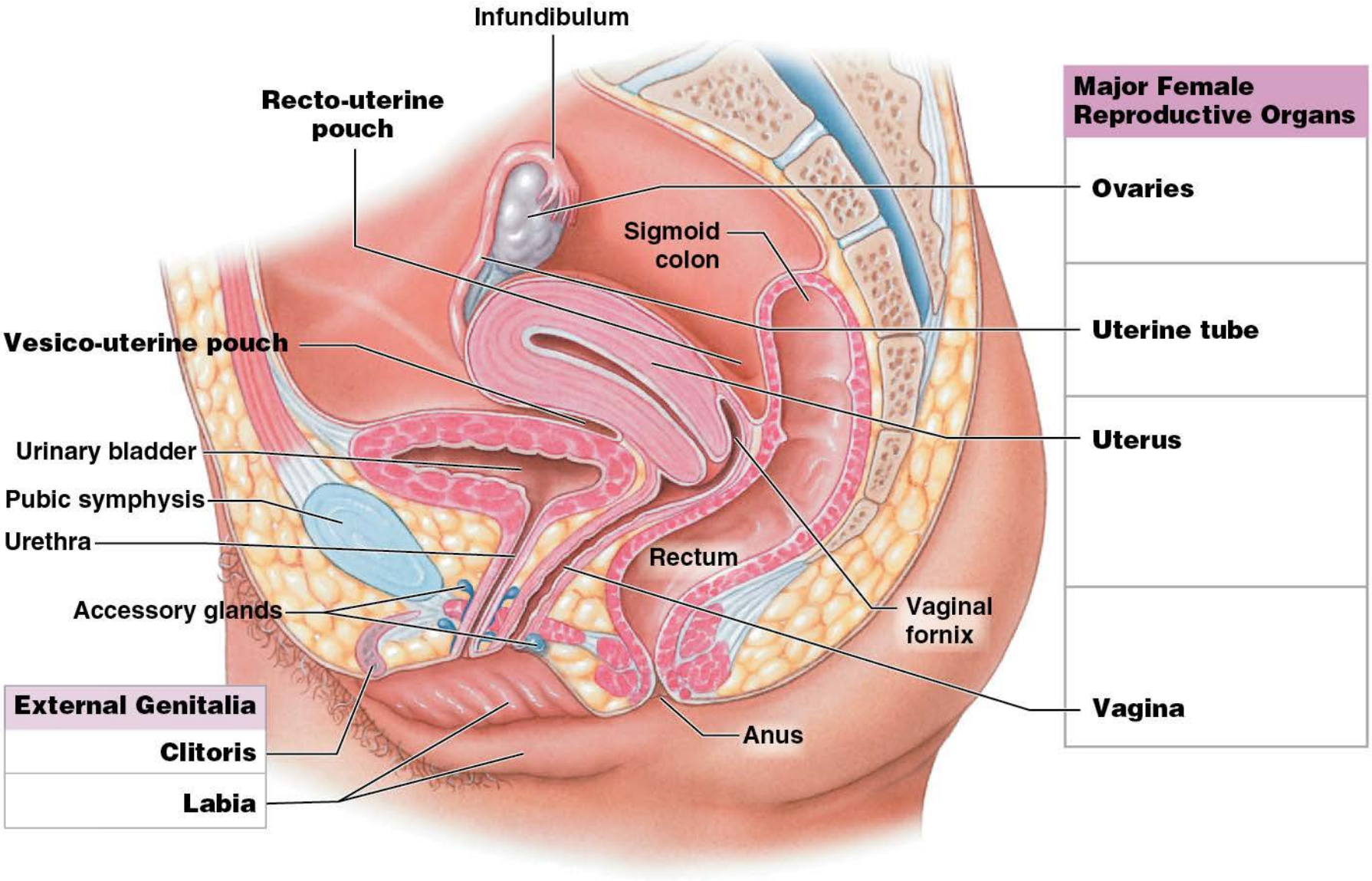
- **Uterine tube**
  - Expanded funnel (**infundibulum**) opens into the pelvic cavity along the surface of the ovary
  - Other end opens into the uterine cavity
- **Uterus**
  - Inferior to the ovaries
  - Usually angled anteriorly above the urinary bladder
- **Vesico-uterine pouch**
  - Pocket between uterus and posterior bladder wall

Module 26.9: Female reproductive organs

Female reproductive system structures (continued)

- **Recto-uterine pouch**
  - Pocket between posterior uterus and anterior colon
- **Vagina**
  - Extends from the uterus base (cervix) to the exterior
- **External genitalia**
  - **Clitoris**
    - Stimulation produces pleasurable sensations associated with **female orgasm**
  - **Labia**

The female reproductive system

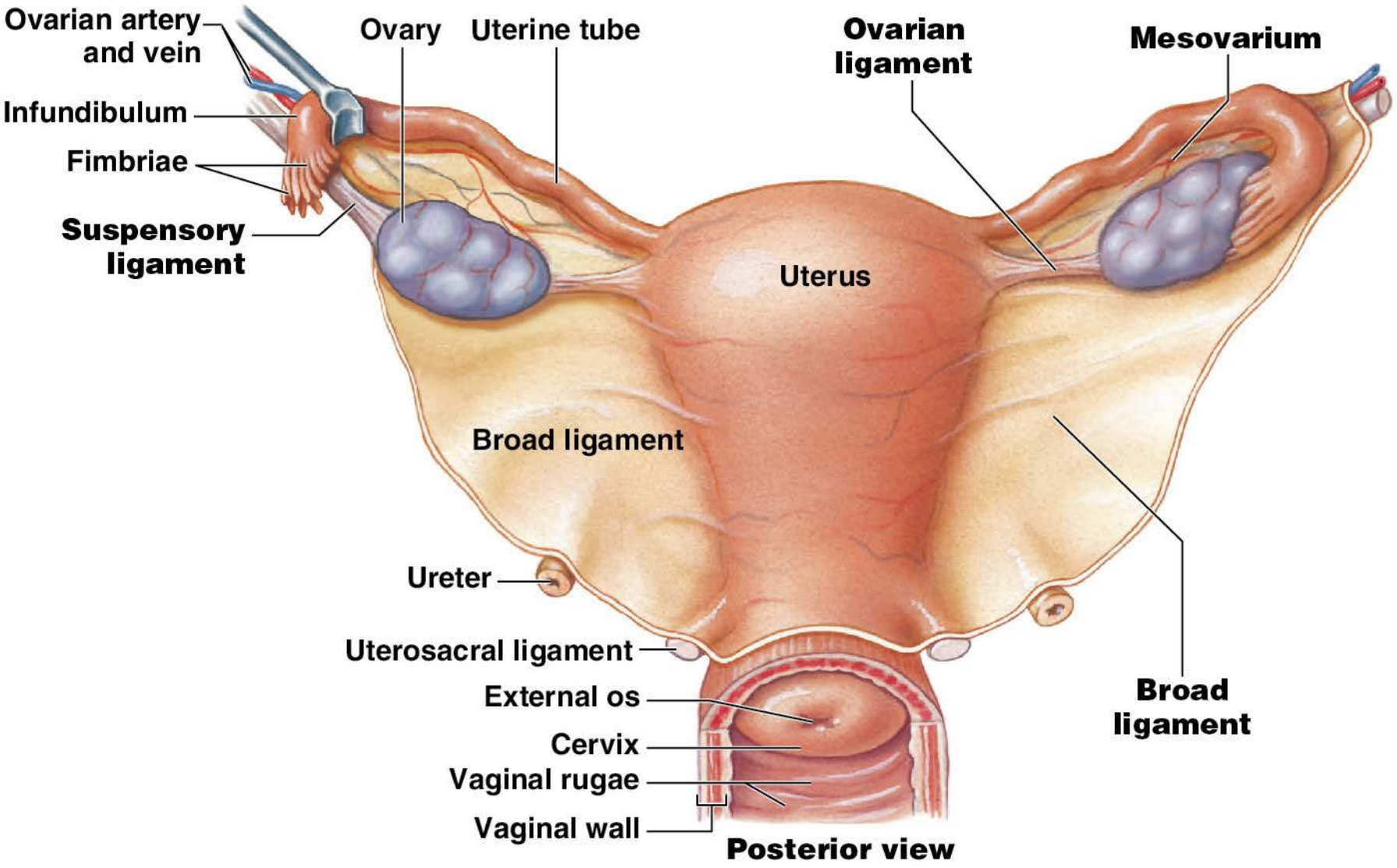


Module 26.9: Female reproductive organs

Connective tissues and ligaments stabilize the ovary

- **Ovarian ligament**
  - Extends from uterus to medial surface of ovary
- **Mesovarium**
  - Fold of mesentery; supports and stabilizes ovary
- **Suspensory ligament**
  - Extends from lateral surface of ovary to pelvic wall
- **Broad ligament**
  - Extensive mesentery enclosing ovaries, uterine tubes, and uterus
  - Attaches to sides and floor of pelvic cavity

Ligaments and connective tissue



Module 26.9: Review

A. Distinguish between the vesico-uterine and recto-uterine pouches.
B. What roles do the ovaries perform?
C. Name the structures enclosed by the broad ligament, and cite the function of the mesovarium.

Learning Outcome: Describe the anatomy of the ovaries, uterus, and associated structures.

Module 26.10: Oogenesis occurs in the ovaries, and ovulation occurs during the 28-day ovarian cycle

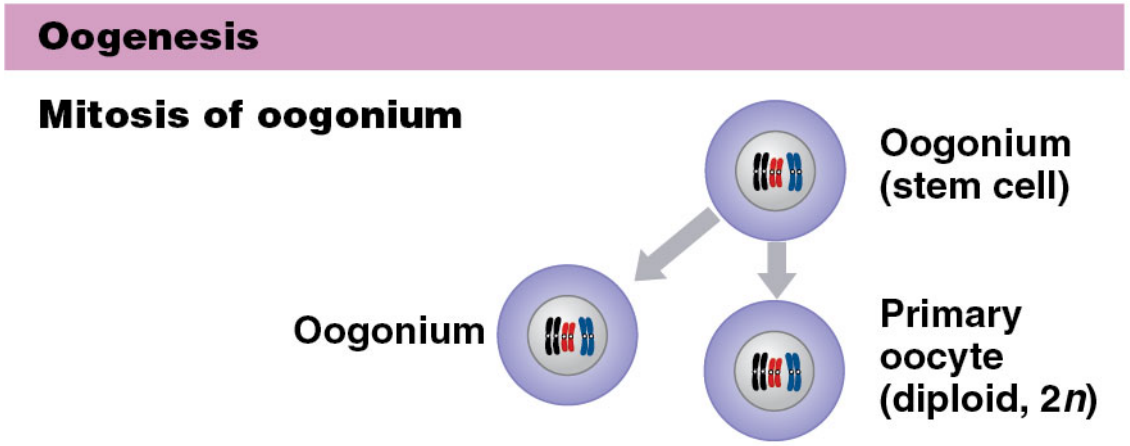
Oogenesis

- Formation and development of the oocyte
- Begins before birth, accelerates at puberty, ends at menopause
- Nuclear events are the same as with spermatogenesis

Module 26.10: Oogenesis and the ovarian cycle

Steps in oogenesis

- Mitosis of **oogonium** (plural, **oogonia**)—female reproductive stem cells
  - Mitosis completed prior to birth
  - For each oogonium, produces one oogonium and one **primary oocyte**



Module 26.10: Oogenesis and the ovarian cycle

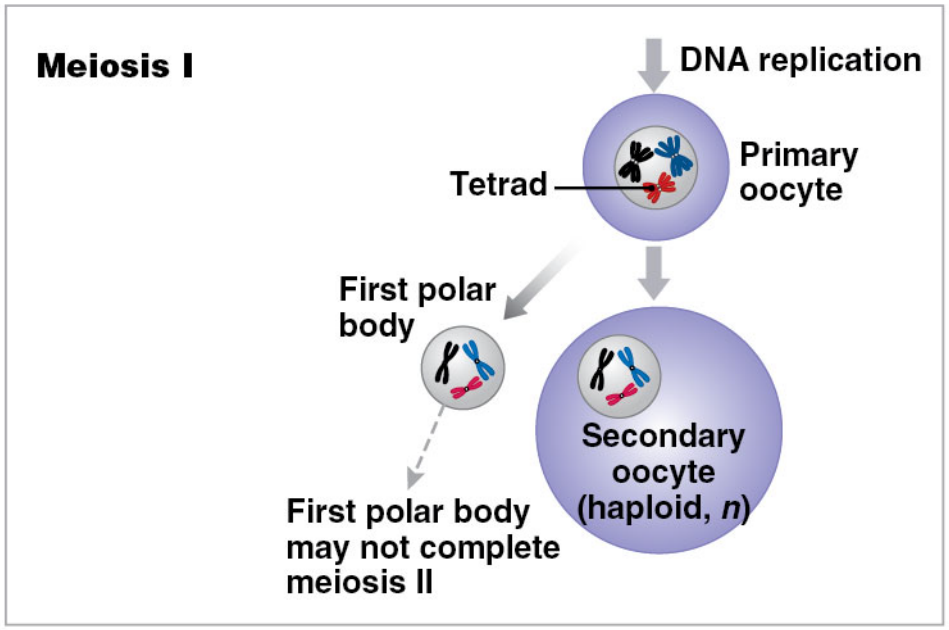
Steps in oogenesis (continued)

- **Meiosis I**
  - Begins between 3rd and 7th month of fetal development
  - Primary oocytes begin meiosis I but stop at prophase I until puberty
    - Rising FSH levels trigger start of the **ovarian cycle**
    - Each month, some of the primary oocytes are stimulated to complete meiosis I
  - Yields haploid secondary oocyte and a polar body
    - Secondary oocyte gets the majority of cytoplasm

Module 26.10: Oogenesis and the ovarian cycle

Steps in oogenesis (continued)

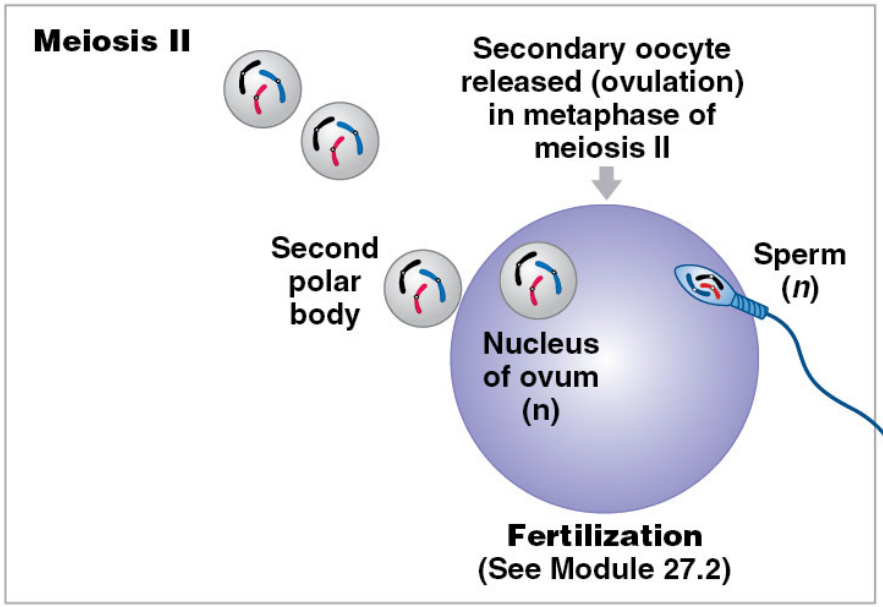
- Ovary releases a secondary oocyte (not a mature ovum)
  - Meiosis does not complete unless fertilization occurs



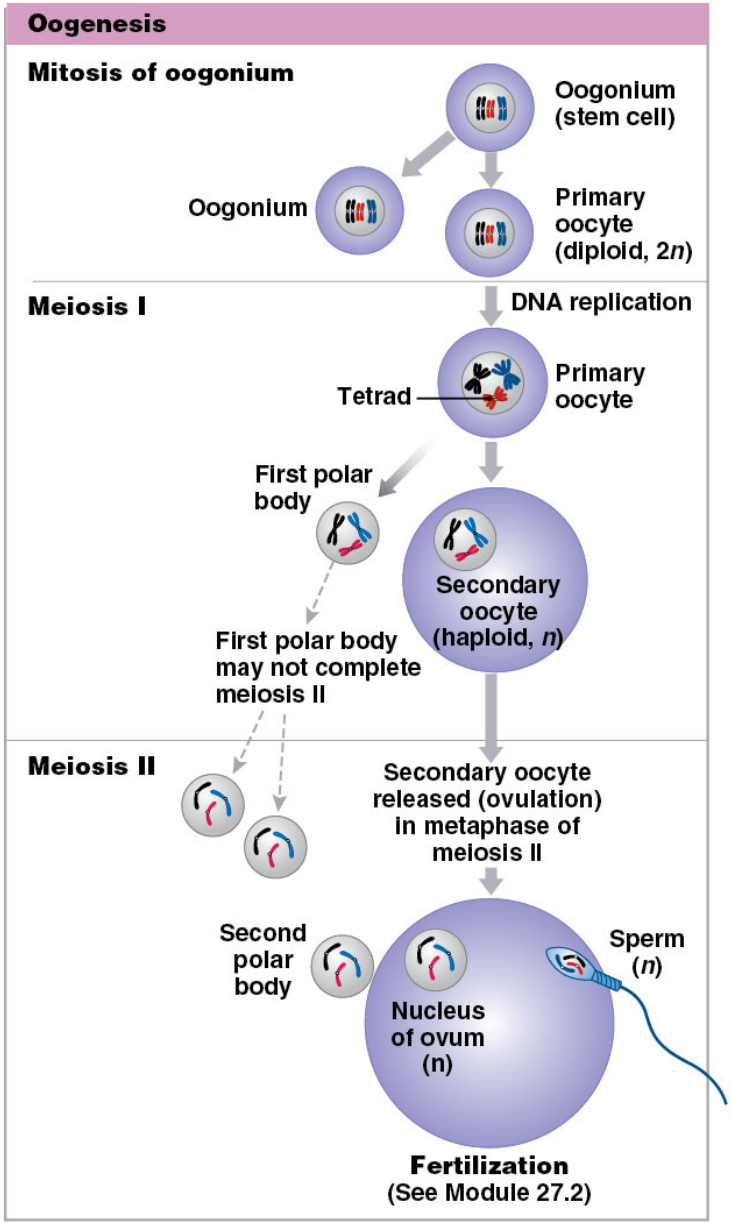
Module 26.10: Oogenesis and the ovarian cycle

Steps in oogenesis (continued)

- **Meiosis II**
  - Secondary oocyte begins meiosis II
    - Suspended in metaphase II at ovulation
  - At fertilization, the secondary oocyte divides into a second polar body and a mature **ovum** (both haploid)



Steps in oogenesis



Module 26.10: Oogenesis and the ovarian cycle

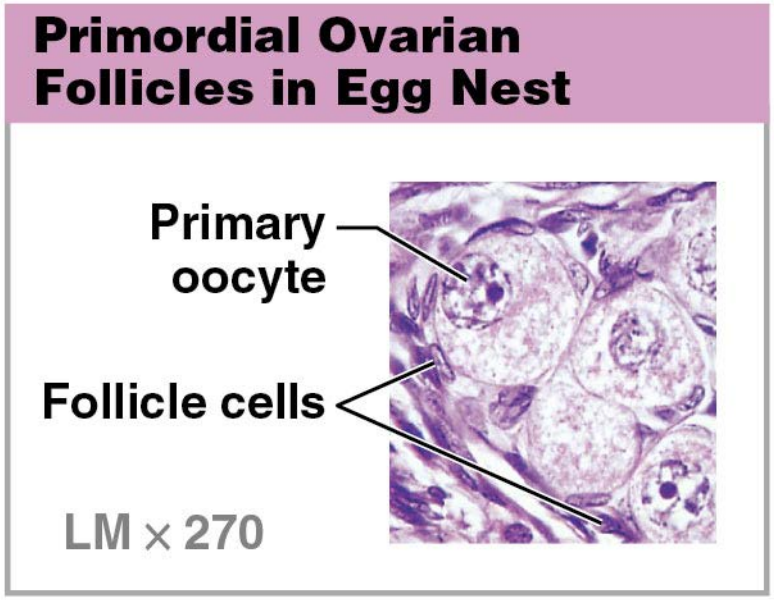
Ovarian cycle

- Involves changes in **ovarian follicles**
  - Specialized structures where oocyte growth and meiosis I occur
- About 2 million **primordial follicles** exist at birth
  - Each containing a primary oocyte
- By puberty, only about 400,000 primordial follicles remain
  - Others degenerated in a process called *atresia*
- Each month, FSH stimulates the development of several follicles

Module 26.10: Oogenesis and the ovarian cycle

Stages of the ovarian cycle

- **Primordial follicle in egg nest**
  - **Primordial follicle**
    - Inactive primary oocyte surrounded by a simple squamous layer of follicle cells
  - **Egg nests**
    - Clusters of primary oocytes in the outer portion of the ovarian cortex, near the tunica albuginea

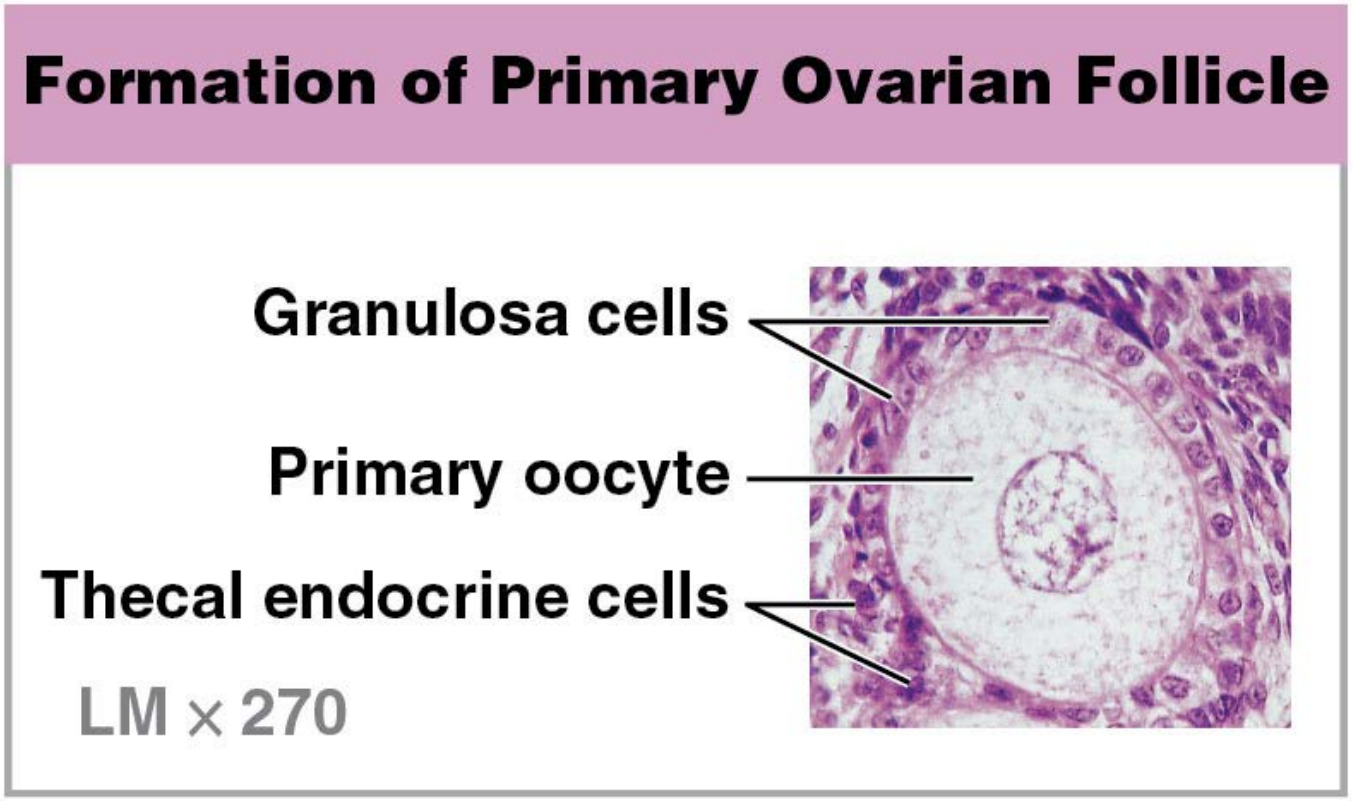


Module 26.10: Oogenesis and the ovarian cycle

Stages of the ovarian cycle (continued)

- **Formation of primary follicles**
  - Follicular cells enlarge, divide, and form several layers around the primary oocyte
  - Follicular cells now called **granulosa cells**
  - **Zona pellucida** (*pellucidus*, translucent)
    - Region that develops around the oocyte
  - **Thecal endocrine cells** (*theca*, box)
    - Layer of cells that form around the follicle
  - Thecal cells and granulosa cells work together to produce estrogen

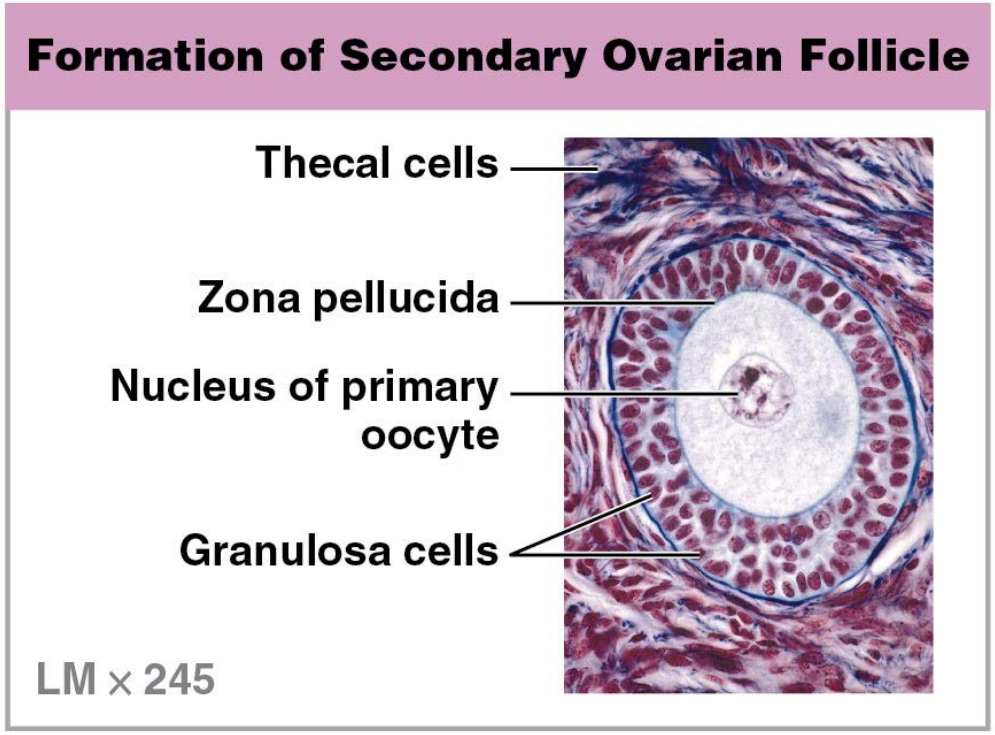
Formation of primary follicles



Module 26.10: Oogenesis and the ovarian cycle

Stages of the ovarian cycle (continued)

- **Formation of secondary follicles**
  - Follicle wall thickens, and follicular cells secrete fluid
  - Fluid-filled pockets expand and separate the inner and outer layers of the follicle

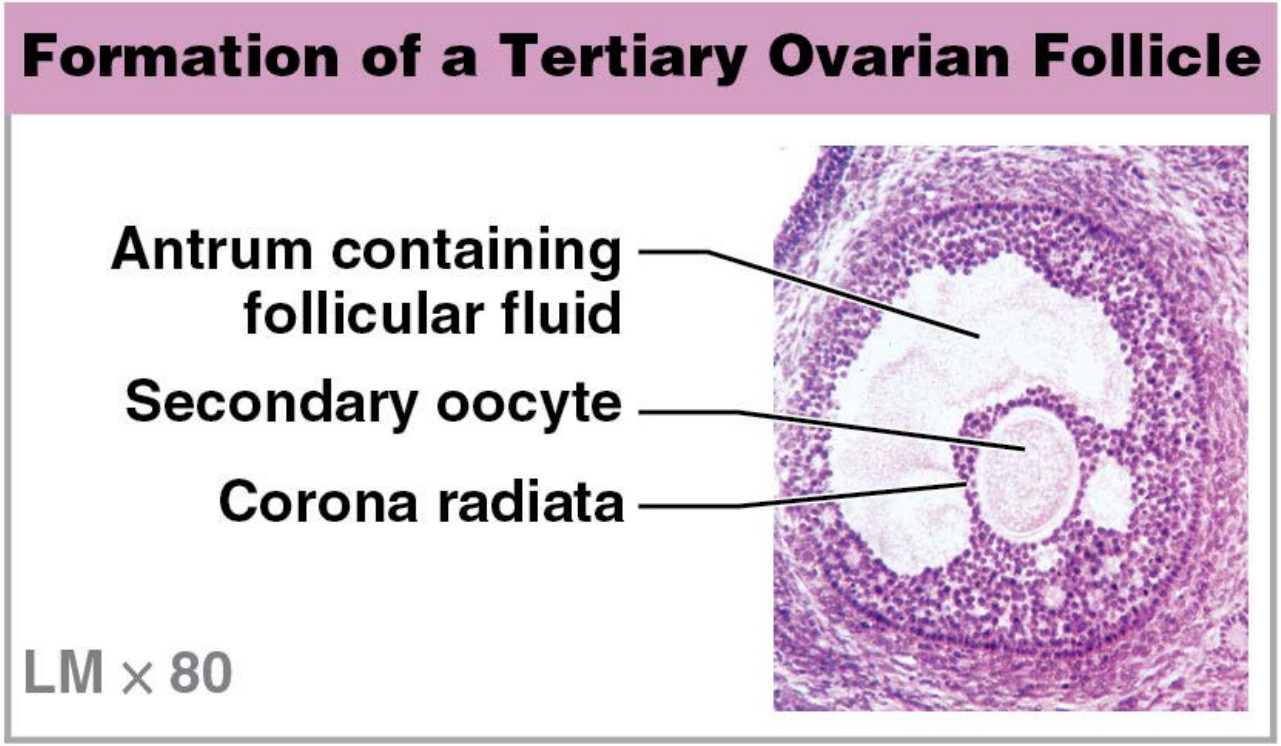


Module 26.10: Oogenesis and the ovarian cycle

Stages of the ovarian cycle (continued)

- **Formation of tertiary follicle**
  - Occurs about day 10–14 of cycle
  - One secondary follicle becomes a **tertiary follicle**, or mature graafian follicle
    - Roughly 15 mm in diameter
  - Expanded central chamber (**antrum**) is filled with follicular fluid
    - Oocyte projects into the antrum
  - Granulosa cells form a protective layer (**corona radiata**) around the secondary oocyte

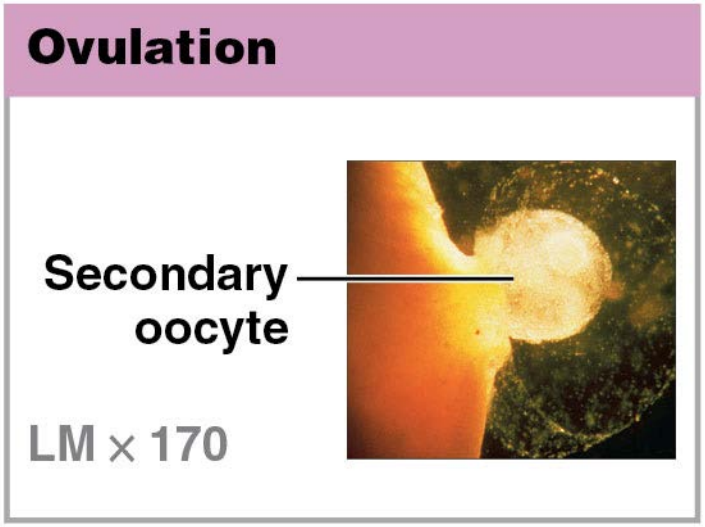
Formation of tertiary follicle



Module 26.10: Oogenesis and the ovarian cycle

Stages of the ovarian cycle (continued)

- **Ovulation**
  - Tertiary follicle releases secondary oocyte and corona radiata into the pelvic cavity
  - Marks end of **follicular phase** and start of **luteal phase**

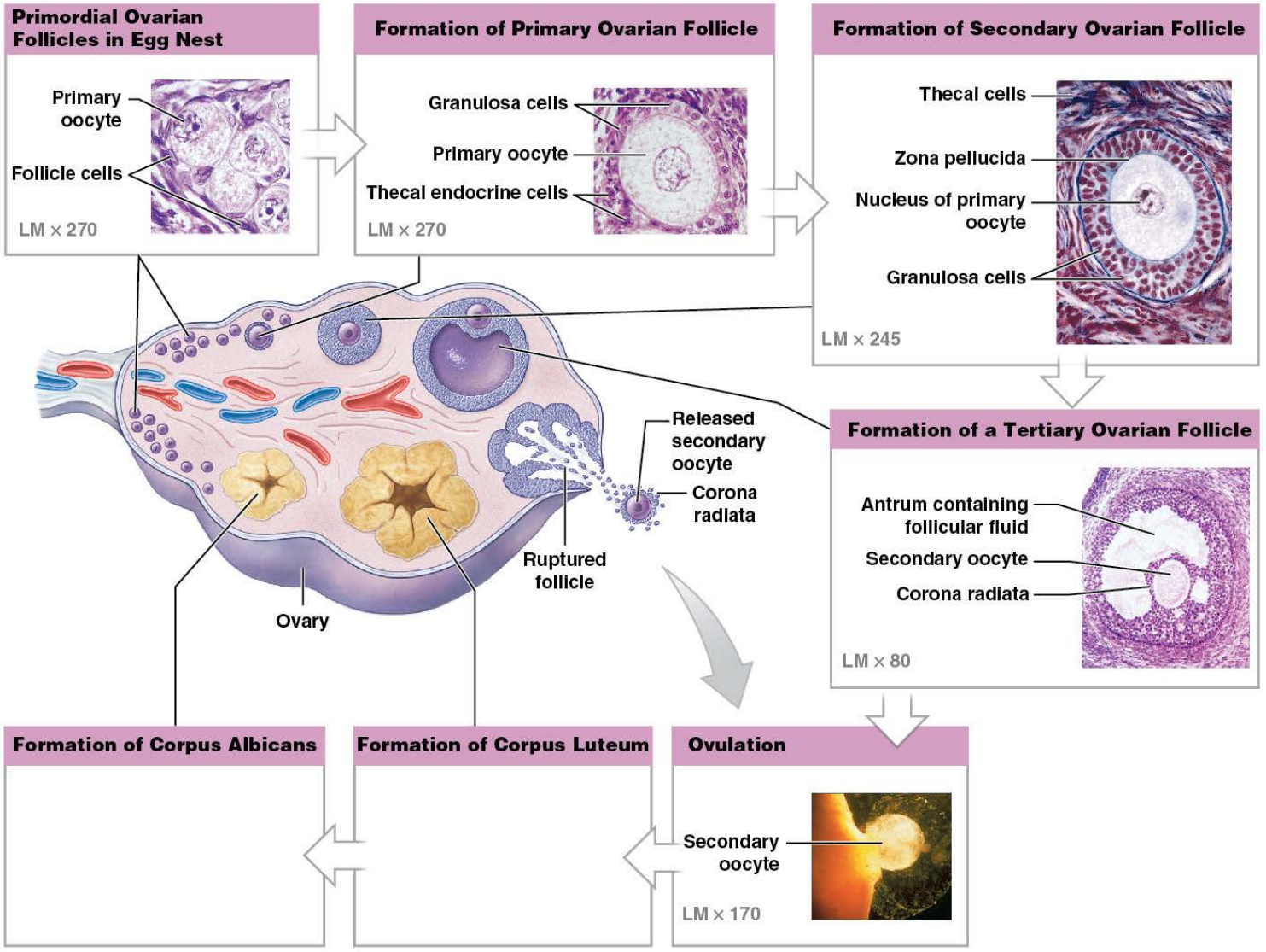


Module 26.10: Oogenesis and the ovarian cycle

Stages of the ovarian cycle (continued)

- **Formation of corpus luteum** (*lutea*, yellow)
  - Empty tertiary follicle collapses
  - Remaining granulosa cells proliferate
  - Secrete progesterone and estrogens
    - Progesterone stimulates maturation of the uterine lining
- **Formation of corpus albicans**
  - Knot of pale scar tissue produced by fibroblasts
  - Formed by degeneration of the corpus luteum when fertilization does not occur after 12 days
  - Marks the end of the ovarian cycle

Stages of the ovarian cycle



Module 26.10: Review

A. Define *oocyte*.
B. List the important events in follicle development.
C. What are the main differences in gamete production between males and females?

Learning Outcome: Outline the processes of meiosis and oogenesis in the ovaries.

Module 26.11: The uterine tubes are connected to the uterus, a hollow organ with thick muscular walls

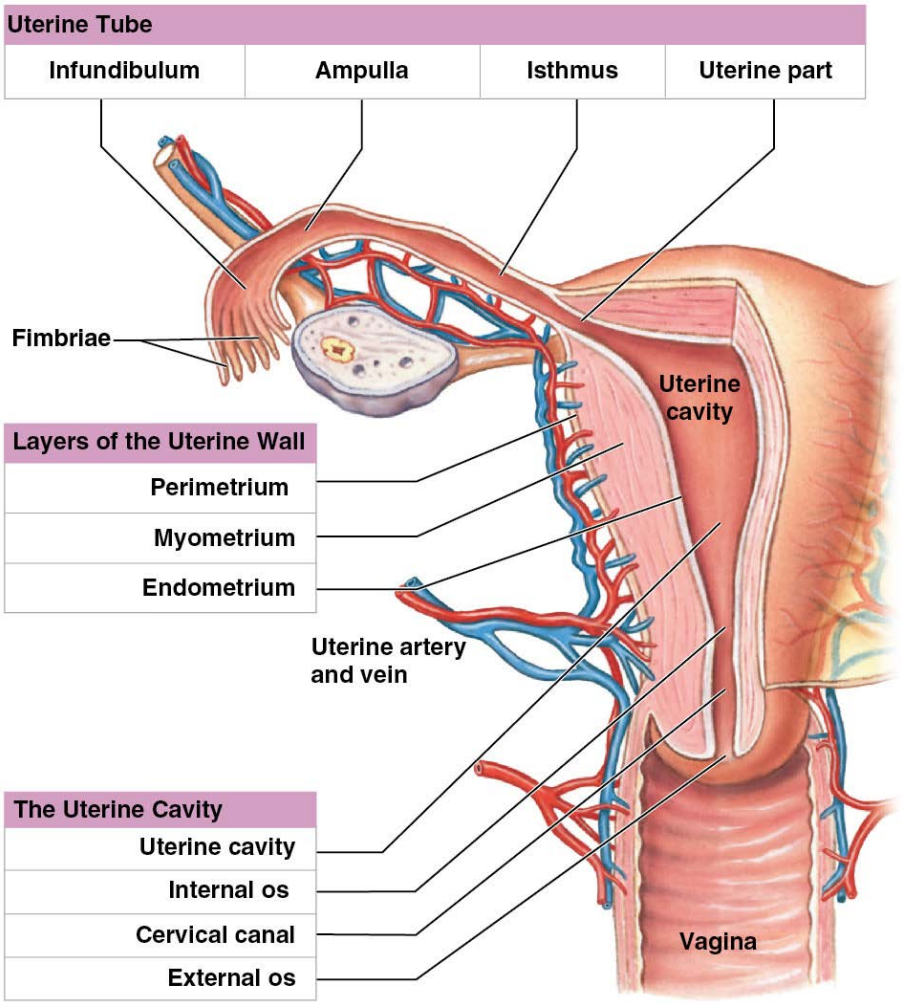
Uterine tubes (fallopian tubes)

- Hollow, muscular structures ~13 cm long
- Lined with ciliated epithelium
- Distal portion connects to the uterus
- **Infundibulum**
  - Funnel-like expansion adjacent to the ovary
  - Has numerous fingerlike projections (**fimbriae**)
    - Extend into the pelvic cavity
    - Drape over the surface of the ovary (but no physical connection)
  - Inner surface lined with cilia that beat toward the lumen of the uterine tube

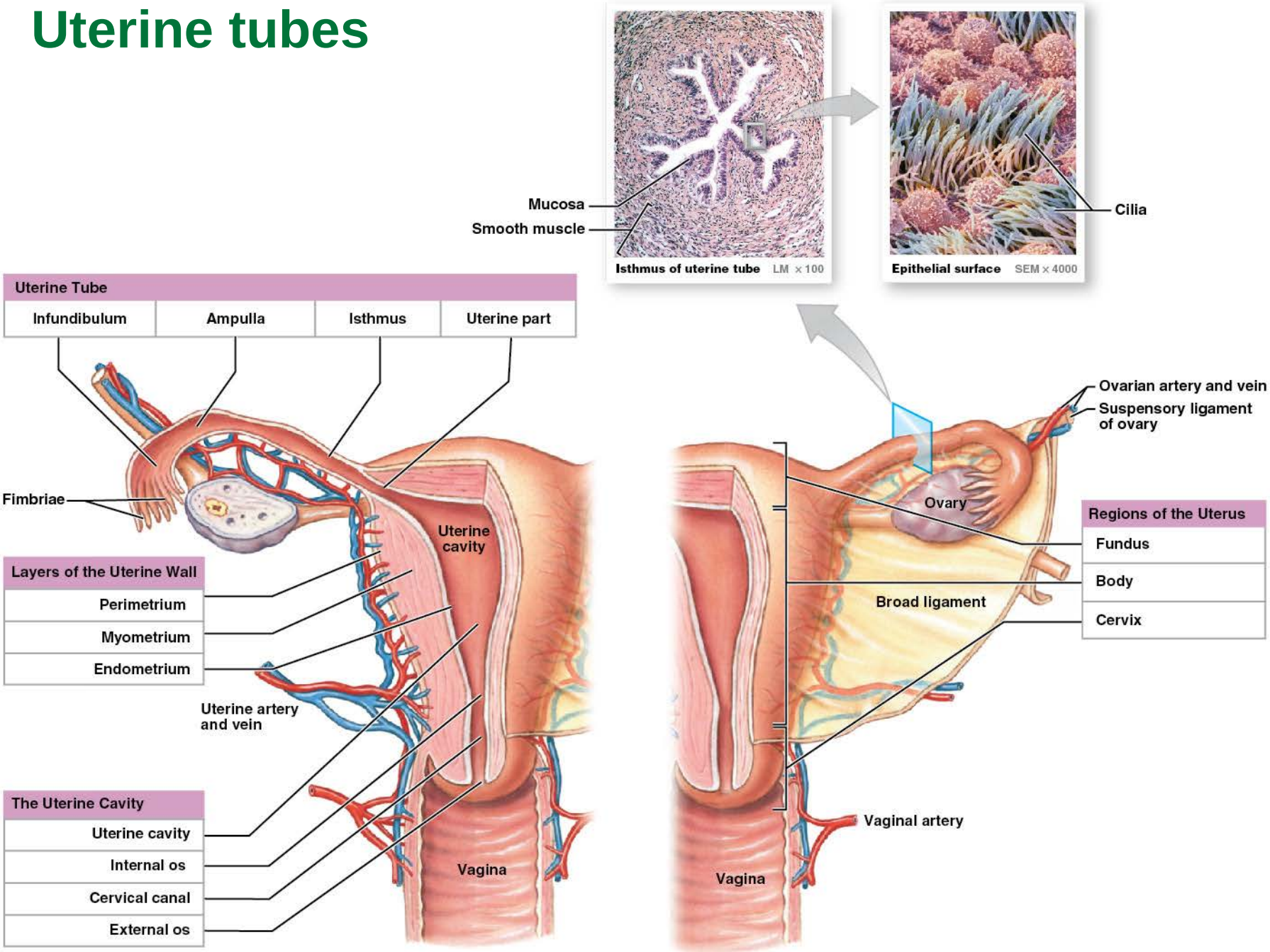
Module 26.11: Uterine tubes and the uterus

Uterine tubes (continued)

- **Ampulla**
  - Muscular middle segment of the uterine tube
- **Isthmus**
  - Short segment connected to the uterine wall



Uterine tubes



Module 26.11: Uterine tubes and the uterus

Oocyte transport

- Involves combination of ciliary movement and peristaltic contraction of smooth muscle in the uterine tube
- Takes 3–4 days for a secondary oocyte to travel from infundibulum to the uterine cavity
- Fertilization must occur within the first 12–24 hours after ovulation

Module 26.11: Uterine tubes and the uterus

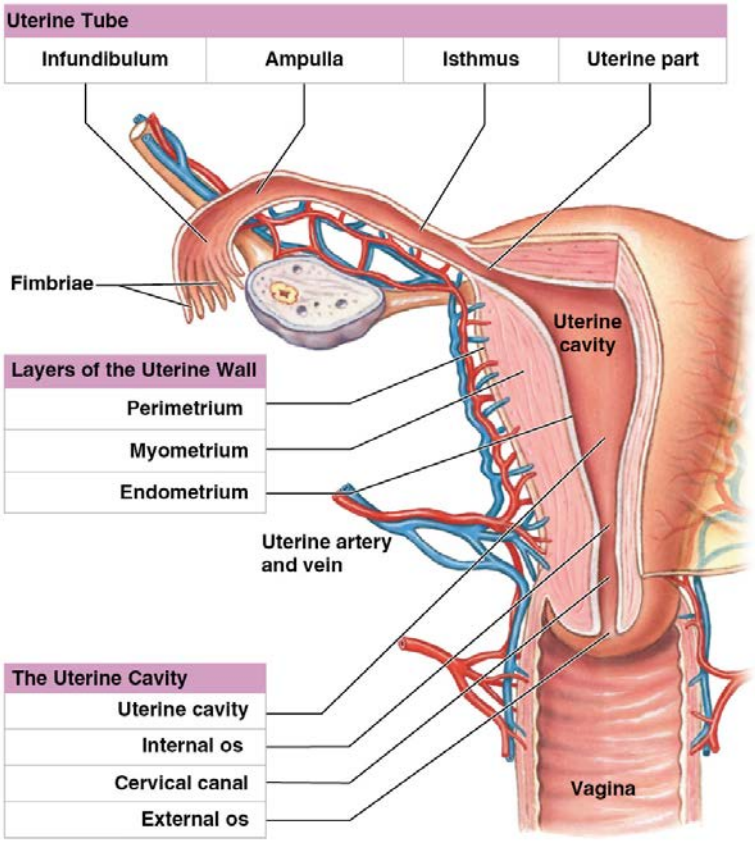
Uterus

- Hollow, muscular organ
- Provides mechanical protection, nutritional support, and waste removal for **embryo** (weeks 1–8) and **fetus** (>8 weeks)
- Contractions in the muscular wall are important in delivering the fetus at birth

Module 26.11: Uterine tubes and the uterus

Layers of the uterine wall

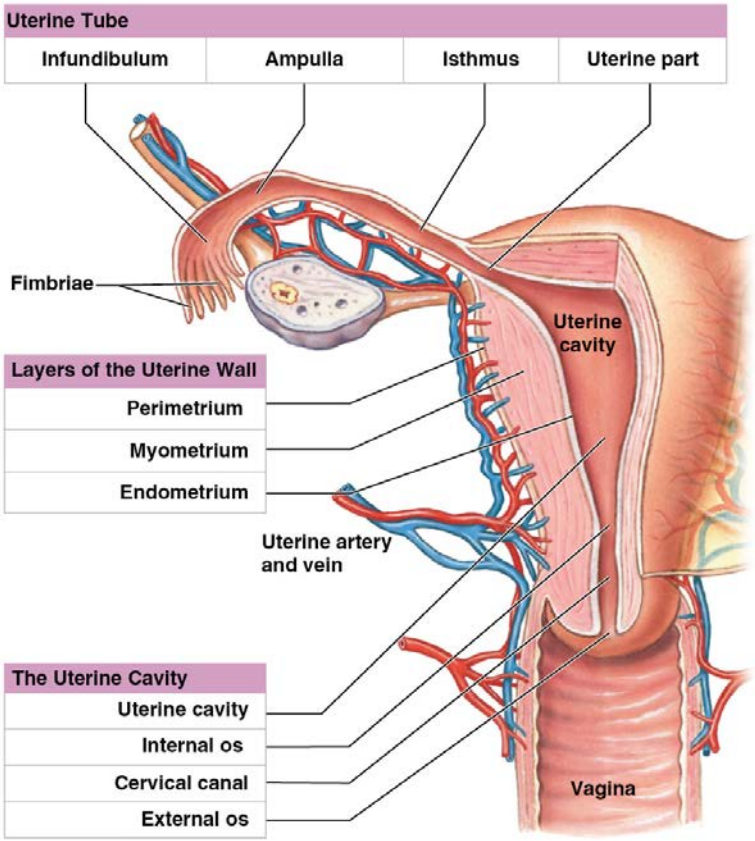
- **Perimetrium** (*peri*, around + *metra,* uterus)
  - Outer surface
  - Incomplete serosa continuous with the peritoneal lining



Module 26.11: Uterine tubes and the uterus

Layers of the uterine wall (continued)

- **Myometrium** (***myo-***, **muscle**)
  - Thick muscular middle layer
  - Smooth muscle layer provides force for childbirth
- **Endometrium**
  - Glandular inner lining whose characteristics change with each uterine cycle

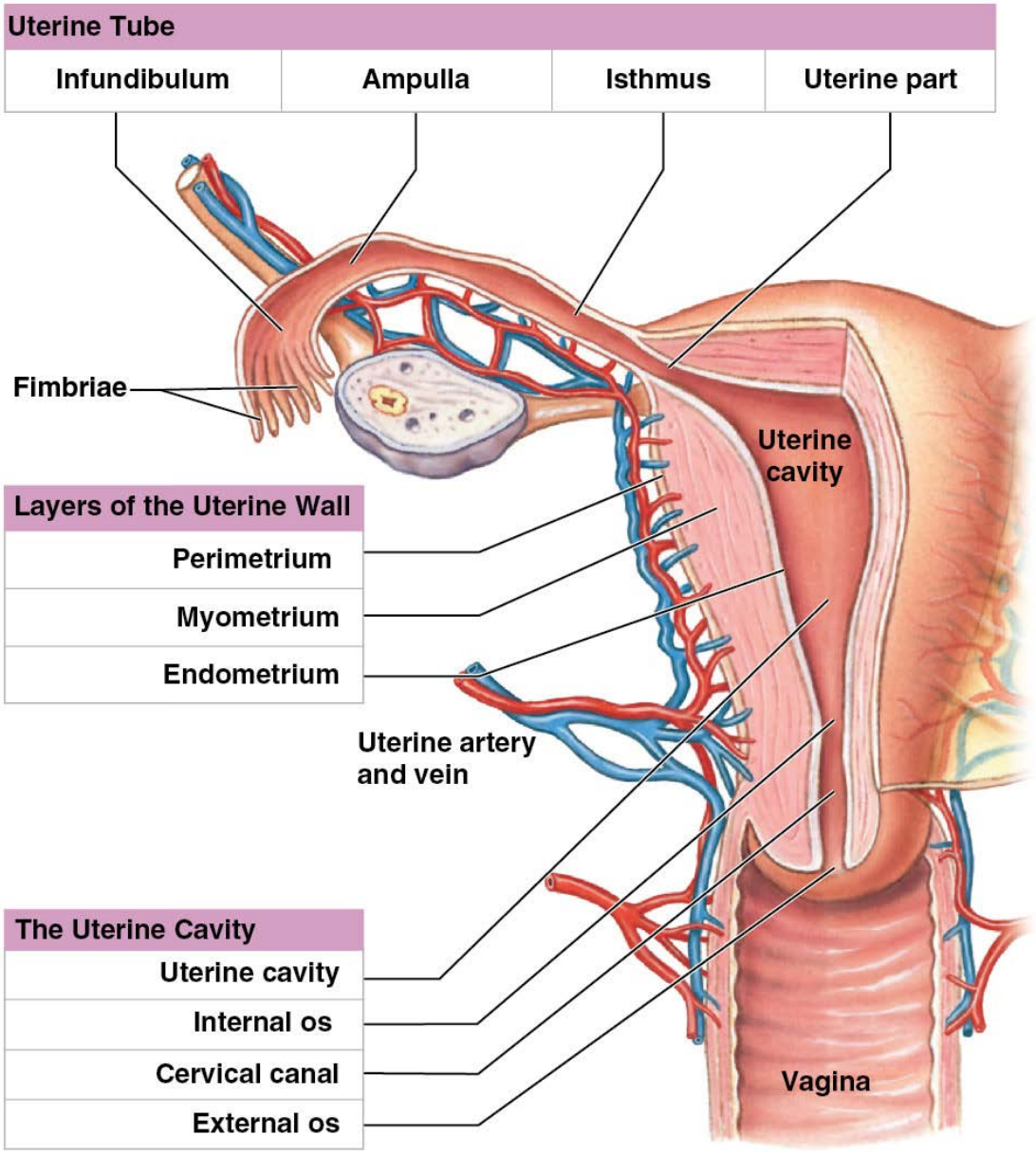


Module 26.11: Uterine tubes and the uterus

The uterine cavity and cervix

- **Uterine cavity**, or **uterine lumen**
  - Large, superior cavity continuous with isthmus of uterine tube
- **Internal os** (*os*, opening or mouth)
  - Opening connecting the uterine cavity to the cervical canal
- **Cervical canal**
  - Constricted passageway at the inferior end of the uterine cavity
  - Begins at internal os; ends at external os
- **External os**
  - Curving vaginal opening into the uterus

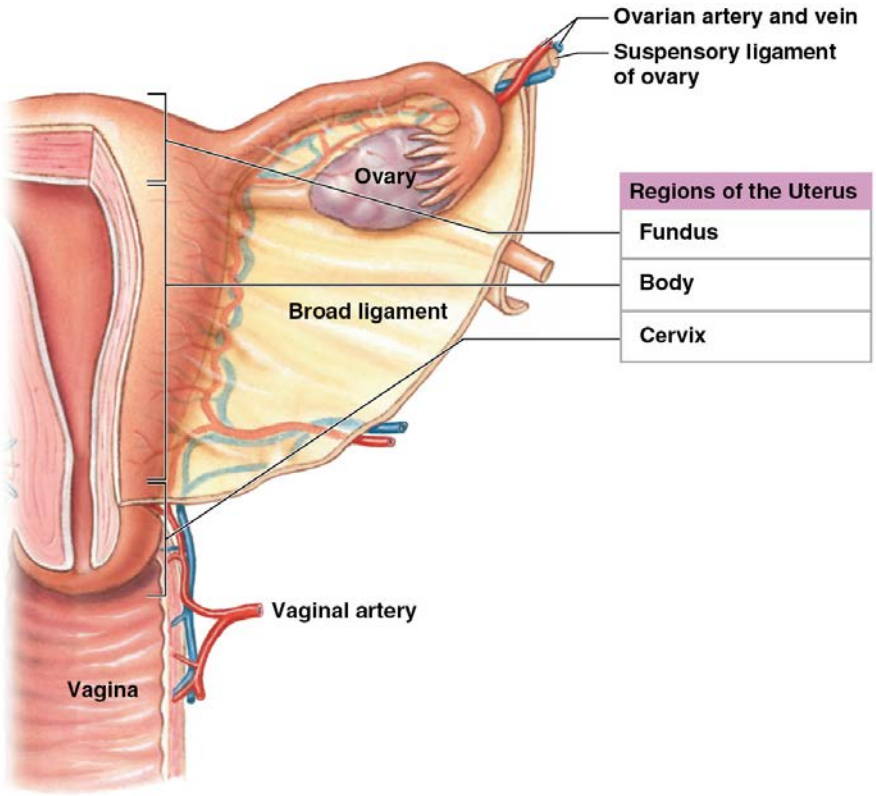
Uterine tubes and the uterus



Module 26.11: Uterine tubes and the uterus

Regions of the uterus

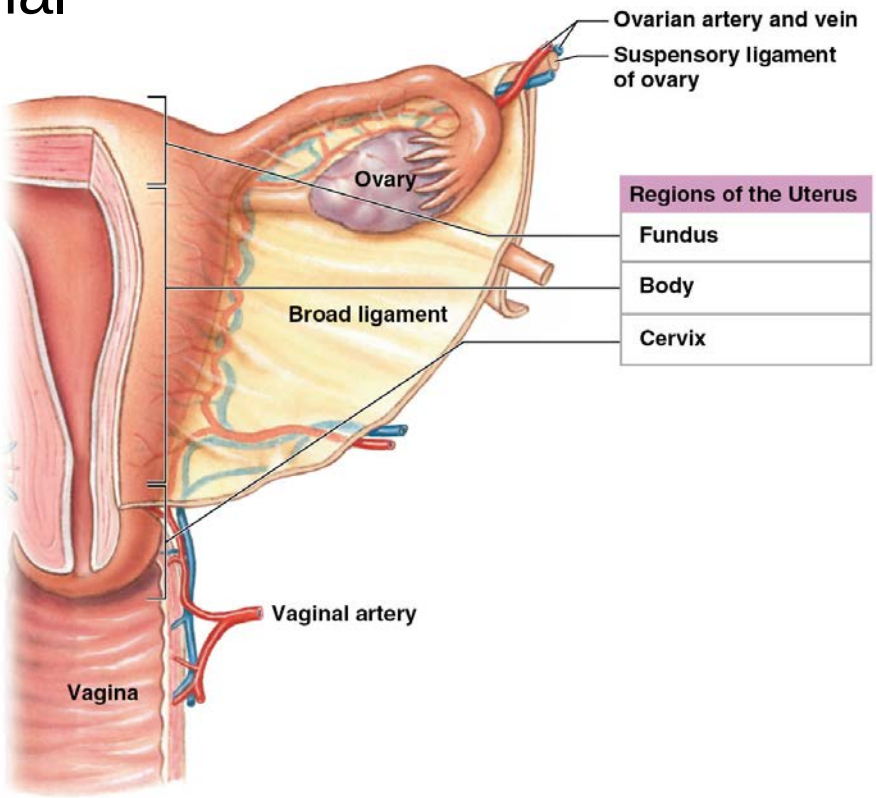
- **Fundus**
  - Rounded portion superior to the openings of the uterine tubes
- **Body**
  - Largest portion of the uterus (two-thirds of the organ)
  - Ends at the constriction encircling the internal os



Module 26.11: Uterine tubes and the uterus

Regions of the uterus (continued)

- **Cervix**
  - Inferior portion of the uterus
  - Surrounds the cervical canal
  - Projects into the vagina



Module 26.11: Review

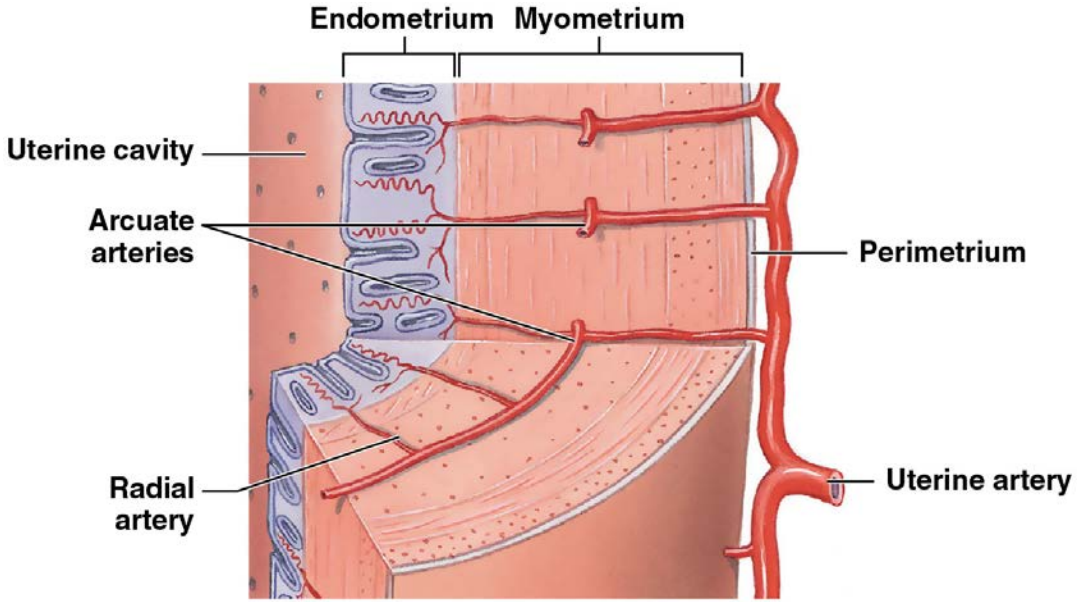
A. How do recently released secondary oocytes reach the uterine tube?
B. Describe the three layers of the uterine wall.
C. Name the regions of the uterus.

Learning Outcome: Describe the structure, histology, and functions of the uterine tubes and uterus.

Module 26.12: The uterine (menstrual) cycle involves changes in the functional layer of endometrium

Uterine vasculature

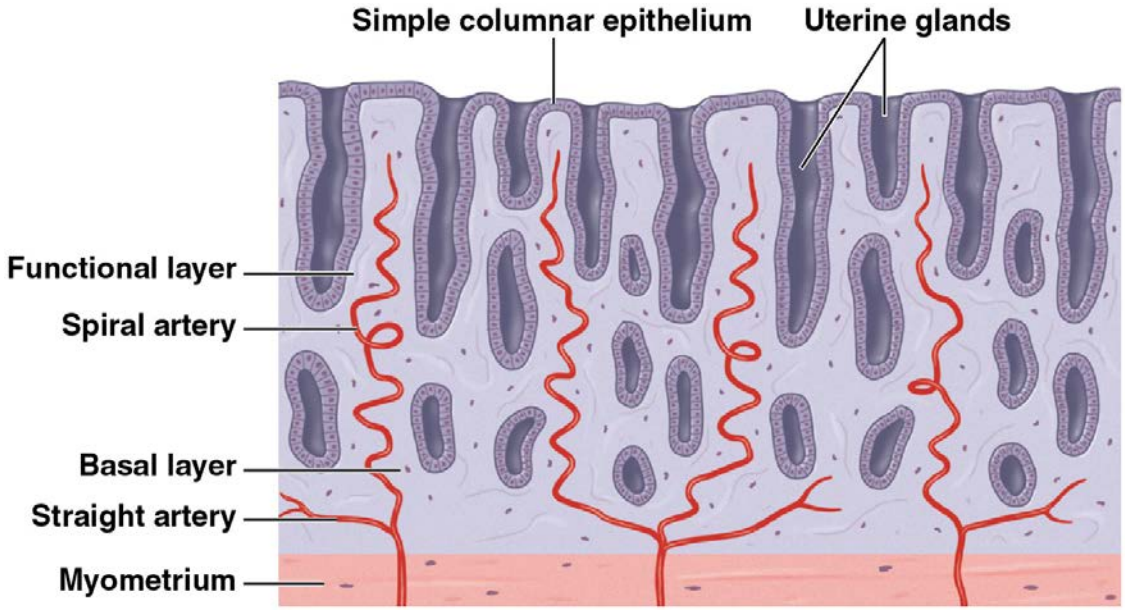
- Uterine artery →
- **Arcuate arteries:** encircle the endometrium →
- **Radial arteries:** supply the endometrium →



Module 26.12: The uterine cycle

Uterine vasculature (continued)

- **Straight arteries:** supply the **basilar layer** (region adjacent to the myometrium) →
- **Spiral arteries:** supply the **functional layer** (contains large tubular uterine glands)



Module 26.12: The uterine cycle

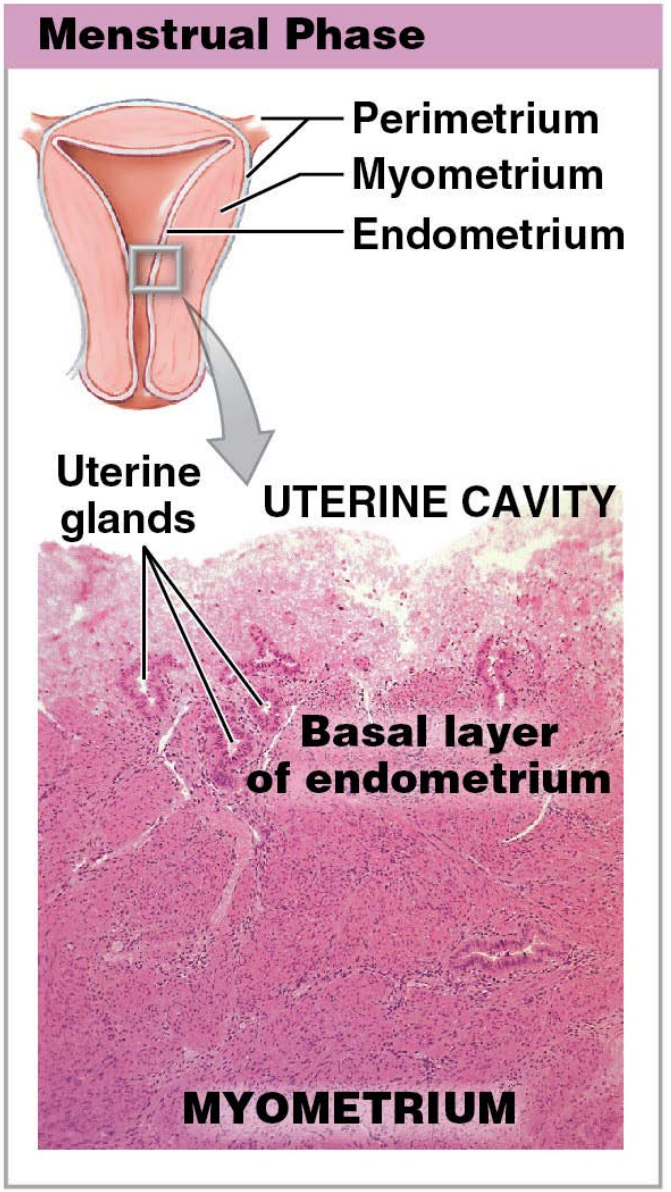
The uterine cycle, or menstrual cycle

- Monthly changes in the functional zone of the uterus in response to sex hormone levels
- Averages 28 days in length (range 21–35 days)
- First cycle (**menarche**) begins ~11–12 years of age
- Cycles continue until **menopause** (~45–55 years of age)
- Regular cycle may be interrupted by illness, stress, starvation, or pregnancy

Module 26.12: The uterine cycle

Phases of the uterine cycle

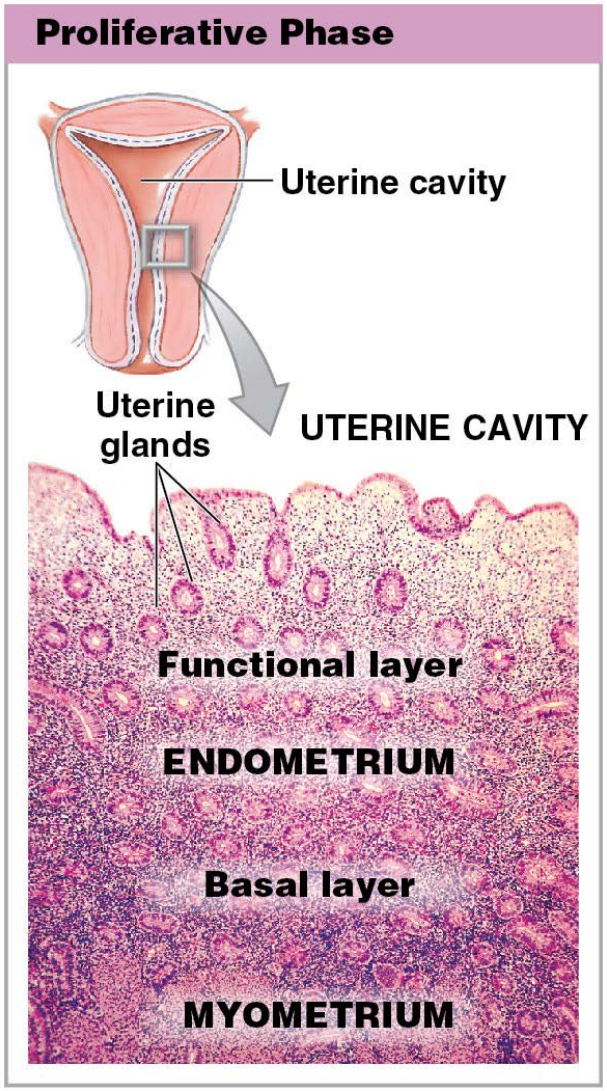
- **Menstrual phase**
  - Degeneration of the functional zone of the endometrium
  - Caused by constricted spiral arteries
  - Process of endometrial sloughing (**menses**, or **menstruation**)
    - Lasts ~1–7 days
    - ~35–50 mL blood lost



Module 26.12: The uterine cycle

Phases of the uterine cycle (continued)

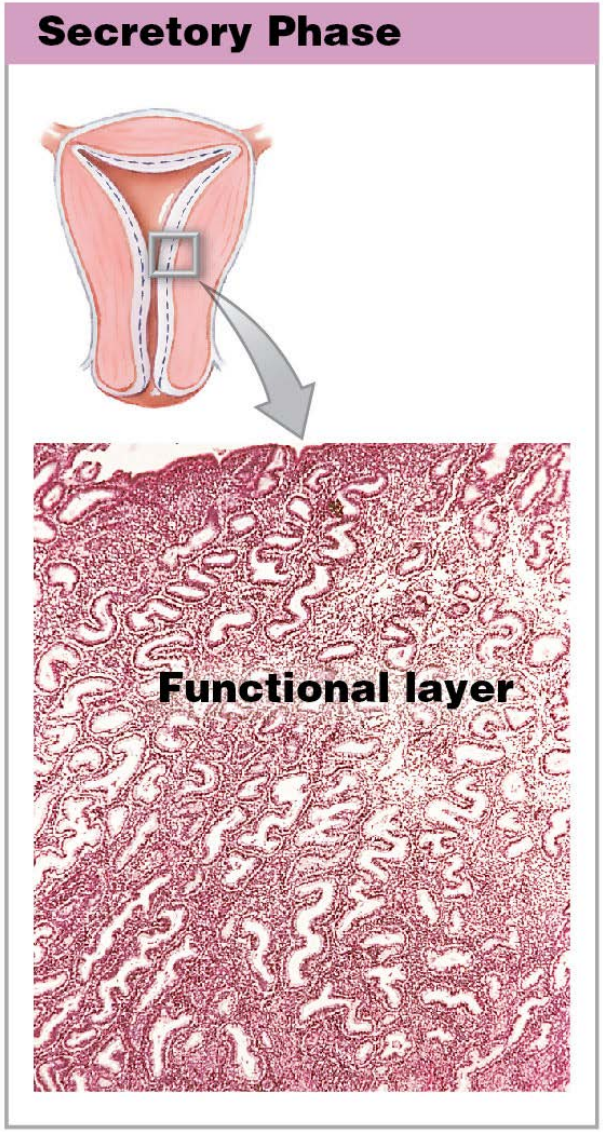
- **Proliferative phase**
  - Uterine gland basal cells multiply and spread, restoring uterine epithelium
  - Stimulated and sustained by estrogens secreted from developing ovarian follicles
  - Builds the functional zone to several millimeters thick
  - Uterine glands manufacture glycogen-rich mucus
    - Can be metabolized by an early embryo



Module 26.12: The uterine cycle

Phases of the uterine cycle (continued)

- **Secretory phase**
  - Uterine glands enlarge
    - Increased secretion of glycoproteins to support embryo
  - Arteries supplying uterine wall elongate and spiral through the functional zone
  - Stimulated by both progesterone and estrogens from the corpus luteum
  - Begins at ovulation and lasts until menses



Module 26.12: Review

A. Name the layers of the endometrium.
B. How long des each menstruation typically last?
C. Describe the phases of the uterine cycle.

Learning Outcome: Identify the phases and events of the uterine cycle.

Module 26.13: The vagina opens into the vestibule

Vagina

- Elastic, muscular tube
- Extends from the cervix to the **vestibule** (space bordered by the labia minora)
- Typically 7.5–9 cm (3–3.6 in.) long
- Variable diameter (highly distensible)
- Internal passageway is the **vaginal canal**

Module 26.13: Vagina and external genitalia

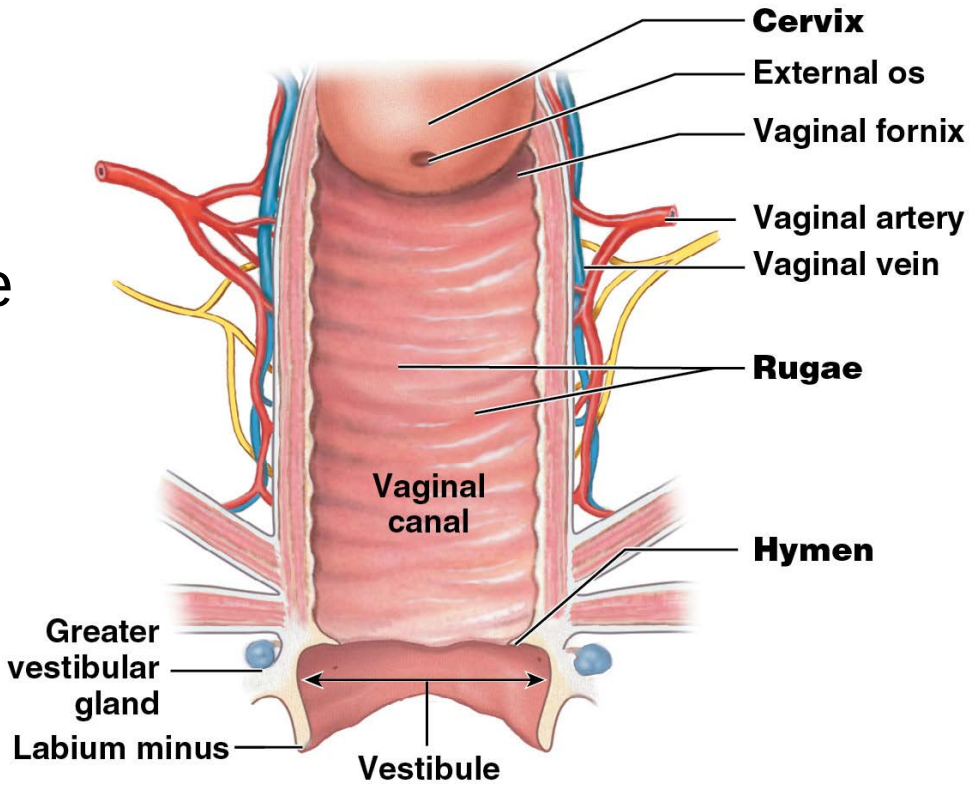
Functions of the vagina

1. Passageway for menstrual fluids
2. Receives penis during sexual intercourse and holds spermatozoa prior to their passage into the uterus
3. Forms inferior portion of birth canal

Module 26.13: Vagina and external genitalia

Components of the vagina

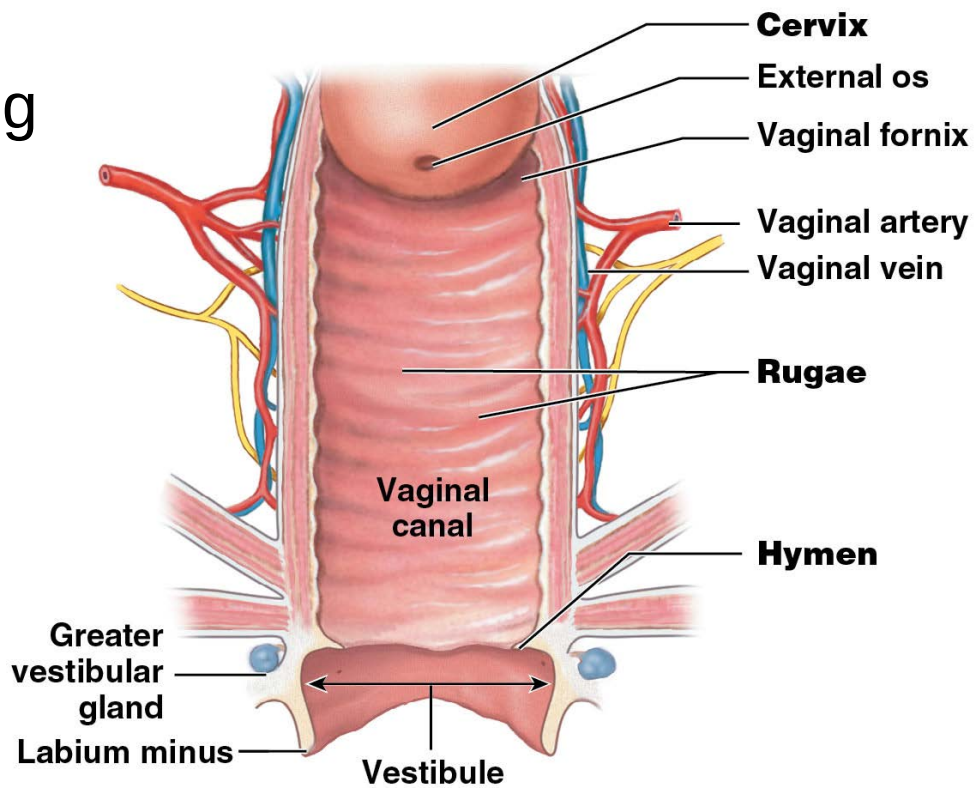
- **Vaginal canal**
  - Internal passageway
  - Lined by nonkeratinized stratified squamous epithelium
- **Fornix**
  - Shallow recess in the vagina surrounding the tip of the cervix
- **Rugae**
  - Folds formed by the vaginal lining when relaxed



Module 26.13: Vagina and external genitalia

Components of the vagina (continued)

- **Hymen**
  - Elastic epithelial fold that usually partially blocks entrance to the vagina
    - Frequently absent
  - Stretched or torn during intercourse, tampon use, or heavy physical exercise



Module 26.13: Vagina and external genitalia

Vulva, or **pudendum**

- Area containing the female external genitalia
- **Vestibule**
  - Central space bounded by small folds called **labia minora** (singular, *labium minus*)
- **Lesser vestibular glands**
  - Secrete onto the vestibular surface, keeping it moist
- **Greater vestibular glands** (Bartholin's glands)
  - Activated during sexual arousal
  - Mucous glands that discharge into the vestibule
  - Same embryonic origins as the bulbo-urethral glands of males

Module 26.13: Vagina and external genitalia

Vulva, or **pudendum** (continued)

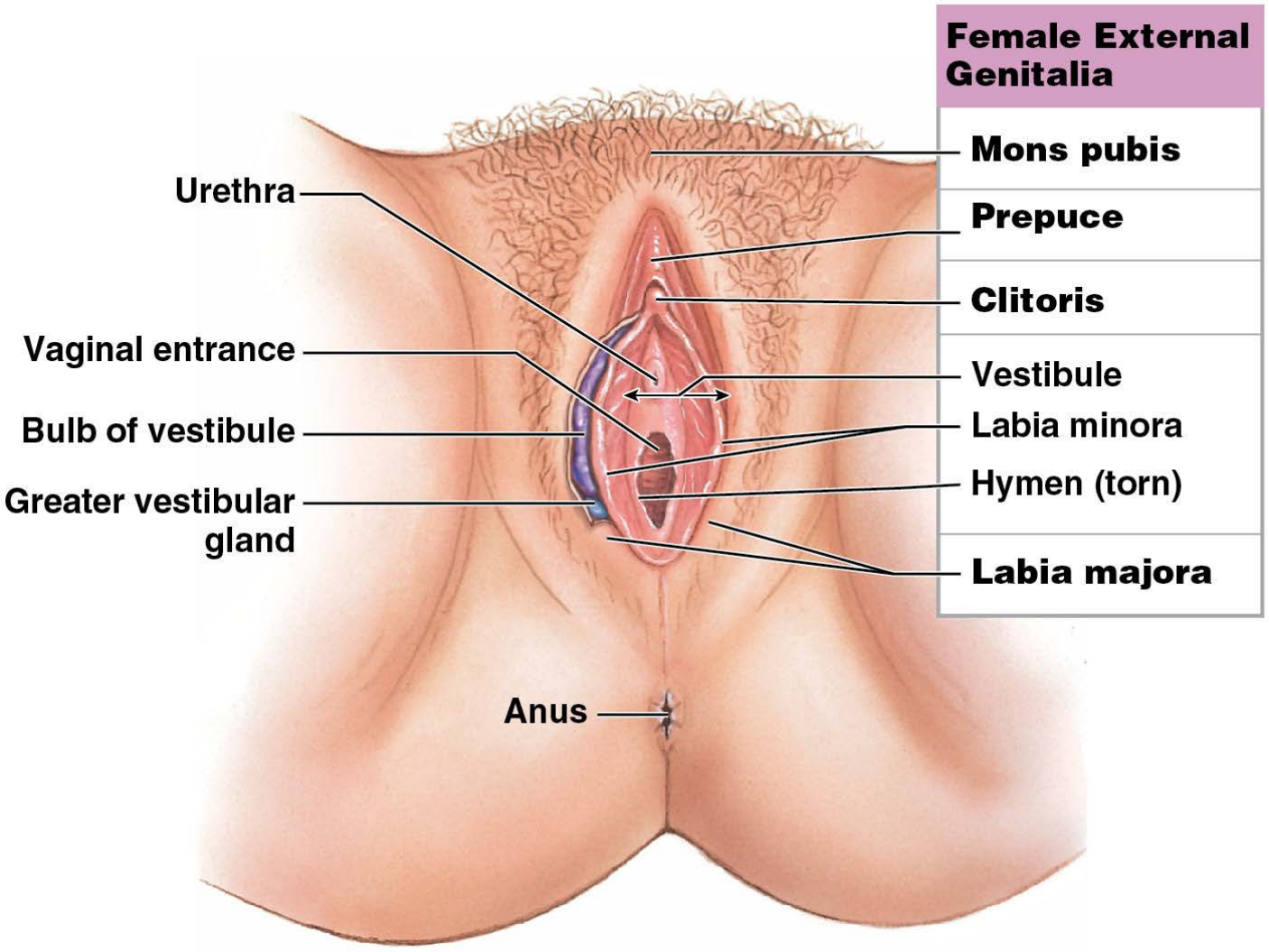
- **Vestibular bulbs**
  - Masses of erectile tissue on either side of the vaginal entrance
  - Have the same embryonic origin as the corpus spongiosum of the penis
- **Mons pubis**
  - Bulge of adipose tissue deep to the skin and superficial to the pubic symphysis

Module 26.13: Vagina and external genitalia

Vulva, or **pudendum** (continued)

- **Clitoris**
  - Projects into the vestibule
  - Contains erectile tissue comparable to the corpora cavernosa and corpus spongiosum of the penis
- **Prepuce**, or hood
  - Extensions of the labia minora encircling the body of the clitoris
- **Labia majora** (singular, *labium majus*)
  - Prominent folds of skin encircling the labia minora and adjacent structures

Female external anatomy



Module 26.13: Review

A. Describe the anatomy of the vagina.
B. Identify the functions of the vagina.
C. Cite the similarities that exist between certain structures in the reproductive systems of females and males.

Learning Outcome: Describe the structure, histology, and functions of the vagina.

Module 26.14: Each breast contains a mammary gland that secretes milk

Mammary glands

- Provide nourishment (milk) for developing infant
- Milk production (**lactation**) controlled by hormones released by the reproductive system and the placenta
- Located on the anterior chest, directly over the pectoralis major muscle

Module 26.14: Mammary glands

Structure of a mammary gland

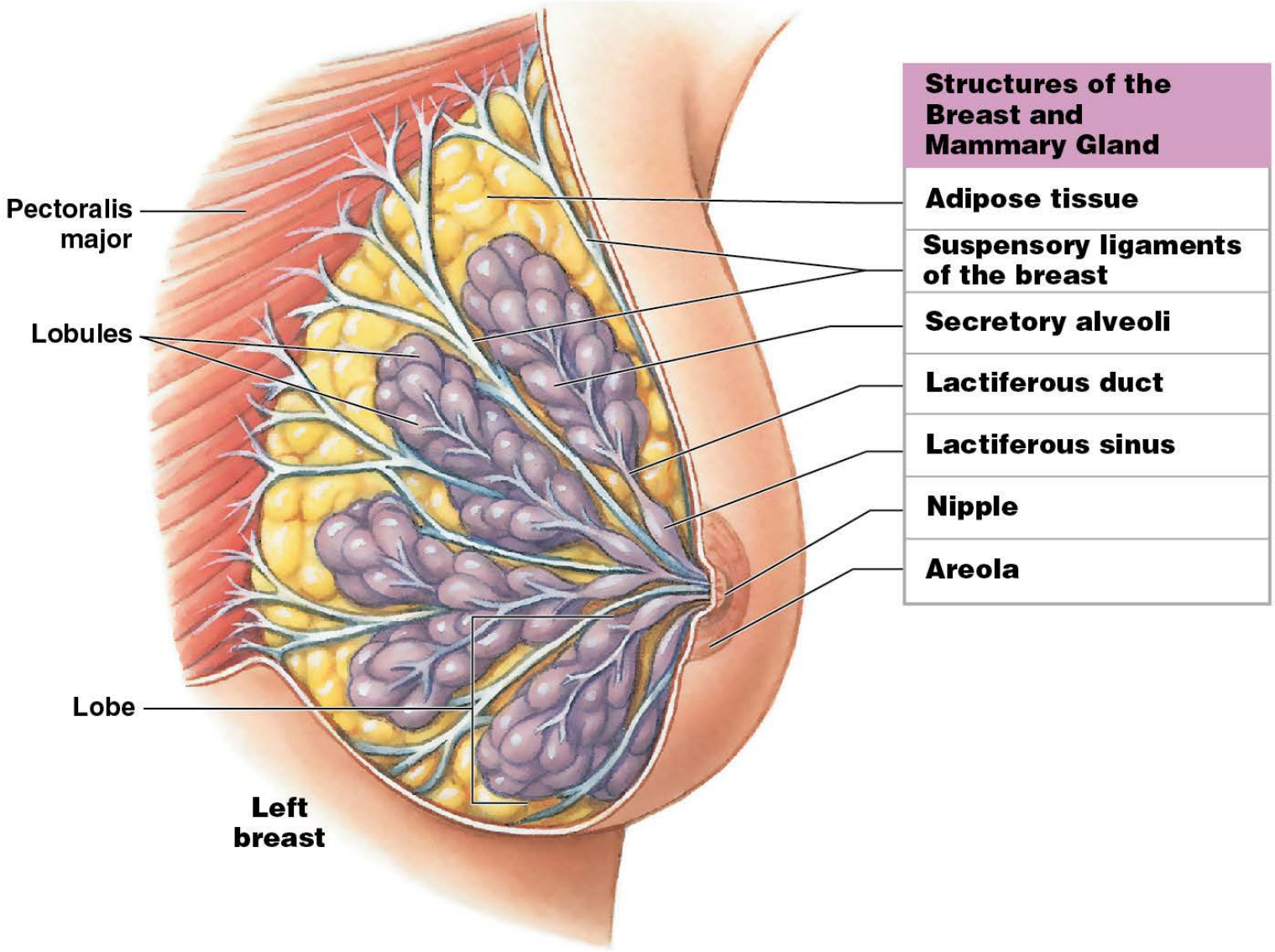
- Embedded in the subcutaneous tissue of the **pectoral fat pad** deep to the skin
- **Suspensory ligaments of the breast**
  - Bands of dense connective tissue
  - Surround the duct system and form partitions between lobes and lobules
- Glandular tissue divided into **lobes**
  - Each lobe has several secretory **lobules**
  - Each lobule is composed of **secretory alveoli**

Module 26.14: Mammary glands

Structure of a mammary gland (continued)

- Ducts from the lobules converge into one **lactiferous duct** per lobe
  - Each lactiferous duct expands near the nipple to form a l**actiferous sinus**
- **Nipple**
  - Conical projection where 15–20 lactiferous sinuses open onto the body surface
- **Areola**
  - Reddish-brown skin around the nipple
  - Grainy texture from sebaceous glands deep to the surface

The breast



Module 26.14: Review

A. Define *lactation*.
B. Explain whether the blockage of a single lactiferous sinus would or would not interfere with the delivery of milk to the nipple.
C. Trace the route of milk from its site of production to the body surface.

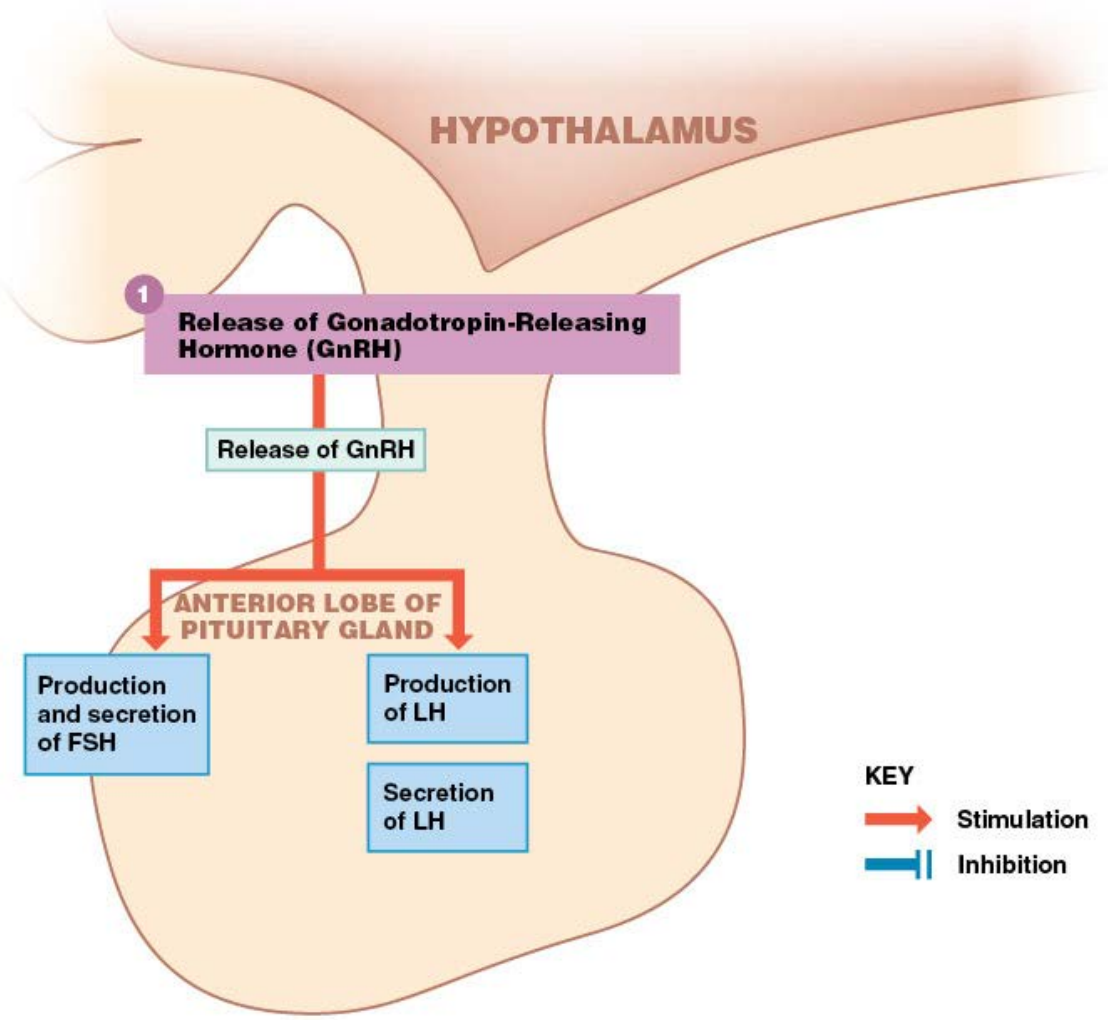
Learning Outcome: Discuss the structure and function of the breasts and mammary glands.

Module 26.15: The ovarian and uterine cycle are regulated by hormones of the hypothalamus, pituitary gland, and ovaries

Ovarian and uterine cycles

- Ovarian and uterine cycles are controlled by cyclical changes in hormones
- Two cycles must operate synchronously for proper reproductive function
- Steps in ovarian cycle hormonal regulation
  1. **Release of gonadotropin-releasing hormone (GnRH)**
     - From hypothalamus
     - Causes production and secretion of FSH
     - Causes production (not secretion) of LH

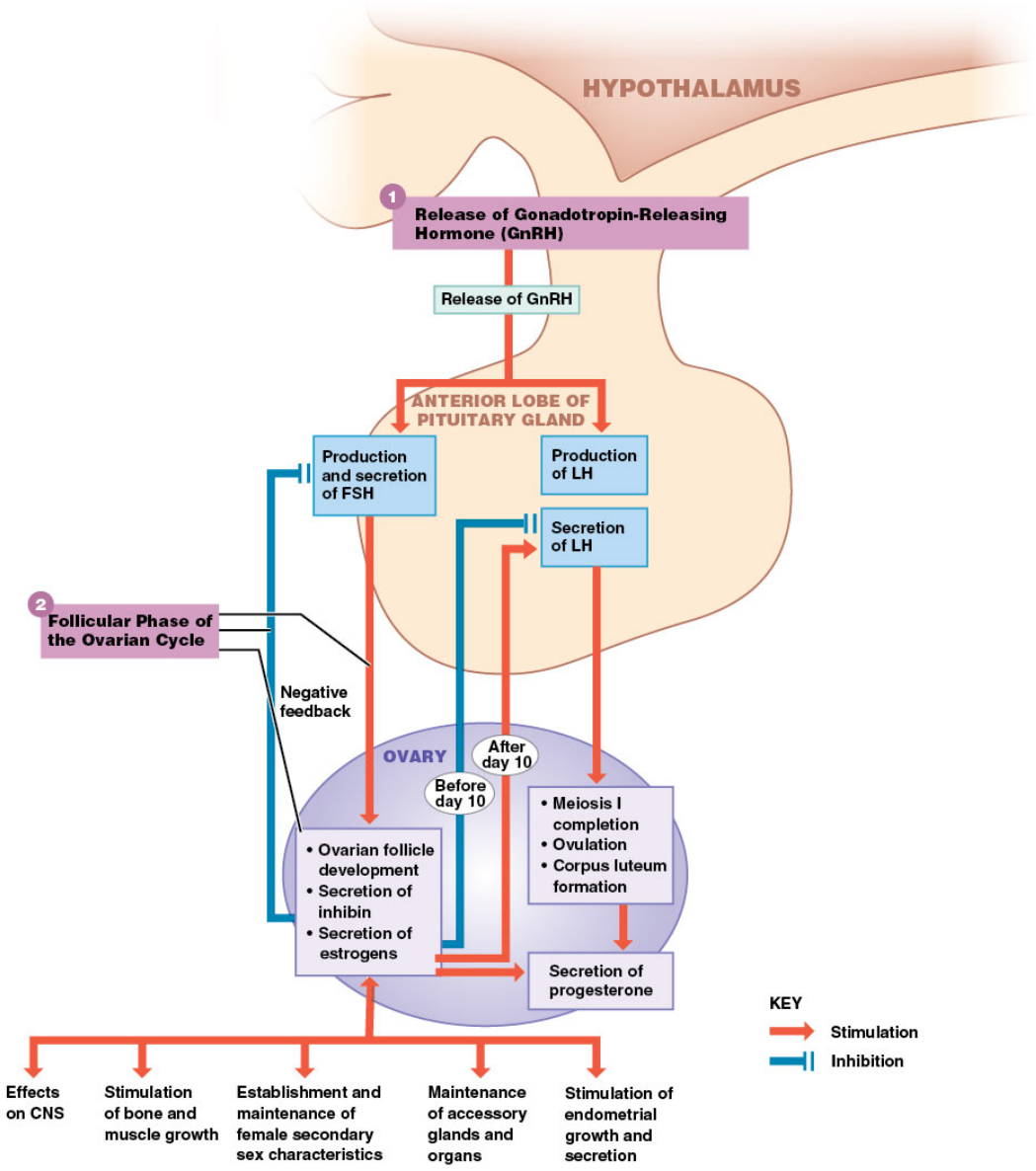
Ovarian cycle, phase 1



Module 26.15: Regulation of the ovarian and uterine cycles

- **Steps in ovarian cycle hormonal regulation** (continued)
  2. **Follicular phase of the ovarian cycle**
     - Begins when FSH stimulates some secondary follicles to become tertiary follicles
     - As follicles develop, FSH levels decline (as a result of negative feedback effects of inhibin)
     - Developing follicles also secrete estrogens (especially **estradiol**)
       - Low levels of estrogens inhibit LH secretion
       - Inhibition decreases as estrogen levels climb
       - Estrogen decreases **basal body temperature** about 0.3ºC (0.5ºF) lower than during the luteal phase

Ovarian cycle, phase 2



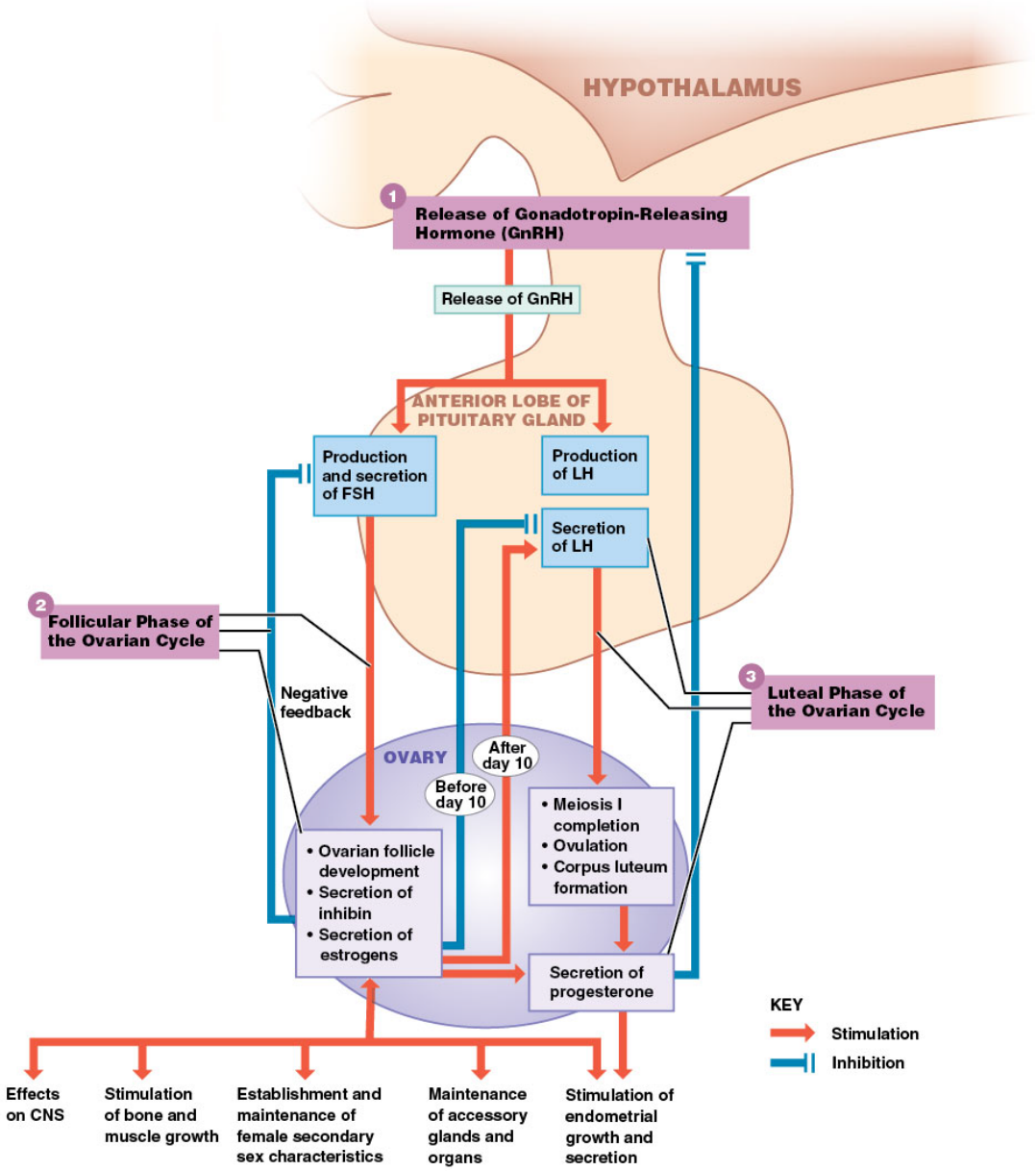
Module 26.15: Regulation of the ovarian and uterine cycles

- **Steps in ovarian cycle hormonal regulation** (continued)
  3. **Luteal phase**
     - GnRH and elevated estrogen levels stimulate LH secretion
     - Massive surge in LH on or around day 14 triggers:
       - Completion of meiosis I by the primary oocyte
       - Forceful rupture of the follicular wall
       - Ovulation (~9 hours after LH peak)
       - Formation of corpus luteum
     - **Luteal phase** begins after ovulation

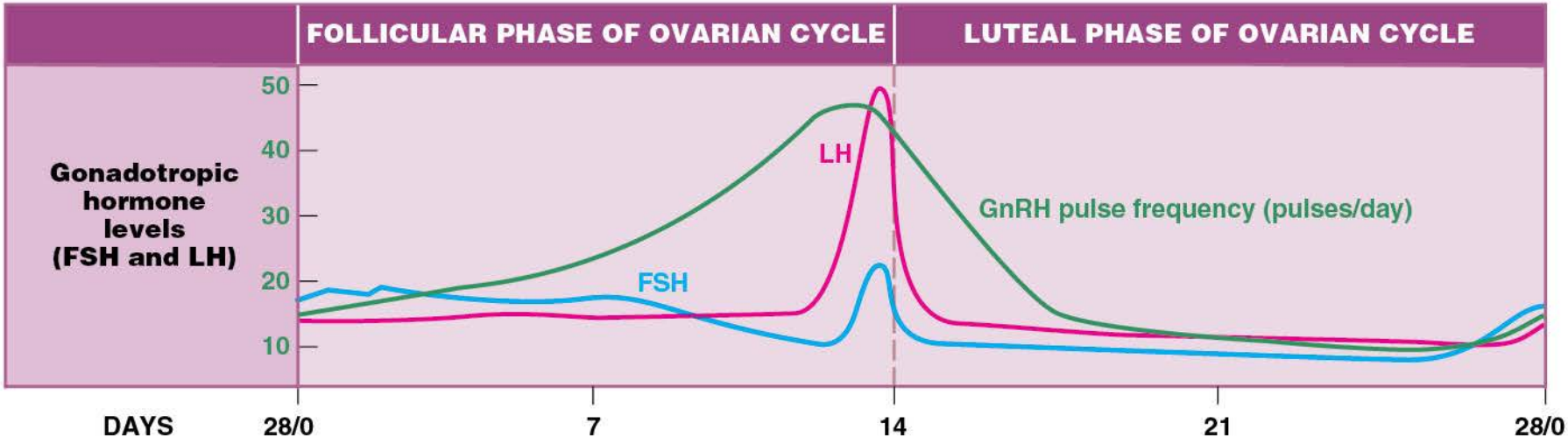
Module 26.15: Regulation of the ovarian and uterine cycles

- **Steps in ovarian cycle hormonal regulation** (continued)
  3. **Luteal phase** (continued)
     - Corpus luteum secretes progesterone
       - Stimulates and sustains endometrial development
     - Progesterone levels increase, and estrogen levels fall
       - Suppresses GnRH
     - If pregnancy does not occur, corpus luteum degenerates
       - Progesterone levels fall
       - GnRH increases and begins a new cycle

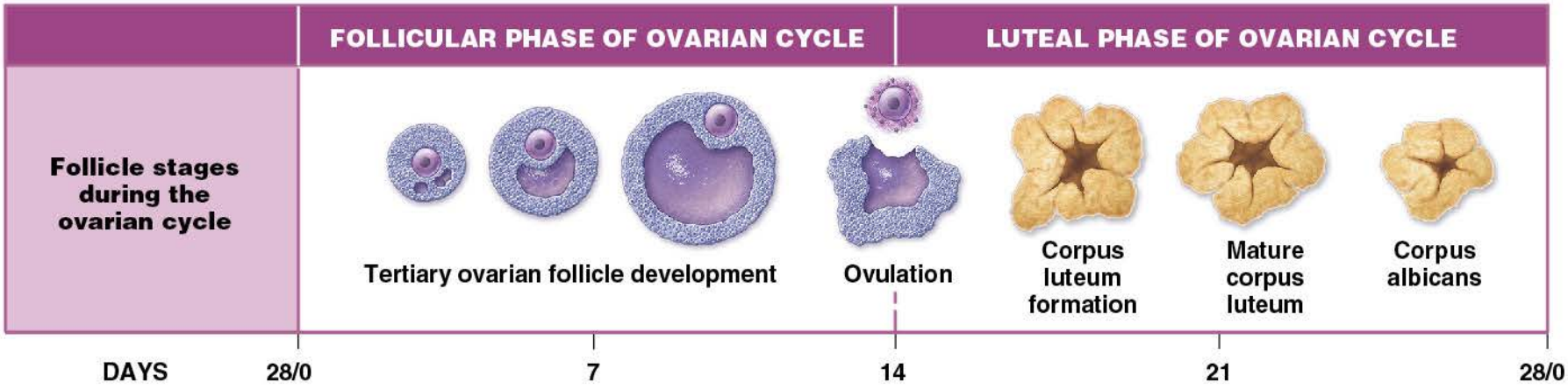
Full ovarian cycle



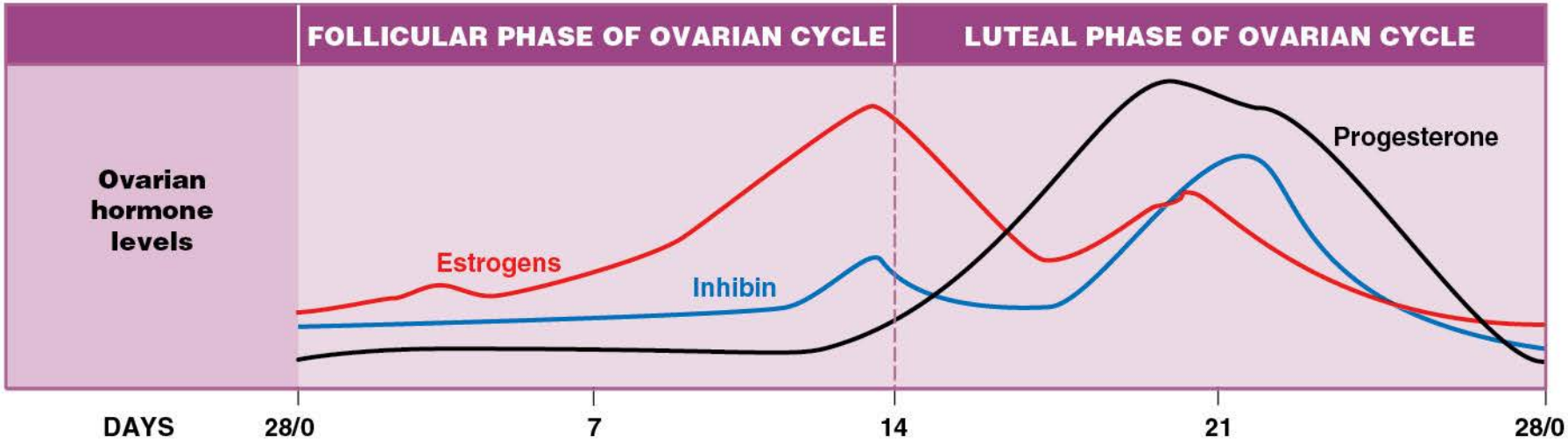
Gonadotropic hormone levels (FSH and LH)



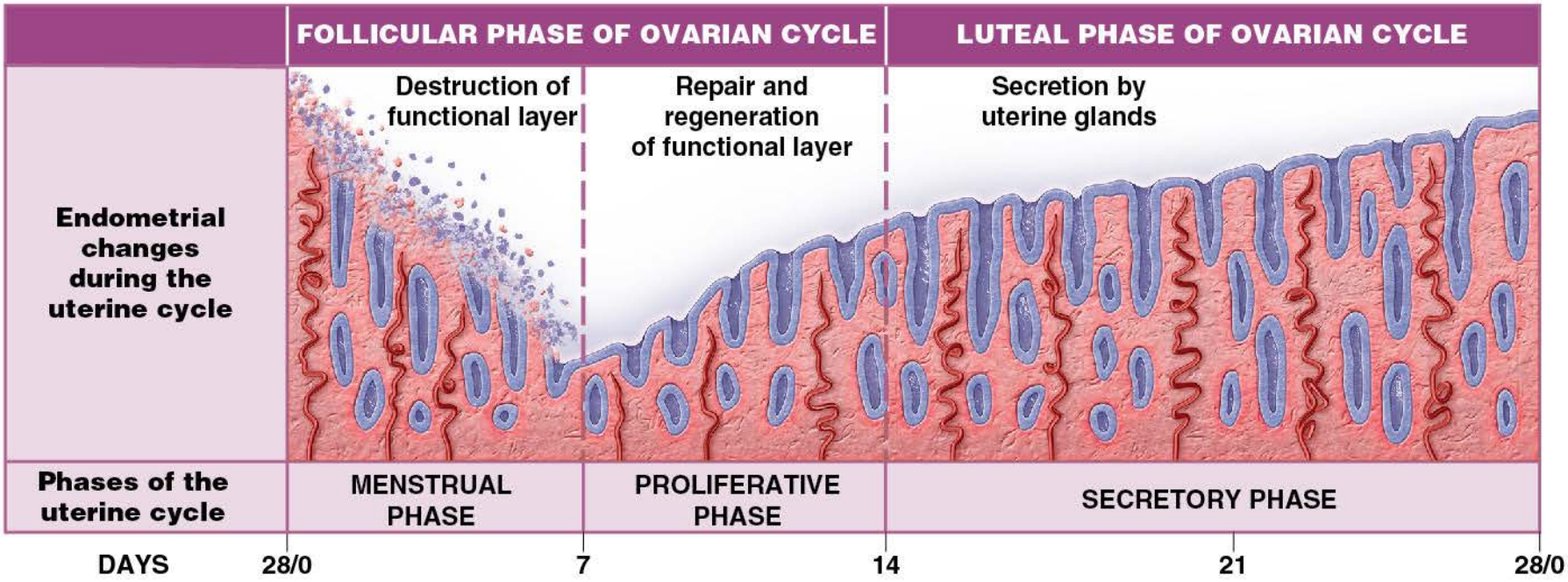
Follicle stages during ovarian cycle



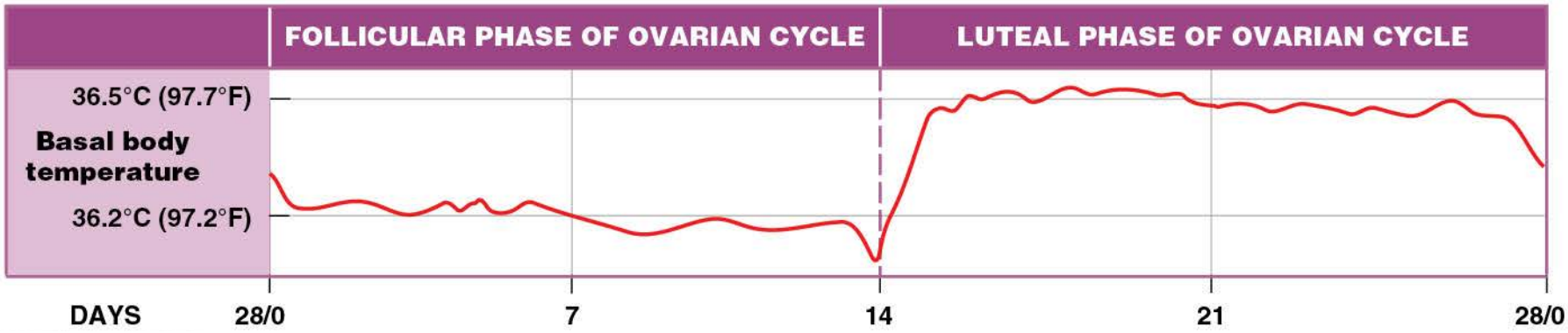
Ovarian hormone levels



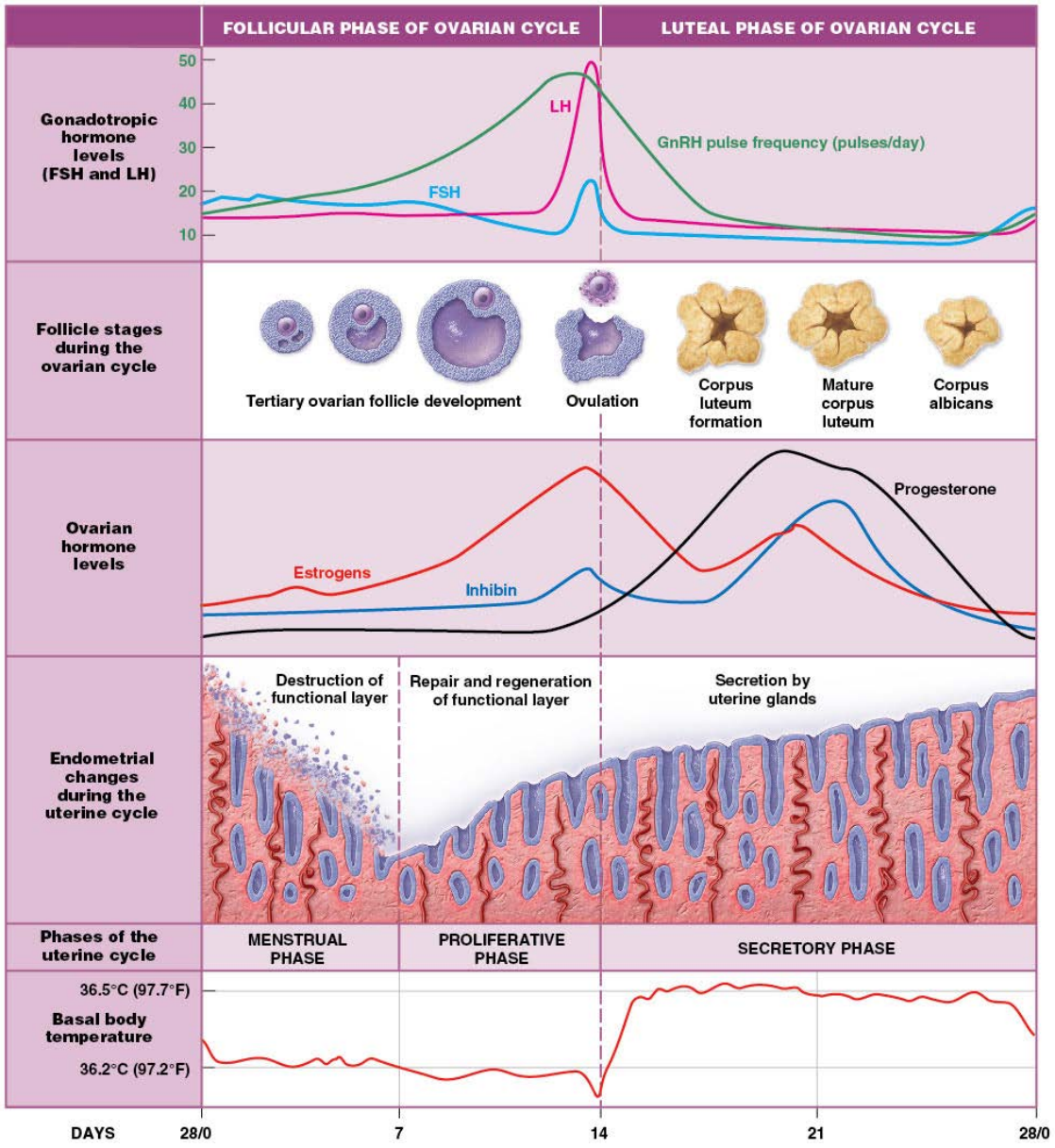
Endometrial changes during uterine cycle



Basal body temperature



Key events of ovarian and uterine cycles



Module 26.15: Review

A. What ovarian cycle changes would result if the LH surge did not occur?
B. What uterine cycle event occurs when estrogen and progesterone decrease?

Learning Outcome: Summarize the hormonal regulation of the female reproductive cycles.

Module 26.16: Clinical Module: Birth control strategies vary in effectiveness and associated risks

Male condoms (**prophylactics**, or "**rubbers**")

- Cover glans and shaft of penis during intercourse
- Prevent spermatozoa from reaching the female reproductive tract
- Only strategy that protects against **sexually transmitted diseases** (**STDs**)
  - Examples: syphilis, gonorrhea, human papillomavirus (HPV), and AIDS

Male Condom

Module 26.16: Birth control strategies

Diaphragm with spermicide

- **Diaphragm**
  - Dome-shaped silicone cup with a flexible rim
  - Because of variability in vagina size, must be fitted to an individual
  - Inserted prior to intercourse to cover the external os
  - Must be coated with spermicide to be effective
  - Failure rate 5–6 percent even with proper fit

Diaphragm with Spermicide

Module 26.16: Birth control strategies

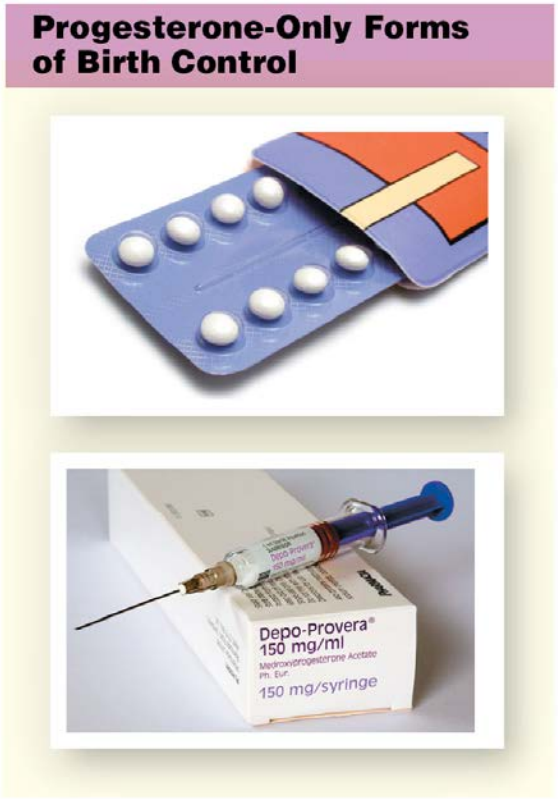
Birth control pills (oral contraceptives)—combined (estrogen and progesterone)

- The most effective form of birth control when used as prescribed
- Have certain health risks
  - Can worsen problems with hypertension, diabetes mellitus, epilepsy, gallbladder disease, heart trouble, or acne
  - Increases risk of venous thrombosis, strokes, pulmonary embolism, and (for women over 35) heart disease

Module 26.16: Birth control strategies

Progesterone-only forms of birth control

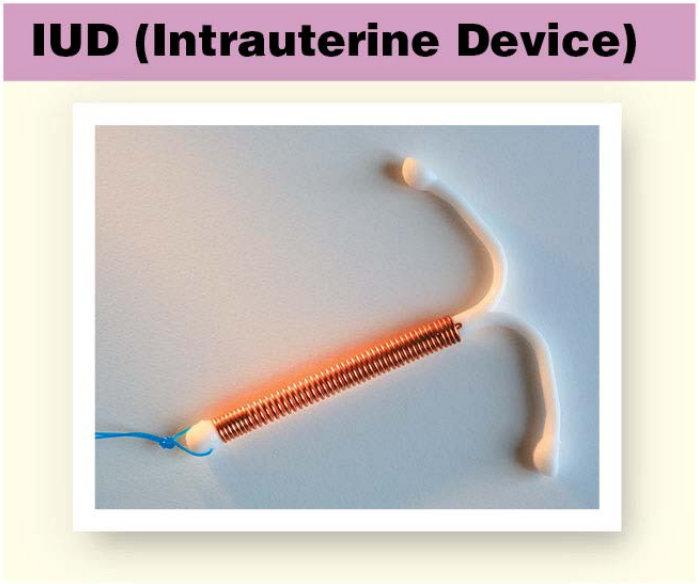
- **Progesterone-only pill** (taken daily)
- **Depo-Provera injection** (injected every 3 months)
  - Uterine cycles become irregular and cease in 50 percent of women
- **Problems include:**
  - Tendency to gain weight
  - Slow return to fertility (up to 18 months) after discontinuing injections



Module 26.16: Birth control strategies

Intrauterine device (IUD)

- Small plastic loop or a T inserted into the uterine cavity
- Copper type affects sperm movement, blocking it from oocyte
- Hormonal type may prevent ovulation and thickens cervical mucus, blocking sperm entry



Module 26.16: Birth control strategies

Rhythm method, or **"Natural Family Planning"**

- Abstaining from sexual activity on days ovulation may be occurring
- Timing based on patterns and physical changes indicating ovulation
  - Basal body temperature
  - Cervical mucus texture
  - Urine tests for LH
- High failure rate (13–20 percent) due to irregularity in women's cycles

The Rhythm Method

Module 26.16: Birth control strategies

Hormonal post-coital contraceptives (Plan B)

- Also called the emergency "morning after" pill
- Involves taking levonorgestrel contraceptive pills up to 3 days after unprotected intercourse
- Prevents the ovary from releasing an oocyte for longer than usual or interferes with fertilization
- Can be purchased over-the-counter

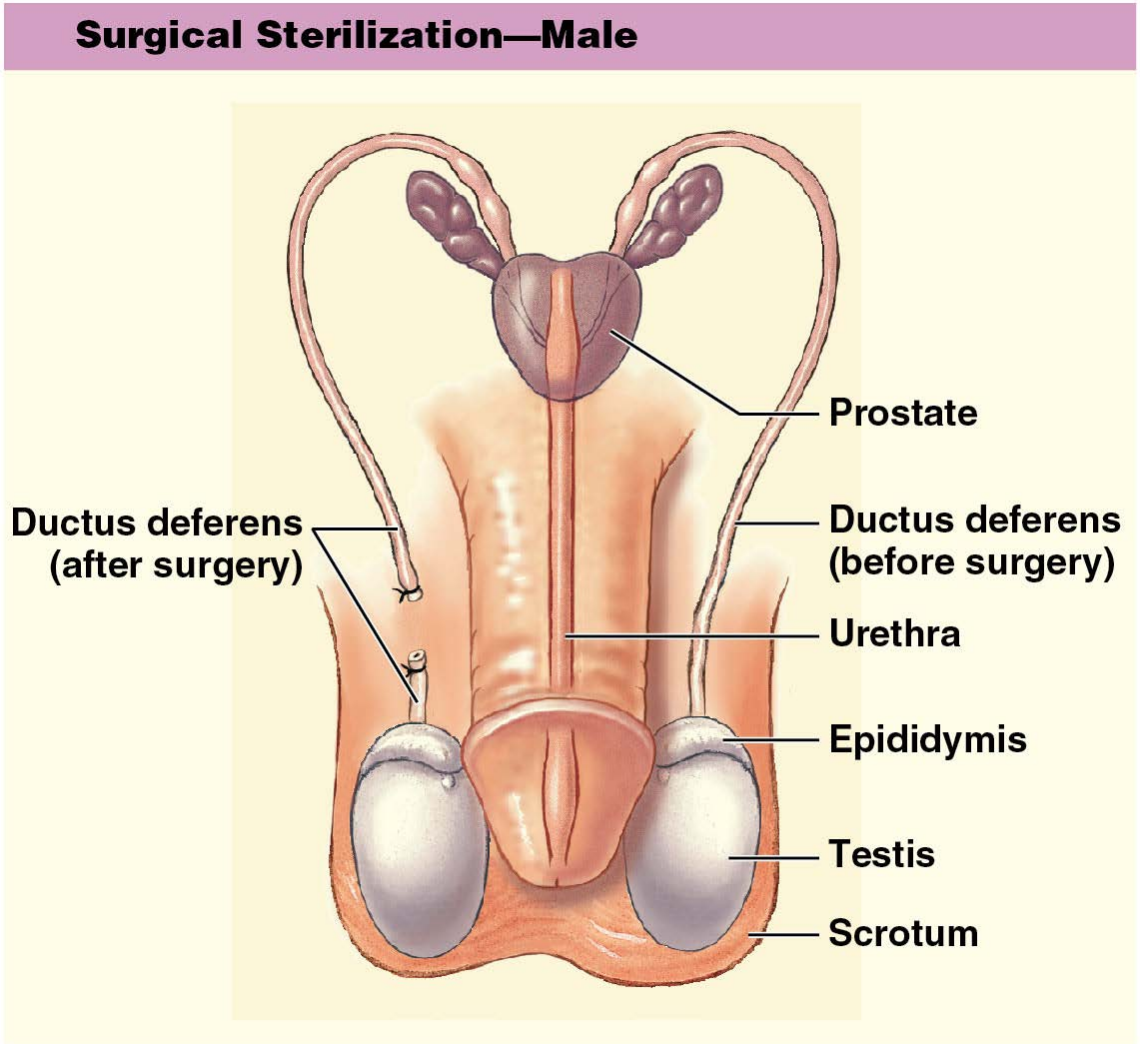
Post-Coital Contraceptives (Plan B)

Module 26.16: Birth control strategies

Surgical sterilization—male

- **Vasectomy**
  - Each ductus deferens is cut and blocked (either segment is removed and tied/cauterized, or silicone plug is inserted)
    - Relatively easy to reverse with silicone plugs
  - Can be performed in a physician's office in minutes
  - Failure rate extremely low
  - No disruption in sexual function
  - Sperm are still produced but degenerate in the male reproductive tract

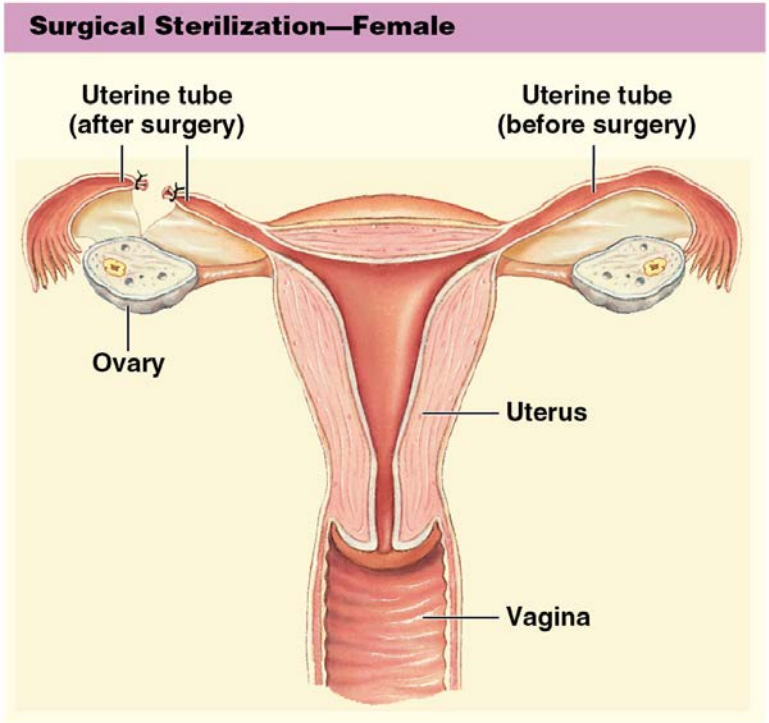
Vasectomy



Module 26.16: Birth control strategies

Surgical sterilization—female

- **Tubal ligation**
  - Each uterine tube is cut and tied
    - Can be done by laparoscopy
  - Requires general anesthesia
  - Complications are more likely than with a vasectomy
  - Failure rate also extremely low



Module 26.16: Review

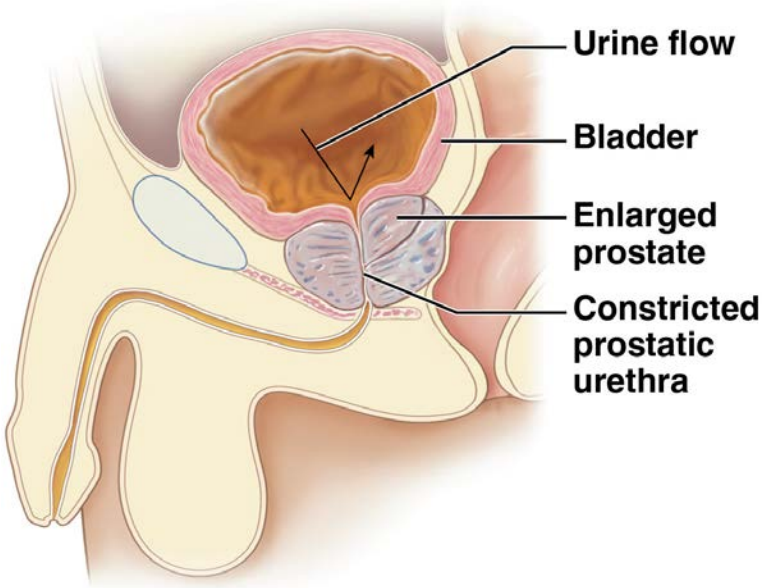
A. Which birth control method provides some protection against sexually transmitted diseases?
B. The use of which birth control method often results in the cessation of the uterine cycle?
C. Define *vasectomy*.

Learning Outcome: Discuss various birth control strategies and their associated risks.

Module 26.17: Clinical Module: Reproductive system disorders are relatively common and often deadly

Prostate disorders

- **Benign prostatic hypertrophy** (**BPH**)
  - Occurs spontaneously in men, typically over age 50
  - Declining testosterone production and the presence of estrogen may stimulate growth
  - Can constrict prostatic urethra and affect urination



Module 26.17: Reproductive system disorders

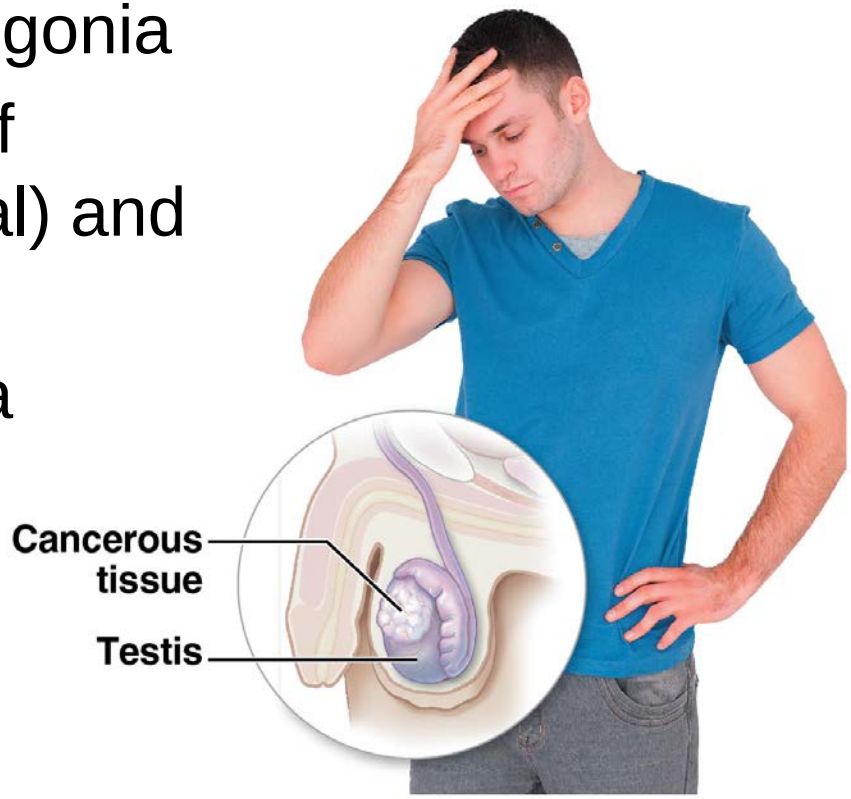
Prostate disorders (continued)

- **Prostate cancer**
  - Second most common cause of cancer deaths in males
  - Can be screened for by blood tests for **prostate-specific antigen** (**PSA**)
  - Treatment is radiation or surgical removal of prostate (**prostatectomy**)

Module 26.17: Reproductive system disorders

Testicular cancer

- Occurs at relatively low rate (1 case per 263 males per year)
- More than 95 percent result from abnormal spermatocytes or spermatogonia
- Treatment is combination of orchiectomy (testes removal) and chemotherapy
- Survival rate near 99% as a result of early diagnosis and improved treatment



Module 26.17: Reproductive system disorders

Breast disorders

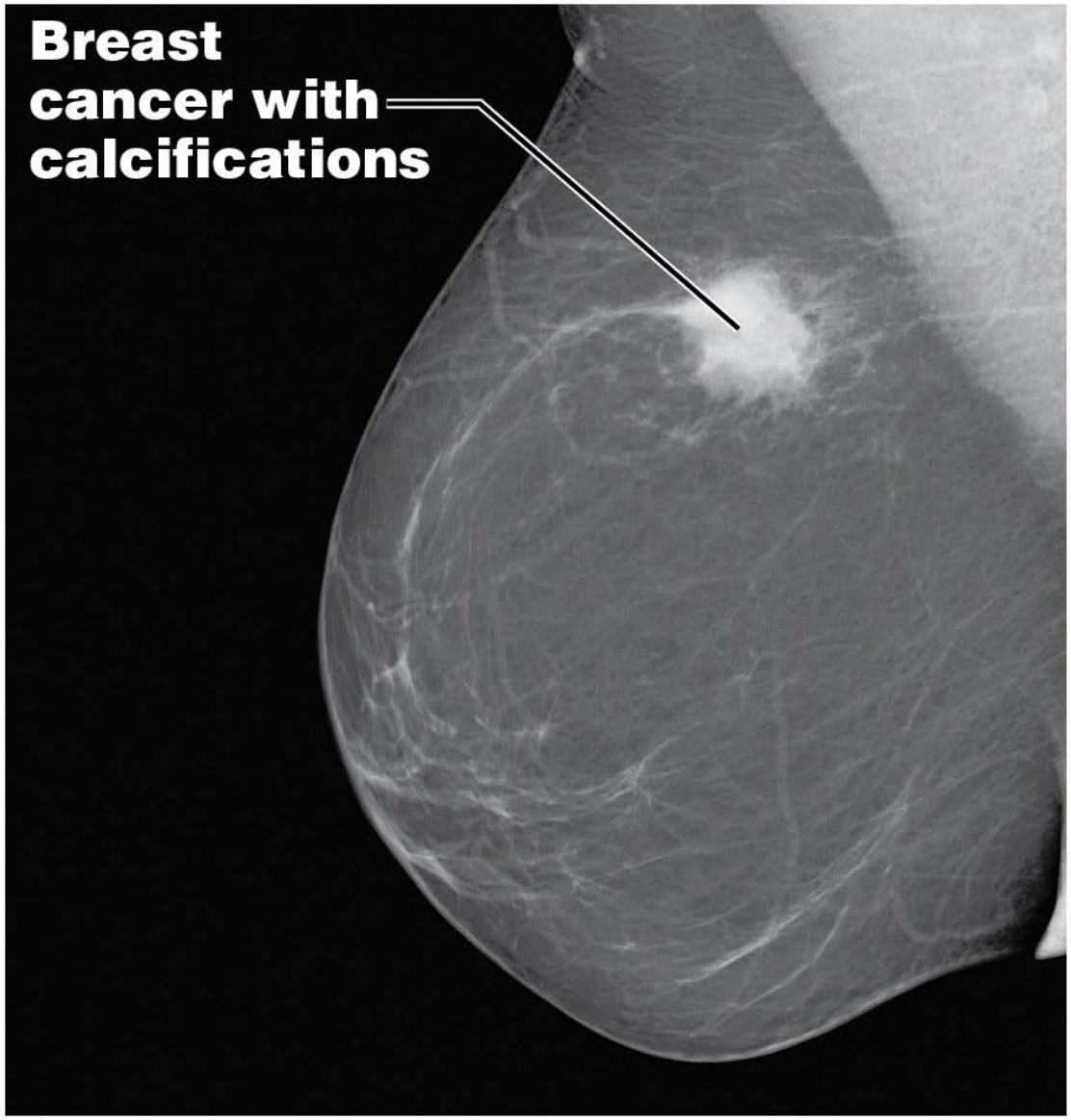
- Changing hormone levels can cause inflammation of the mammary gland tissues
- **Cysts**
  - Formed if inflamed lobules are walled off by scar tissue
  - **Fibrocystic disease**
    - Condition in which clusters of cysts can be felt as discrete masses
    - Benign condition, but biopsy may be needed to distinguish masses from **breast cancer**

Module 26.17: Reproductive system disorders

Breast disorders (continued)

- **Breast cancer**
  - Malignant metastasizing tumor of mammary gland
  - Leading cause of death in women ages 35–45
    - Most common in women over age 50
  - Notable risk factors
    - Family history of breast cancer
    - First pregnancy after age 30
    - Early menarche or late menopause
  - Treatment includes surgery, radiation, chemotherapy, and hormones
    - Surgical removal may involve removal of part or all of mammary gland as well as axillary lymph nodes

Breast cancer

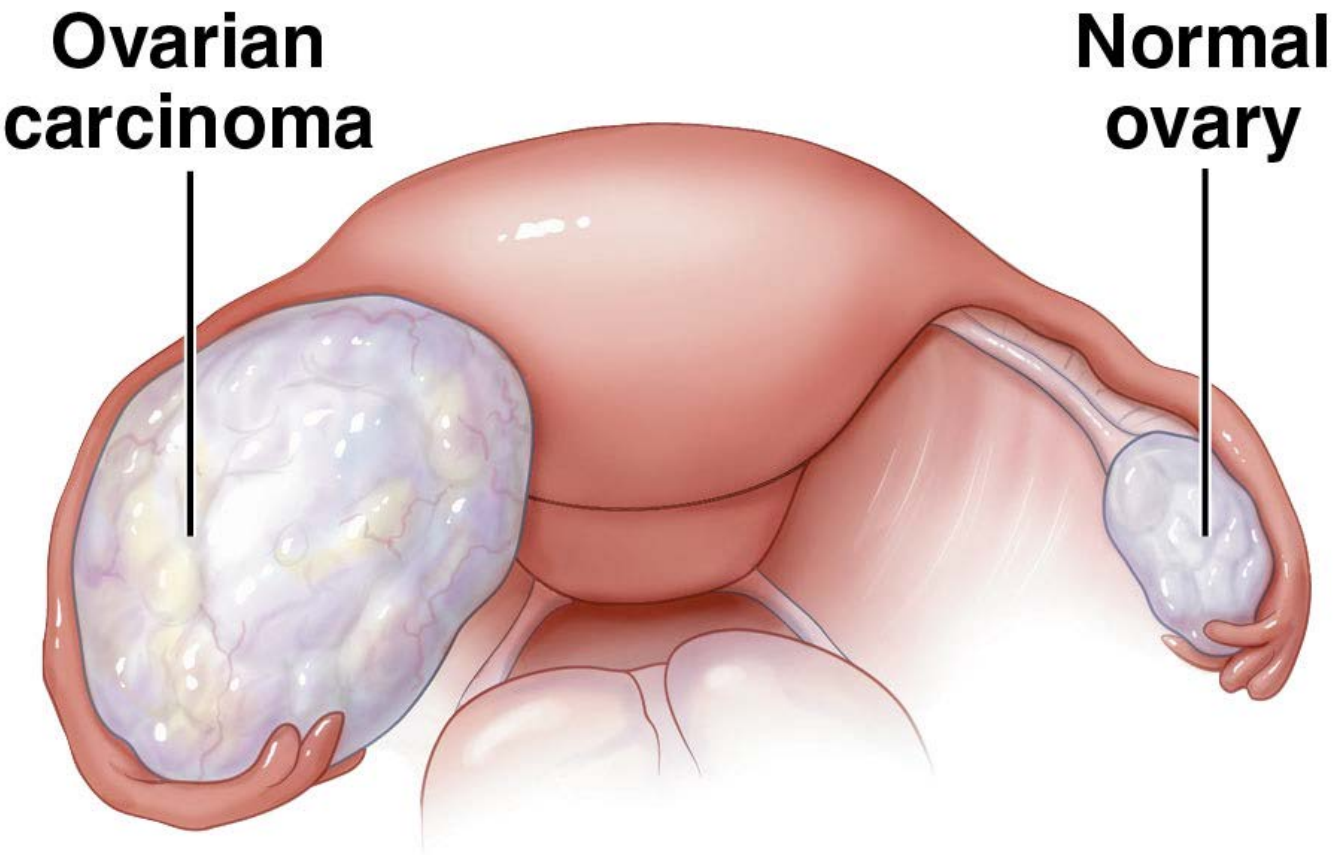


Module 26.17: Reproductive system disorders

Ovarian cancer

- Accounts for more deaths than any other cancer of female reproductive system
- Treatment is chemotherapy, radiation, and surgery
- Prognosis
  - For cancers originating in the general ovarian tissues or abnormal oocytes, relatively good prognosis
  - For 85 percent of ovarian cancers that are **carcinomas** (epithelial cancers), sustained remission is obtained in only one-third of cases

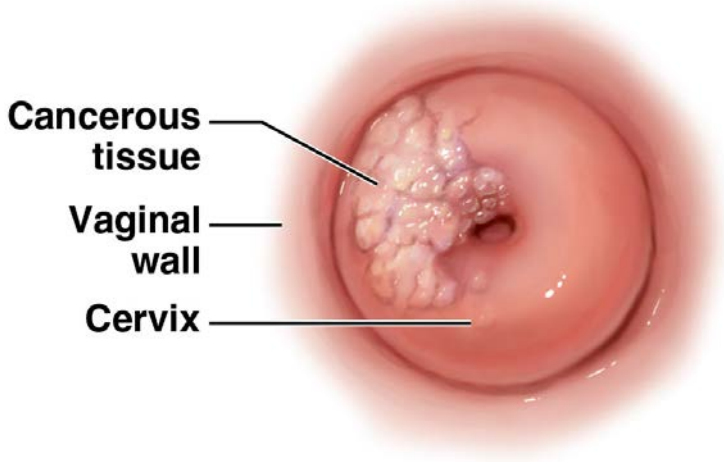
Ovarian cancer



Module 26.17: Reproductive system disorders

Cervical cancer

- Starts in cells of cervix
- Death rate decreased as a result of Pap test for early detection



- **Human papillomavirus** (**HPV**) is responsible for 75 percent of cervical cancers
  - Vaccine protects against several types of HPV

Module 26.17: Reproductive system disorders

Sexually transmitted diseases (STDs)/sexually transmitted infections (STIs)

- Transferred from person to person primarily or exclusively by sexual intercourse
- Consequences range from inconveniences to lethal
- Include at least two dozen bacterial, viral, and fungal infections
  - *Examples: Chlamydia*, HIV, syphilis, gonorrhea

Module 26.17: Reproductive system disorders

Sexually transmitted diseases (**STDs**)**/sexually transmitted infections** (**STIs**) (continued)

- Incidence increasing in the U.S.
  - Contributors to the problem include poverty, intravenous drug use, prostitution, and drug-resistant pathogens

Module 26.17: Review

A. Compare benign prostatic hypertrophy with prostate cancer.
B. Which pathogen is associated with most cases of cervical cancer?
C. Define *sexually transmitted disease*.

Learning Outcome: Discuss several common reproductive system disorders.