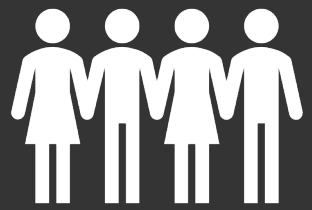

The Reproductive Systems

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Did you know that…

- Current world population is at 7.8 billion (2021)
- China still holds the world's largest population
- Philippines is included in the top 20 largest countries by population *(www.worldometer.info)*

Outline

- Male reproductive system
- Female reproductive system
- Female reproductive cycle
- Development of the reproductive system

Definition of Terms

Gynecology

Urology

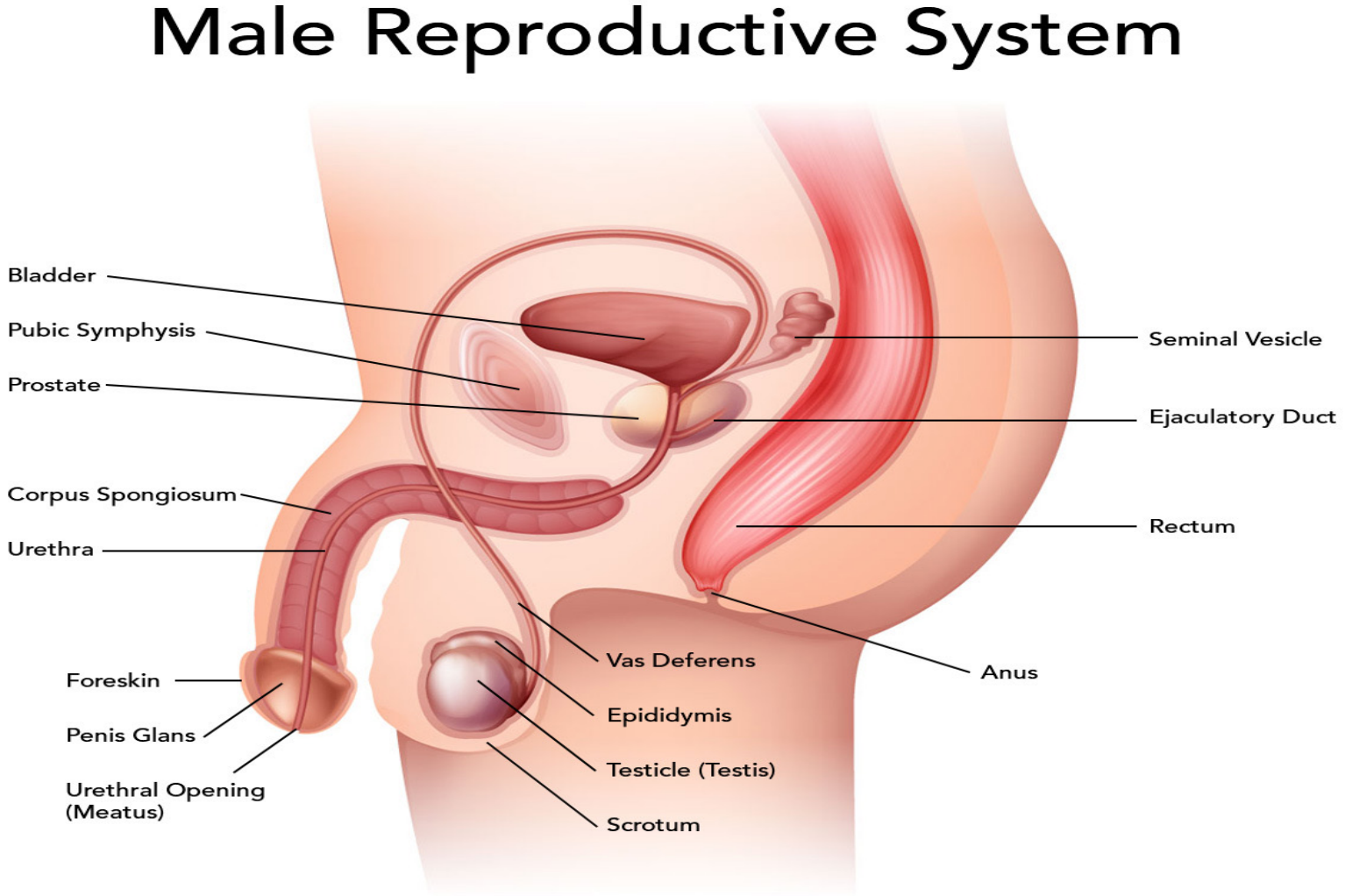
Andrology

Definition of Terms

- Gametes
- Gonads
- Ducts
- Accessory sex glands
- Supporting Structures

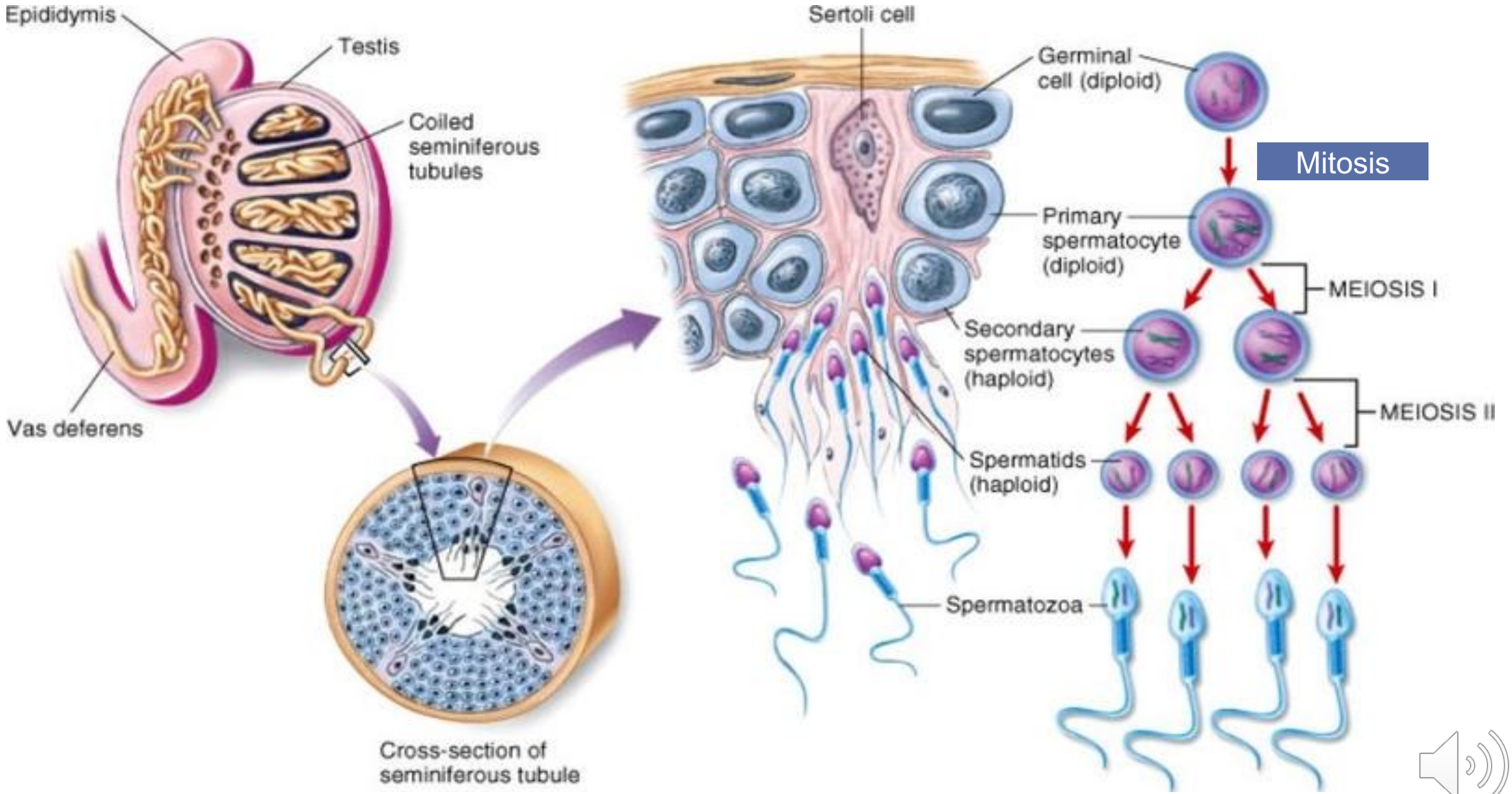
Male Reproductive System

Overview of the Male Reproductive System



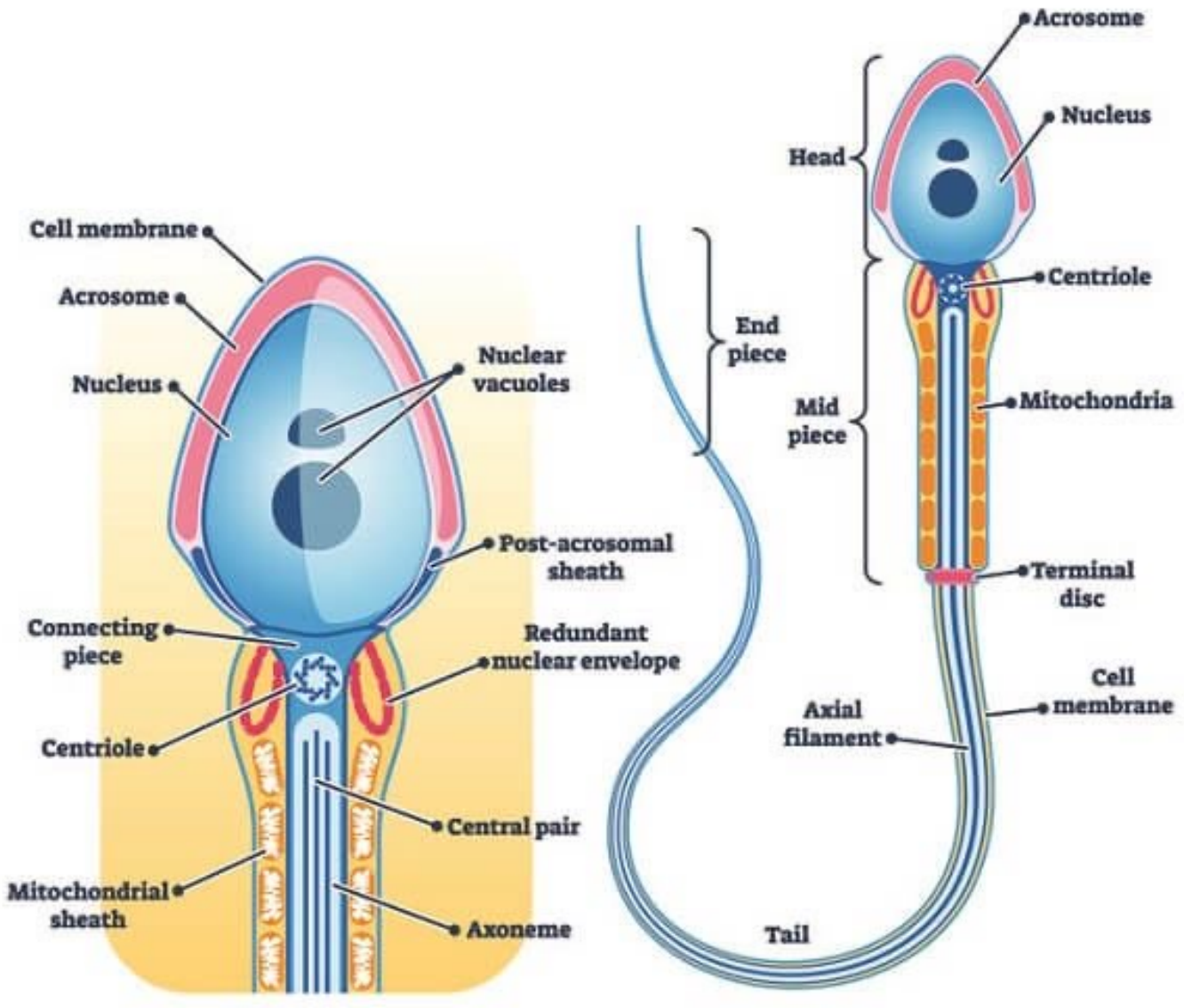
The Male Gonads

- **TESTES or TESTICLES**
  - Paired oval-shaped glands inside the scrotum
  - During fetal development, they are located near the kidneys, in the posterior portion of the abdomen, and begin their descent into the scrotum through the inguinal canals during the latter half of the seventh month
  - 2 main functions: production of sperm and male hormone (testosterone)
- **SCROTUM**
  - Loose skin and underlying subcutaneous layer that hangs from the root of the penis to support the testes
  - The location of the scrotum and contraction of its muscle fibers regulate the temperature of the testes
  - Cremaster muscle - contracts and pulls scrotum closer to the body whenever the temperature falls too low

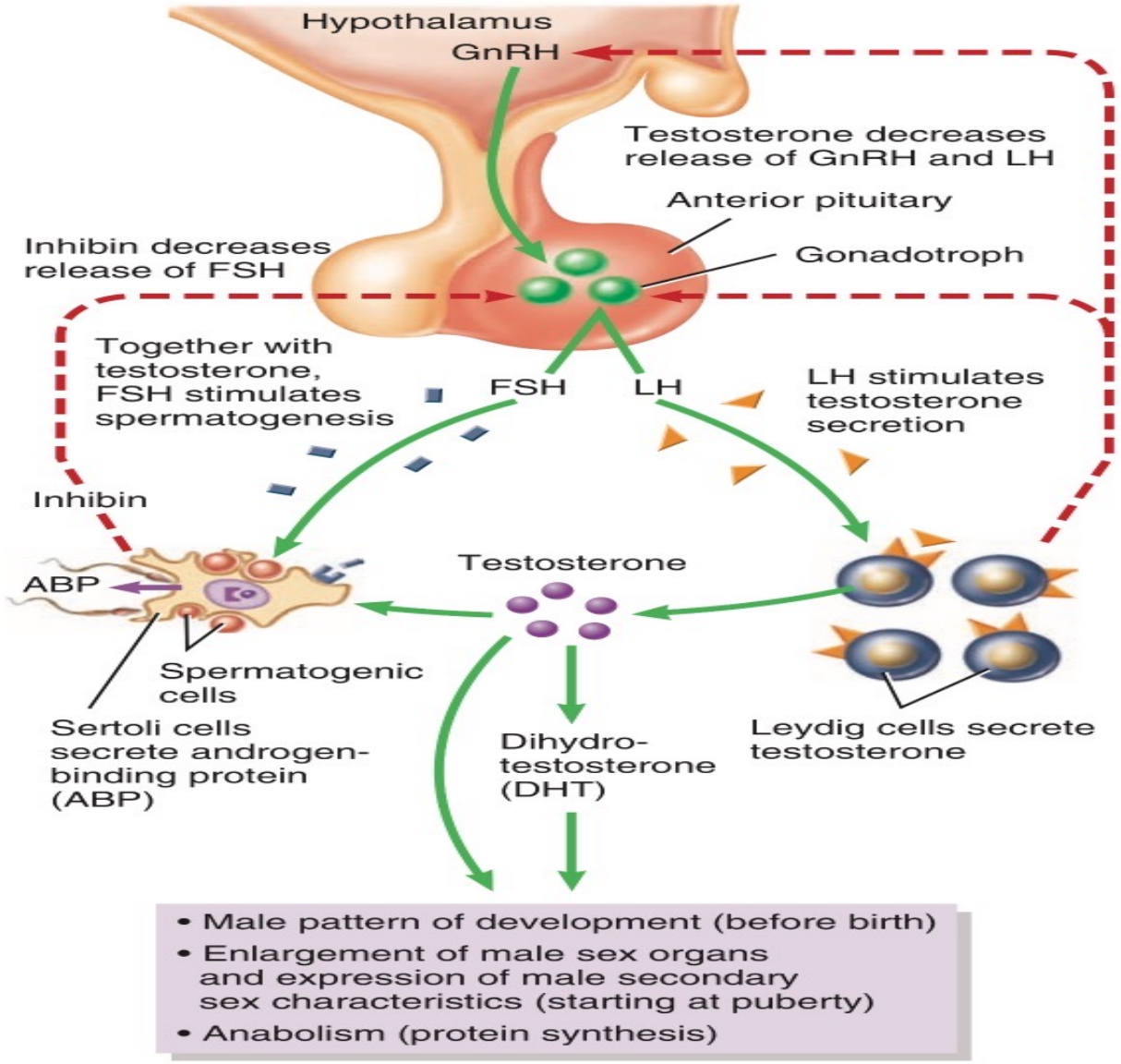

Epididymis
Testis
Coiled seminiferous tubules
Vas deferens
Cross-section of seminiferous tubule
Sertoli cell
Germinal cell (diploid)
Mitosis
Primary spermatocyte (diploid)
MEIOSIS I
Secondary spermatocytes (haploid)
MEIOSIS II
Spermatids (haploid)
Spermatozoa

Sperm

- male reproductive cell (gamete)



Hormonal Control of the Testes



Reproductive System Ducts in Males

- **Epididymis**
  - Site of sperm maturation; can store sperm which remains viable for months
  - Comma-shaped organ that if uncoiled, it measures up to 600cm long
- **Ductus Deferens**
  - Conveys sperm during sexual arousal from the epididymis towards the urethra
  - 45 cm long, ascend along the border and loops over the ureter, and passes over the side and down the posterior surface of the urinary bladder
- **Ejaculatory Ducts**
  - 2cm long, formed by the union duct from the seminal vesicle and the ductus deferens
- **Urethra**
  - 20cm long; shared terminal duct of the reproductive and urinary system

Accessory Male Sex Glands

- **Seminal Vesicles**
  - secretes an alkaline, viscous fluid that contains fructose, prostaglandin, and clotting protein; constitutes 60% of the volume of semen
- **Prostate**
  - Secretes a milky, slightly acidic fluid that contains citric acid and proteolytic enzymes, acid phosphatase, and seminal plasmin; constitutes 25% of the semen
  - Responsible for the milky appearance of the sperm
- **Bulbourethral Glands**
  - Secretes alkaline fluid into the urethra which enhances sperm viability.
  - Secretes mucus that lubricates the end of the penis and the lining of the urethra

Semen

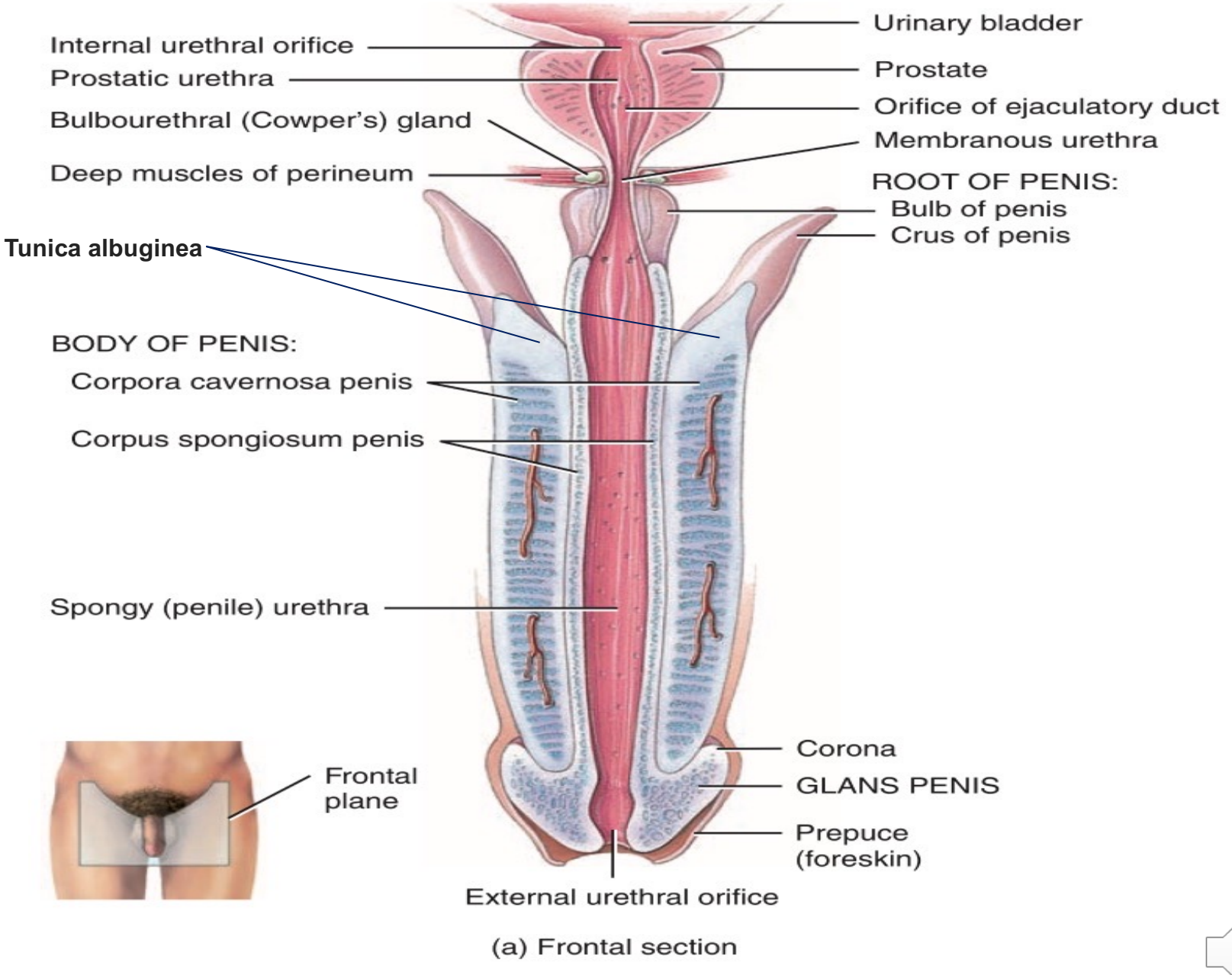
- Mixture of sperm and seminal fluid
- 2.5-5.0 mL per ejaculation (50-150 million sperm per mL)
- pH 7.2-7.7
- Coagulates within 5 minutes and reliquifies within 10-20 minutes

Penis

- Contains the urethra; passageway for ejaculation of semen and excretion of urine
- Average length when flaccid is 3.4-3.7 inches, the erect penis is between 5.1-5.7 inches

Parts of the Penis:

1. Body
2. Glans Penis
3. Root



Erection and Ejaculation

Erection

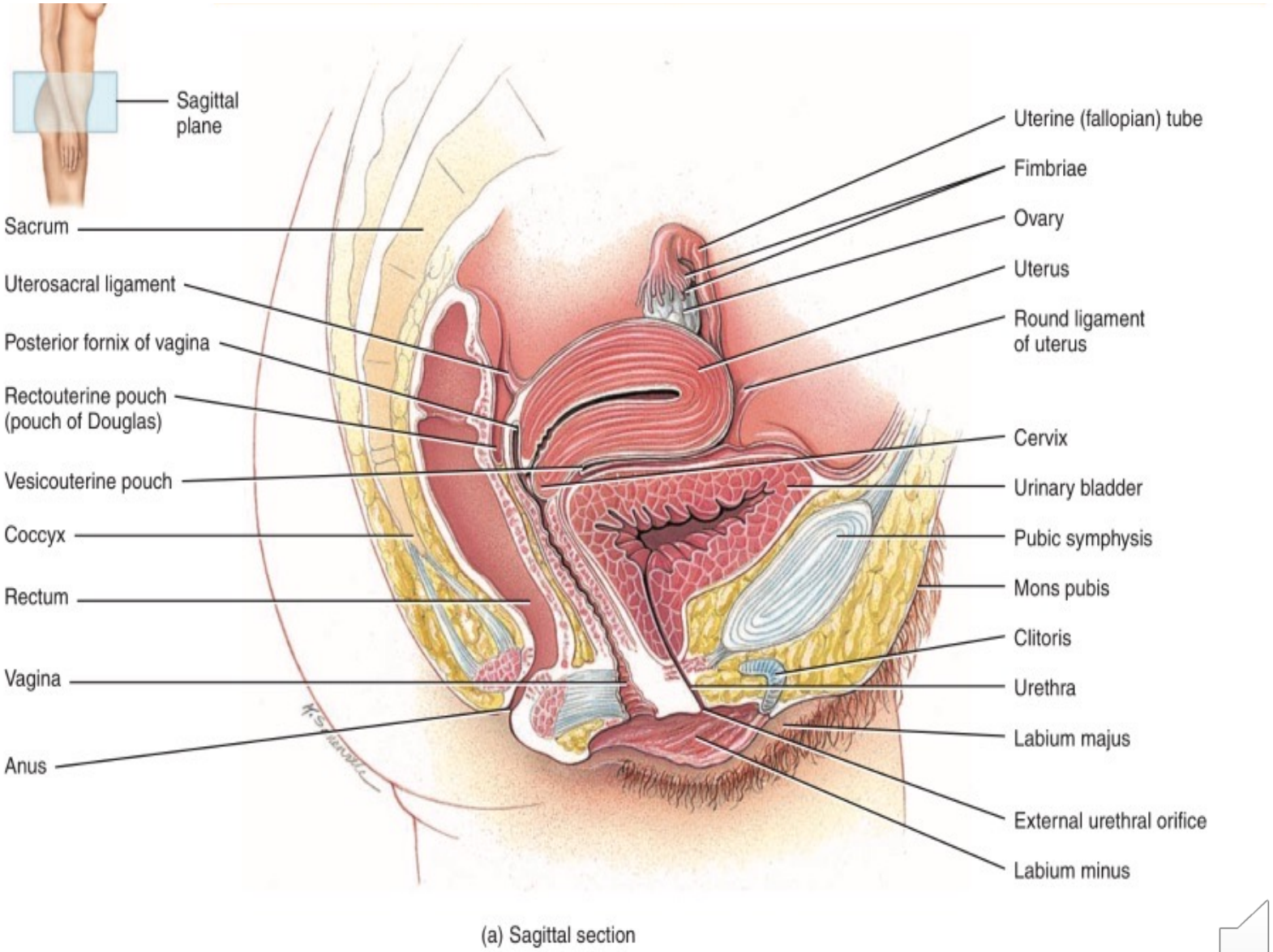
- Enlargement and stiffening of the penis during sexual stimulation
- Initiated and maintained by the parasympathetic fibers that produces and releases nitric oxide that causes the erectile tissue to relax resulting to blood vessel dilatation, allowing increase blood flow

Ejaculation

- Powerful release of semen from the urethra to the external urethral orifice
- Initiated by the sympathetic reflex coordinated by the lumbar portion of the spinal cord
- This reflex causes the smooth muscle sphincter at the base of the urinary bladder to close, preventing urine from being expelled during ejaculation

Female Reproductive System

Overview of the Female Reproductive System

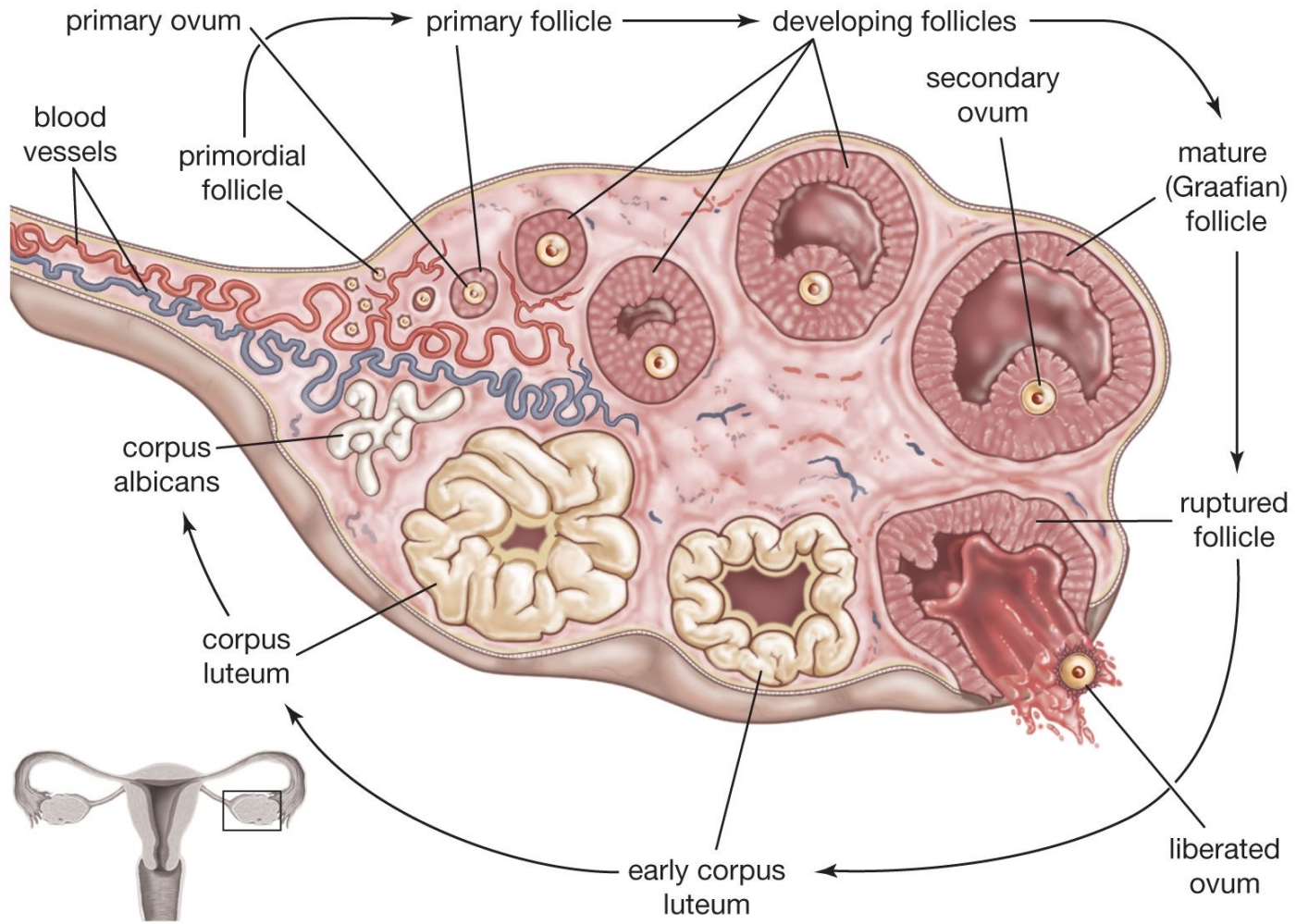


(a) Sagittal section

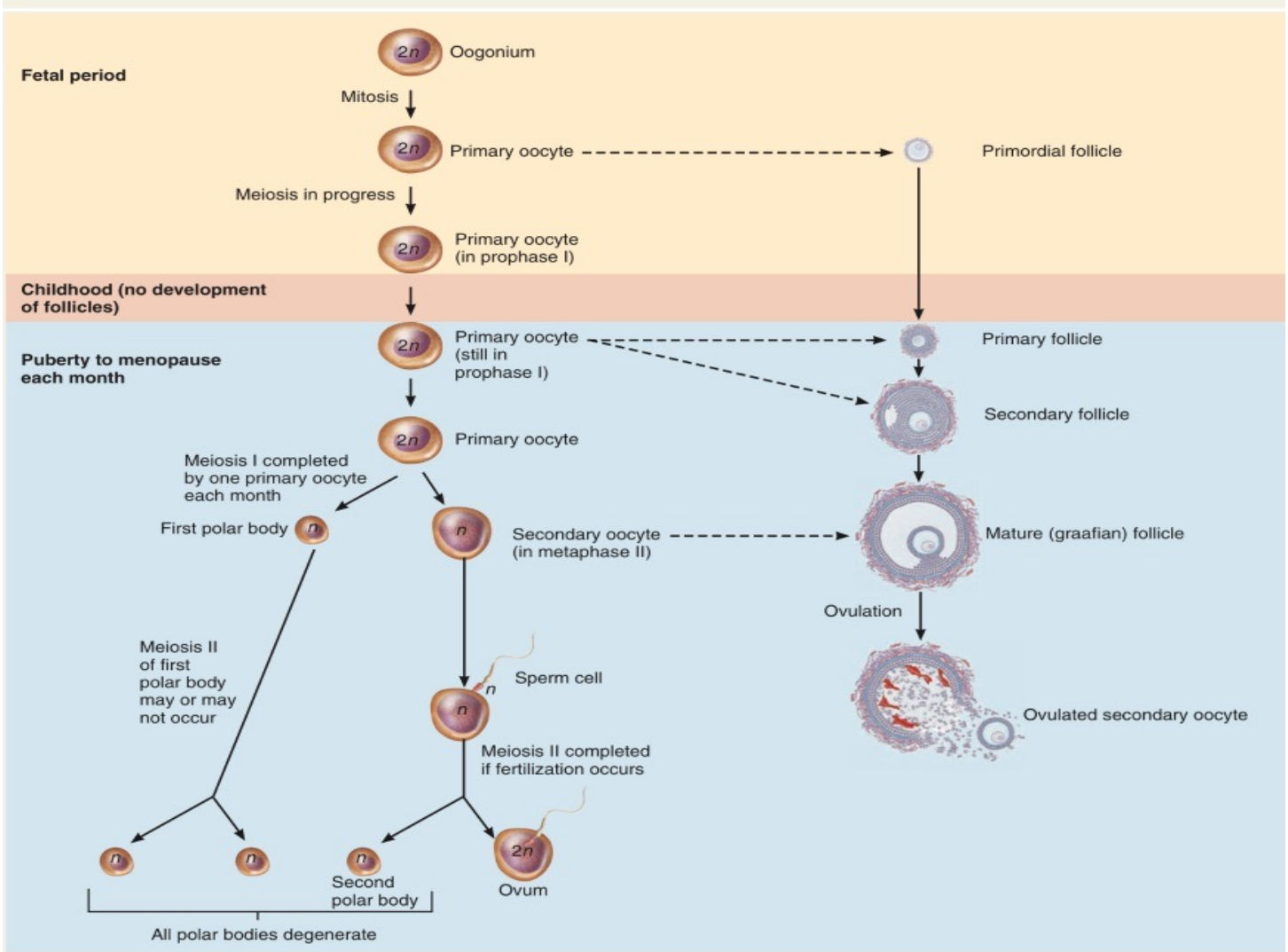
The Female Gonads

- **Ovaries**
  - Paired glands that resemble unshelled almonds in size and shape
  - Produces secondary oocytes and hormones, including progesterone and estrogen (female sex hormones), inhibin and relaxin
  - Anchored to the uterus through the *ovarian ligament* and attached to the pelvic wall through the *suspensory ligament*
  - Parts:
    - Germinal epithelium
    - Tunica albuginea
    - Ovarian cortex – consist of ovarian follicles
    - Ovarian medulla

Ovaries

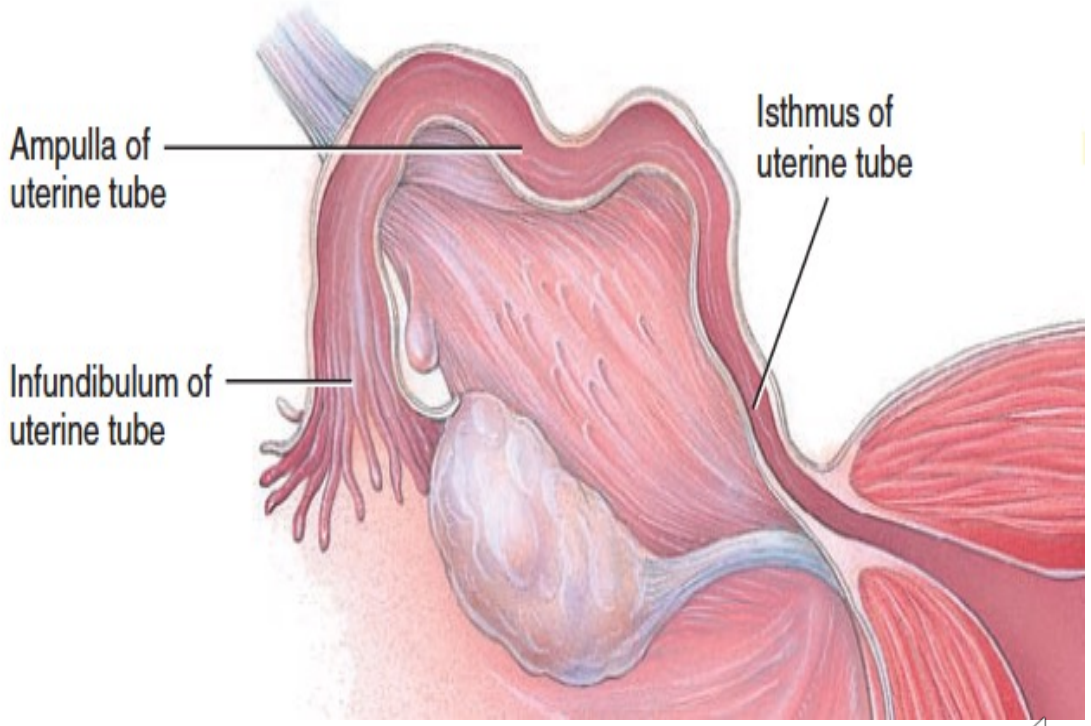


Oogenesis and Follicular Development



Uterine Tubes

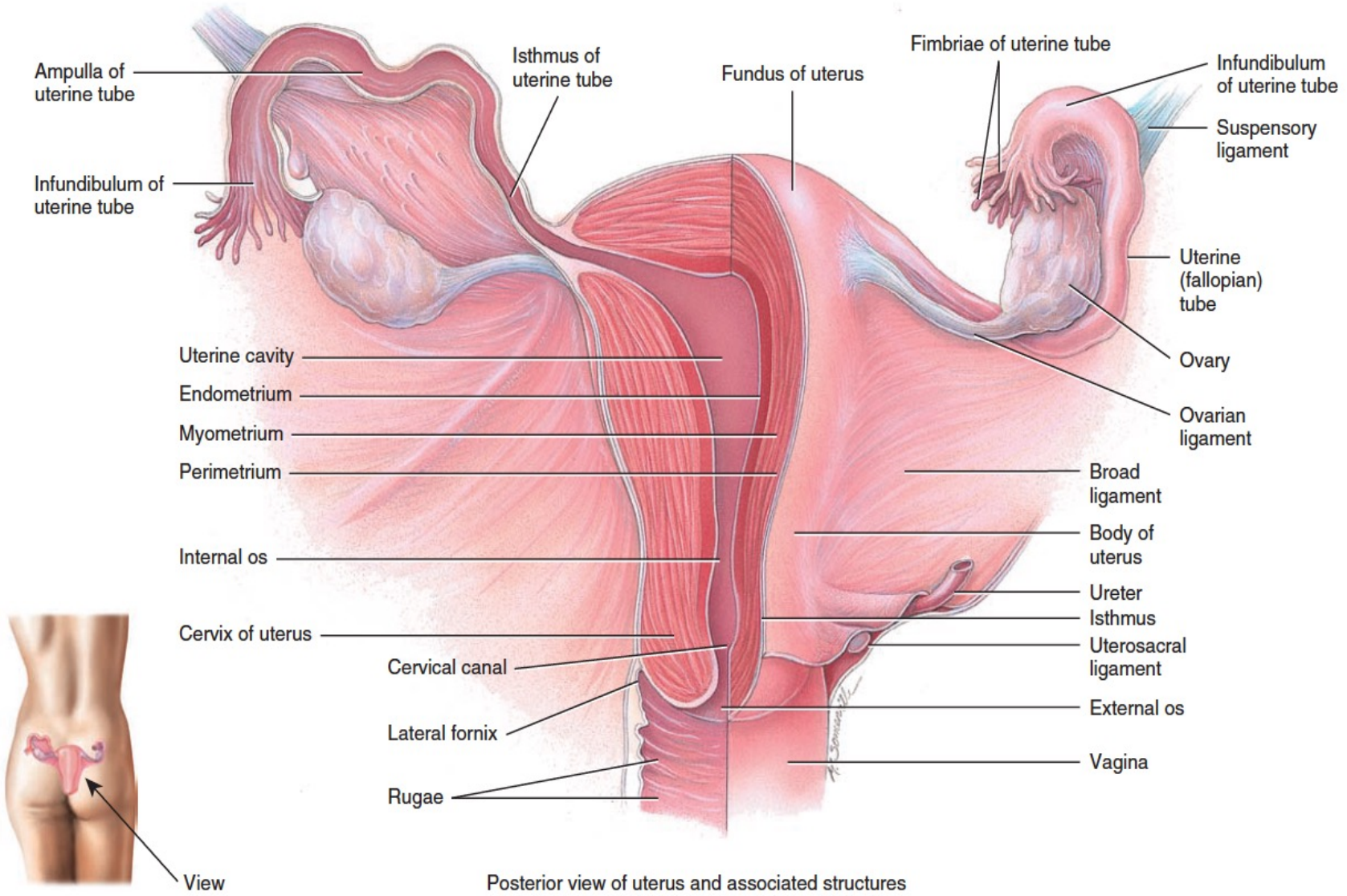
- Also known as fallopian tubes or oviducts
- 10cm in length
- Provide a route of sperm to reach an ovum and transport secondary oocytes and fertilized ova from the ovaries to the uterus
- The epithelium contains ciliated simple columnar cells that helps move the fertilized ovum towards the uterus



Uterus

- Also called womb; 7.5cm x 5cm x 2cm (LWH)
- Site of implantation of a fertilized ovum, development of fetus during pregnancy, and labor
- Situated between the urinary bladder and the rectum; size and shape of an inverted pear

Uterus



Posterior view of uterus and associated structures

Cervical Mucus

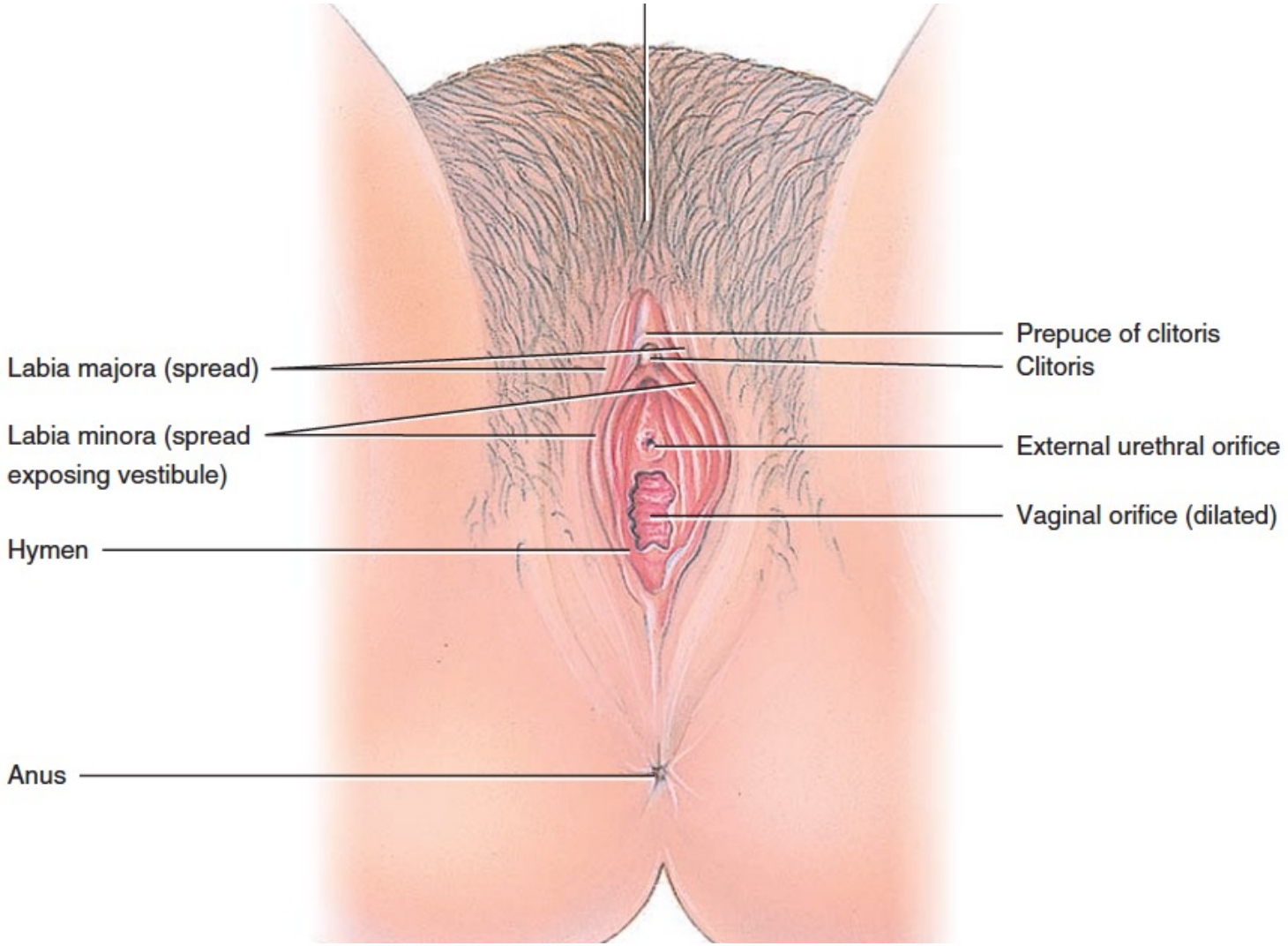
- The cervix contains secretory cells that produces cervical mucus
- A mixture of water glycoproteins, lipids, enzymes and inorganic salts
- Females secrete 20-60mL per day during reproductive years
- More alkaline and less viscous towards time of ovulation for the sperm to be able to pass through from the vagina to the uterus

Vagina

- Long, tubular, fibromuscular canal lined with mucous membrane that extends from the exterior body to the uterine cervix
- Receptacle of penis during sexual intercourse, outlet for menstrual flow and passage for childbirth
- Contains large stores of glycogen, which produces organic acid, resulting to an acidic environment
- HYMEN – forms a border around and partially closes the inferior end of the vaginal opening to the vaginal orifice

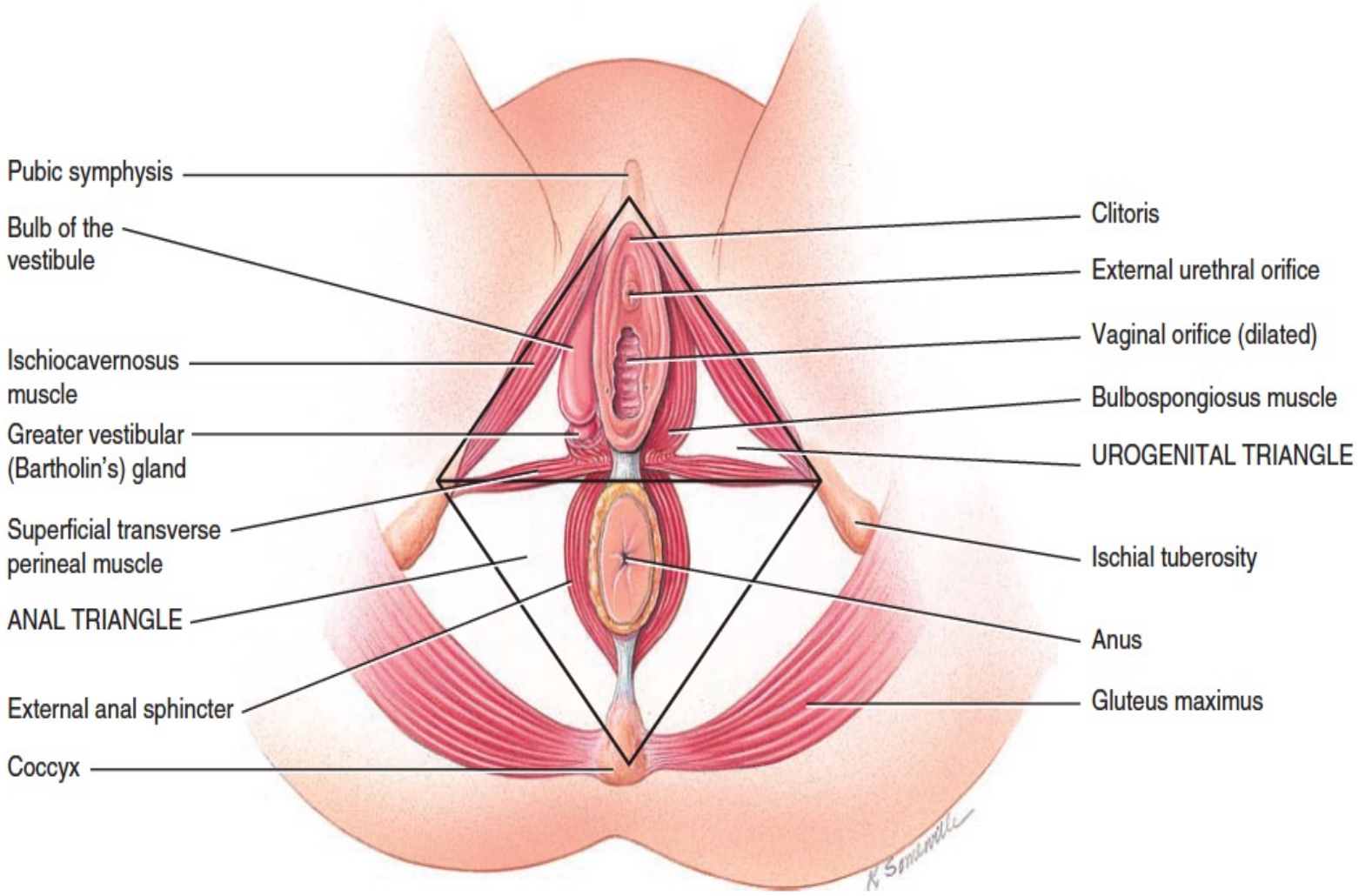
Vulva

- ✓ Also known as pudendum
- ✓ External genitals of female



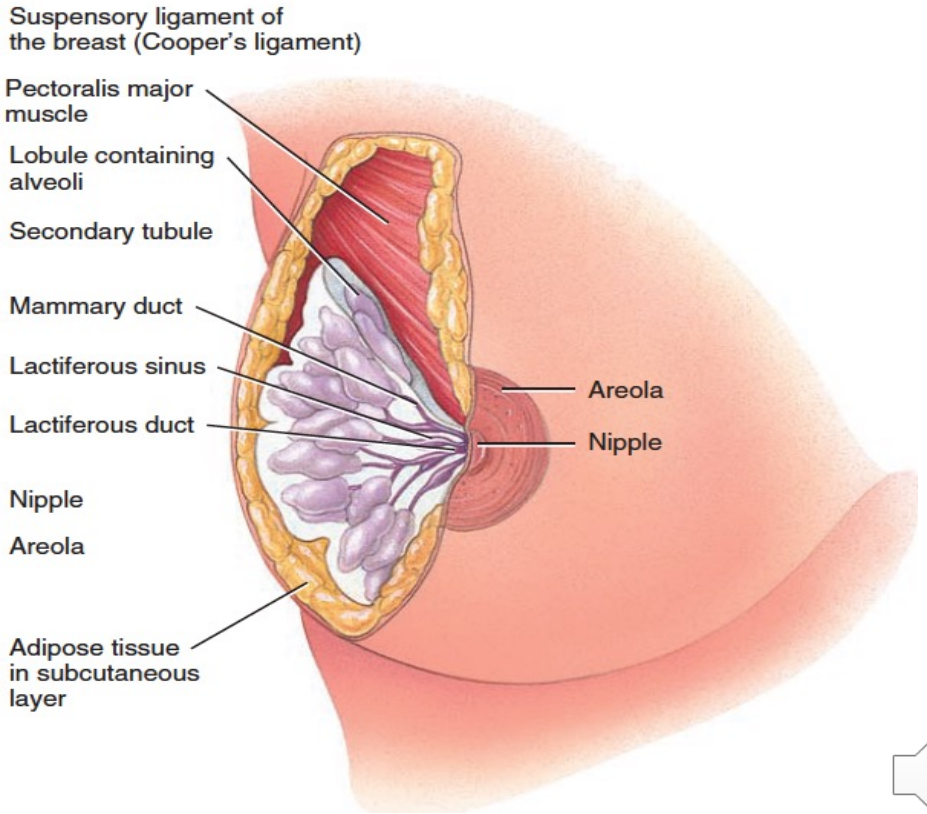
Perineum

Diamond-shaped area medial to the thighs and buttocks of both males and females

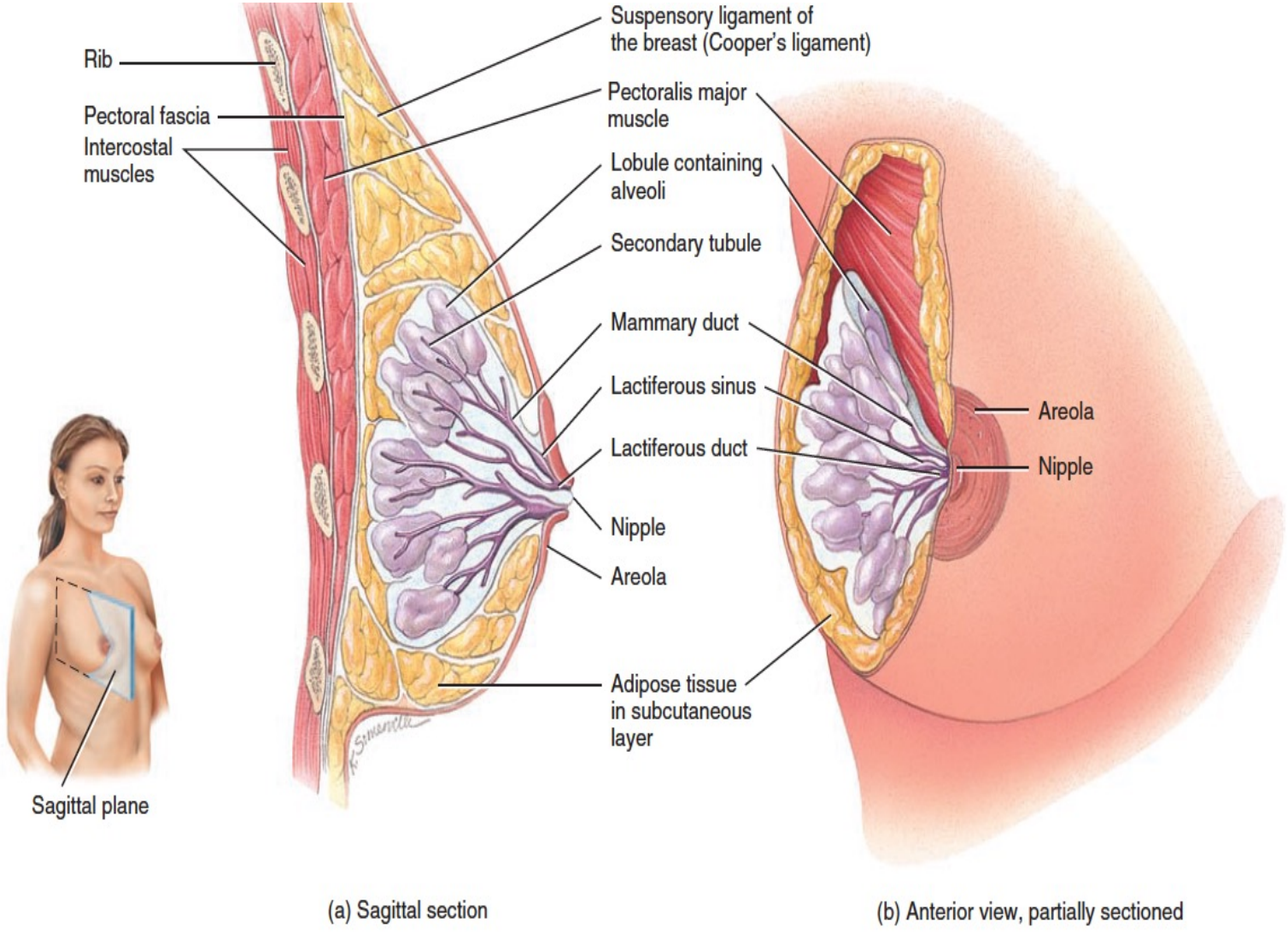


Female Breasts

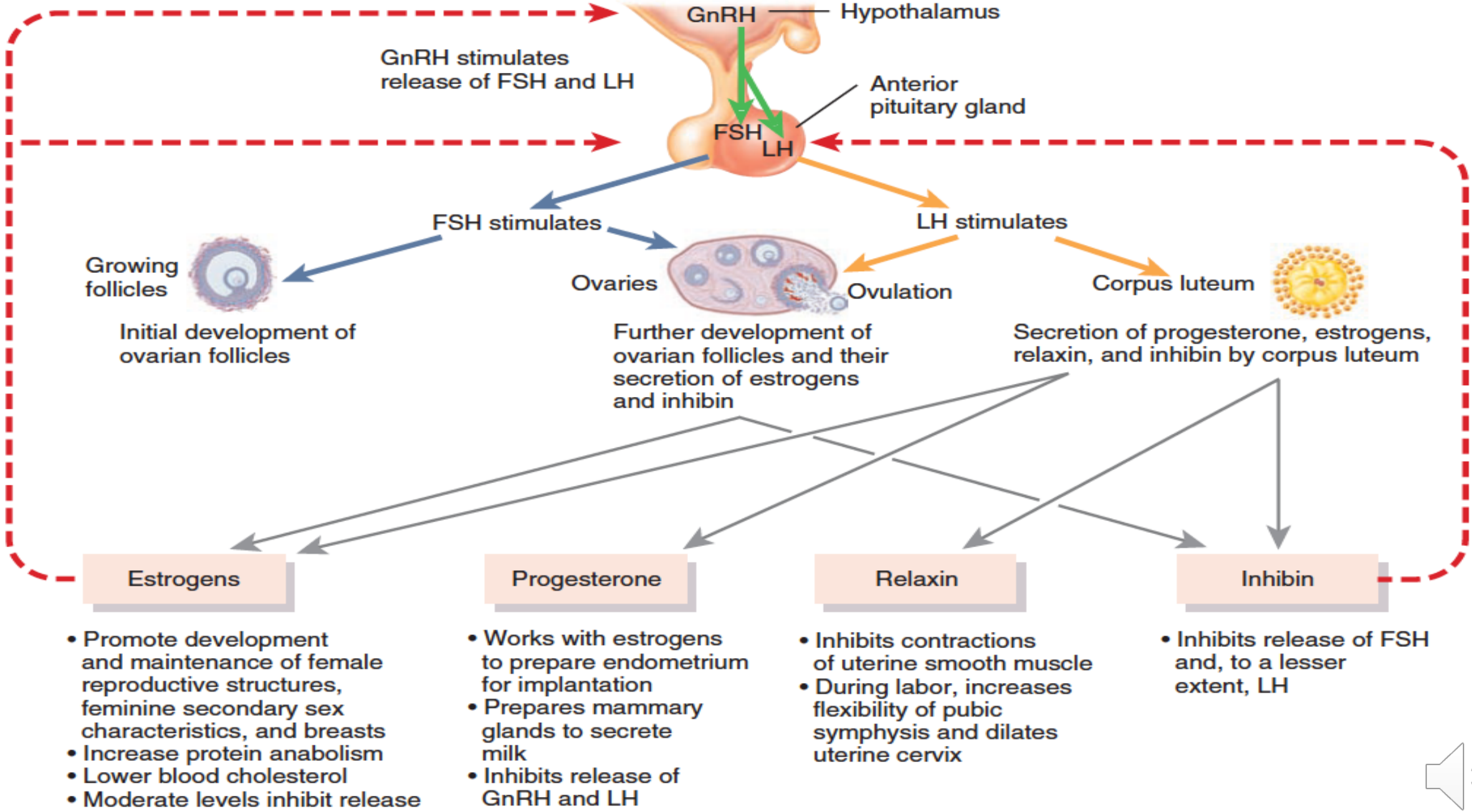
- Breast is a hemispheric projection or variable size anterior to the pectoralis major and serratus anterior muscle and attached to them by a layer of fascia composed of dense irregular tissue

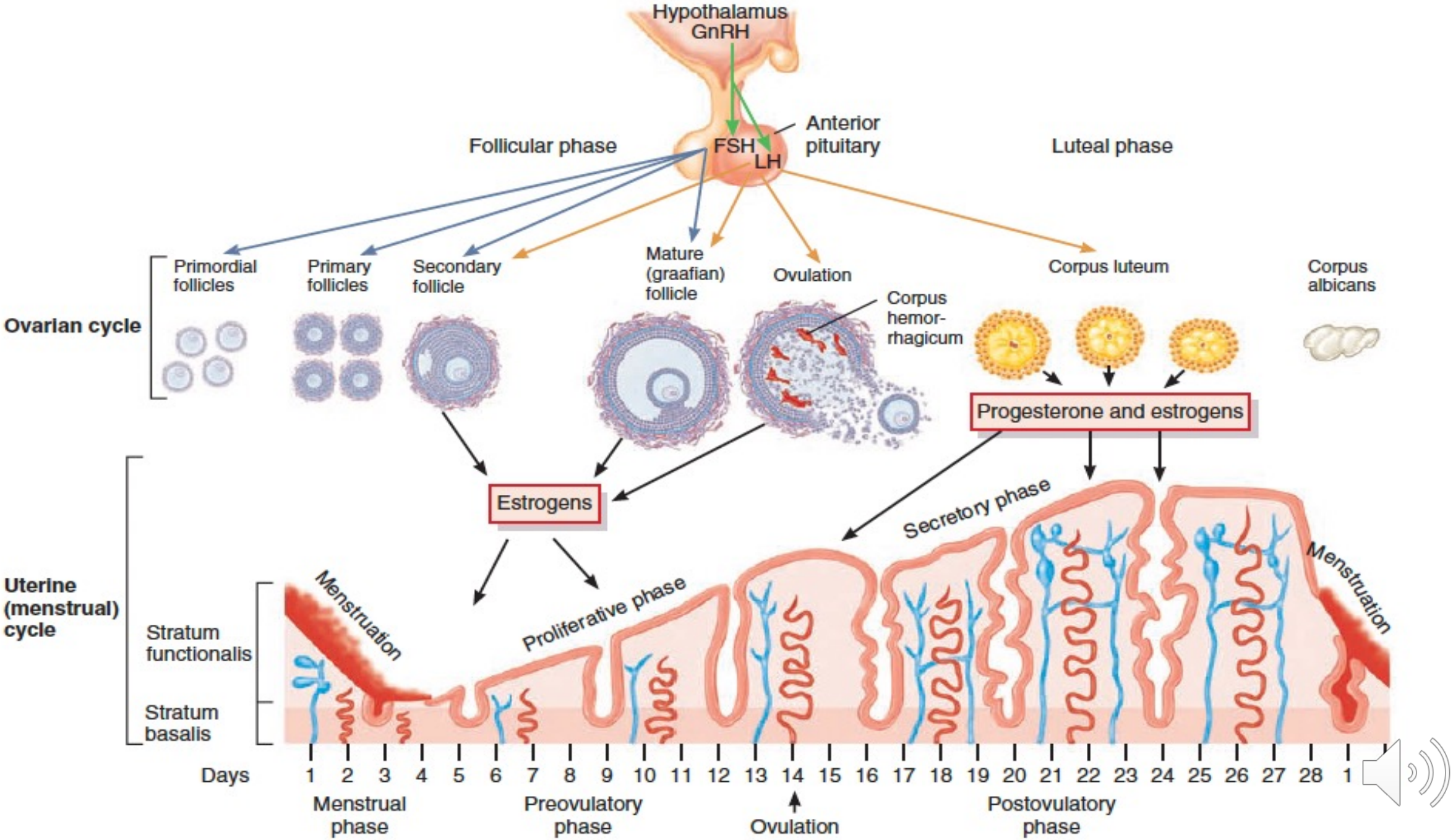


Mammary Gland



Female Reproductive Cycle


GnRH
Hypothalamus
GnRH stimulates release of FSH and LH
Anterior pituitary gland
FSH
LH
FSH stimulates
LH stimulates
Growing follicles
Ovaries
Ovulation
Corpus luteum
Initial development of ovarian follicles
Further development of ovarian follicles and their secretion of estrogens and inhibin
Secretion of progesterone, estrogens, relaxin, and inhibin by corpus luteum
Estrogens
Progesterone
Relaxin
Inhibin
• Promote development and maintenance of female reproductive structures, feminine secondary sex characteristics, and breasts
• Increase protein anabolism
• Lower blood cholesterol
• Moderate levels inhibit release of GnRH, FSH, and LH
• Works with estrogens to prepare endometrium for implantation
• Prepares mammary glands to secrete milk
• Inhibits release of GnRH and LH
• Inhibits contractions of uterine smooth muscle
• During labor, increases flexibility of pubic symphysis and dilates uterine cervix
• Inhibits release of FSH and, to a lesser extent, LH


Hypothalamus
GnRH
Anterior pituitary
FSH
LH
Follicular phase
Luteal phase
Ovarian cycle
Primordial follicles
Primary follicles
Secondary follicle
Mature (graafian) follicle
Ovulation
Corpus hemor-rhagicum
Corpus luteum
Corpus albicans
Progesterone and estrogens
Estrogens
Uterine (menstrual) cycle
Stratum functionalis
Stratum basalis
Menstruation
Proliferative phase
Secretory phase
Menstruation
Days
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 1
Menstrual phase
Preovulatory phase
Ovulation
Postovulatory phase

Development of the Reproductive Systems

- Gonads develop from gonadal ridges that arise from the growth of intermediate mesoderm.
- During the ***fifth week of development***, the gonadal ridges appear as bulges just medial to the mesonephros (intermediate kidney).
- Adjacent to the genital ridges are the **mesonephric ducts or Wolffian ducts**, which eventually develop into structures of the reproductive system in males.
- A second pair of ducts, the **paramesonephric ducts or Müllerian ducts** (mil-E-re¯-an), develop lateral to the mesonephric ducts and eventually form structures of the reproductive system in females.

Thank you for listening!