

## CHAPTER TWENTY - EIGHT

### Content Review

1. Both reproductive systems have organs called gonads that produce reproductive cells, called gametes. Additionally, the gonads produce large amounts of sex hormones (estrogen and progesterone in the female, and androgens in the male) that control maturation, development, and changes in the reproductive system organs. Both reproductive systems have a duct system to convey gametes away from the gonads toward the site of fertilization (in females) or simply to the outside of the body (in males). Both reproductive systems are primarily nonfunctional and “dormant” until puberty. Homologues are (female to male): clitoris to penis, labia majora to scrotum, and vestibular glands to bulbourethral glands.
2. (1) GnRH (gonadotropin-releasing hormone) is released by the hypothalamus to stimulate the release of (2) FSH (follicle-stimulating hormone) and (3) LH (luteinizing hormone) from the anterior pituitary. At the beginning of the follicular phase, FSH and LH stimulate the maturation of some primordial follicles into primary follicles. Each growing primary follicle secretes (4) estrogen as it continues to mature. The estrogen stimulates changes in the uterine lining. Ovulation is induced when there is a peak in LH secretion. The corpus luteum secretes estrogen as well as (5) progesterone, which stabilize and build up the uterine lining, and prepare the uterus for possible implantation of a fertilized oocyte. When a woman is pregnant, the levels of estrogen, progesterone, and (6) prolactin rise dramatically. Under the influence of increasing prolactin, the mammary gland grows and forms more expanded and numerous alveoli. While prolactin produces breast milk, (7) oxytocin is responsible for milk ejection upon response to a stimulus, such as a baby crying or sucking the nipple. Oxytocin is also responsible for uterine contractions.
3. The infundibulum is the free, funnel-shaped, lateral margin of the uterine tube. It has numerous fingerlike folds called fimbriae that enclose the ovary only at ovulation. The ampulla is the dilated region of the uterine tube medial to the infundibulum. The isthmus, extending medially from the ampulla toward the lateral wall of the uterus, constitutes about two-thirds of the uterine tube. The interstitial segment extends medially from the isthmus and pierces the wall of the uterus.
4. The uterine wall is composed of the perimetrium, myometrium, and endometrium. The outer perimetrium is a serous membrane that becomes continuous with the broad ligament. The myometrium is the thick middle tunic formed from three intertwining layers of smooth muscle. The innermost tunic is the endometrium, a mucosal membrane composed of a simple columnar epithelium and an underlying lamina propria filled with compound tubular glands that enlarge during the uterine (menstrual) cycle.
5. **Ovarian Cycle:** The follicular phase occurs from day 1 to 13 of an approximate 28-day cycle. FSH and LH stimulate some primordial follicles to mature into primary follicles. One primary follicle matures into a secondary follicle, which in turn matures into a vesicular follicle. Division of the primary oocyte produces a secondary oocyte. Ovulation, occurring on day 14, is the release of the secondary oocyte from a vesicular follicle. The luteal phase extends from day 15 to 28, when the remaining

follicle cells in the ruptured vesicular follicle turn into a corpus luteum. The corpus luteum secretes large amounts of progesterone and some estrogen to stabilize and build up the uterine lining, and prepare the uterus for possible implantation of a fertilized oocyte.

**Uterine Cycle:** The menstrual phase occurs during days 1–5 (approximately), when the functional layer is sloughed off. The proliferative phase occurs from approximately day 6 to 14. The initial growth and development of the functional layer of the endometrium overlap the time of follicle growth and estrogen secretion. The last phase is the secretory phase, extending from approximately day 15 to 28, during which vascularization and development of uterine glands increase as a result of progesterone secretion from the corpus luteum.

6. Externally, the mammary gland has a nipple, a cylindrical projection on the center of the breast containing multiple tiny openings of the excretory ducts. The areola is the pigmented rosy or brownish ring of skin around the nipple. Its surface often appears uneven and grainy as a result of the numerous sebaceous glands immediately internal to the surface. Internally, the mammary glands are subdivided into lobes, which are further subdivided into smaller compartments called lobules that contain alveoli. Alveoli become larger and more numerous during pregnancy, and produce milk in the lactating female.
7. Sustentacular cells (also called nurse or Sertoli cells) are located throughout the seminiferous tubule, where they provide a protective environment for the developing sperm cells, and their cytoplasm helps “nurse” the developing sperm. The sustentacular cells also form a blood-testis barrier and help protect developing sperm cells from the male immune system.
8. In spermatogenesis, (1) sperm form from diploid primordial germ cells called spermatogonia; (2) spermatogonia divide by mitosis, producing a new spermatogonium and a diploid primary spermatocyte; (3) a primary spermatocyte undergoes meiosis I, producing two haploid cells called secondary spermatocytes; (4) secondary spermatocytes go through meiosis II to form haploid spermatids; and (5) spermatids undergo spermiogenesis to become spermatozoa.
9. Seminal vesicles produce a viscous, whitish-yellow alkaline fluid containing fructose and prostaglandins. The fructose nourishes the sperm as they travel through the female reproductive tract, while the prostaglandins promote the widening and slight dilation of the external os of the cervix. The prostate gland secretes a slightly acidic, milky fluid that is rich in citric acid, seminal plasmin, and prostate-specific antigen (PSA). The citric acid is a nutrient for sperm health, the seminal plasmin is an antibiotic that combats urinary tract infections, and the PSA helps liquefy semen following ejaculation. The bulbourethral glands secrete a clear, viscous mucin that forms mucus when mixed with water. This mucin protects the urethra and serves as a lubricant for the insertion of the penis into the vagina during sexual intercourse.
10. During sexual excitement, blood from the central artery enters the cavernous bodies of the penis and fills the venous spaces. As the venous spaces become engorged with blood, the cavernous bodies become rigid and compress the veins that drain blood away from the venous spaces. Thus, the spaces fill with blood, but the blood will not leave the cavernous bodies until the sexual excitement ceases. Parasympathetic innervation is responsible for erection of the penis.