The Female Reproductive System

- General functions:
  - To produce and maintain egg cells (ova)
  - Transport ova to site of fertilization
  - To provide a favorable environment for a developing embryo
  - To move offspring to the external environment
  - To produce female sex hormones

The Female Reproductive System

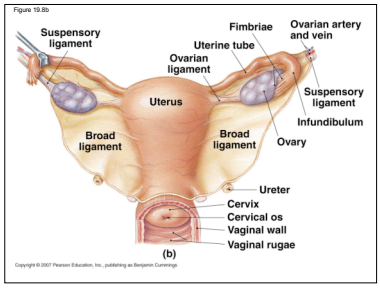
- The principal structures include:
  - Ovaries produce ova
  - Female reproductive tract:
    - Uterine tubes
    - Uterus
    - Vagina

The Female Reproductive System

- Accessory Structures:
  - Lesser/greater vestibular glands
  - Mammary glands
- External genitalia:
  - Vulva
  - Vestibule
  - Labia minora
  - Clitoris
  - Mons pubis
  - Labia majora

The Ovaries

- Responsible for
  - The production of the ova
  - Secretion of female sex hormones
- Stabilized by a mesentary known as the broad ligament and a pair of suspensory ligaments
- Subdivided into the medulla and cortex; cortex appears granular b/c of ovarian follicles
- Composed of connective tissue, blood vessels, nerves, lymphatic vessels, and ovarian follicles

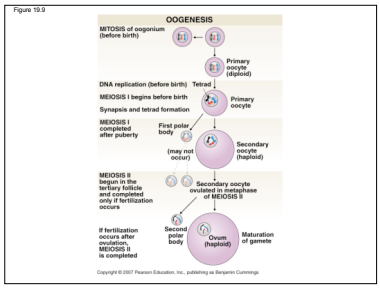


Oogenesis

- Ovum (egg cell) formation
- Begins before birth, accelerates at puberty, and ends at menopause
- Occurs once a month → ovarian cycle
- Oogonia (stem cells) complete their mitotic division before birth
- Primary oocytes (daughter cells) undergo meiosis during fetal development (3-7 months) → process stops at prophase I

Oogenesis (cont.)

- Once puberty is reached the primary oocytes that remain can then develop into follicles
- During meiosis, the primary oocyte gives rise to a secondary oocyte in which the chromosome number is reduced to half
- The division of the primary oocyte results in the unequal distribution of the cytoplasm → large secondary oocyte and 1st polar body
- Fertilization of a secondary oocyte produces a zygote → the oocyte divides unequally → second polar body and zygote result



Follicle Development

- Ovarian follicles – specialized structures in the ovaries where both oocyte growth and meiosis I of oogenesis occur
- Primordial follicles – cluster of oocytes and follicle cells → develop into primary follicle → secondary follicle
- Complete maturation as part of the ovarian cycle

The Ovarian Cycle

- 28 day cycle that includes follicular maturation, ovulation, and the luteal phase
- Follicular phase (10-14 days) – secondary follicle → tertiary follicle. Completion of meiosis I occurs which produces the secondary oocyte and begins meiosis II. Meiosis II will not be completed unless fertilization occurs.

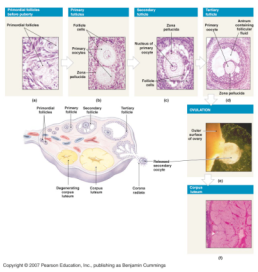
The Ovarian Cycle (cont.)

- Ovulation (day 14) – release of the secondary oocyte by the ruptured follicle

The Ovarian Cycle (cont.)

- Luteal phase – follicle collapses and remaining cells form the corpus luteum. Corpus luteum disintegrates marking the end of the 28 day cycle (unless fertilation occurs).

Figure 19.10



The Uterine Tubes

- Uterine tubes (Fallopian tubes or oviducts) – ciliated cells line the tube and peristaltic contractions in the wall help transport the secondary oocyte
- Infundibulum – funnel-shape expansion; end closest to the ovary; contains fimbriae (fingerlike projections) that help draw the oocyte into the tube
- It take s about 3-4 days for the oocyte to travel from the infundibulum to the uterine cavity; unfertilized oocytes degenerate w/out completing meiosis

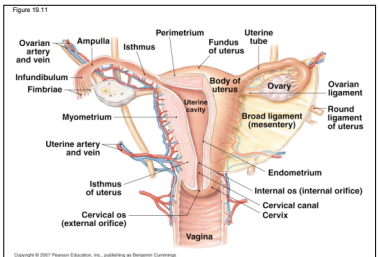
The Uterus

- Uterus – muscular chamber; receives and sustains developing embryo; contracts to deliver baby
- Consists of 2 regions: the body and cervix
  - Body – largest division, attaches to uterine tubes
  - Cervix – lower third of uterus; tubular part extends inferiorly into the upper part of the vagina
  - Uterine wall consists of the inner endometrium, muscular myometrium, and covered by the perimetrium

The Uterus (cont.)

- Pap test (smear) – The Pap test can tell if you have an infection, abnormal (unhealthy) cervical cells, or cervical cancer
- Pelvic Inflammatory Disease (PID) – bacterial infection in the uterus, uterine tubes, and ovaries (Clinical Note p.627)
- Endometriosis - occurs when the endometrial tissue that grows inside the uterus, grows outside the uterus—on the ovaries, fallopian tubes and other areas in the pelvis.

Figure 19.11



The Uterine Cycle

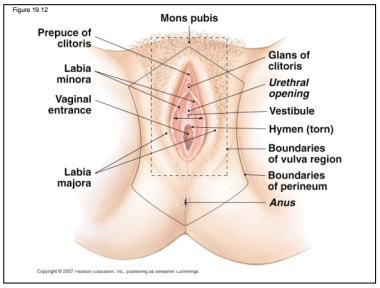
- Uterine (menstrual) cycle – repeating changes in the endometrium – 28 day cycle
- Menarche - First cycle (puberty approx. 11-12yrs)
- Menopause – last cycle (45-55 years)
- Three phases:
  - Menses - menstruation
  - Proliferative phase - repair
  - Secretory phase – prepares for arrival of embryo
- Amenorrhea – delayed menarche or disruption in normal cycle (> 6mos.)

The Vagina

- Muscular tube extending between the uterus and vestibule
- Vaginal orifice is partially closed by thin membrane called the hymen
- Functions:
  - Conveys uterine secretions to external environment
  - Receives the penis during intercourse
  - Provides an open channel for the fetus during birth

External Genitalia

- Vulva – perineal region enclosing the female external genitalia
- Vestibule – space between the labia minora that contains vaginal and urethral openings
- Labia Minora – forms margins of the vestibule; protects vaginal and urethral openings; covered with smooth hairless skin
- Labia Majora – enclose and protect external genitalia
- Mons pubis – prominent bulge created by adipose tissue
- Clitoris - contains erectile tissue; produces feelings of pleasure during sexual stimulation due to abundant sensory receptors

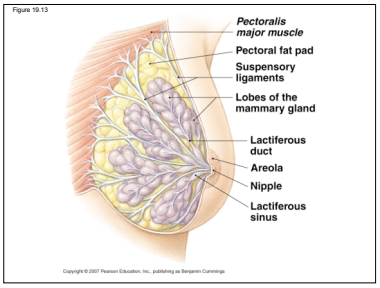


Vestibular Glands

- Greater vestibular glands – mucous glands that secrete mucus into the vestibule during sexual arousal
  - Correspond to the bulbourethral glands
- Lesser Vestibular glands – keep vestibule moist

Mammary Glands

- Specialized organs of the integumentary system that are controlled by hormones of the reproductive system; located in the breasts
- Lactation – milk production
- Each gland is composed of several lobules → each of which contain milk glands and a lactiferous duct that leads to the nipple and opens onto the body surface



Breast Cancer

- A malignant, metastasizing tumor off the mammary gland
- Almost 90% begin in the ducts and lobes of the mammary glands
- Leading cause of death in women ages 35-45, but is most common in woman over age 50.

Hormones and the Female Reproductive Cycle

- More complicated hormonal patterns than the male b/c hormones must coordinate the ovarian and uterine cycles (not coordinated → infertility)
- FSH – follicular development
- LH – triggers ovulation
- Estrogen – affect CNS (libido), stimulate bone and muscle growth, femal secondary sexual characteristics, maintaining accessory structures and glands, initiate repair and growth of endometrium, regulate GnRH secretions
- Progesterone – change the uterus
- Inhibin – inhibits secretion of FSH

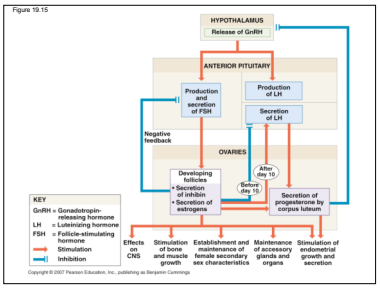
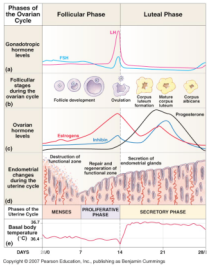


Figure 19.14



Hormones and Body Temperature

- During the follicular phase, when estrogen dominates, the body temperature is slightly lower than it is during the luteal phase, when progesterone dominates.
- At the time of ovulation, the body temperature declines sharply.
- Keeping records of body temperature over several menstrual cycles can help woman determine the exact day of ovulation.

Table 19.1

TABLE 19-1 *Hormones of the Reproductive System*

HORMONE	SOURCE	REGULATION OF SECRETION	PRIMARY EFFECTS
Gonadotropin-releasing hormone (GnRH)	Hypothalamus	*Males:* inhibited by testosterone *Females:* inhibited by estrogens and/or progestins	Stimulates FSH secretion and LH synthesis in males and females
Follicle-stimulating hormone (FSH)	Anterior pituitary gland	*Males:* stimulated by GnRH, inhibited by inhibin and testosterone *Females:* stimulated by GnRH, inhibited by estrogens and/or progestins	*Males:* stimulates spermatogenesis and spermiogenesis through effects on sustentacular cells *Females:* stimulates follicle development, estrogen production, and oocyte maturation
Luteinizing hormone (LH)	Anterior pituitary gland	*Males:* stimulated by GnRH *Females:* production stimulated by GnRH and secretion by estrogens	*Males:* stimulates interstitial cells to secrete testosterone *Females:* stimulates ovulation, formation of corpus luteum, and progestin secretion
Androgens (primarily testosterone)	Interstitial cells of testes	Stimulated by LH	Establishes and maintains secondary sex characteristics and sexual behavior, promotes maturation of spermatozoa, inhibits GnRH secretion
Estrogens (primarily estradiol)	Follicular cells of ovaries; corpus luteum	Stimulated by FSH	Stimulates LH secretion (at high levels), establishes and maintains secondary sex characteristics and behavior, stimulates breast development and secretions, inhibits secretion of GnRH
Progestins (primarily progesterone)	Corpus luteum	Stimulated by LH	Stimulates endometrial growth and glandular secretion, inhibits GnRH secretion
Inhibin	Sustentacular cells of testes and follicle cells of ovaries	Stimulated by FSH and factors released by developing sperm (*male*) or developing follicles (*female*)	Inhibits secretion of FSH (and possibly GnRH)