Exercises 42 & 43
Anatomy & Physiology of the Reproductive System

Male reproductive organs
Male Reproductive Organs

posterior view

Ampulla
Seminal vesicle
Ejaculatory duct
Bulbourethral gland
Prostate gland
Epididymis
Testis
Penis
Urethra
Glans penis

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Structure of the Testes
Formation of Sperm Cells
Spermatogenesis
• the genetic information in sperm cells and egg cells varies from cell to cell
Structure of a Sperm Cell
Male Internal Accessory Organs

- epididymides
- vasa deferentia
- seminal vesicles
- prostate gland
- bulbourethral glands
Epididymides

- tightly coiled tubes
- connected to ducts within testis
- promote maturation of sperm cells
Vas Deferens

- muscular tubes
- about 45 cm each
- extends from epididymis to ejaculatory duct
- contained within the spermatic cord part of the way
Seminal Vesicles

- attached to vas deferens near base of bladder
- secrete alkaline fluid
- secrete fructose and prostaglandins
- contents empty into ejaculatory duct
Prostate Gland

- surrounds proximal portion of urethra
- ducts of gland open into urethra
- secretes a thin, milky, alkaline fluid
- secretion enhances fluid mobility
- composed of tubular glands in connective tissue
- also contains smooth muscle
• inferior to the prostate gland
• secrete mucus-like fluid
• fluid released in response to sexual stimulation
Semen

• sperm cells
• secretions of seminal vesicles, prostate gland, and bulbourethral glands
• slightly alkaline
• prostaglandins
• nutrients
• 120 million sperm cells per milliliter
Scrotum

- pouch of skin and subcutaneous tissue
- dartos muscle – smooth muscle in subcutaneous tissue; contracts to cause wrinkling of the scrotum
- medial septum divides scrotum into two chambers
- each chamber lines with a serous membrane
- each chamber houses a testis and epididymis
Penis

• conveys urine and semen
• specialized to become erect for insertion into the vagina
Penis

Superficial dorsal vein
Deep dorsal vein
Dorsal nerve
Dorsal artery
Deep artery
Corpora cavernosa
Tunica albuginea
Urethra
Corpus spongiosum
Prepuce
Glans penis

Skin
Subcutaneous tissue
Connective tissue (fascia)
External urethral orifice

(a)
# Functions of the Male Reproductive Organs

<table>
<thead>
<tr>
<th>Organ</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Testis</td>
<td></td>
</tr>
<tr>
<td>Seminiferous tubules</td>
<td>Produce sperm cells</td>
</tr>
<tr>
<td>Interstitial cells</td>
<td>Produce and secrete male sex hormones</td>
</tr>
<tr>
<td>Epididymis</td>
<td>Stores sperm cells undergoing maturation; conveys sperm cells to ductus deferens</td>
</tr>
<tr>
<td>Ductus deferens</td>
<td>Conveys sperm cells to ejaculatory duct</td>
</tr>
<tr>
<td>Seminal vesicle</td>
<td>Secrete an alkaline fluid containing nutrients and prostaglandins that helps neutralize the acidic components of semen</td>
</tr>
<tr>
<td>Prostate gland</td>
<td>Secrete an alkaline fluid that helps neutralize the acidic components of semen and enhances sperm cell motility</td>
</tr>
<tr>
<td>Bulbourethral gland</td>
<td>Secrete fluid that lubricates end of the penis</td>
</tr>
<tr>
<td>Scrotum</td>
<td>Encloses, protects, and regulates temperature of testes</td>
</tr>
<tr>
<td>Penis</td>
<td>Conveys urine and semen to outside of body; inserted into the vagina during sexual intercourse; the glans penis is richly supplied with sensory nerve endings associated with feelings of pleasure during sexual stimulation</td>
</tr>
</tbody>
</table>
Hormonal Control of Male Reproductive Functions

- The hypothalamus controls the maturation of sperm cells and development of male secondary sex characteristics.
- Negative feedback among the hypothalamus, the anterior lobe of the pituitary gland, and the testes controls the concentration of testosterone.
Organs of the Female Reproductive System

- Uterine tube
- Ovary
- Uterus
- Urinary bladder
- Symphysis pubis
- Urethra
- Clitoris
- Labium minus
- Labium majus
- Vaginal orifice
- Fimbriae
- Rectouterine pouch
- Fornix
- Cervix
- Rectum
- Vagina
- Anus

(a)
Oogenesis

• the process of egg cell formation
Follicle Maturation

Primordial follicle

Mature (Graafian) follicle
Follicle Maturation
Ovulation

- Uterine tube
- Oocyte
- Ovary
Ovulation

Corpus albicans

Corpus luteum

Ovulation

Uterine tube

Secondary oocyte

Zona pellucida

Corona radiata

Primordial follicle

Primary follicle

Ovary

Follicular cells

Primary oocyte

Follicular fluid

First polar body
Female Internal Accessory Organs

- uterine tubes
- uterus
- vagina
Uterine Tubes

- convey eggs toward the uterus
Lining of Uterine Tubes

(a) Connective tissue layer, basement membrane, nucleus, cytoplasm, cilia

(b)
Uterine Wall

- **Lumen**
- **Endometrium**
- **Myometrium**
- **Perimetrium**
Uterus

- hollow muscular organ that receives the embryo that has been fertilized in the uterine tube
• fibromuscular tube that conveys uterine secretions, receives the penis during intercourse, and provides an open channel for offspring
Female External Reproductive Organs

- labia majora
- labia minora
- clitoris
- vestibular glands
Mammary Glands

- located in the subcutaneous tissue of the anterior thorax within the breasts
- composed of lobes
- estrogens stimulate breast development in females
# Functions of the Female Reproductive Organs

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<tr>
<th>Organ</th>
<th>Function</th>
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<tr>
<td>Ovary</td>
<td>Produces oocytes and female sex hormones</td>
</tr>
<tr>
<td>Uterine tube</td>
<td>Conveys secondary oocyte toward uterus; site of fertilization; conveys developing embryo to uterus</td>
</tr>
<tr>
<td>Uterus</td>
<td>Protects and sustains embryo during pregnancy</td>
</tr>
<tr>
<td>Vagina</td>
<td>Conveys uterine secretions to outside of body; receives erect penis during sexual intercourse; provides open channel for offspring during birth process</td>
</tr>
<tr>
<td>Labia majora</td>
<td>Enclose and protect other external reproductive organs</td>
</tr>
<tr>
<td>Labia minora</td>
<td>Form margins of vestibule; protect openings of vagina and urethra</td>
</tr>
<tr>
<td>Clitoris</td>
<td>Produces feelings of pleasure during sexual stimulation due to abundant sensory nerve endings in glans</td>
</tr>
<tr>
<td>Vestibule</td>
<td>Space between labia minora that contains vaginal and urethral openings</td>
</tr>
<tr>
<td>Vestibular glands</td>
<td>Secrete fluid that moistens and lubricates the vestibule</td>
</tr>
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</table>
Hormonal Control of Female Reproductive Functions

- Estrogens inhibit LH and FSH during most of the reproductive cycle.
# Female Reproductive Cycle

<table>
<thead>
<tr>
<th>Major Events in a Reproductive Cycle</th>
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<tr>
<td>1. The anterior pituitary gland secretes FSH and LH.</td>
</tr>
<tr>
<td>2. FSH stimulates maturation of a follicle.</td>
</tr>
<tr>
<td>3. Granulosa cells of the follicle produce and secrete estrogens.</td>
</tr>
<tr>
<td>a. Estrogens maintain secondary sex traits.</td>
</tr>
<tr>
<td>b. Estrogens cause the endometrium to thicken.</td>
</tr>
<tr>
<td>4. The anterior pituitary gland releases a surge of LH, which stimulates ovulation.</td>
</tr>
<tr>
<td>5. Follicular and thecal cells become corpus luteum cells, which secrete estrogens and progesterone.</td>
</tr>
<tr>
<td>a. Estrogens continue to stimulate uterine wall development.</td>
</tr>
<tr>
<td>b. Progesterone stimulates the endometrium to become more glandular and vascular.</td>
</tr>
<tr>
<td>c. Estrogens and progesterone inhibit secretion of FSH and LH from the anterior pituitary gland.</td>
</tr>
<tr>
<td>6. If the secondary oocyte is not fertilized, the corpus luteum degenerates and no longer secretes estrogens and progesterone.</td>
</tr>
<tr>
<td>7. As the concentrations of luteal hormones decline, blood vessels in the endometrium constrict.</td>
</tr>
<tr>
<td>8. The uterine lining disintegrates and sloughs off, producing a menstrual flow.</td>
</tr>
<tr>
<td>9. The anterior pituitary gland is no longer inhibited and again secretes FSH and LH.</td>
</tr>
<tr>
<td>10. The reproductive cycle repeats.</td>
</tr>
</tbody>
</table>
The order of hormone peaking is deceptive in diagrams such as these (& the one in the text).

Order typically proceeds like this:
E2 – targets granulosa cells
FSH – follicle (the support structure for the ova) matures
LH – Peaking of this hormone ovulation
P4 – Slowly peaks after ovulation & lasts for awhile to support any potential early embryo