Female Reproductive System

A. Functions

1. Oogenesis

2. Copulation – receive sperm from male

3. Hormone production

4. Provide sites for egg fertilization, implantation & development

5. Acts as birth canal

6. Lactation

B. Structures

1. Internal Structures

A) Ovaries – produce egg and hormones

1) Covered by 2 cell layers

a) Germinal epithelium – outer layer

i) Cuboidal cells

b) Tunica albuginea – inner layer

i) Fibrous CT

2) Interior is composed of numerous sac-like structures (ovarian follicles)

a) Each contains an oocyte

B) Uterine tubes – conduct egg to uterus, location of fertilization

1) Infundibulum – expanded opening at the proximal end (near the ovary)

2) Fimbriae – finger-like extensions of the infundibulum

a) Not directly attached to the ovary

b) Help “sweep” the egg into the uterine tube

3) Takes 3 days for an egg to pass through

C) Uterus – site of implantation & development

1) 3 tissue layers

a) Endometrium – inner layer; simple columnar epithelium

b) Myometrium – middle layer; smooth muscle tissue

c) Perimetrium – outer layer; simple squamous and areolar CT

2) Cervix – narrow neck of the uterus that projects into the vagina inferiorly

a) Contains openings to the uterus & vagina

i) External & internal os – openings between cervix & vagina and

the cervix & uterus respectively

D) Vagina – receives sperm during copulation; serves as birth canal

1) 3 tissue layers

a) Mucosal layer – inner layer; non-keratinized stratified squamous

b) Muscular layer – middle layer; smooth muscle

c) Fibrous layer – outer layer; areolar CT

2) Fornix – clefts created where the vagina surrounds the cervix

3) Vaginal orifice – opening between the vaginal canal the outside the body

a) Is usually partially covered by a thin mucus membrane known as the hymen

until the time of first intercourse

2. External Structures (collectively known as the vulva)

A) Labia majora

1) Hair-covered, longitudinal folds comprised mostly of adipose covered by skin

2) Enclose and protect other external structures

B) Labia minora

1) Hairless, flattened, longitudinal folds located in the cleft between the labia

majora; composed largely of CT

2) Close to cover and protect vaginal and external urethral openings

3) Vestibule – region between the labia minora

a) Contains the vaginal and urethral orifices

b) Vestibular glands – produce mucus to facilitate copulation; analogous to the

bulbourethral glands in males

c) Paraurethral glands – produce mucus to facilitate copulation; analogous to the

prostate gland in males

C) Clitoris

1) Located at the anterior junction of the labia minora; highly innervated by sensory

neurons

2) Functions in physiological, sexual arousal; analogous to the glans penis

D) Perineum

1) Soft tissue between vagina & anus

2) Tears or is cut (episiotomy) during natural childbirth

E) Mons Pubis

1) Rounded ridge of adipose tissue over the pubic symphysis

2) Covered with hair at puberty

C. Oogenesis & Ovulation

1. During development, primordial follicles begin forming (usually ~2 million)

A) These become inactive until puberty; many die in-between (~400,000 remain)

B) Contain 2 types of cells

1) A single primary (1o) oocyte (diploid)

a) Will become the future egg

2) Several follicular cells

a) Make up the wall of the follicle

2. At puberty, LH and FSH initiate the maturation of primordial follicles (1 each month)

into primary follicles

3. Primary follicle continues to grow resulting in a secondary follicle

A) Follicular cells are now called granulosa cells and are several layers thick

B) Has a distinct fluid-filled portion = antrum

4. Secondary follicle continues to enlarge resulting in a Graafian follicle

A) The 1o oocyte is now isolated within its own cell layer = corona radiata

1) Zona pellucida – thick transparent membrane surrounding the oocyte just

beneath the corna radiata

5. LH & FSH cause the 1o oocyte (in the Graafian follicle) to undergo meiosis I

resulting in 2 daughters

A) Secondary (2o) oocyte (haploid)

1) Obtains most of the cytoplasm and is the larger of the 2

2) Will go on to become egg

B) First polar body

1) Much smaller than secondary oocyte

2) Contains 1 set of chromosomes and left-over cytoplasm

3) Will eventually degenerate

6. The follicle then fuses with the membrane of the ovary and continues to fill with fluid

resulting is a blister-like structure

7. LH causes the walls of the follicle to weaken and the follicle bursts releasing the

secondary oocyte into the uterine tube = ovulation

A) The walls of the ruptured follicle stay in the ovary becoming the corpus luteum

8. If fertilization occurs, the 2o oocyte undergoes meiosis II resulting in 2

daughters

A) One fertilized ovum (egg) or zygote (diploid)

1) Will develop into an embryo

B) Second polar body

1) Similar to first polar body in structure

2) Will also degenerate

9. If no fertilization, meiosis II won’t occur, the 2o oocyte moves to the uterus and is

discharged during menses

D. Ovarian cycle (usually 28 days)

1. Follicular phase – FSH begins development of the follicle; days 1-13

2. Ovulation – LH causes release of the egg into the uterine tube; day 14

3. Luteal phase – corpus luteum forms from remains of Graafian follicle; days 15-28

A) produces estrogen and progesterone in preparation for implantation & inhibin to

inhibit further follicle maturation

1) If no implantation occurs, corpus luteum degenerates, hormone production

ceases, and menses & follicular maturation begin

a) The resulting structure is referred to as the corpus albicans, which will

eventually degenerate

2) If implantation occurs, human chorionic gonadotropin (hCG) is produced by the

developing embryo to maintain the corpus luteum until the placenta develops

E. Uterine cycle (usually 28 days)

1. Menses – sloughing off of the uterine lining; days 1-5

2. Proliferative phase – prior to ovulation; endometrium thickens and develops more

blood vessels in preparation for implantation; days 6-14

3. Secretory phase – after ovulation; uterine lining produces estrogen and progesterone in

preparation for implantation; days 15-28

A) If no implantation occurs, the cycle starts over and menses begins again

B) If implantation occurs, the cycle will stop until the end of the pregnancy

F. Menopause – cessation of menstruation

1. Occurs 45-55 years of age

2. Ovaries fail to respond to FSH

3. Number of remaining follicles decrease

4. Estrogen levels decline

5. Hot flashes and mood swings common due to hormonal imbalances

G. Hormones (review LH & FSH from endocrine chapter)

1. Ovaries

A) Estrogens

1) Actually a group of hormones

2) Estradiol is the most common

3) Have a number of functions

a) Enlargement of vagina, uterus, uterine tubes, and ovaries

b) Responsible for secondary sex characteristics

i) Development of the breasts and mammary glands

ii) Increased deposits of adipose, mostly in breasts, thighs, and buttocks

iii) Increased blood flow to skin

B) Progesterone

1) Promotes changes in the uterus

2) Involved with mammary gland maturation

3) Regulates hormones of the anterior pituitary (LH & FSH)

2. Adrenal Gland

A) Androgens

1) Secreted by the adrenal cortex

2) Physical changes depends on its concentration

a) Low concentrations

i) Results in narrow shoulders and broad hips

b) High concentrations

i) Cause increased hair growth in axillary and pubic regions

3) Also responsible for female libido

H. Mammary Glands

1. Modified sweat glands present in both sexes

2. Functional only in females in response to prolactin

3. Purpose is production and ejection of milk

4. Alveolar cells secrete the milk and are clustered in lobules

5. Each lobule drains into lactiferous duct which dilates to form a lactiferous sinus just

beneath the areola

A) Site of milk accumulation during nursing

6. Areola

A) The pigmented portion of the breast with a protruding nipple

7. Nipple

A) Contains openings of lactiferous ducts

I. Birth Control

1. Condoms (97-99%)/diaphragms (82-98%) – prevent sperm from entering the cervix

2. Intrauterine devices (IUDs) (97-99%) – damage sperm passing through the cervix

3. Pills (98-99.5%) – prevent ovulation

4. Injections (99-99.7%) – prevent ovulation

5. Sterilization (98-99.4%)

A) Vasectomy – the vas deferens are severed and sealed to prevent sperm from being

released during ejaculation

B) Tubal ligation – the uterine tubes are severed and sealed to prevent sperm from

reaching the egg

6. Rhythm method (75-99%) – female breaks down her monthly cycle into “safe” and

“unsafe” days; she refrains from sexual activity or uses other birth control on “unsafe”

days

7. Withdrawal method (81-96%) – male withdraws before climax to prevent the release of

sperm into the female

J. Disorders

1. Pelvic inflammatory disease (PID) – results from a bacterial infection of the uterus,

uterine tubes, or other reproductive structures causing inflammation of the infected

structures

2. Cervical cancer – most common among women ages 30-50

A) Seen with higher frequency when there is a history of sexually transmitted diseases

(especially HPV) or multiple pregnancies

3. Amenorrhea – abnormal cessation of menses

4. Dysmenorrhea – painful menstruation

5. Endometriosis – over production of endometrium

6. Breast cancer – cancer of the glandular breast tissue

A) #1 cancer among women in the U.S.

B) #1 cancer killer in women worldwide

7. Ectopic pregnancy – when the fertilized ovum implants in tissue other than the uterus

A) Commonly in the uterine tubes but can also occur in cervix, ovaries, and abdomen