Lecture Notes: **Reproductive System**

I) Introduction

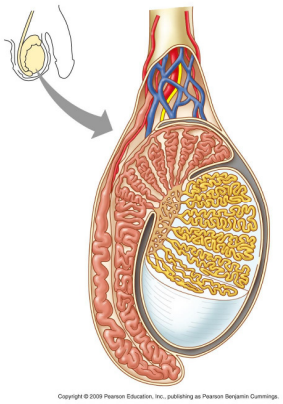
A) General:

1) Gonads: primary sex organ

2) Function:

(a) Produce gametes (sex cells)—eggs and sperm

(b) Produce hormones



B) **Male reproductive system**

1) Gonad: **testes**

(a) **Seminiferous tubules** —spermatogenesis

(b) **Interstitial cells** —lie between sminiterous tubules and produce testosterone (male sexual characterstics)

(c) **Scrotum** (skin sac hangs outside adominopelvic cavity)

(d) Temperature regulation for spermatogenesis

2) Duct System:

(a) **Epididymis**

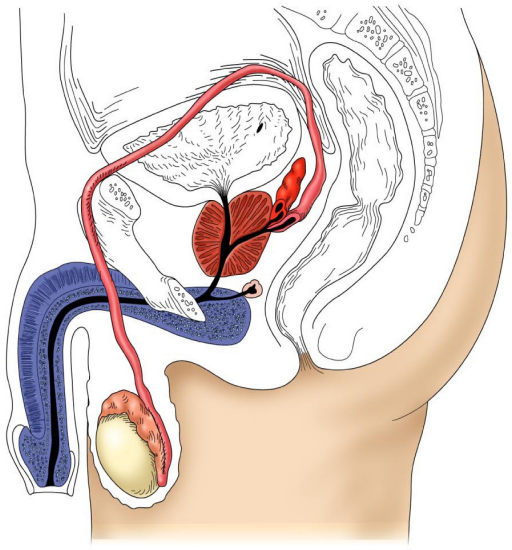
(1) long, highly coiled tube (20 ft)

(2) Function:

(a) **capacitation**: sperm maturation/motility (minimum 16-18 hours to become viable)

(b) sperm storage (8 weeks)

(c) recycled/phagocytized



(b) **Vas deferens (ductus deferens)** (18")

(1) propels sperm from epidymis to urethra by peristalsis

(2) vasectomy

(c) **Urethra**

(1) urinary system: urine transport

(2) reproductive system: semen/sperm transport

3) **Semen** = sperm + accessory gland secretions

(a) (pair) **seminal vesicles** (60% volume)

(1) Fructose (motility)

(2) Prostaglandins-stimulate uterine peristalsis and decrease mucus viscosity to aid entry

(b) **Prostate gland** (30% volume)

(1) Encircles base bladder

(2) Activate sperm

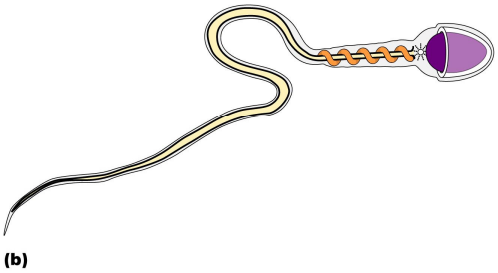
(c) (pair) **Bulbourethral (cowpers) glands**

(1) Neutralize acidic conditions of male urethra

4) **Sperm** (male gamete)

(a) Head: (DNA) 23 Chromosomes

(b) **Acrosome**: contains enzyme (hyaluronidase) which digests ovum's plasma membrane to allow for sperm penetration/ fertilization



(c) **Midpiece** or middle piece: many mitochondria and small amounts of stored food

(d) **Flagella** motility (3-4 inches per hour)

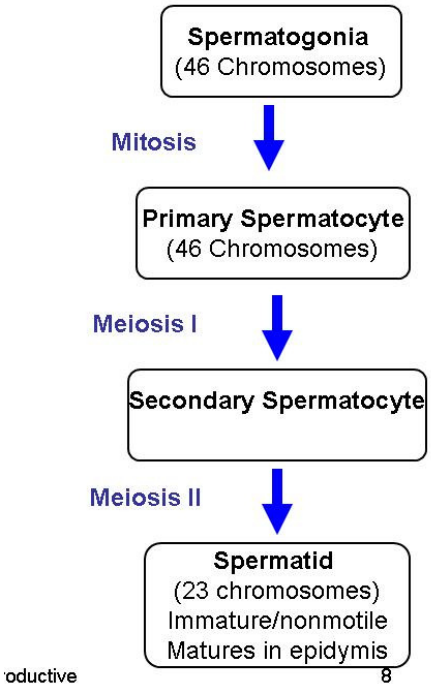
C) Gametogenesis: Spermatogenesis

1) Location: seminiferous tubules

2) **Spermatogonia** (stem cell)
(a) mitotic (clones)
(b) primary spermatocyte (46 DNA)

3) **meiosis**: type of cell division that produces gametes, cells with ½ number of chromosomes as parent cell
(a) Meiosis I (IPMAT)
(b) Meiosis II (PMAT)

4) 64-72 days



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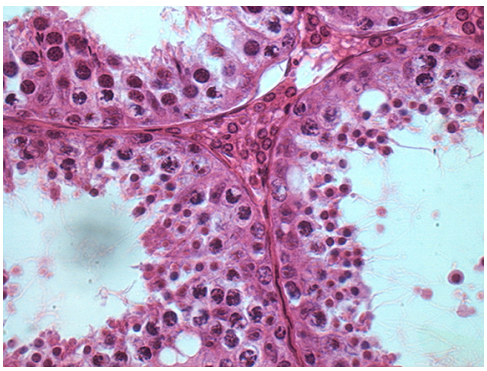
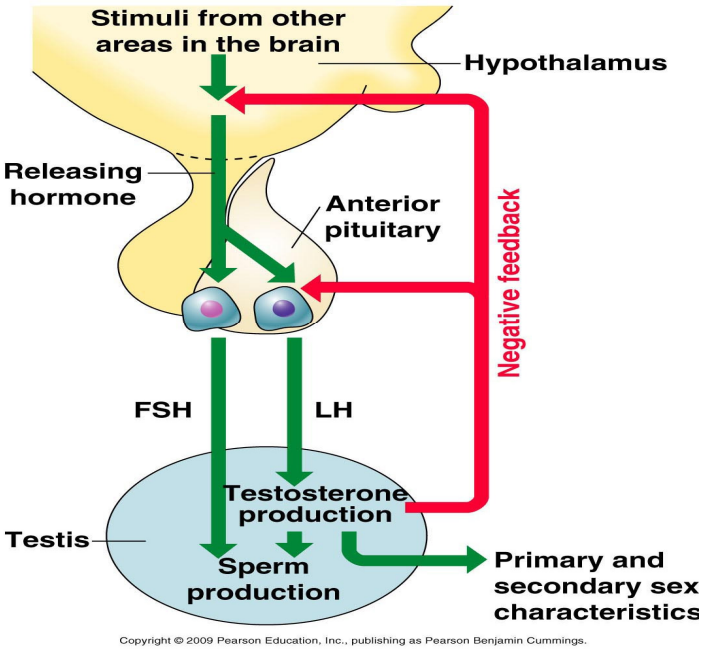


D) **Reproductive hormones of the male**

1) **Gonadotropin-releasing hormone** (GnRH):
   (a) Produced by hypothalamus
   (b) Function: Stimulate anterior pituitary to produce and release FSH and LH

2) **FSH** (Follicle Stimulating Hormone)
   (a) produced by anterior pituitary gland
   (b) Function: stimulate spermatogenesis

3) **LH** (Leutenizing hormone)
   (a) produced by anterior pituitary gland
   (b) Function: stimulate interstitial cells to produce testosterone



4) **Testosterone**: main male sex hormone
   (a) Development and functioning of the ♂sex organs
   (b) regulate the testosterone levels in the blood
   (c) Development/maintenance of secondary sexual characteristics (features of nonreproductive system organs!)
      (1) Greater height than ♀
      (2) Greater muscle mass
      (3) Broad shoulders
      (4) Longer legs relative to trunk length
      (5) Deeper voices/ More pronounced Adam's apple (part of the larynx)
      (6) Distribution of body hair/ Receding hair line

E) **Female reproductive system**

1) General:
   (a) Gonad: Ovary (paired) held in position by ligaments
   (b) site of gametogenesis/oogenesis
   (c) born with $2(10^6)$ partially formed, decreases to 400,000 by puberty and only 400 mature
   (d) Produce hormones (estrogen/progesterone)
   (e) Protect/nurture developing fetus

2) Gametogenesis: Oogenesis/Ovarian Cycle

(2) **Gametogenesis**: oogenesis (occurs prior birth)

Oogonium
(before birth) Mitotic-46 chromosomes

↓ **Mitosis**

Primary Oocyte
(before birth) 46 chromosomes
Suspended animation (puberty)—FSH and LH

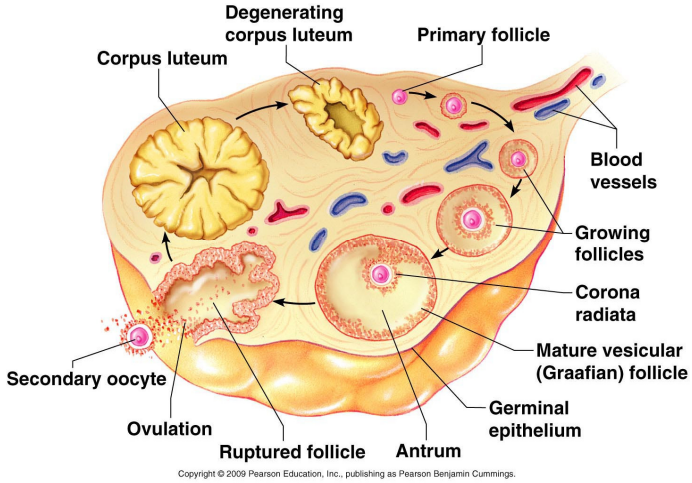
↓ **Meiosis I**

Polar Body

Secondary Oocyte
(Puberty)
Follicular cells producing hormones
(create antrum)

(Follicular cells remain in ovary)
Corpus luteum: *temporarily*
Continues
to produce progesterone
to inhibit FSH and LH
preventing another
ovum from maturing

Peak of LH
triggers ovulation
Secondary Oocyte
Travels oviduct
Completes meiosis II
ONLY if fertilized



3) Uterine tubes or Fallopian Tubes
   (a) 4" long funnel with fimbriae (finger-like projections catch oocyte
   (b) lined with ciliated epithelial cells
   (c) smooth muscle (peristalsis)

4) Uterus
   (a) size/shape pear
   (b) myometrium (muscle)—rhythmic contractions
   (c) endometrium: mucosal lining undergoes cyclic changes (shed during menses)
   (d) site of embryo implantation and development

5) cervix: narrowed neck

6) vagina

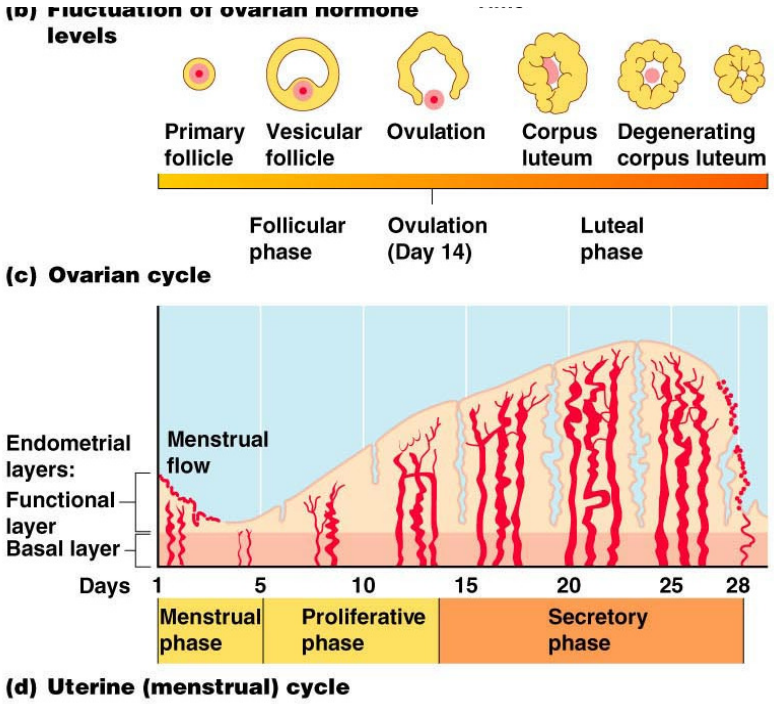
F) **Reproductive hormones of the female**

1) **Gonadotropin-releasing hormone (GnRH):**
   (a) Produced by hypothalamus
   (b) Function: stimulates anterior pituitary gland to produce FSH and LH

2) **FSH** (Follicle Stimulating Hormone)
   (a) Produced by anterior pituitary gland
   (b) gametogenesis

3) **LH** (leutenizing hormone)
   (a) Produced by anterior pituitary gland
   (b) Stimulates follicular cells to produce female hormones
   (c) Triggers maturation and ovulation

4) **Estrogen** (ovary—developing follicles/follicular cells)
   (a) Stimulate growth, maturation and maintenance of female reproductive organs
   (b) promote proliferative phase of uterine cycle-prepares uterus for implantation



5) **Progesterone** (ovary—follicular cells/corpus luteum)
   (a) promotes uterine secretory phase
   (b) maintains uterus during pregnancy
   (c) causes mammary glands to mature and produce milk during pregnancy

G) **Uterine cycle**: Average cycle lasts 28 days.

1) **Days 1-5 Menstrual phase**
   (a) Uterus/ endometrium is shed

2) **Days 6-13 Proliferative phase**
   (a) Estrogen prepares uterus
   (b) Increase blood supply/glandular epithelium

3) *Day 14 (LH Peaks) ovulation*

4) **Days 15-28 Secretory phase**
   (a) endometrium prepares for implantation (low FSH and LH)
   (b) progesterone promotes vascular growth and glands secrete nutrients to sustain embryo
   (c) *no fert→ corpus luteum stops progesterone and FSH/LH rise and repeats*

H) **Fertilization and pregnancy:**

1) Fertilization occurs within 24 hrs of ovulation within the upper (fallopian) uterine tube
2) The dividing mass of cells travels down the fallopian tube
3) Embryo implants in the endometrium
4) from fertilization to implantation—about 14 days
5) NOTE: 60% of all fertilized eggs fail to implant

6) The placenta develops from fetal and maternal tissue
    (a) **Human chorionic gonadotropin** (HCG): maintains the corpus luteum until chorion can produce enough progesterone to inhibit maturation and ovulation of another oocyte