Gonads = ovaries
Gametes = ova (one/month)
Unlike the male, mostly internal

Female repro system must produce gametes AND maintain developing embryo
Overview of Anatomy
**Ovaries**

**Retroperitoneal**
- Broad Ligament
- Suspensory Ligament

**Functions:**
- Ovum production
- Hormone production

**Circulation:**
- Ovarian Artery and Vein
Histology

- Capsule: Tunica albuginea
- Germinal epithelium (misnomer)
- Ovarian cortex with developing gametes
- Medulla has blood supply
**Oogenesis** (= ovum production)

Takes place inside ovarian follicles in ovaries as part of ovarian cycle

**Oogonia** (= stem cells) complete mitotic divisions before birth

At birth: \(\sim 2 \times 10^6\) primary oocytes

At puberty: \(\sim 400,000\) primary oocytes

40 years later: 0 (even though only \(\sim 500\) used) \(\Rightarrow\) Atresia
Oogenesis

Ovarian cycles start at puberty under influence of estrogen.

Ovulation

Fig 24.15
Oogenesis

1. **Primordial follicle**
   1. A dormant stage, ready to develop
   2. Each month some proceed
   3. Most (99%) atrophy (**atresia**)
Oogenesis

2. Primary follicle (days 3-8)
   1. Double layer of theca cells
   2. Enlargement due to estrogen
   3. More atresia
Oogenesis

3. **Secondary follicle (days 8-10)**
   1. Liquor folliculi appears
   2. Theca more developed
   3. Granulosa cells producing estrogen, under influence of FSH
   4. Zona pellucida visible
Oogenesis

4. **Tertiary (Graafian or vesicular) follicle (days 11-14)**
   1. Ready for ovulation
   2. Theca well developed
   3. Granulosa cells secreting estrogen
   4. First meiosis completed

- CO = Cumulus oophorus
- G = Granulosa cells
- CR = corona radiata
Tertiary or Graafian Follicle

- Spans entire width of cortex
- First meiotic division being completed: 1° oocyte divides into one 2° oocyte and one polar body
Ovarian cyst

Cyst = bag, usually filled with fluid

Usually follicular or luteal cysts.
Ovulation

Oocyte and follicular cells shed into abdominal cavity and collected by fimbria

then

1. Empty follicle forms corpus luteum which produces progesterone
2. Corpus luteum degenerates and becomes corpus albicans
3. GnRH increases under low estrogen and progesterone levels
Menstrual Cycle

- Day 1: first day of menses (period)
- Days 7-14: Proliferative phase
  - Follicle develops, secretes estrogen
- Day 14: Ovulation
- Days 14-28 (luteal phase):
  - Corpus luteum forms from follicle, secretes progesterone, eventually becomes corpus albicans

(c) Fluctuation of ovarian hormone levels
Uterine Tube

= Fallopian tube =

oviduct = salpinx

Infundibulum with fimbriae
- Ampulla (place of fertilization)
- Isthmus
- Intramural portion

Most common site of ectopic pregnancy

Tubal ligation
Uterine Tube Histology

- Ciliated and non-ciliated simple columnar epithelium
- Ciliary movement and periodic peristaltic contractions move ova
- Secretion of nutrient substances
The Uterus = Womb

Fundus, Body, Isthmus, Cervix

Uterine wall ~ 1.5 cm
made up of
1. Endometrium,
2. Myometrium,
3. Incomplete perimetrium (visceral peritoneum)

Blood supply
- Uterine arteries from internal iliac
- Ovarian arteries from abdominal aorta (inferior to renal arteries)

fig 24.11
Histology of Endometrium

- **Functional zone** – deciduum, sheds during menses
  - menstruation - flow sheds functionalis layer of endometrium
  - proliferative phase - under influence of estrogen basal cells proliferate
  - secretory phase - progesterone maintains functionalis

- **Basilar zone** – permanent layer, deep to functionalis
Functions of Uterus

- Protection of embryo/fetus
- Nutritional support
- Waste removal
- Ejection of fetus at birth
Cervix and Vagina

- Cervix attaches to vagina at ~ 90° angle
  - Fibrous connective tissue
- **Fornix** – pocket surrounding uterine cervix (surgical access to pelvic cavity; location of birth control device)
- **Vagina** – fibro-muscular tube serving as
  - receptacle for intercourse
  - passageway for menstrual products
  - birth canal
- **External genitalia**
  - Labia majora and minora
  - Clitoris
  - Urethral papilla
Fertilization

- **Acrosomal Reaction**
  - Enzymes in acrosome dissolve part of zona pellucida
- **Cortical Reaction**
  - Destroys receptors for further spermatozoa
- **Fertilized zygote enters uterus at ~ day 4**
Pregnancy

- Implantation (day 6)
  - Blastocyst + trophoblast
  - Loss of zona pellucida
  - Trophoblast proliferates
  - Attachment to endometrium
Pregnancy

- **Placenta**
  - Formed from trophoblast and endometrum which is now called the chorion
  - Chorionic villi contact maternal blood supply

- Becomes an endocrine gland:
  - HCG (similar to LH) maintains the CL for 3 months
  - Later, estrogen and progesterone
  - Relaxin and human placental lactogen

- Provides nutrition and waste removal
Parturition

- Gestation ~ 280 days (266 days after last menstruation)
- Stages
  - Dilation
  - Expulsion
  - Placental
The Mammary Gland

Modified sweat gland, holocrine secretion
Overlaying the pectoralis major muscle
15-20 separate lobes separated by suspensory ligaments; each lobe contains several secretory lobules
Lactiferous ducts leaving lobules; converge into 15-20 lactiferous sinuses
Site of most breast cancers
Milk stored in lactiferous sinus until released at tip of nipple, influenced by oxytocin
The nipple is surrounded by the areola
Lymphatic Drainage of Mammary Glands . . . . is of considerable clinical importance, why ??
Breast Cancer

- Although breast cancer is primarily a disease of women, about 1% of breast cancers occur in men.
- Breast cancer is the most common type of cancer in women and is the second leading cause of death by cancer in women, following only lung cancer.
- In 2000, the American Cancer Society estimated that 184,200 new cases of breast cancer were diagnosed in the United States.
- The average woman at age 30 years has 1 chance in 280 of developing breast cancer in the next 10 years. This chance increases to 1 in 70 for a woman aged 40 years, and to 1 in 40 at age 50 years. A 60-year-old woman has a 1 in 30 chance of developing breast cancer in the next 10 years.
- DCIS or IDC
The Systems

(a) Integumentary System
Forms the external body covering; protects deeper tissues from injury; synthesizes vitamin D; site of cutaneous (pain, pressure, etc.) receptors, and sweat and oil glands.

(b) Skeletal System
Protects and supports body organs; provides a framework the muscles use to cause movement; blood cells are formed.

(c) Muscular System
Allows manipulation of the environment, locomotion, and facial expression; maintains body temperature.

(d) Nervous System
Fast-acting control system of the body; responds to internal and external changes by activating appropriate muscles and glands.

(e) Endocrine System
Glands secrete hormones that regulate processes such as growth, reproduction and nutrient use (metabolism) by body cells.

(f) Cardiovascular System
Blood vessels transport blood, which carries oxygen, carbon dioxide, nutrients, wastes, etc.; the heart pumps blood.
Repetitio est mater studiorum!