CHAPTER 27 REPRODUCTIVE

Reproductive System

- Homeostasis of the Species

  strategies of life

- need more individuals
- need way for species to survive vs. environment:
  - make a lot of individuals ; identical
  - make a few individuals ; variety

  sexy words

- genitalia sex organs
- DNA genetic code
- sex cells gametes
  - ovum
  - sperm
- primary sex organs = gonads
  produce sex cells
  produce hormones
  - ovaries
  - testes
- accessory sex organs aid sex cells, organs

  purpose of sex :

- to join sex organs ?
- to join gametes ?
- to join DNA ?

  genetics

- chromosome 1 molecule of DNA
  many genes
- humans have 23 different chromosomes
  - haploid # = 23
- humans have pairs of each chromosome
  - diploid # = 46 (23 pairs)

  mitosis

- 1 diploid cell → 2 diploid cells
- identical daughter cells

  this is how tissues grow - increase # of cells

  problem :

- How can we get variety ?
- How can we keep diploid # ?
Meiosis

- 1 diploid cell → 4 different haploid cells
- haploid cells = gametes

- 2 cell divisions w/ only 1 DNA replication
  - meiosis I
  - meiosis II

- provides genetic variety

Meiosis

- mitosis 1 diploid cell → 2 identical diploid cell
- meiosis 1 diploid cell → 4 different haploid cells

- sex cells = gametes haploid cells
  - male sperm spermatogenesis
  - female ovum oogenesis

- zygote united ovum and sperm diploid new individual

spermatogenesis

- spermatogonia stem cells
- primary spermatocyte start meiosis I
- secondary spermatocyte start meiosis II
- spermatids after meiosis II
- spermatozoa developed flagella

- where?
  - spermatogenesis seminiferous tubules
  - sperm maturation epididymis

Testes

- produces sperm, hormones
- seminiferous tubules produce sperm
- rete testis collects sperm, posteriorly
- sustentacular cells (Sertoli) blood-testis barrier
- interstitial cells (Leydig) testosterone
- tunica vaginalis serous lining of scrotum
  - abdominal peritoneum
- tunica albuginea fibrous capsule of testis

scrotum

- contains testes
- skin and connective tissues
- sperm require ~ 34°C to develop

- cremaster muscles pulls testis closer
- dartos muscle wrinkles skin to retain heat
- sperm
  - head
    - nucleus DNA
    - acrosome hydrolytic enzymes
  - midpiece
    - mitochondria
    - nutrients glucose, ATP, water
  - flagellum

- path of sperm
  - testes – seminiferous tubules
  - rete testis
  - epididymis
  - ductus deferens = vas deferens
  - ejaculatory duct
  - prostatic urethra
  - membranous urethra
  - spongy urethra

- epididymis
  - sperm maturation ~ 20 days
    - flagella become active
    - acrosome enzymes form
  - sperm storage ~ few months
  - smooth muscle

- ductus deferens
  - = vas deferens
  - transports sperm during ejaculation
  - extends from epididymis to ejaculatory duct
  - histology:
    - pseudostratified columnar epithelium
    - thick muscularis layer
    - peristalsis
  - spermatic cord = ductus deferens + testicular vessels and nerves

- seminal vesicles
  - 2, on posterior wall of bladder
  - produce seminal fluid 60% of semen
    - fructose, nutrients
    - immunosuppressive
  - smooth muscle
  - ducts empty into ejaculatory duct

- prostate gland
  - inferior to bladder
  - produce secretions:
    - aid sperm motility
    - PSA prostate – specific antigen
  - ejaculatory duct ductus deferens + seminal duct
  - smooth muscle contracts during ejaculation
bulbourethral gland

- secretes mucus into urethra
- neutralizes acidity from urine

penis

- spongy urethra
- erectile bodies c.t + smooth muscle
  - corpus spongiosum vascular network
    - contains urethra
  - 2 corpora cavernosa
- bulbospongiosus muscle surrounds corpora
- glans penis sensitive tip
- prepuce foreskin

Oogenesis

- oogonia stem cells
- primary oocytes
  - meiosis I pauses at birth
  - resume meiosis I puberty
- secondary oocyte + 1st polar body
  - meiosis II
  - ovulation
    - completes meiosis II only if fertilized
- ovum + 3 polar bodies
  - gamete haploid

developing ovum

- primordial follicle = oocyte + follicle cells
- primary follicle resume meiosis
  - primary oocyte
    - granulosa cells
    - zona pellucida
    - theca folliculi
- secondary follicle
  - secondary oocyte + zona pellucida
    - antrum
    - corona radiata
- Graafian follicle
- ovum gamete

ovary - after ovulation

- ovulation
  - release of secondary oocyte from ovary

- corpus luteum
  - follicle after ovulation
  - produces progesterone
- corpus albicans
  - fibrosed corpus luteum
  - if no pregnancy
Ovary

• produces ovum; hormones
• ovarian cortex outer
  — developing oocytes
  — follicles
• ovarian medulla inner
  — blood vessels and c.t.
• tunica albuginea fibrous capsule
• attachments
  — broad ligament ovary to uterus
  — suspensory ligament ovary to pelvic wall
  — ovarian ligament ovary to uterus

fallopian tubes

• = uterine tubes = oviducts
• infundibulum open end at ovary
• fimbriae projections over ovary
• ampulla long portion
• isthmus connect to uterus
• ciliated epithelium
• smooth muscle peristalsis

• mesosalpinx part of broad ligament

uterus

• fundus upper part
• body main part
• cervix neck; extends into vagina
  — internal os opening to uterus
  — external os opening to vagina
  — cervical canal
• uterine supports
  — mesometrium broad ligt, to pelvic wall
  — round ligt of uterus to anterior body wall

uterine wall

• perimetrium outer serous layer
• myometrium smooth muscle
• endometrium mucosa lining
  — stratum basalis basal layer
    — always present
    — forms functional layer
  — stratum functionalis functional layer
    — formed each cycle
    — lost during menses
    — site of implantation
    — future placenta
**vagina**

- vagina = birth canal
- st. squamous epith. + smooth muscle
- fornix = area of vagina around cervix
- hymen = mucosa covering vaginal orifice
- greater vestibular glands = Batholin’s

**external genitalia**

- = vulva
- mons pubis = fat pad on pubic bone
- labia majora = large, outer skin folds
- labia minora = inner skin folds
- vestibule = area between labia minora
- clitoris = sensitive; erectile tissue
- fourchette = bottom of labia majora

**Mammary glands**

- modified sweat glands
- alveolar glands = produce milk
  - develop during pregnancy
- lactiferous sinus = stores milk
- lactiferous ducts = from gland to nipple
- mostly adipose
- suspensory ligaments = Cooper’s ligaments
- prolactin
  - stim alveolar glands
- oxytocin
  - stim milk release

**uterine cycle – menstrual cycle**

- loss of functional layer
  - menstrual phase = day 1 – 5
- growth of functional layer
  - proliferative phase = day 5 – 14
  - secretory phase = day 15 – 28

**ovarian cycle**

- follicular phase = day 1 - 14
  - primary and secondary follicles
  - oogenesis
- ovulation = day 14
  - secondary oocyte released from Graafian follicle
- luteal phase = day 14 - 28
  - corpus luteum = produces progesterone
    - functions ~ 10 days
  - corpus albicans
w/o fertilization

- corpus luteum degenerates
- corpus luteum stops making progesterone
- menstruation

w/ fertilization

- hCG = human chorionic gonadotropin
  - made by embryo (chorion)
  - stimulates corpus luteum

- = pregnancy test
- produced until placenta takes over ~ 3rd month

cycle changes

- menarche 1st menstrual period
- menopause end of ovulation and menstrual cycles
  - gradual ↓ ovary sensitivity to FSH and LH
  - gradual ↓ estrogen levels
- ovulation ceases ~ age 46 – 54

birth control

- Birth control meds prevent ovulation
  - estrogen + progesterone
- tubal ligation
- vasectomy
- rhythm