Reproductive Systems

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The Reproductive System

- Reproductive and urinary systems closely related
  - *Female primates*: separate systems
- Organs not always distinct
  - Many have same origin in fetus
  - Called “homologous structures”
Embryonic Development of the Sex Organs: FYI

5–6 week embryo 
sexually indifferent stage

Mesonephros
Gonadal ridge
Metanephros (kidney)
Mesonephric (Wolffian) duct
Paramesonephric (Müllerian) duct
Cloaca

Figure 24.28
The Reproductive System

- **Gonads**: essential organs of reproduction
  - *Testes* in males
  - *Ovaries* in females
    - Homologous to testes
  - secrete hormones
    - Testosterone
    - Estrogen/progesterone
Embryonic Development of the Sex Organs: FYI

7–8 week male embryo

Testes
Efferent ductules
Epididymis
Parmesonephric duct (degenerating)
Mesonephric duct forming the ductus deferens
Urinary bladder
Seminal vesicle
Urogenital sinus forming the urethra

8–9 week female fetus

Ovaries
Parmesonephric duct forming the uterine tube
Mesonephric duct (degenerating)
Fused parmesonephric ducts forming the uterus
Urinary bladder (moved aside)
Urogenital sinus forming the urethra and lower vagina

Figure 24.28
The Reproductive System

- Gonads, con’t…
  - produce gametes (sex cells)
    - Spermatozoa – male gametes
    - Ova (eggs) – female gametes
      - Homologous to sperm
      - Contain 23 chromosomes
Embryonic Development of the Sex Organs: FYI

At birth
male development

- Urinary bladder
- Seminal vesicle
- Prostate gland
- Bulbourethral gland
- Ductus deferens
- Urethra
- Efferent ductules
- Epididymis
- Testis
- Penis

At birth
female development

- Uterine tube
- Ovary
- Uterus
- Urinary bladder (moved aside)
- Vagina
- Urethra
- Hymen
- Vestibu

Figure 24.28
Male Reproductive System

- Testes
- Duct system
  - Epididymis
  - Ductus deferens
  - Urethra
Male Reproductive System

- Accessory organs
  - Seminal vesicles
  - Prostate gland
  - Bulbourethral gland
- External genitalia
  - Penis
  - Scrotum
Male Reproductive System

- **Testes**
  - form in the abdominal cavity
  - descend to the scrotum ~1 month before birth
  - pass through inguinal canal
  - cryptorchidism
Descent of Testes: FYI
Testes

- Coverings of the testes

- *Tunica albuginea* – fibrous C.T. capsule
Testes

Coverings, con’t.

- **Septa**: extensions of the capsule
  - extend into the testis
  - divide it into lobules
Testes

- Each lobule contains seminiferous tubules
- Function: to produce sperm
- Empty sperm into the rete testis
Testes

- *Interstitial cells*
  - Between seminiferous tubules
  - Produce androgens
    - Precursor to Testosterone
Epididymis

- Sperm then move to the *epididymis*
- Comma-shaped, tightly coiled tube
  - About 15’ long
- On superior, posterior part of the testis
Male Reproductive System

Figure 16.2
Epididymis

- Functions:
  - Site where sperm mature (YMCA!!)
  - Stores sperm cells (~ 20 days)
  - Expels sperm to the *vas deferens* during ejaculation
Vas Deferens (Ductus Deferens)

- Paired structures
- Carry sperm from epididymis to ejaculatory duct
  - Pass through the inguinal canal
  - Over superior surface of urinary bladder
- Move sperm by peristalsis
Male Reproductive System

Figure 16.2

Slide 16.2c
Ductus Deferens (Vas Deferens)

- Spermatic cord
  - vas deferens
  - blood vessels
    - Spermatic artery and vein
  - nerves
- in a connective tissue sheath
- OUTSIDE body cavity
Spermatic Cord

Figure 16.2c
Vas Deferens

- Ends in the *ejaculatory duct*
  - unites with prostatic urethra

- **Vasectomy** – cutting the vas deferens to prevent transportation of sperm
Urethra

- Extends from the base of urinary bladder to tip of penis
  - ~8 cm
- Carries both urine and sperm
- Sperm enter from the ejaculatory duct
Urethra

• Regions of male urethra
  • Prostatic urethra
  • Membranous urethra
  • Spongy (penile) urethra
Seminal Vesicles

- Paired structures
- Located posterior to urinary bladder
- Produce ~60% of semen
  - Fructose (sugar)
  - Vitamin C
  - Prostaglandins
  - Other substances
Male Reproductive System

Figure 16.2
Prostate Gland

- Attached to apex of urinary bladder
- Surrounds prostatic urethra
- Secretes a milky fluid
  - ~35% of semen
  - Helps activate sperm
  - Enters urethra via small ducts
Male Reproductive System

Figure 16.2
Bulbourethral (Cowper’s) Glands

- Pea-sized glands inferior to the prostate
- Produce a thick, clear mucus
  - Cleanses the urethra
  - Serves as a lubricant
  - Secreted into the penile urethra
  - May contain sperm!!
Male Reproductive System

Figure 16.2
Semen: FYI

- Mixture of sperm and accessory gland secretions
- Accessory gland secretions:
  - provide energy for sperm cells (36 kcal/tsp!)
  - Alkalinity helps neutralize the acidic environment of vagina
  - inhibit bacterial multiplication
  - contents enhance sperm motility
External Genitalia

- **Scrotum**
  - Divided sac of skin outside the abdomen
  - Maintains testes ~3°C lower than normal body temperature
    - protects sperm viability
External Genitalia

- **Penis**
  - Delivers sperm into female reproductive tract
  - **Structures:**
    - Shaft
    - Glans penis (enlarged distal portion)
    - Prepuce (foreskin)
      - removed by circumcision
External Genitalia

- Shaft of penis
  - three columns of spongy erectile tissue
    - 2 corpora cavernosa
    - 1 corpus spongiosum
      - Surrounds penile urethra
Spongy Tissue of Penis

- Erectile tissue
  - Corpus spongiosum
  - Corpora cavernosa
External Genitalia

Shaft of penis, con’t.

• Columns are filled with blood capillaries
• Engorge with blood during sexual arousal
• Cause erection of penis
• Blood drains after orgasm
Testosterone Production

- The most important male hormone
- Produced in interstitial cells
Testosterone Function

- Stimulates reproductive organ development
- Causes sex drive
- Causes secondary sex characteristics
  - Deepening of voice
  - Increased hair growth
  - Enlargement of skeletal muscles
  - Thickening of bones
Spermatogenesis: FYI

- Production of sperm cells
- Begins at puberty and continues throughout life
- Occurs in the seminiferous tubules
Processes of Spermatogenesis: FYI

- Stem cells undergo rapid mitosis before puberty
- At puberty, FSH modifies stem cell division
  - One cell produced is a stem cell
  - The other cell becomes a primary spermatocyte
Processes of Spermatogenesi: FYI

- Primary spermatocytes undergo meiosis
- Haploid spermatids are produced
  - Sperm cells result after maturing of spermatids
- Spermatogenesis takes 64 to 72 days
- Each ejaculation contains 2-4 billion sperm
Spermatogenesis

- Primary spermatocytes
- Spermatids
- Spermatozoa
Anatomy of a Mature Sperm Cell: FYI

- The only human flagellated cell
- DNA is found in the head

Figure 16.5