**REPRODUCTIVE S. (Chp. 16)**

- DNA in body and sex cells -

- **Body cells:**
  - Each body cell has 46 chromosomes (23 pairs) within the nucleus.
  - Cells that have pairs of chromosomes are called diploid (2N).

- **Sex cells:**
  - Gametes (egg and sperm) have only 23 chromosomes (1 of each pair) in their nuclei.
  - Cells that have only 1 of each pair of chromosomes is called haploid (N).
  - During fertilization a sperm and egg combine to form a zygote and the chromosome number is restored to the diploid number of 46.

---

**Mitosis and meiosis**

- **Mitosis:**
  - Is a type of duplication division in which a cell makes an exact copy of itself.
  - This process is used for growth and repair of tissues.
  - Used by body cells (cells other than sex cells).

- **Meiosis:**
  - Is a type of reduction division in which a cell halves the number of chromosomes.
  - This process is used to form eggs and sperm.
  - Used by gametes.

---

**Male anatomy**

1. Scrotum (1)- sac
2. Testes (2) (seminiferous tubules: make sperm)
3. Epididymis (2)
4. Vas deferens (2)
5. Urethra (1)
6. Penis
3 glands:
   - seminal vesicles, prostate & bulbourethral gl.
16.2 Male reproductive system

**Male anatomy: Scrotum(Temp.control) and Testes(Interstitial and Sertoli cells)**

SPERMATOGENESIS

**Sperm anatomy**

- 3 parts:
  - Head: covered by a cap called the acrosome which stores enzymes needed to penetrate the egg
  - Middle piece: contain mitochondria to make energy (ATP)
  - Tail: provides movement for the sperm

Male anatomy: 3 glands that contribute to semen

- Seminal vesicles – produce a sugary fluid that provide energy for the sperm
- Prostate gland – produces an alkaline fluid to help buffer the acidic pH in the vagina
- Bulbourethral glands – produce mucus that acts as a lubricant in the urethra
Male anatomy: Penis

- Penis:
  - organ used for sexual intercourse and urination (different times)
- Glans penis:
  - Sensitive tip of the penis usually covered by foreskin
  - Circumcision is the removal of all or part of the foreskin
  - Erectile dysfunction (impotency) occurs when the erectile tissue does not expand enough to compress the veins

Hormonal regulation in males

- Gonadotropin-releasing hormone (GnRH) – secreted by the thalamus to control release of other hormones
- Follicle-stimulating hormone (FSH) – promotes the production of sperm
- Luteinizing hormone (LH) – controls the production of testosterone
- Testosterone – important for normal development and functioning of the male reproductive organs (from interstitial cells –between seminiferous tubules in testes)
Female anatomy: Genital tract

- Ovaries – produce eggs and sex hormones
- Oviducts – moves eggs and normal site of fertilization
- Uterus – normal site of implantation and fetal development
- Cervix – opening to the uterus that can dilate during childbirth
- Vagina – birth canal and the copulatory organ of the female

Female anatomy: External anatomy

- Labia major – 2 large folds of fatty skin
- Labia minor – 2 small folds just inside the labia major that contain the opening to the urethra and vagina
- Mons pubis – fatty skin covered in coarse hair
- Clitoris – erectile organ and very sensitive
The ovarian cycle: The ovary

- Contains many follicles each containing an immature egg (oocyte)
- At puberty a female has ~300,000-400,000 follicles
- During the lifetime of a female only ~400 follicles mature
- One follicle matures each month from puberty until menopause (end of ovarian and uterine cycles discussed next)
- Ovulation is the monthly release of an oocyte from the ovary when a follicle ruptures

Anatomy of the ovary:

...Follow egg production

The ovarian cycle

- This is the formation and release of an immature egg
- Controlled by GnRH(releasing) from the hypothalamus
- 2 phases:
  - Follicular phase:
    - FSH promotes the development of a follicle that secretes estrogen
    - An estrogen spike leads to a surge in LH and ovulation around day 14 in the 28-day cycle
  - Luteal phase:
    - LH promotes the development of the corpus luteum that functions to secrete progesterone
    - When pregnancy does not occur menstruation begins
The uterine cycle

- A 28-day cyclic event in the uterus:
  - Days 1-5: low level of estrogen and progesterone causing the inner uterine lining (endometrium) to disintegrate and menstruation occurs
  - Days 6-13 (proliferative phase): increase in estrogen causing the endometrium to thicken
  - Day 14: ovulation usually occurs
  - Days 15-28 (secretory phase): increase in progesterone causes endometrium to double or triple in thickness in preparation for the developing embryo. If the egg is not fertilized then the corpus luteum regresses and the endometrium breaks down

Hormones in the ovarian and uterine phase

Some common birth control methods

- Abstinence – not engaging in sexual intercourse
- Hormonal control:
  - Birth control pills: block FSH and LH release to stop follicular development and ovulation
  - Contraceptive injections: injection of hormones (progesterone and/or estrogen) to stop ovulation
  - Contraceptive implants: synthetic progesterone to prevent ovulation
- Barrier methods:
  - IUD: small plastic piece inserted into the uterus to prevent implantation
  - Condom (male and female): blocks fertilization
  - Diaphragm: soft latex cup that covers the cervix so sperm cannot enter the uterus
- Sterilization:
  - Vasectomy: cutting and sealing the vas deferens
  - Tubal ligation: cutting and sealing the oviducts

Note: Abstinence and the use of condoms (but not 100%) are the only methods that protect against STDs
What is infertility and what causes it?

- This is the inability to achieve pregnancy after one year of regular, unprotected intercourse

- Causes:
  - Overweight females
  - Low sperm count
  - Blocked oviducts
  - Endometriosis (uterine lining out of place)

What are your options if you are infertile?

- Adoption – legal custody of a non-biological child

- Assisted reproductive technologies:
  - Artificial insemination by a donor (AID): sperm are placed inside the vagina by a trained physician
  - In vitro fertilization (IVF): conception occurs in laboratory glassware then embryos are transferred to a woman’s uterus
  - Gamete intrafallopian transfer (GIFT): similar as IVF except the eggs and sperm are placed in the oviducts immediately after they have been brought together
  - Surrogate mothers: women are legally paid to have babies
  - Intracytoplasmic sperm injection (ICSI): a single sperm is injected into an egg typically when a man has infertility problems
16.6 Sexually transmitted infections

STD’s: HIV/AIDS (See Supplement)

• HIV causes AIDS, the last stage of an HIV infection, in which the helper T cell count is low and the immune system is compromised leading to many potential opportunistic infections

• No cure but there is a treatment called highly active antiretroviral therapy (HAART) that can limit HIV reproduction

STD’s: Genital warts

• Caused by human papillomaviruses (HPVs)
• Transmitted through skin to skin contact

• Can be transmitted without symptoms
• Most people do not have symptoms but for the few that do most of them self-warts, and flat lesions, most often on the penis or opening to the vagina

• Associated with cervical cancer (up to 90% of cases)
• Most often found through regular pap smear screenings in women and other tests.
• Can be transmitted to a baby during birth
• New vaccine was developed this year to help prevent cervical cancer but doesn’t stop every strain

STD’s: Herpes

• Caused by herpes simplex virus (HSV)
• Two types
  – Type 1 is usually found above the waist
  – Type 2 is usually found below the waist (genital herpes)
• Transmitted through skin to skin contact and secretions
• Can be transmitted when there are no symptoms

• Usually have painful ulcers periodically in the same place(s) each time
• Outbreaks occur when the virus is reactivated by stress, sunlight, fever, lack of sleep etc.
• No cure but there are drugs that can keep outbreaks to a minimum or stop them entirely
• Can cause problems in a fetus during birth
STD's: Hepatitis

- An infection of the liver by one of 6 viruses (Hep A,B,C,D,E,G)
- Hep B: most commonly sexually transmitted
- Transmitted through sexual contact and by contaminated blood
- Hepatitis B can lead to liver failure
- Vaccine available for both Hep A and B

STD's: Chlamydia

- Very common bacterial infection in men and women
- Some men and most women do not have symptoms (~ 18-21 days after exposure) but if they do:
  - Male symptoms: burning during urination and a mucoid discharge
  - Female symptoms: vaginal discharge and symptoms of a UTI
- If the infection reaches the uterus, oviducts and the ovaries it can lead to pelvic inflammatory disease (PID) and sterility
- Can be transmitted to a baby during birth (causes inflammation of the eyes and/or pneumonia)

STD's: Gonorrhea

- Also a common bacterial infection in men and women
- Male symptoms (~3-5 days after contact): pain during urination and a thick, greenish yellow penile discharge
- Can also lead to PID and sterility in men and women
- Resistance to antibiotics is common in this bacterium!
- Can be contracted by a baby during birth leading to an eye infection and even blindness
Recognizing the 3 stages of syphilis

Other common infections of the reproductive tract

- **Bacterial vaginosis (BV):**
  - Accounts for ~ 50% of vaginitis in American women
  - Caused by a disruption of the normal flora in the vagina leading to an overgrowth of certain bacteria

- **Trichomoniasis**
  - Caused by a protozoan
  - Can cause a frothy discharge, with a foul smell and itching
  - Common cause of vaginitis

- **Candidiasis**
  - An overgrowth of normal yeast (fungus called Candida) in the vagina
  - Characterized by tissue that is red, inflammed and itchy; sometimes a white, curdy discharge as well
  - Birth control hormones and use of antibiotics make women more prone to this overgrowth

Health focus: Preventing transmission of STDs?

- Abstinence
- Develop long-term monogamous relationships

- Be aware if your partner is an intravenous drug user because prevalence of STDs are higher in that group
- Avoid anal-rectal intercourse
- Uncircumcised males are more likely to be infected so use caution
- Practice safer sex
  - Always use a latex condom during intercourse
  - Avoid oral sex
  - Limit or do not use alcohol and drugs that can impair your judgment or change your behavior