Chapter 28
The Reproductive Systems

• Sexual reproduction produces new individuals
  – germ cells called gametes (sperm & 2nd oocyte)
  – fertilization produces one cell with one set of chromosomes from each parent

• Gonads produce gametes & secrete sex hormones

• Reproductive systems
  – gonads, ducts, glands & supporting structures
  – Gynecology is study of female reproductive system
  – Urology is study of urinary system & male reproductive system
Chromosomes in Somatic Cells & Gametes

• Somatic cells (diploid cells)
  – 23 pairs of chromosomes for a total of 46
    • each pair is homologous since contain similar genes in same order
    • one member of each pair is from each parent
  – 22 autosomes & 1 pair of sex chromosomes
    • sex chromosomes are either X or Y
    • females have two X chromosomes
    • males have an X and a smaller Y chromosome

• Gametes (haploid cells)
  – single set of chromosomes for a total of 23
  – produced by special type of division: meiosis
Meiosis I -- Prophase I

- Chromosomes become visible, mitotic spindle appears, nuclear membrane & nucleoli disappear
- Events not seen in prophase of Metaphase or Meiosis II
  - synapsis
    - all copies of homologous chromosomes pair off forming a tetrad
  - crossing-over
    - portions of chromatids are exchanged between any members of the tetrad
    - parts of maternal chromosomes may be exchanged with paternal ones
  - genetic recombination produces gametes unlike either parent
Exchange of Genetic Material

- Chromosomes are exchanged between chromatids on homologous chromosomes.
Meiosis I -- Metaphase I, Anaphase I & Telophase I

- In metaphase I, homologous pairs of chromosomes line up along metaphase plate with attached microtubules.
- In anaphase I, each set of homologous chromatids held together by a centromere are pulled to opposite ends of the dividing cell.
- Telophase I and cytokinesis are similar to mitotic division.
- Result is 2 cells with haploid number of chromosomes.
Meiosis II

- Consists of 4 phases: prophase II, metaphase II, anaphase II, and telophase II
- Similar steps in this cellular process as in mitosis
  - Centromeres split
  - Sister chromatids separate and move toward opposite poles of the cell
- Each of the daughter cells produced by meiosis I divides during meiosis II and the net result is 4 genetically unique haploid cells or gametes.
Male Reproductive System

- Gonads, ducts, sex glands & supporting structures
- Semen contains sperm plus glandular secretions
Scrotum

• Sac of loose skin, fascia & smooth muscle divided into two pouches by septum

• Skin contains dartos muscle causes wrinkling

• Temperature regulation of testes
  – sperm survival requires 3 degrees lower temperature than core body temperature
  – cremaster muscle in spermatic cord
    • elevates testes on exposure to cold & during arousal
    • warmth reverses the process
Scrotal Sacs, Dartos & Cremaster Mm

- Internal oblique muscle
- Aponeurosis of external oblique muscle (cut)
- Fundiform ligament of penis
- Suspensory ligament of penis
- Transverse section of penis:
  - Corpora cavernosa penis
  - Spongy (penile) urethra
  - Corpus spongiosum penis
- Scrotal septum

**Cremaster muscle**

**Dartos muscle**

- External spermatic fascia
- Skin of scrotum

- Spermatic cord
- Superficial inguinal ring
- Cremaster muscle
- Inguinal canal
- Ductus (vas) deferens
- Autonomic nerve
- Testicular artery
- Lymphatic vessel
- Pampiniform plexus of testicular veins
- Epididymis
- Tunica albuginea of testis
- Tunica vaginalis (peritoneum)
- Internal spermatic fascia
- Raphe
Testes

- Paired oval glands measuring 2 in. by 1 in.
- Surrounded by dense white capsule called tunica albuginea
  - septa form 200 - 300 compartments called lobules
- Each is filled with 2 or 3 seminiferous tubules where sperm are formed
Descent of Testes

• Develop near kidney on posterior abdominal wall
• Descends into scrotum by passing through inguinal canal
  – during 7th month of fetal development
Tunica Vaginalis

- Piece of peritoneum that descended with testes into scrotal sac.
- Allows for easier movement of testes within scrotum.
Cryptorchidism

• Testes do not descend into the scrotum
• 3% of full-term & 30% of premature infants
• Untreated bilateral cryptorchidism results in sterility & a greater risk of testicular cancer
• Descend spontaneously 80% of time during the first year of life
  – surgical treatment necessary before 18 months
Spermatogenesis is formation of sperm cells from spermatogonia.
Location of Stages of Sperm Formation

• Seminiferous tubules contain
  – all stages of sperm development: spermatogonia, primary spermatoocyte, secondary spermatoocyte, spermatid, spermatozoa
  – supporting cells called sertoli cells
• Leydig cells in between tubules secrete testosterone
Supporting Cells of Sperm Formation

• Sertoli cells -- extend from basement membrane to lumen
  – form blood-testis barrier
  – support developing sperm cells
  – produce fluid & control release of sperm into lumen
  – secrete inhibin which slows sperm production by inhibiting FSH
Spermatogenesis

- Spermatogonium (stem cells) give rise to 2 daughter cells by mitosis
- One daughter cell kept in reserve -- other becomes primary spermatocyte
- Primary spermatocyte goes through meiosis I
  - DNA replication
  - tetrad formation
  - crossing over
Spermatogenesis

- Secondary spermatocytes are formed
  - 23 chromosomes of which each is 2 chromatids joined by centromere
  - goes through meiosis II
- 4 spermatids are formed
  - each is haploid & unique
  - all 4 remain in contact with cytoplasmic bridge
  - accounts for synchronized release of sperm that are 50% X chromosome & 50% Y chromosome
Spermiogenesis & Spermiation

- Spermiogenesis = maturation of spermatids into sperm cells
- Spermiation = release of a sperm cell from a sertoli (sustentacular) cell
Sperm Morphology

- Adapted for reaching & penetrating a secondary oocyte
- Head contains DNA & acrosome (hyaluronidase and proteinase enzymes)
- Midpiece contains mitochondria to form ATP
- Tail is flagellum used for locomotion
Hormonal Control of Spermatogenesis

- Puberty
  - hypothalamus increases its stimulation of anterior pituitary with releasing hormones
  - anterior pituitary increases secretion LH & FSH

- LH stimulates Leydig cells to secrete testosterone
  - an enzyme in prostate & seminal vesicles converts testosterone into dihydrotestosterone (DHT-more potent)

- FSH stimulates spermatogenesis
  - with testosterone, stimulates sertoli cells to secrete androgen-binding protein (keeps hormones levels high)
  - testosterone stimulates final steps spermatogenesis
Hormonal Effects of Testosterone

• Testosterone & DHT bind to receptors in cell nucleus & change genetic activity
• Prenatal effect is born a male
• At puberty, final development of 2nd sexual characteristics and adult reproductive system
  – sexual behavior & libido
  – male metabolism (bone & muscle mass heavier)
  – deepening of the voice
Control of Testosterone Production

- Negative feedback system controls blood levels of testosterone
- Receptors in hypothalamus detect increase in blood level
- Secretion of GnRH slowed
- Anterior pituitary (FSH & LH hormones) slowed
- Leydig cells of testes slowed
- Blood level returns normal
Effect of Inhibin Hormone

- Sperm production is sufficient
  - sertoli cells release inhibin
  - inhibits FSH secretion by the anterior pituitary
  - decreases sperm production

- Sperm production is proceeding too slowly
  - less inhibin is released by the sertoli cells
  - more FSH will be secreted
  - sperm production will be increased
Pathway of Sperm Flow through the Ducts of the Testis

- Seminiferous tubules
- Straight tubules
- Rete testis
- Efferent ducts
- Ductus epididymis
- Ductus (vas) deferens
Epididymis

- Comma-shaped organ, 1.5in long along posterior border of each testis
- Head, body and tail region
- Multiple efferent ducts become a single ductus epididymis in the head region
  - 20 foot tube if uncoiled
- Tail region continues as ductus deferens
Histology of the Epididymis

• Ductus epididymis
  – lined with pseudostratified ciliated columnar epithelium
  – layer of smooth muscle
• Site of sperm maturation
  – motility increases over 2 week period
• Storage for 1-2 months
• Propels sperm onward
Ductus (Vas) Deferens

- Pathway of 18 inch muscular tube
  - ascends along posterior border of epididymis
  - passes up through spermatic cord and inguinal ligament
  - reaches posterior surface of urinary bladder
  - empties into prostatic urethra with seminal vesicle

- Lined with pseudostratified columnar epithelium & covered with heavy coating of muscle
  - convey sperm along through peristaltic contractions
  - stored sperm remain viable for several months
Spermatic Cord

- All structures passing to and from the testes
  - testicular artery
  - pampiniform plexus of veins
  - autonomic nerves
  - lymphatic vessels
  - ductus (vas) deferens
  - cremaster muscle
Vasectomy

• Male sterilization
• Vas deferens cut & tied off
• Sperm production continues
• Sperm degenerate
• 100% effective
• 40% reversible
Inguinal Canal & Inguinal Hernias

- Inguinal canal is 2 inch long tunnel passing through the 3 muscles of the anterior abdominal wall -- weakens wall
  - originates at deep inguinal ring and ends at superficial ring
- Indirect hernia -- loop of intestine protruding through deep ring
- Direct hernia -- loop of intestine pushes through posterior wall of inguinal canal
- More common in males
Ejaculatory Ducts

- Formed from duct of seminal vesicle & ampulla of vas deferens
- About 1 inch long
- Adds fluid to prostatic urethra just before ejaculation
Urethra

- 8 inch long passageway for urine & semen
- Prostatic urethra (1 inch long)
- Membranous urethra (passes through UG diaphragm)
- Penile (spongy) urethra (through corpus spongiosum)
Accessory Sex Glands
Seminal Vesicles

- Pair of pouchlike organs found posterior to the base of bladder
- Alkaline, viscous fluid
  - neutralizes vaginal acid & male urethra
  - fructose for ATP production
  - prostaglandins stimulate sperm motility & viability
  - clotting proteins for coagulation of semen
Prostate Gland

- Single organ the size of chestnut found inferior to bladder
- Secretes milky, pH 6.5 fluid that increases sperm motility and viability
  - citric acid for ATP production & enzymes for seminal liquefaction
- Many duct openings
- Enlarges with age
Bulbourethral or Cowper’s Gland

- Paired, pea-sized gland within the UG diaphragm
- Secretes alkaline mucous into spongy urethra
- Neutralizes acids and lubricates
Semen

- Mixture of sperm & seminal fluid
  - glandular secretions and fluid of seminiferous tubules
  - slightly alkaline, milky appearance, sticky
  - contains nutrients, clotting proteins & antibiotic seminalplasmin

- Typical ejaculate is 2.5 to 5 ml in volume
- Normal sperm count is 50 to 150 million/ml
  - actions of many are needed for one to enter
- Coagulates within 5 minutes -- reliquefies in 15 due to enzymes produced by the prostate gland
- Semen analysis----bad news if show lack of forward motility, low count or abnormal shapes
Penis

- Passageway for semen & urine
- Body composed of three erectile tissue masses filled with blood sinuses
- Composed of bulb, crura, body & glans penis
Cross-Section of Penis

- **Corpora cavernosa**
  - upper paired, erectile tissue masses
  - begins as crura of the penis attached to the ischial & pubic rami and covered by ischiocavernosus muscle

- **Corpus spongiosum**
  - lower erectile tissue mass
  - surrounds urethra
  - begins as bulb of penis covered by bulbospongiosus muscle
  - ends as glans penis
• Bulb of penis or base of corpus spongiosum enclosed by bulbospongiosus muscle
• Crura of penis or ends of corpora cavernosa enclosed by ischiocavernosus muscle
Erection & Ejaculation

• Erection
  – sexual stimulation dilates the arteries supplying the penis
  – blood enters the penis compressing the veins so that the blood is trapped.
  – parasympathetic reflex causes erection

• Ejaculation
  – muscle contractions close sphincter at base of bladder and move fluids through ductus deferens, seminal vesicles, & ejaculatory ducts
  – ischiocavernous & bulbospongiosus complete the job
Glans Penis

- Enlarged distal end of corpus spongiosum
- External urethral orifice is small slit
- Covered by loosely fitting prepuce or foreskin
Circumcision

- Removal of prepuce
- 3 - 4 days after birth
- Possibly lowers UTIs, cancer & sexually transmitted disease
Female Reproductive System

- Ovaries produce 2nd oocytes & hormones
- Uterine tubes transport fertilized ova
- Uterus where fetal development occurs
- Vagina & external genitalia constitute the vulva
- Mammary glands produce milk
The Ovary

- Pair of organs, size of unshelled almonds found in upper pelvic region
- Regional histology
  - tunica albuginea is capsule of dense connective tissue
  - cortex is region just deep to tunica, contains follicles
  - medulla is deeper region composed of connective tissue, blood vessels & lymphatics
  - germinal epithelium is simple epithelial covering over the ovary
Reproductive Ligaments

- Broad ligament suspends uterus from side wall of pelvis
- Mesovarium attaches ovaries to broad ligament
- Ovarian ligament anchors ovary to uterus
- Suspensory ligament covers blood vessels to ovaries
- Round ligament attaches ovaries to inguinal canal
Follicular Stages

- Stages of follicular development
  - primordial
  - primary
  - secondary
  - Graafian (Mature)
  - ovulation

- Corpus luteum is ovulation wound
  - fills in with hormone secreting cells
- Corpus albicans is white scar left after corpus luteum is not needed
Histology of a Graafian Follicle

• Zona pellucida -- clear area between oocyte & granulosa cells
• Corona radiata is granulosa cells attached to zona pellucida--still attached to oocyte at ovulation
• Antrum formed by granulosa cells secreting fluid
• By this time, the oocyte has reached the metaphase of meiosis II stage and stopped developing -- first polar body has been discarded
Life History of Oogonia

- Germ cells from yolk sac migrate to ovary & become oogonia
- As a fetus, oogonia divide to produce millions by mitosis but most degenerate (atresia)
- Some develop into primary oocytes & stop in prophase stage of meiosis I
  - 200,000 to 2 million present at birth
  - 40,000 remain at puberty but only 400 mature during a woman’s life
- Each month, hormones cause meiosis I to resume in several follicles so that meiosis II is reached by ovulation
- Penetration by the sperm causes the final stages of meiosis to occur
Review of Oogenesis

During fetal development meiosis I begins but stops in prophase.

After puberty, primary oocytes complete meiosis I, which produces a secondary oocyte and a first polar body that may or may not divide again.

The secondary oocyte begins meiosis II but stops in metaphase.

A secondary oocyte (and first polar body) is ovulated.

After fertilization, meiosis II resumes. The oocyte splits into an ovum and a second polar body.

The nuclei of the sperm cell and the ovum unite, forming a diploid (2n) zygote.
Uterine or Fallopian Tubes

- Narrow, 4 inch tube extends from ovary to uterus
  - infundibulum is open, funnel-shaped portion near the ovary
  - fimbriae are moving finger-like processes
  - ampulla is central region of tube
  - isthmus is narrowest portion joins uterus
Histology & Function of Uterine Tube

• Histology = 3 Layers
  – mucosa = ciliated columnar epithelium with secretory cells provide nutrients & cilia move along ovum
  – muscularis = circular & longitudinal smooth muscle
    • peristalsis helps move ovum down to the uterus
  – serosa = outer serous membrane

• Function -- events occurring in the uterine tube
  – fimbriae sweep oocyte into tube, cilia & peristalsis move it along, sperm reaches oocyte in ampulla, fertilization occurs within 24 hours after ovulation & zygote reaches uterus about 7 days after ovulation
Lining of the Uterine Tubes

- Cilia of ciliated columnar epithelial cell
- Secretory cell with microvilli
Anatomy of the Uterus

• Site of menstruation & development of fetus
• Description
  – 3 inches long by 2 in. wide and 1 in. thick
  – subdivided into fundus, body, isthmus & cervix
  – interiorly contains uterine cavity accessed by cervical canal (internal & external os)
Position of Uterus

- **Anteflexion** -- normally projects anteriorly and superiorly over the urinary bladder
- **Retroflexion** -- posterior tilting of the uterus
Histology of the Uterus

- **Endometrium**
  - simple columnar epithelium
  - stroma of connective tissue and endometrial glands
    - stratum functionalis
      - shed during menstruation
    - stratum basalis
      - replaces stratum functionalis each month

- **Myometrium**
  - 3 layers of smooth muscle

- **Perimetrium**
  - visceral peritoneum
Blood Supply to the Uterus

- Uterine arteries branch as arcuate arteries and radial arteries that supply the myometrium
- Straight & spiral branches penetrate to the endometrium
  - spiral arteries supply the stratum functionalis
  - their constriction due to hormonal changes starts menstrual cycle
Hysterectomy

• Surgical removal of the uterus
• Indications for surgery
  – endometriosis, ovarian cysts, excessive bleeding, cancer of cervix, uterus or ovaries
• Complete hysterectomy removes cervix
• Radical hysterectomy removes uterus, tubes, ovaries, part of vagina, pelvic lymph nodes and supporting ligaments
Vagina

- **Passageway for birth, menstrual flow & intercourse**

- **Description**
  - 4 inch long fibromuscular organ ending at cervix
    - mucosal layer
      - stratified squamous epithelium & areolar connective tissue
      - large stores of glycogen breakdown to produce acidic pH
    - muscularis layer is smooth muscle allows considerable stretch
    - adventitia is loose connective tissue that binds it to other organs
  - lies between urinary bladder and rectum
  - orifice partially closed with membrane (hymen)
Vulva (pudendum)

- Mons pubis -- fatty pad over the pubic symphysis
- Labia majora & minora -- folds of skin encircling vestibule where find urethral and vaginal openings
- Clitoris -- small mass of erectile tissue
- Bulb of vestibule -- masses of erectile tissue just deep to the labia on either side of the vaginal orifice
Perineum

- Diamond-shaped area between the thighs in both sexes
  - bounded by pubic symphysis and coccyx
  - urogenital triangle contains external genitals
  - anal triangle contains anus
Mammary Glands

- Modified sweat glands that produce milk (lactation)
  - amount of adipose determines size of breast
  - milk-secreting glands open by lactiferous ducts at the nipple
  - areola is pigmented area around nipple
  - suspensory ligaments suspend breast from deep fascia of pectoral muscles (aging & Cooper’s droop)
Fibrocystic Disease of the Breasts

• Most common cause of breast lumps
• Cysts and thickenings of alveoli develop
• Cause
  – hormonal imbalance
    • excess of estrogen or deficiency of progesterone in the postovulatory phase
  – result is lumpy, swollen & tender breast a week before menstruation begins
Female Reproductive Cycle

- Controlled by monthly hormone cycle of anterior pituitary, hypothalamus & ovary
- Monthly cycle of changes in ovary and uterus
- Ovarian cycle
  - changes in ovary during & after maturation of oocyte
- Uterine cycle
  - preparation of uterus to receive fertilized ovum
  - if implantation does not occur, the stratum functionalis is shed during menstruation
Hormonal Regulation of Reproductive Cycle

• GnRH secreted by the hypothalamus controls the female reproductive cycle
  – stimulates anterior pituitary to secrete FSH & LH
  – FSH initiates growth of follicles that secrete estrogen
    • estrogen maintains reproductive organs
  – LH stimulates ovulation & promotes formation of the corpus luteum which secretes estrogens, progesterone, relaxin & inhibin
    • progesterone prepares uterus for implantation and the mammary glands for milk secretion
    • relaxin facilitates implantation in the relaxed uterus
    • inhibin inhibits the secretion of FSH
Overview of Hormonal Regulation

GnRH stimulates release of FSH and LH

FSH stimulates

LH stimulates

Corpus luteum

Secretion of progesterone, estrogens, relaxin, and inhibin by corpus luteum

Growing follicles

Initial secretion of estrogens by growing ovarian follicles

Further development of ovarian follicles and their secretion of estrogens, progesterone, and inhibin

Estrogens

- Promote development and maintenance of female reproductive structures, feminine secondary sex characteristics, and breasts
- Increase protein anabolism
- Lower blood cholesterol
- Moderate levels inhibit release of GnRH, FSH, and LH

Progesterone

- Works with estrogens to prepare endometrium for implantation
- Prepares breasts to secrete milk
- Inhibits release of GnRH and LH

Relaxin

- Inhibits contractions of uterine smooth muscle
- During labor, relaxes pubic symphysis and dilates uterine cervix

Inhibit

- Inhibits release of FSH and, to a lesser extent, LH
Phases of Female Reproductive Cycle

- Primordial follicles
- Primary follicles
- Secondary follicle
- Mature (Graafian) follicle
- Ovulation
- Corpus luteum
- Corpus albicans
- Estrogens
- Progesterone and estrogens
- Secretory phase
- Menstruation
- Proliferative phase

Days:
- 1-4: Menstrual phase
- 5-14: Preovulatory phase
- 15: Ovulation
- 16-28: Postovulatory phase
- 29-30: Menstruation
Hormonal Changes

- Menstrual phase
- Preovulatory phase
- Ovulation
- Postovulatory phase

Hormone concentration over days:
- LH
- Estrogens
- FSH
- Progesterone
Menstrual Phase

• Menstruation lasts for 5 days
• First day is considered beginning of 28 day cycle
• In ovary
  – 20 follicles that began to develop 6 days before are now beginning to secrete estrogen
  – fluid is filling the antrum from granulosa cells
• In uterus
  – declining levels of progesterone caused spiral arteries to constrict -- glandular tissue dies
  – stratum functionalis layer is sloughed off along with 50 to 150 ml of blood
Preovulatory Phase

• Lasts from day 6 to 13 (most variable timeline)

• In the ovary (follicular phase)
  – follicular secretion of estrogen & inhibin has slowed the secretion of FSH
  – dominant follicles survives to day 6
  – by day 14, graafian follicle has enlarged & bulges at surface
  – increasing estrogen levels trigger the secretion of LH

• In the uterus (proliferative phase)
  – increasing estrogen levels have repaired & thickened the stratum functionalis to 4-10 mm in thickness
Ovulation

• Rupture of follicle & release of 2nd oocyte on day 14

• Cause
  – increasing levels of estrogen stimulate release of GnRH which stimulates anterior pituitary to release more LH

• Corpus hemorrhagicum results
Signs of Ovulation

• Increase in basal body temperature
• Changes in cervical mucus
• Cervix softens
• Mittelschmerz---pain
Postovulatory Phase

• Most constant timeline = lasts 14 days

• In the ovary (luteal phase)
  – if fertilization did not occur, corpus albicans is formed
    • as hormone levels drop, secretion of GnRH, FSH & LH rise
  – if fertilization did occur, developing embryo secretes human chorionic gonadotropin (hCG) which maintains health of corpus luteum & its hormone secretions

• In the uterus (secretory phase)
  – hormones from corpus luteum promote thickening of endometrium to 12-18 mm
    • formation of more endometrial glands & vascularization
  – if no fertilization occurs, menstrual phase will begin
Negative Feedback on GnRH

High levels of estrogens (without progesterone) stimulate release of GnRH, LH, and FSH.

Moderate levels of estrogens inhibit secretion of GnRH, FSH, and LH.

Inhibin inhibits secretion of FSH and LH.

Low levels of progesterone and estrogens promote secretion of GnRH, FSH, and LH.

Ovary:
- Growth of primary and secondary follicles
- Maturation of one dominant follicle
- Ovulation
- Formation of corpus luteum
- Formation of corpus albicans

Ovarian hormones:
- Increasing secretion of estrogens and inhibin by granulosa cells
- Increased secretion of progesterone and estrogens by cells of corpus luteum
- Increased secretion of inhibin by cells of corpus luteum
- No secretion of progesterone and estrogens by corpus albicans

Uterus:
- Repair and proliferation of endometrium
- Preparation of endometrium for arrival of fertilized ovum
- Menstruation
Menstrual Abnormalities

• Amenorrhea = absence of menstruation
  – hormone imbalance, extreme weight loss or low body fat as with rigorous athletic training

• Dysmenorrhea = pain associated with menstruation
  – severe enough to prevent normal functioning
  – uterine tumors, ovarian cysts, endometriosis or intrauterine device

• Abnormal uterine bleeding = excessive amount or duration or intermenstrual
  – fibroid tumors or hormonal imbalance
Human Sexual Intercourse

• 4 phases
  – excitement phase produced by parasympathetic NS
    • engorgement of blood vessels & cardiovascular changes
  – plateau phase of variable duration
    • sexual flush to face & chest
  – orgasm phase (climax)
    • rhythmical muscular contractions & pleasure
    • sympathetic nervous system causes ejaculation
  – resolution
    • profound relaxation & return to normal
    • male refractory period where 2nd ejaculation is impossible

• Some male & female physiological differences
Erectile Dysfunction (Impotence)

• Consistent inability of adult male to hold an erection long enough for sexual intercourse

• Causes
  – psychological or emotional factors
  – physical factors
    • diabetes mellitus, vascular disturbances, neurological disturbances, testosterone deficiency, drugs (alcohol, nicotine, antidepressants, tranquilizers, etc)

• Viagra causes vasodilation of penile arteries and brings on an erection
Birth Control Methods

• Surgical
• Hormonal
• Mechanical barriers
• Periodic abstinence
• Coitus interruptus
• Induced abortion
Surgical Sterilization

• Male (vasectomy)
  – removal of a portion of the vas deferens
    • incision in posterior scrotal sac
    • out patient & local anesthesia
  – sperm can no longer reach the exterior
    • degenerate and removed by phagocytosis
  – sexual desire not effected since testosterone levels unchanged

• Female (tubal ligation)
  – uterine tubes are tied closed and cut
  – sperm can not reach oocyte
Hormonal Birth Control

• Oral contraceptive --- “the pill”
  – progesterone & estrogen combination pill
    • negative feedback on the anterior pituitary & hypothalamus to prevent secretion of FSH & LH
      – no follicular development or ovulation
      – no possible pregnancy
  – other benefits of the pill
    • regulate menstrual cycle & reduce endometriosis

• Risks increased for smokers
  – increased chances of blood clot formation

• Not recommended for people with liver disease, hypertension, heart disease, migraines
Other Hormonal Methods

• Norplant
  – surgically implanted capsules releasing progestin & inhibiting ovulation for 5 years

• Depo-provera
  – intramuscular injection of progesterone every 3 months that changes uterine lining & ovum maturation

• Vaginal ring
  – worn internally releasing progestin or combination of progestin & estrogen
Intrauterine Devices

- Small object made of plastic, copper or steel left in cavity of uterus
  - changes uterine lining so is unfavorable for embryo implantation
  - approved for 10 year usage
- May cause excessive bleeding or discomfort
Spermatocides

• Chemical substances in foam, cream, jelly, douche or suppository that kill sperm upon contact
• Available without prescription
• Normally used in conjunction with a barrier device
• May inactivate HIV virus & decrease incidence of gonorrhea
Mechanical Barriers

- Male & female condoms (vaginal pouch)
  - covers penis or lines vagina
- Diaphragm = dome-shaped cap over cervix
  - prevents entry of sperm into uterus
  - does not protect against AIDS or STD
  - may cause recurrent UTIs
- All of the above may offer some protection against sexually transmitted disease
Physiological Methods of Birth Control

- **Rhythm method (periodic abstinence)**
  - abstaining from intercourse when secondary oocyte is likely to be viable (3 to 7 days of cycle)
    - 3 days before ovulation, ovulation & 3 days after
    - few women absolutely regular cycles
    - will not know it was an irregular cycle until too late

- **Sympto-thermal method**
  - observe body for signs of ovulation & abstain form intercourse accordingly
    - increased basal body temperature & mucus changes
    - problem is sperm is viable for 48 hours

- **Coitus interruptus (withdrawal before ejaculation)**
Induced Abortion

• Miscarriage is a spontaneous loss of the fetus
• Induced abortions
  – vacuum aspiration (suction)
  – infusion of saline solution to kill embryo
  – surgical evacuation (scraping)
• `RU 486 is called a nonsurgical abortion
  – antiprogestin drug that causes uterine lining to collapse & embryo is lost (menstruation occurs)
  – can be taken up to 5 weeks after conception
Aging Female Reproductive System

- Hormone-directed sexual characteristics start to develop at puberty
- Reproductive cycle occurs once/month from menarche (10-14) until menopause (between 40 & 50)
- Fertility declines with age
  - decreasing number of viable follicles
  - less frequent ovulation
  - declining ability of uterus to support young embryo
- Menopause is cessation of menstruation
  - no remaining follicles to stimulate estrogen secretion
  - osteoporosis, hot flashes, mood swings, organ atrophy
Aging Male Reproductive System

- Decline in reproductive function is more subtle (capacity may remain into 90’s)
- Decline in testosterone at 55
  - reduced muscle synthesis
  - fewer viable sperm
  - reduced sexual desire
- Enlargement of prostate (benign hyperplasia)
  - 1/3 of males over 60
  - frequent urination, decreased force of stream, bed-wetting & sensation of incomplete emptying
Sexually Transmitted Disease

- On the increase in the United States
- Chlamydia -- bacteria; asymptomatic, leads to sterility from scar tissue formation
- Gonorrhea -- bacteria, discharge common, blindness if newborn is infected during delivery
- Syphilis -- bacteria, painless sores (chancre), 2nd stage all organs involved, 3rd stage organ degeneration is apparent (neurosyphilis)
- Genital Herpes -- virus, incurable, painful blisters
- AIDS & hepatitis B -- viruses (chapters 22 & 24)
Testicular Cancer

- Most common cancer in age group 20-35
  - one of the most curable
- Begins as problem with spermatogenic cells within the seminiferous tubules
- Sign is mass within the testis
- Regular self-examination is important
Prostate Cancer

• Leading male cancer death
  – treatment is surgery, radiation, hormonal and chemotherapy

• Blood test for prostate-specific antigen (PSA)
  – enzyme of epithelial cells
  – amount increases with enlargement (indication of infection, benign enlargement or cancer)

• Over 40 yearly rectal exam of prostate gland
  – acute or chronic prostatitis is an infection of prostate causing swelling, tenderness & blockage of urine flow
  – treat with antibiotics
Premenstrual Syndrome (PMS)

- Physical & emotional distress during the postovulatory (luteal) phase
  - disappear at onset of menstruation
- Signs & symptoms are variable
  - mood swings, depression, headache, fatigue, backache, constipation, breast tenderness, edema
- Since occurs only after ovulation, oral contraceptives are an effective treatment
  - careful diet & exercise may help
Endometriosis

• Growth of endometrial tissue outside of the uterus
  – tissue discharged from open-end of uterine tubes during menstruation
  – can cover ovaries, outer surface of uterus, colon, kidneys and bladder

• Problem is tissue responds to hormonal changes by proliferating then breaking down & bleeding
  – causes pain, scarring & infertility
Breast Cancer

• Second-leading cause of cancer death in the U.S.
  – 1 in 8 women affected
  – rarely before 30, but more common after menopause
    • 5% of cases are younger women (genetic mutation)

• Detection by self-examination & mammography
  – ultrasound determines if lump is benign, fluid-filled cyst or solid & possibly malignant

• Risk factors
  – family history, no children, radiation, alcohol & smoking

• Treatment
  – lumpectomy, radical mastectomy, radiation therapy or chemotherapy
Ovarian Cancer

• Most common cause of gynecological deaths excluding breast cancer
  – difficult to detect before metastasizes
• Difficult to detect before metastasis
• Risk factors
  – over 50, white, family history, nulliparity, first pregnancy after 30, diet (high fat, low fiber and lack of vitamin A), asbestos & talc
• Early symptoms unremarkable -- heartburn, nausea, bloating, loss of appetite, etc
Cervical Cancer

• Starts as cervical dysplasia (change in shape, growth & number of cells)
• May progress to cervical cancer
• Detected in Pap smear
• Linked to genital warts and large number of sexual partners at an early age
Yeast Infection

- *Candida albicans* is yeastlike fungus that grows on mucous membranes
- Causes vulvovaginal candidiasis or vaginitis
  - inflammation of the vagina
  - severe itching and pain
  - yellow discharge with odor
- More likely after antibiotic therapy for some other disease