

LESSON PLAN: 8

COURSE TITLE: MEDICATION TECHNICIAN

UNIT: III BODY SYSTEMS, DRUGS, AND OBSERVATIONS

SCOPE OF UNIT:

This unit includes body systems, drug classifications, and problems of observation.

INFORMATION TOPIC: III-8 OR DEMONSTRATION:

**BODY SYSTEMS, DISEASE PROCESS, AND TREATMENTS**

**(Lesson Title)**

OBJECTIVES – THE STUDENT WILL BE ABLE TO:

1. Identify the four main parts of the basic body structure.
2. Compare normal versus abnormal changes of aging.
3. Identify special healthcare risks for ill older adults.
4. Identify the eleven body systems.
5. Identify the organs and functions of each body system.
6. List commonly seen diseases and conditions and the medications used to treat them.

SUPPLEMENTARY TEACHING/LEARNING ITEMS:

1. Skeletorso.
2. Anatomical wall charts.
3. HO 19: Stages of Pressure Ulcers.

INFORMATIONAL ASSIGNMENT:

Read Lesson Plan 8 prior to class and be prepared to discuss the information presented.

INTRODUCTION:

A basic knowledge of the structures and functions of the body systems will assist you in recognizing deviations from the normal. This is especially critical as a foundation for observing the individual's response to medications prescribed. In this lesson, we will examine each system, its structures, functions, and related health problems common in long-term care.

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OUTLINE:

I. Body Plan

- A. Cells – cells are the basic unit of all living things. The human body is made up of trillions of cells. There are many different types of cells; each has a special function.
- B. Tissues – groups of similar cells combine to form tissues.
- C. Organs – a group of tissues that perform a single function make up organs.
- D. Systems – a group of organs working together with a specific function make up a body system.

Cells → Tissues → Organs → Body Systems.

II. Changes in “Normal” Older Adults That Affect Drug Effectiveness

- A. Changes affecting absorption of drugs – drugs are not absorbed from the GI tract as easily.
  - 1. Poor musculature results in decreased peristalsis.
  - 2. Blood supply to GI tract decreases.
  - 3. Number of absorbing cells in the stomach decreases.
  - 4. Slower emptying of the stomach.
- B. Changes affecting the distribution of drugs.
  - 1. Decrease in total body water.
  - 2. Decrease in lean body mass; increased fat.
  - 3. Lowered cardiac output.
- C. Changes affecting metabolism of drugs – usually slower or impaired metabolism of drugs.
  - 1. Decrease in liver function which normally detoxifies the body.

2. Decrease in effectiveness of kidney function.
  3. Increased risk of drug toxicity.
- D. Changes affecting the elimination of drugs – causes drugs to be eliminated more slowly.
1. Reduced filtration by kidneys – 30% reduction by age 65.
  2. Increased renal dehydration.
  3. Decreased number of kidney cells – 40% less by age 75.

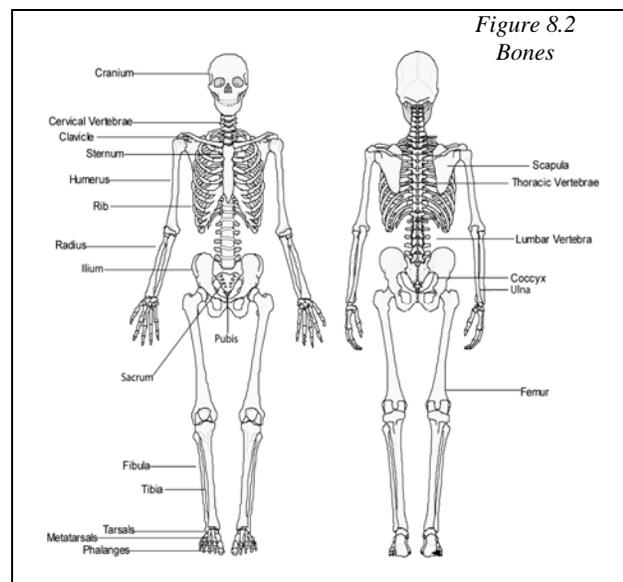
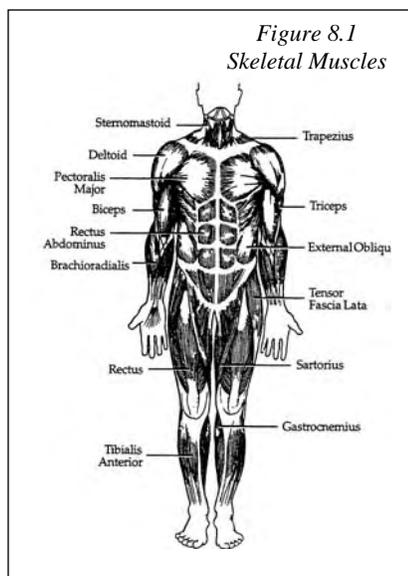
### III. Special Risks of Ill Older Adults

- A. Existence of one or more chronic medical conditions.
- B. Greater likelihood of serious drug side effects.
- C. Drug interactions.

### IV. Musculoskeletal System

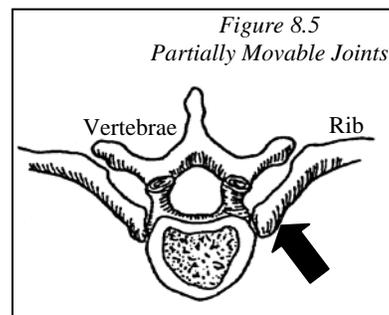
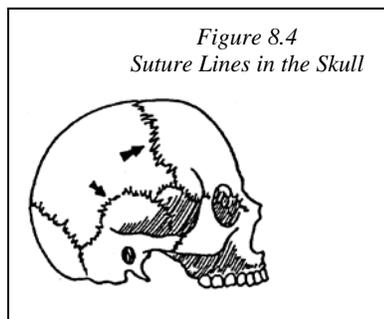
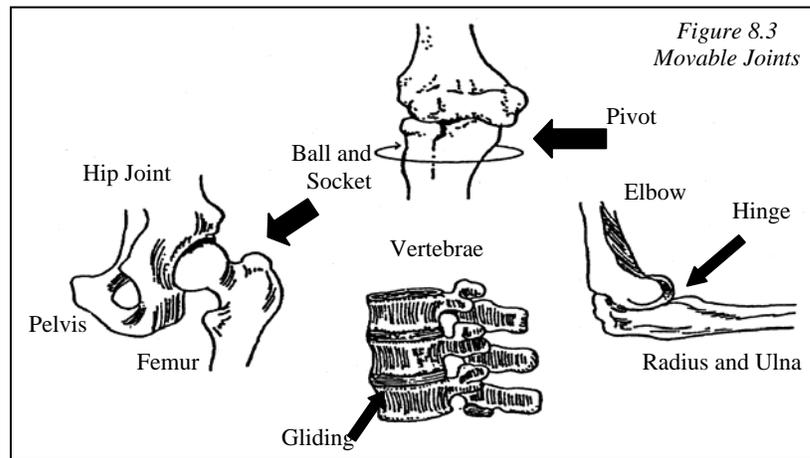
#### A. Structures.

1. Skeletal muscles – muscle connected to bone (see Figure 8.1).
2. Bones – dense solid connective tissue (see Figure 8.2).



3. Joints – point of juncture between two bones.
  - a. Movable (see next page Figure 8.3).

- 1) Pivot (e.g., wrist).
- 2). Ball and socket (e.g., shoulder or hip).
- 3) Gliding (e.g., vertebrae).
- 4) Hinge (e.g., elbow or knee).
  - i. Immovable – suture lines in the skull (see Figure 8.4).
  - ii. Partially movable – ribs at the spine (see Figure 8.5).



4. Additional structures include:
  - a. Tendons – bands of fibrous connective tissue that attach a muscle to a bone.
  - b. Ligaments – connect bone to bone.
  - c. Cartilage – connective tissue found in the joints.

**B. Functions.**

1. Skeleton – the skeleton contains 206 bones and provides:
  - a. Support.

- b. Protection.
  - c. Leverage.
  - d. Production of blood cells.
  - e. Calcium storage.
2. Muscles.
- a. Movement.
  - b. Heat production.
  - c. Posture.
  - d. Protection.
- C. Age related changes affecting the musculoskeletal system.
- 1. Muscular weakness and atrophy.
  - 2. Loss of height due to thinning of vertebrae and intervertebral disks.
  - 3. Stiffening and degeneration of the joints.
  - 4. Decrease in bone density due to reabsorption of calcium.
  - 5. Slumped posture due to spine deterioration.
  - 6. Loss of cartilage.
- D. Diseases and conditions affecting the Musculoskeletal System.
- 1. Fractures are a break in the bone due to trauma/injury or spontaneously from diseases like osteoporosis (pathological fractures). Hip fractures, which are common in the elderly, normally require surgical treatment. Compression fractures, fractures of vertebra from pressure, require stabilization of the spinal column and rest to allow healing.
    - a. Medications used to treat fractures include narcotic analgesics such as Vicodin, OxyContin.
  - 2. Arthritis.
    - a. Osteoarthritis – the most common form of arthritis is also called degenerative joint disease (DJD). Osteoarthritis is a chronic and progressive condition causing deterioration of the joint cartilage and formation of reactive new bone. Heberden’s nodes, abnormal cartilaginous enlargement of the knuckles is commonly seen when

the hands are involved. The hips and knees are the most commonly affected joints.

- 1) Medications used to treat osteoarthritis include non-steroidal anti-inflammatory drugs (NSAIDS) such as Motrin, non narcotic analgesics such as aspirin or Tylenol, and COX-2 inhibitors such as Celebrex. Corticosteroids such as Hydrocortisone and hyaluronic acid derivatives such as Hyalgan may be injected directly into the affected joints.
  - b. Rheumatoid arthritis – a chronic destructive inflammation of the joints and related structures that may result in deformities. Rheumatoid arthritis usually first appears in middle age and is more common in women. It is considered to have an autoimmune component. Rheumatoid arthritis can be treated with many of the same drugs used to treat osteoarthritis as well as gold compounds and drugs such as Remicade and Enbrel which reduce joint and tissue inflammation, pain and swelling, but whose mechanism of action is not known.
  - c. Gout – a metabolic disease that results in an increased production or decreased excretion of uric acid. The excess uric acid is converted into crystals that become deposited in joints and other tissues. It is more commonly seen in men than in women. The big toe and foot are most commonly affected. Anti-gout drugs include Benemid and Zyploprim which decrease uric acid levels.
3. Osteoporosis – a disorder characterized by loss of bone mass in which bone becomes “spongy” or “honeycomb” in appearance. It is more common in sedentary or immobilized individuals, patients on long term steroid therapy and post-menopausal females due to decreased estrogen production. Osteoporosis increases the risk of fractures and can cause compression of the chest cavity, low back pain, loss of stature and other deformities.
  - a. Medications include calcium supplements such as Oscal or Tums, Vitamin D, drugs that inhibit bone resorption such as Miacalcin and Fosamax and estrogen replacements/receptor modulators such as Premarin and Evista.
4. Sprains, strains and "pulled muscles" are acute conditions treated with rest and physical therapy. Medications used include analgesics, anti-inflammatory drugs, and skeletal muscle relaxants such as Paraflex or Robaxin.

## V. Nervous System

### A. Structures (see next page Figure 8.6).

1. Brain – large mass of nerve tissue that regulates and coordinates all body activity. The brain is divided into lobes which control special functions such as speech, hearing, sight, movement, memory, etc.
2. Spinal cord – cord of nerve tissue; extends from lower brain to lower back.
3. Nerves – carry electrical messages to and from different parts of the body.

NOTE: The brain and the spinal cord make up the *Central Nervous System (CNS)* and the cranial and spinal nerves make up the *Peripheral Nervous System (PNS)*.

B. Functions.

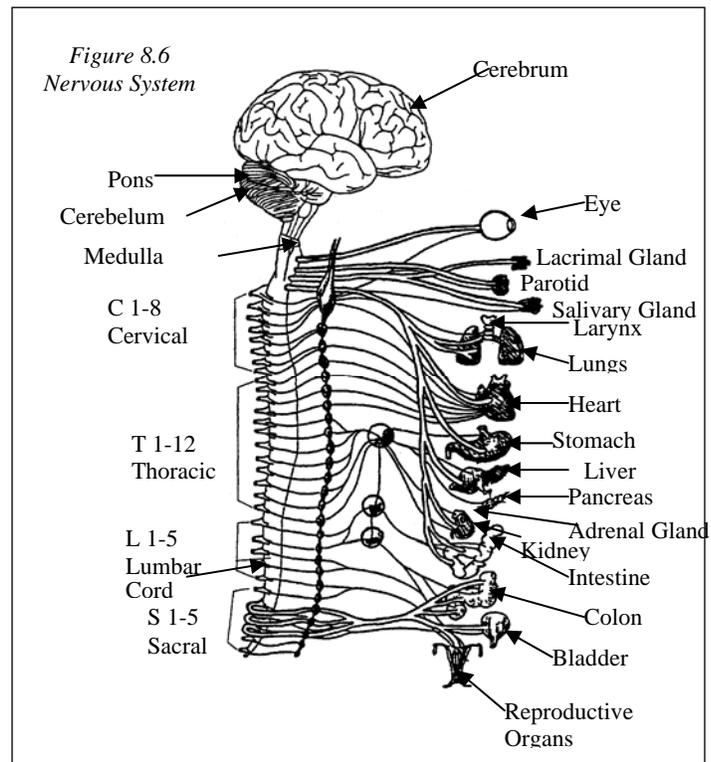
1. Controls and coordinates body activities.

C. Age related changes affecting the nervous system.

1. Nerve transmission time slows resulting in a slower reaction time.
2. Minimal shrinking of the brain that does not affect ADLs.
3. Temperature control center of the brain (hypothalamus) becomes less effective at regulating body temperature.
4. Pain threshold increases.
5. Change in sleep patterns that result in frequent awakening.

D. Diseases and conditions affecting the nervous system.

1. Alzheimer’s disease – a chronic disorder involving alterations in the number, structure and function of neurons in certain areas of the cerebral cortex. It is characterized by confusion, memory loss, restlessness, and speech disorders. It affects more females than males with usual onset after age 65.



- a. Treatment is aimed at slowing the progression of the disease. Current treatments do not “cure” the disease. Medications include Memantine, Aricept, Exelon, and Reminyl.
2. A cerebral vascular accident (CVA) – also known as “stroke,” is caused by hemorrhage, thrombus (clot), or other occlusion (blockages) in the blood vessels of the brain. Symptoms include headache, vomiting, disorientation, slurred speech, mouth drooping, unequal pupils. A CVA may result in unconsciousness, loss of cognitive functioning, and/or paralysis. Medications include anti-coagulants such as Coumadin or aspirin, and anti-hypertensives such as hydrochlorothiazide.
3. Amyotrophic lateral sclerosis (ALS) – also known as “Lou Gehrig’s disease.” ALS is a muscular weakness and atrophy due to degeneration of motor neurons of spinal cord, medulla, and cortex. No current medications reverse the disease.
4. Spinal cord injuries – usually result in paralysis below the level of injury. No current medication reverses the condition. Medications are used to treat spinal cord injury problems related to immobility, such as pressure ulcers, pneumonia, bowel and bladder problems and depression.
5. Parkinson’s Disease – a chronic disease of the brain cells that control movement characterized by, fine, slowly spreading tremors, muscular weakness and rigidity. Symptoms include a shuffling gait, frequent falls, and a stooped posture with the head bent forward or down. Medications include anti-Parkinson’s drugs such as Sinemet, Lodosyn, and Cogentin. Tremors may be treated with a drug such as Corgard or Inderal.
6. Multiple sclerosis (MS) – an inflammatory disease, possibly related to a virus that causes degeneration of the brain, spinal cord and nerves resulting in weakness/numbness of limbs, visual disturbances, and dizziness. MS is characterized by exacerbations and remissions. Medications include steroidal anti-inflammatory drugs such as prednisone.
7. Epilepsy and other seizure disorders – alterations of cerebral function characterized by sudden, brief episodes of altered consciousness, motor activity, or sensory phenomena. Symptoms range from a barely noticeable staring or lack of attention to a full tonic/clonic seizure with loss of consciousness, incontinence, muscle jerking, and tongue biting. Drugs called anticonvulsants such as Dilantin, Tegretol, phenobarbital, Mysoline, Zarontin, and Klonopin are commonly prescribed. No one drug is effective for all types of seizures.
8. Shingles (herpes zoster) – caused by the same virus as chickenpox; lays dormant and emerges as painful vesicular eruptions along peripheral nerves. Lesions may last for several weeks in the elderly with pain

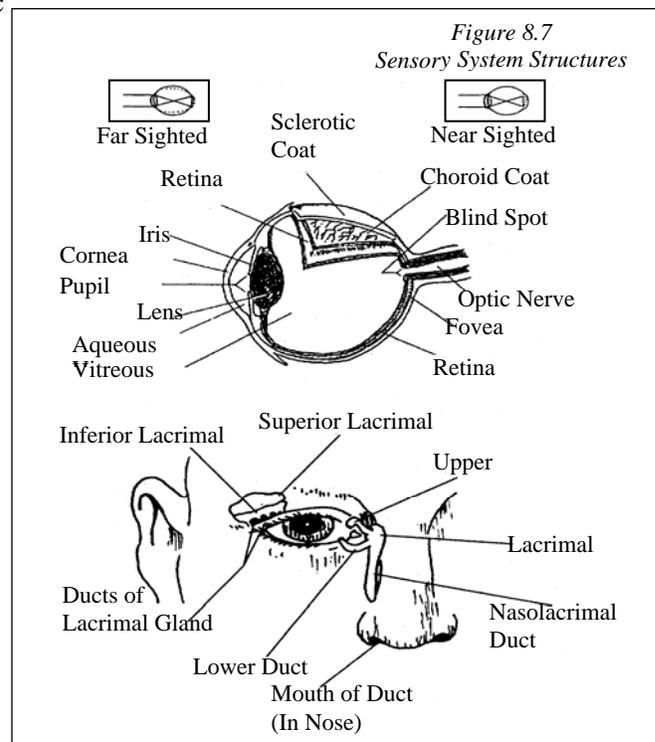
lasting for months after the lesions disappear. Medications include analgesics and topical or systemic antiviral medications such as Zovirax and tricyclic antidepressants such as Elavil to treat neuralgia.

9. Transient ischemic attack (TIA) – results from a temporary lack of blood flow to the brain due to a partial occlusion. Symptoms of a TIA vary with the site and degree of blockage. Visual disturbances, dizziness, weakness, numbness, and unconsciousness may occur. The attack is usually brief, lasting only a few minutes. A TIA may be referred to as a “mini-stroke.” Medications include anti-coagulants such as Coumadin or aspirin; anti-hypertensives such as hydrochlorothiazide; and antiplatelet agents such as Plavix and Aggrenox.
10. Anxiety and Neurosis – symptoms include intense anxiousness, tension and a feeling of apprehension or fear that is at a level not normally seen in that situation. Antianxiety drugs/tranquilizers such as Xanax, Ativan and BuSpar are commonly used.
11. Depression – caused by a decreased level of chemicals in the brain. Symptoms include appetite changes, lack of ability to concentrate, feelings of guilt or hopelessness, insomnia, crying, and lack of pleasure in any activity. Antidepressants called mood elevators are used to treat depressions. Medications commonly prescribed for depression include: Celexa, Effexor, Lexapro, Paxil, Prozac, Zoloft and Wellbutrin.
12. Psychosis – a serious disorder characterized by agitation, hallucinations, severe depression, and impaired thinking so severe that the person loses touch with reality. Schizophrenia is the most common form of psychosis. Antipsychotic drugs are commonly used to treat this condition. Examples of antipsychotic medications include: Risperdal, Zyprexa, Seroquel, and Thorazine.

## VI. Sensory System

### A. Structures (see Figure 8.7)

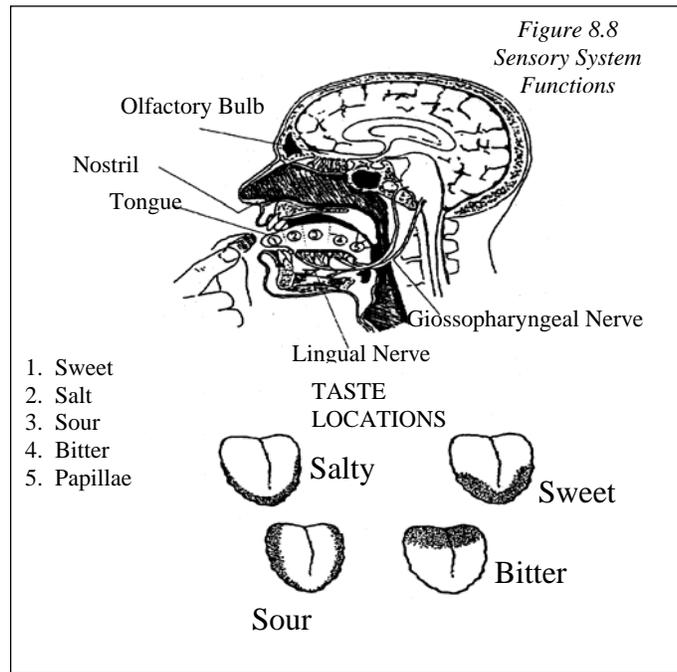
1. Eyes.
2. Ears.
3. Nose.
4. Mouth and throat.
5. Skin



B. Functions (see Figure 8.8).

1. Vision.
2. Hearing.
3. Balance.
4. Smell.
5. Taste.
6. Touch.

C. Age-related changes affecting the sensory system.



1. Difficulty distinguishing colors, especially pastels and the blue and green color ranges.
2. Decreased ability to see in dim lighting situations.
3. Diminished night vision and depth perception.
4. Dryness of the eyes due to decreased tear production.
5. Decreased peripheral vision.
6. Increased sensitivity to glare.
7. Eyes adjust more slowly to changes in lighting conditions.
8. Decreased ability to hear high-pitched and very low pitched sounds.
9. Decreased number of olfactory bulbs resulting in a diminished sense of smell.
10. Decreased number of taste buds resulting in a diminished sense of taste and enjoyment of meals.
11. Decreased perception of pain, pressure, touch, heat and cold.
12. Increased production and thickening of ear wax (cerumen) resulting in decreased hearing.
13. Slower reaction time.
14. Decreased finger dexterity.

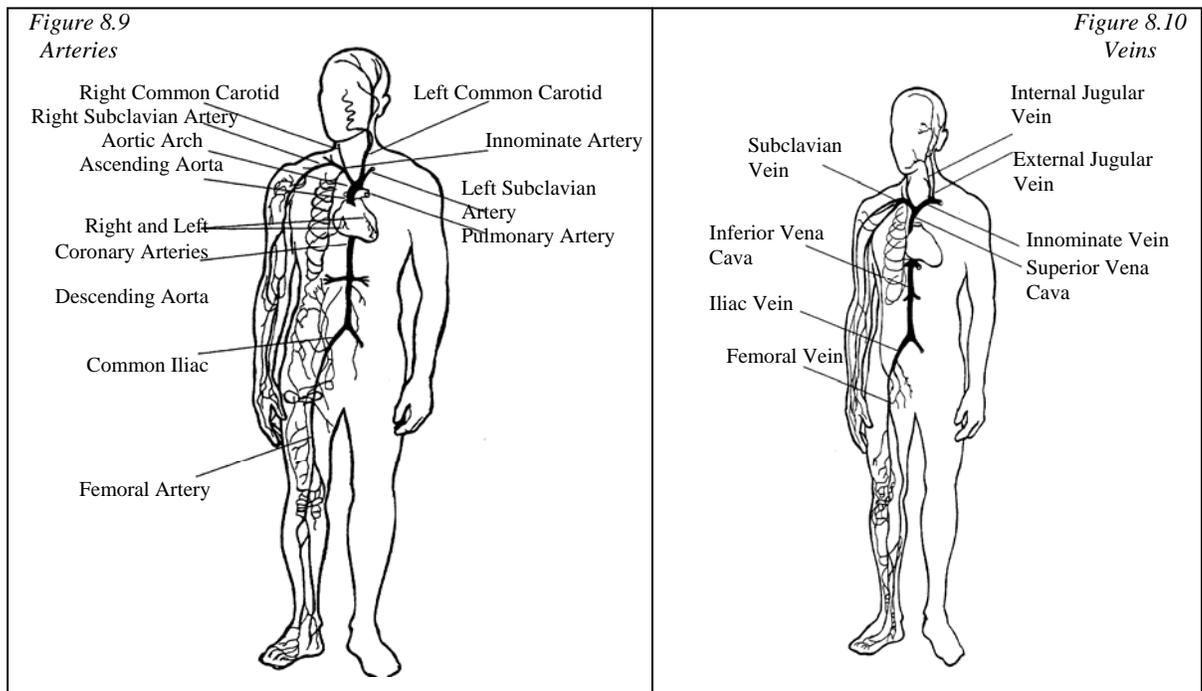
15. Diminished sense of balance. Difficulty maintaining balance while standing on one foot; leading to problems when stepping into a bathtub and walking up/down stairs.
- D. Diseases and conditions affecting the sensory system.
1. Eye.
    - a. Cataracts – clouding of the lens of the eye.
    - b. Glaucoma – increased intraocular pressure that may lead to blindness. Treated with ophthalmic drops such as Betoptic or Timoptic.
    - c. Blindness.
    - d. Conjunctivitis – inflammation of the mucous membranes lining the eye. Treated with antibiotic drops such as Sodium Sulamyd or ointments such as ophthalmic Neosporin Ophthalmic.
    - e. Macular degeneration – a progressive deterioration of the retina resulting in loss of central vision.
    - f. Retinopathy – a non-inflammatory eye disorder resulting in changes to the blood vessels of the eye; frequently associated with diabetes.
    - g. "Dry eyes" – diminished secretion of tears. Frequently treated with an over the counter (OTC) drop such as Artificial Tears and/or antihistamine drops such as Visine.
  2. Ear.
    - a. Hearing loss.
    - b. Cerumen impactions – “wax” accumulation in ear canal; frequently treated with products designed to loosen cerumen such as Cerumenex or Debrox.
    - c. Otitis media – inflammation of the middle ear; usually treated with an antibiotic/anti-inflammatory drop such as Cortisporin.
    - d. Deafness.

3. Nose.
  - a. Rhinitis – inflammation of the mucous membranes in the nose due to irritants or allergies. Medications used to treat allergic rhinitis include antihistamines such as Zyrtec or Claritin; decongestants such as Sudafed that act as vasoconstrictors and decrease blood flow to the swollen mucous membranes. Intranasal corticosteroids that may be prescribed to treat rhinitis include Rhinocort and Flonase.
  - b. Sinusitis – inflammation of sinuses.
4. Mouth, tongue and throat.
  - a. Tumors.
  - b. Excessive dryness of mouth.
  - c. Tooth and gum disorders.
5. Skin (HO 19).
  - a. Paresthesia – sensation of numbness or tingling.

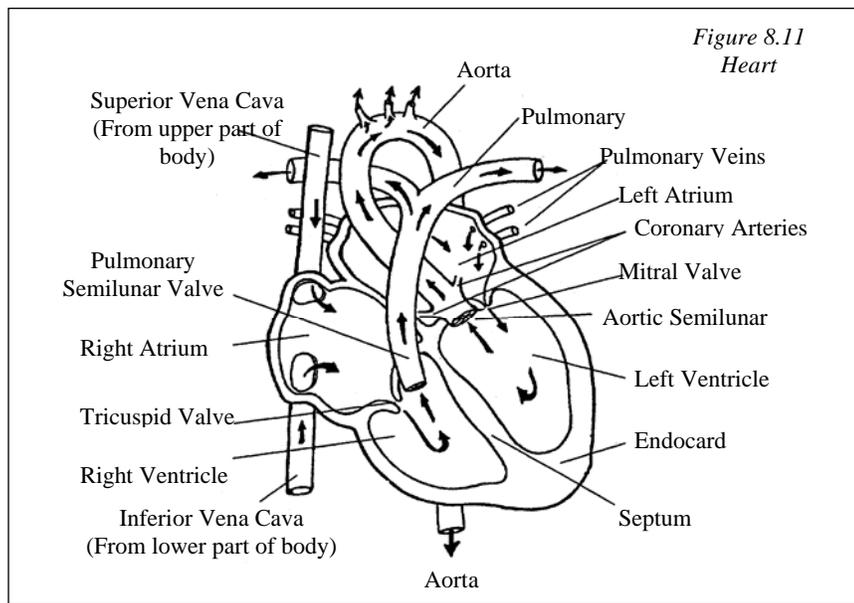
## VII. Cardiovascular System

### A. Structures.

1. Blood vessels-veins, arteries and capillaries (see Figures 8.9; 8.10).



2. Heart (see Figure 8.11).



3. Blood.

B. Functions.

1. Carries nutrients and oxygen to all cells of the body by way of blood vessels.
2. Removes waste products and carbon dioxide from cells.

C. Age related changes affecting the cardiovascular system.

1. Decreased ability of the heart to pump the blood throughout the body decreased cardiac output.
2. Narrowing of the blood vessels and loss of elasticity of vessel walls resulting in poor circulation and increased blood pressure.
3. Slowing of the pulse rate.
4. Decreased ability of the cardiovascular system to respond to position changes resulting in orthostatic hypotension.
5. Decreased ability of the cardiovascular system to respond to an increased demand for blood supply such as with exercise or exertion.
6. Thickening of the heart valves resulting in heart murmurs.
7. Heart rate takes longer to return to normal range after exercise.

D. Diseases and conditions affecting the cardiovascular system.

1. Angina pectoris – chest pain, usually radiating to the left shoulder and down the arm. It is usually caused by atherosclerosis of the coronary arteries and lack of oxygen to the heart muscle. Angina is frequently related to exertion, emotional stress, or exposure to extreme cold.
  - a. Medications include nitrates to dilate the blood vessels such as Nitro-Bid, drugs to decrease the heart rate such as Tenormin and drugs such as Cardizem to relax the smooth muscles of the blood vessels.
2. Arrhythmia – an abnormal rhythm or pattern of the heart beat. Atrial fibrillation, atrial flutter, heart block, and premature beats are examples of arrhythmias. Arrhythmias may be treated with a pacemaker; a device implanted in the chest to stimulate and regulate the heart rate. Antiarrhythmics medications include Catapres, Norpace, Tambocor, Tenormin, and Cardizem.
3. Congestive heart failure (CHF) – a condition resulting from failure of the heart to maintain adequate circulation of the blood. Right sided heart failure results in a backup of blood from the right ventricle into the venous circulation. This results in liver enlargement and edema in the extremities. Left sided heart failure results in a backup of blood from the left ventricle into pulmonary circulation resulting in pulmonary edema and difficulty breathing.
  - a. Medications used to treat CHF include diuretics such as Lasix to decrease fluid buildup and cardiac glycosides such as Lanoxin which make the heart beat more slowly and more efficiently.
4. Myocardial infarction (MI) – also called a “heart attack”. MI is caused by occlusion of one or more of the coronary arteries. Symptoms include nausea, sweating, fatigue, weakness, dizziness, irregular heart rate, hypotension, tachypnea, shortness of breath, and squeezing pain in the center of the chest that may spread to the shoulder, neck, arm, jaw, and fingers.
  - a. Medications include platelet aggregation inhibitors such as Plavix and injectable thrombolytic drugs such as Streptase and Activase.
5. Hypertension – a condition in which BP is higher than normal, generally readings above 150/90 are considered hypertension. Medications used to treat hypertension include diuretics such as Lasix and anti-hypertensives such as Inderal, Calan, and Lopressor
6. Ischemic heart disease – occurs when there is a lack of oxygen (O<sub>2</sub>) supply to the heart. It is usually caused by atherosclerosis. It may be called coronary heart disease or arteriosclerotic heart disease. Treatment

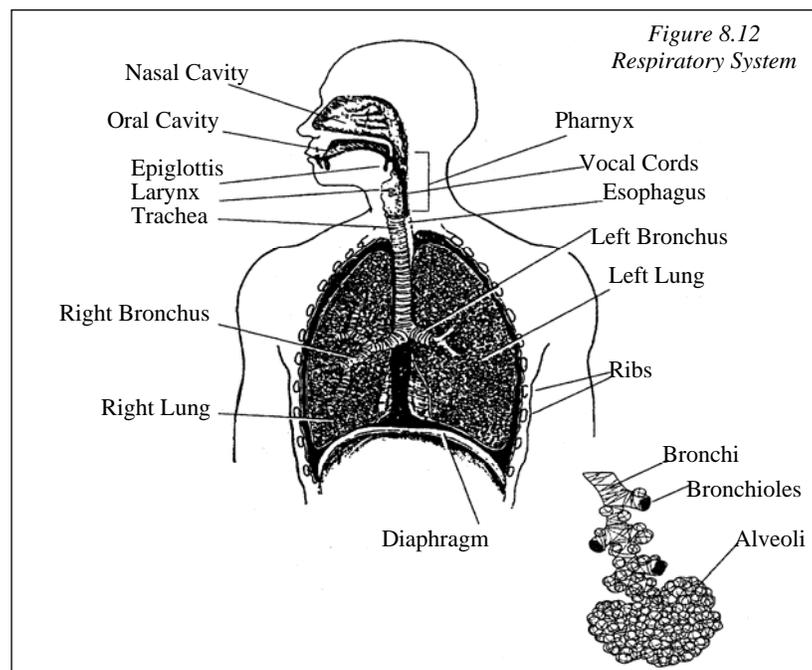
is aimed at improving oxygen supply to the heart, or decreasing the need for O<sub>2</sub>.

- a. Medications include calcium channel blockers such as Procardia or Cardizem.
7. Anemia is a disorder characterized by a decrease in hemoglobin in the blood to a level below normal range. Medications include iron replacement drugs such as Feosol.

## VIII. Respiratory System (see Figure 8.12).

### A. Structures.

1. Nose.
2. Mouth.
3. Pharynx – passageway from nasal cavity to larynx and from mouth to esophagus.
4. Larynx – upper end of trachea; organ of voice.
5. Trachea – tube from larynx to bronchi.
6. Lungs – organs of respiration.
7. Bronchi – two main branches from trachea to lungs.
8. Bronchioles – smaller branches from bronchi.
9. Alveoli – the many terminal sacs where gases are exchanged in respiration.



B. Functions.

1. Provides oxygen to cells.
2. Removes wastes in form of CO<sub>2</sub>.

C. Age-related changes affecting the respiratory system.

1. Loss of elasticity of lungs, lungs do not expand or contract as well.
2. Chest muscle weakness results in shallow breathing and less effective cough.

D. Diseases and conditions affecting the respiratory system.

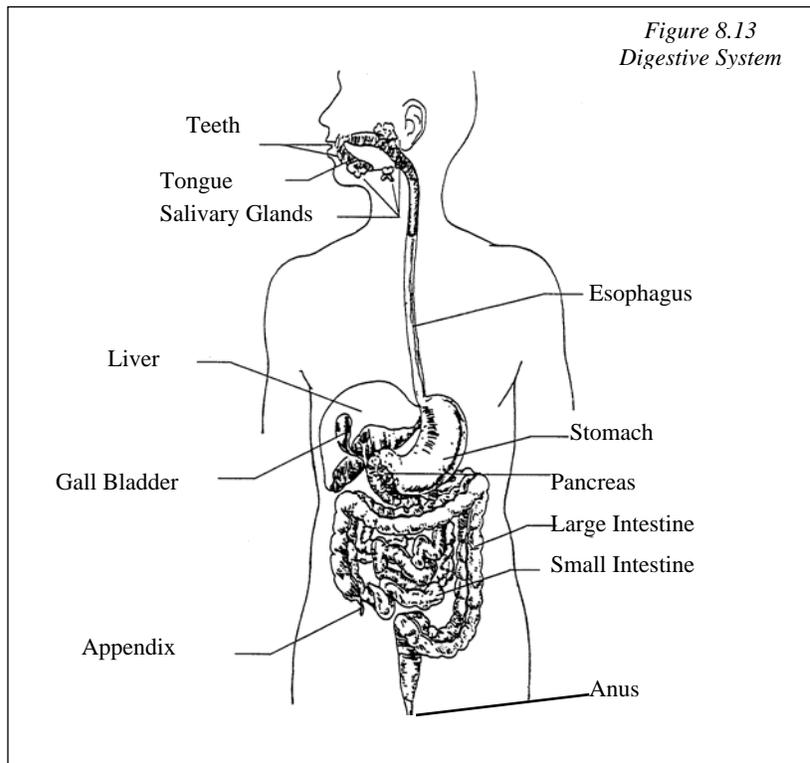
1. Chronic Obstructive Pulmonary Disease (COPD), also known as Chronic Obstructive Lung Disease (COLD), or Emphysema. This disease results in a decreased ability of the lungs to perform the function of ventilation. COPD may be related to exposures to chemicals inhaled in the workplace. COPD is treated with bronchodilators such as Theodur and mucolytics that help to liquefy and loosen thick mucous secretions such as Mucomyst.
2. Pneumonia – an inflammation/infection of the lungs caused by bacteria, viruses, aspiration, and chemical irritants. Treatment is based on the cause, usually with antibiotics such as amoxicillin and corticosteroids such as Pulmicort to decrease inflammation.
3. Lung Cancer – a malignancy in the respiratory system usually caused by cigarette smoking. Symptoms of lung cancer include persistent cough, dyspnea, and chest pain. Surgery is the most effective treatment.
4. Tuberculosis (TB) – caused by a bacteria. Treatment with a combination of anti-tuberculosis drugs such as INH and Rifadin is usually necessary.

IX. Digestive System (see next page Figure 8.13)

A. Structures.

1. Mouth – Includes the teeth, tongue and salivary glands. Takes food in, chews it and mixes food with saliva; one liter of saliva is produced daily.
2. Esophagus – tube from mouth to stomach.
3. Stomach – mixes food and fluids with digestive juices.
4. Liver – largest internal organ in the body and the primary organ of drug metabolism. The liver secretes substances that aid in digestion and

produces approximately 1 pint of bile per day. The liver stores iron, vitamins A, D, and excess glucose. It also metabolizes fats, proteins and carbohydrates, and detoxifies medications and other substances.



5. Gallbladder – stores bile.
6. Pancreas – also part of the endocrine system. Secretes insulin used to break complex carbohydrates into simple useable energy.
7. Small intestine – is twenty feet long and made up of 3 sections; the duodenum, the jejunum and the ileum. Food is absorbed into the bloodstream in the small intestine.
8. Large intestine – is five to six feet long and made up of 3 sections; the ascending, the transverse and the descending colon. The large intestine reabsorbs water and moves waste products through the system to the rectum.
9. Rectum – connects the large intestine to the anus.

NOTE: Bacteria live all along the 30-foot Digestive tract.

#### B. Functions.

1. Ingests food and fluids.

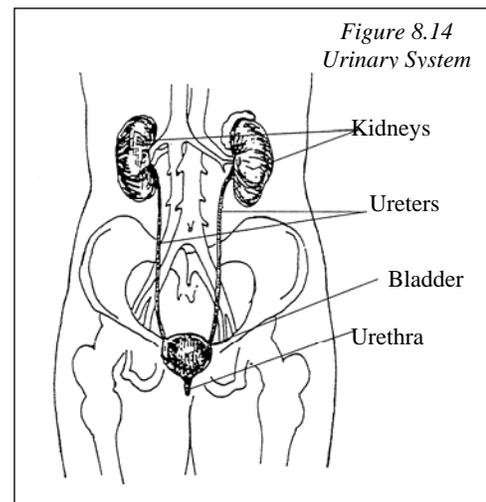
2. Prepares food for use by the body – breaks food into 3 main nutrients: carbohydrates, fats, and proteins.
  3. Excretes wastes.
- C. Age related changes affecting the digestive system.
1. Loss of teeth results in decreased dietary intake and weight loss.
  2. Nutritional needs remain the same, but the need for calories decreases as activity and metabolic rate decreases.
  3. Slower peristalsis results in constipation and increased intestinal gas (flatus).
  4. Saliva production diminishes which can make swallowing difficult and leads to a drier mouth.
  5. Decreased blood flow to the liver and decrease liver enzymes results in less efficient drug metabolism and detoxification.
  6. Decreased gastrointestinal secretions affect digestion and absorption of food and drugs.
- D. Diseases and conditions affecting the digestive system.
1. Cancer of the mouth, stomach, liver and intestines.
  2. Cirrhosis of the liver – due to fibrous tissue formed as a result of infection or obstruction of bile ducts.
  3. Constipation – the passage of unusually hard dry stools. It may be caused by inadequate fluid and/or fiber intake, and lack of exercise. If left untreated constipation can lead to fecal impaction; the buildup of hard stool that cannot pass through the rectum normally. Laxatives such as Milk of Magnesia, Colace, and castor oil, or enemas such as Fleet Enema may be used to treat constipation. Bulk producing laxatives such as Metamucil may be ordered on a daily basis to prevent constipation.
  4. Diarrhea – the frequent passage of unformed watery stool is treated with Anti-diarrheals such as Lomotil or Imodium. Bacterial diarrhea, also called “traveler’s diarrhea,” is also treated with an antibiotic such as Cipro.
  5. Gallstones – when a stone is formed by bile pigments and calcium salts that may cause pain and jaundice. Patients who are unable to undergo surgery to remove gallstones may be given drugs such as Actigall to help dissolve the stones.

6. Gastritis – an inflammation of the stomach. It is frequently treated with antacids such as Mylanta and drugs such as Zantac to decrease stomach acid.
7. Gastro Esophageal Reflux Disease (GERD) – occurs when the stomach acid flows back into the esophagus causing pain and irritation. Drugs such as Prevacid that decrease the production of acid and GI stimulants that increase the rate of gastric emptying such as Reglan may be used.
8. Hemorrhoids – enlarged veins in the lower rectum or anus. They are usually treated with anti-inflammatory suppositories, ointments, or creams such as Anusol.
9. Hepatitis.
  - a. Type A – transmitted by the fecal/oral route.
  - b. Type B – transmitted by blood and/or body fluids.
  - c. Type C – transmitted by blood and/or body fluids.
  - d. Type D – transmitted by blood and/or body fluids.
  - e. Others.
10. Hiatal hernia – protrusion of part of the stomach upwards through the diaphragm.
11. Ulcers – open lesions on gastric mucosa. Antacids such Maalox, and drugs that block the release of stomach acids such as Tagamet and Prevacid are commonly prescribed.

X. Urinary System (see Figure 8.14)

A. Structures.

1. Kidneys – filter the blood.
2. Ureters – transports urine from the kidneys to bladder.
3. Bladder – muscular sac that stores urine.
4. Urethra – connect the bladder to the urinary meatus, the external opening through which urine passes.



B. Functions.

1. Normally produces 1000cc-1500cc of clear yellow urine each day.
2. Removes waste products from the blood stream.
3. Maintains a stable balance of water and body chemicals (homeostasis).

C. Age related changes affecting the urinary system.

1. Bladder opening weakens and may result in incontinence and dribbling of urine.
2. Decrease in bladder muscle tone results in incomplete emptying of the bladder which leads to chronic retention and urinary tract infections.
3. Decreased ability of the kidneys to filter wastes and concentrate urine.

D. Diseases and conditions affecting the urinary system.

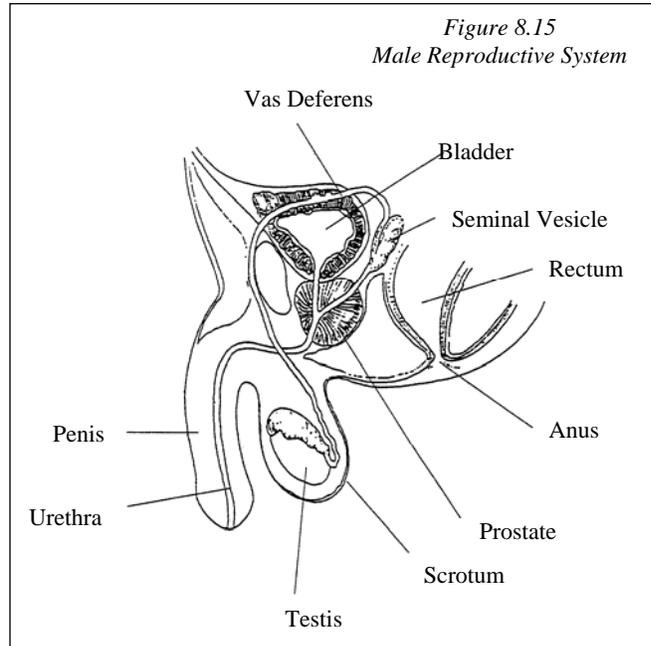
1. Urinary tract infections (UTI) can occur at any point in the urinary system. The most frequent cause of infection is *E. Coli* – a pathogen from the intestinal tract. Urinary tract infections are treated with antibiotics such as Cipro; sulfonamides such as Gantrisin; and combination drugs such as Septra. Pyridium, a urinary analgesic, may be used to relieve the pain associated with a UTI.
2. Renal failure – the inability of the kidneys to excrete wastes, concentrate urine and conserve electrolytes. Antibiotics and diuretics may be used.
3. Benign prostatic hypertrophy (BPH) – common in men over the age of 50. Symptoms include difficulty urinating and decreased urinary stream. Medications include Proscar and Hytrin.
4. Urinary retention – the inability to empty the bladder. Antispasmodic drugs such as Urispas maybe used to relax the smooth muscle in the urethra and bladder and promote normal bladder function.
5. Urinary incontinence – the inability to control the release of urine from the bladder. Antispasmodic drugs such as Ditropan may be used to relax the smooth muscle in the urethra and bladder and promote normal bladder function.

XI. Reproductive System

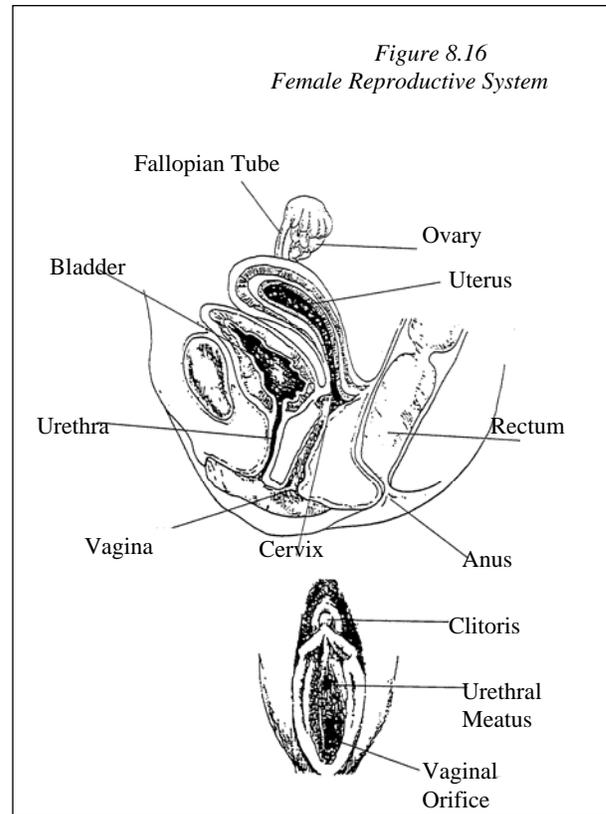
A. Structures.

1. Male (see next page Figure 8.15).

- a. Testes (gonads).
  - b. Prostate.
  - c. Penis.
  - d. Urethra.
  - e. Ducts.
2. Female (see Figure 8.16).
    - a. Ovaries.
    - b. Fallopian tubes.
    - c. Uterus.
    - d. Vagina.



- B. Function.
1. Produce reproductive cells.
    - a. Male – sperm.
    - b. Female – ovum or egg.
  2. Produce hormones responsible for secondary sex characteristics.
    - a. Male – testosterone.
    - b. Female – estrogen and progesterone.
- C. Age related changes affecting the reproductive system.



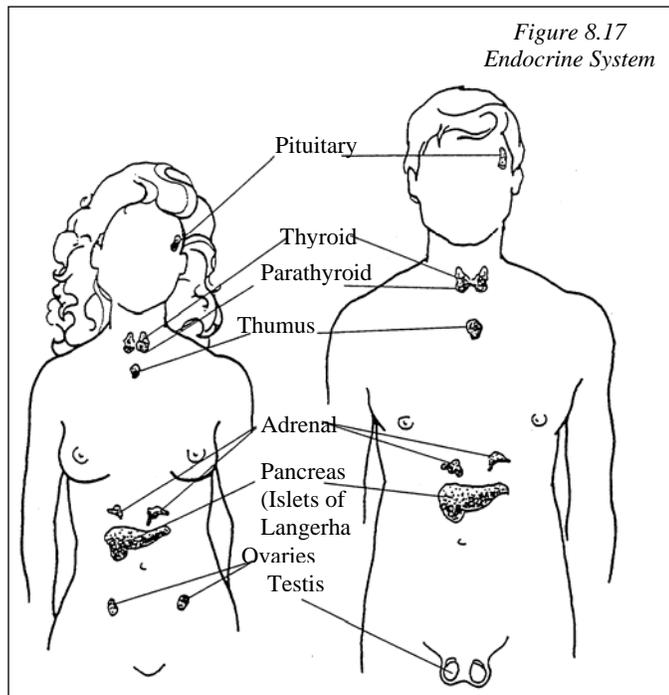
1. Slight decrease in testosterone and sperm production in men.
2. Enlargement of the prostate gland.
3. Significant decrease in estrogen production after menopause in women.

4. Vaginal dryness resulting in increased risk of infection.
- D. Diseases and conditions affecting the reproductive system.
1. Male.
    - a. Prostate Cancer.
    - b. Sexually transmitted diseases (STD) – cause widespread inflammation and scarring. Treatment is based on the bacteria, protozoa, or virus causing the infection. Anti-protozoal/antibiotics such as Flagyl and Vibramycin are sometimes prescribed.
  2. Female.
    - a. Uterine cancer.
    - b. Ovarian cancer.
    - c. Dysmenorrhea – painful menstruation. Treatment may include analgesics such as Tylenol or a non-steroidal anti-inflammatory such as Advil or Aleve.
    - d. Pregnancy.
    - e. Vaginitis – an inflammation of the vagina sometimes caused by a lack of hormones in post-menopausal women. Treatment may include estrogen replacement therapy such as Premarin.
    - f. Vaginal yeast infections – caused by *Candida albicans*. Topical drugs use to treat this infection include Monistat and Mycelex.
    - g. Sexually transmitted diseases (STD) – cause widespread inflammation and scarring. Treatment is based on the bacteria, protozoa, or virus causing the infection. Anti-protozoal/antibiotics such as Flagyl and Vibramycin are sometimes prescribed.

## XII. Endocrine System (see next page Figure 8.17)

- A. Structures.
1. Pituitary.
  2. Thyroid.
  3. Parathyroid.
  4. Adrenal.
  5. Pancreas.

## 6. Gonads.



### B. Functions.

1. Secretes hormones to regulate body processes.
2. Controls growth and development.
3. Metabolism.
4. Reproduction.

### C. Age related changes affecting the endocrine system.

1. Decreased hormone production.
2. Decreased ability to tolerate stress.

### D. Diseases and conditions affecting the endocrine system.

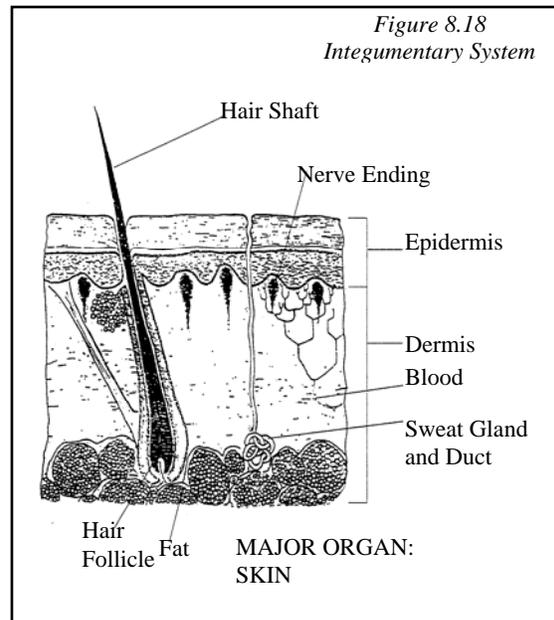
1. Hypothyroidism – condition resulting from decreased activity of the thyroid gland. Symptoms include weight gain, mental and physical lethargy, dry skin, and constipation. Medications include Armour Thyroid and Synthroid.
2. Hyperthyroidism – results from hyperactivity of the thyroid gland. Symptoms include nervousness, tremor, constant hunger, weight loss, fatigue, palpitations, and diarrhea. Anti-thyroid medications include Tapazole and Iodotope.

3. Diabetes mellitus – occurs when the pancreas fails to produce any insulin (type I); when the pancreas either produces an insufficient amount of insulin or the body cells are not receptive to the insulin being produced (type II). Diabetes is the leading cause of blindness, amputation, and kidney failure. The incidence of diabetes increases with age. Medications include insulins such as Humulin or oral antidiabetic drugs such as Glucotrol and Actos.

### XIII. Integumentary System

#### A. Structures. (see Figure 8.18)

1. Skin – largest organ of the body.
2. Nails.
3. Hair.
4. Sebaceous glands – oil secreting glands.
5. Sweat glands.



#### B. Functions.

1. Provides protection.
2. Regulates body temperature.
3. Excretes wastes.
4. Manufactures vitamin D.

#### C. Age related changes affecting the integumentary system.

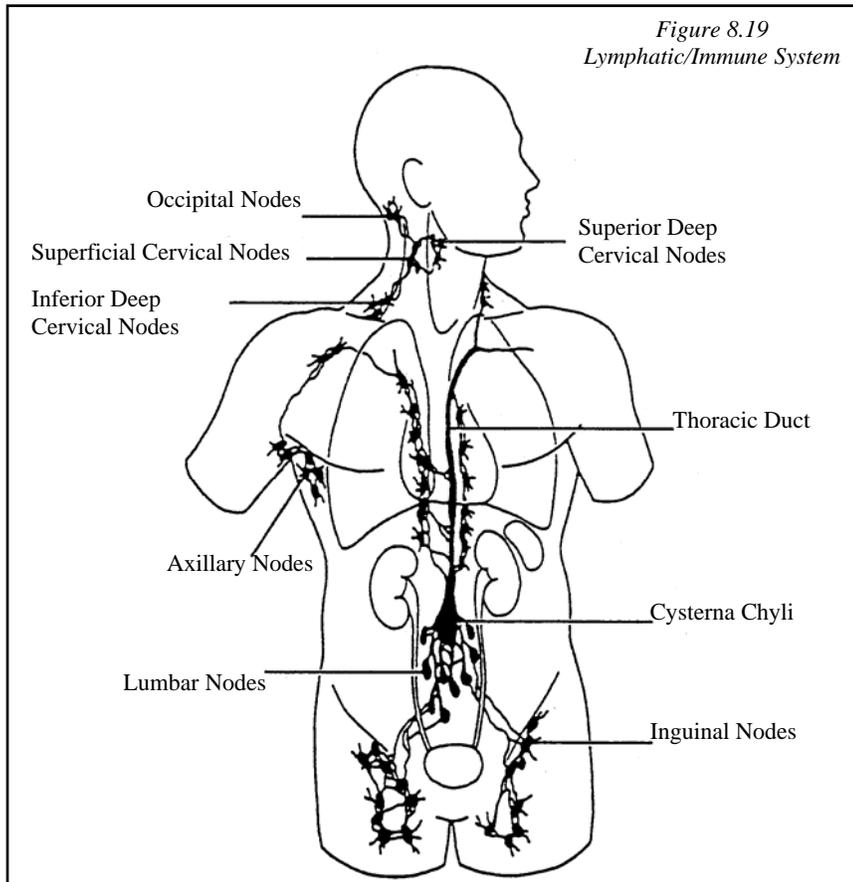
1. Decreased subcutaneous fat and thinning of the skin results in wrinkles.
2. Cell replacement takes longer and results in slower wound healing and increased chance of infection.
3. Skin becomes dry and less elastic.
4. Loss of sweat glands and subcutaneous fat makes temperature regulation more difficult.
5. Hair pigment decreases and hair becomes white or gray.
6. Hair thins and becomes fine.

7. Nails may become thick and brittle.
- D. Diseases and conditions affecting the integumentary system.
1. Skin cancer.
  2. Burns and skin ulcers – may contain a large amount of necrotic (dead) tissue. Topical enzymes such as Santyl ointment dissolve necrotic tissue and allow new tissue to form. The topical drug Regranex stimulates the formation of healthy granulation tissue. Topical antibiotics such as Silvadene may also be applied to prevent infection (HO 19).
  3. Scabies/lice – a skin condition caused by tiny parasites called mites. It is transmitted by skin to skin contact and causes persistent itching. Topical medications include Nix and RID.
  4. Skin infections – boils, yeast infections, fungal infections and infections around the nails. Treatment is based on the cause of the infection. Bacterial infections may be treated with a topical antibiotic such as Garamycin or Polysporin. Fungal infections such as ringworm or athlete's foot can be treated with a topical antifungal such as Lotrimin or Lamisil. Yeast is commonly treated with an anti-yeast drug such as Mycostatin.
  5. Dry skin – it is very important to keep skin moist. Dry skin is caused by a lack of water; not a lack of oil. Dry skin is more prone to cracking and becoming infected.
  6. Dermatitis – inflammation and itching of the skin; can be caused by many factors including poison ivy, insect bites, psoriasis and eczema. Topical corticosteroids such as Cortaid or Topicort are commonly prescribed. Topical antihistamines such as Benadryl inhibit redness and itching due to an allergic skin reaction. For more severe reactions, systemic corticosteroids such as Medrol may be prescribed.

#### XIV. Lymphatic/Immune System

- A. Structures (see next page Figure 8.19).
1. Lymph – fluid in lymphatic system.
  2. Lymph nodes – rounded bodies of lymphatic tissue.
  3. Tonsils – masses of lymphatic tissue in the pharynx.
  4. Thymus – lymphatic organ.
  5. Spleen – organ of lymphatic tissue; stores and filters blood.

Figure 8.19  
Lymphatic/Immune System



B. Functions.

1. Produces antibodies.
2. Protects the body from bacterial invasion.
3. Manufactures white blood cells (lymphocytes).
4. Filters impurities such as dead cells.

C. Age related changes affecting the lymphatic/immune system.

1. Less resistance to disease and infections.
2. Slower wound healing.
3. Loss of ability to differentiate between normal and abnormal cell results in increase in autoimmune diseases and cancer.

D. Diseases and conditions affecting the lymphatic/immune system.

1. Lymphatic cancer.

2. Infections – can occur in any body system. The best method of treating an infection is to prevent it from occurring. Influenza and Pneumonia vaccines are commonly given to those at high risk of developing the disease. Anti-infective, antibiotic, antifungal, and antiviral medications are used to treat the causes of infection.
3. Acquired Immune Deficiency Syndrome (AIDS) – caused by the human immunodeficiency virus (HIV). HIV is transmitted through contact with an infected individual, contaminated blood, or used needles. An infected mother can transmit the virus to her fetus before birth or after delivery by breast feeding. Current medications are designed to suppress the virus and treat secondary infections. Medications include Retrovir, Epivir, Rescriptor, Agenerase, and combination drugs.

#### XV. Summary and Conclusion

- A. Body plan.
- B. Changes in “Normal,” older adults that affect drug effectiveness.
- C. Special risks of ill older adults.
- D. Musculoskeletal system.
- E. Nervous system.
- F. Sensory system.
- G. Cardiovascular system.
- H. Respiratory system.
- I. Digestive system.
- J. Urinary system.
- K. Reproductive system.
- L. Endocrine system.
- M. Integumentary system.
- N. Lymphatic system.

In this lesson we have examined the body systems, their structures, and functions and related diseases. The next lesson is introduction to pharmacology.