Unit G Master Outline

G. Hematology

1H07.01 Explain the structure of the blood.

A. Adult = 8-10 pints
B. Composition
   1. Plasma
   2. Serum
   3. Cellular components (red blood cells, white blood cells, platelets)
C. Plasma
   1. Straw colored
   2. Contains water, blood proteins, plasma proteins, nutrients, etc.
D. Erythrocytes
   1. Shape = biconcave discs, donut-shaped
   2. Hemoglobin
      a. Gives red color
      b. Heme is iron, globin is protein
      c. Arterial blood is bright red = lots of oxygen
      d. Venous blood is dark crimson = lots of CO_2
E. Leukocytes
   1. May be granular, agranular, translucent or ameboid
   2. Larger than erythrocytes
   3. Types of white cells
      a. Neutrophils
      b. Eosinophils
      c. Basophils
      d. Lymphocytes
      e. Monocytes
F. Thrombocytes
   1. Platelets
   2. Make the blood clot
   3. Smallest solid components of blood
   4. Not cells – fragments of megakaryocytes

1H07.02 Analyze the function of the blood.

A. Four main functions
   1. Transport oxygen, nutrients, cellular waste products and hormones
   2. Aids in distribution of heat
   3. Regulates acid-base balance
   4. Helps protect against infection
B. Plasma
   1. Liquid part of blood
   2. Plasma proteins
      a. Fibrinogen – blood clotting
      b. Albumin – osmotic pressure and volume
      c. Prothrombin – helps blood coagulate, production dependent on Vitamin K
   4. Reduction of Heparin

C. Erythrocytes
   1. Contain hemoglobin
      a. Transports O_2 to tissues and CO_2 away from cells
      b. Red cells travel to lungs to get O_2 and give up CO_2, then to tissues to deliver O_2 and pick up CO_2
   2. Erythropoiesis – manufacture of red cells in bone marrow
   3. Life span
      a. Red cells live 120 days
      b. Old cells broken down by spleen and liver
   4. Hemolysis – rupture of erythrocyte from blood transfusion or disease

D. Leukocytes
   1. Fight infection
   2. Phagocytosis – white cells surround, engulf and digest harmful bacteria
   3. Basophils produce heparin – and anticoagulant
   4. Diapedesis – when white cells move through capillary walls into neighboring tissues
   5. Inflammation
      a. Body's reaction to chemical and physical trauma
      b. Pathogenic – disease producing microorganisms that can cause infection
      c. Symptoms – redness, local heat, swelling and pain
      d. Why? Bacterial toxins, increased blood flow, collection of plasma in tissues (edema)

E. Thrombocytes (Platelets)
   1. Synthesized in red marrow
   2. Necessary for the initiation of the blood clotting process

F. Coagulation
   1. Cut or injury causes to break/clump
   2. Chain reaction follows and involves the release of thromboplastin, prothrombin, thrombin and fibrinogen
   3. Fibrin creates a mesh that traps red blood cells, platelets and plasma, creating a blood clot
   4. Anticoagulants prevent blood clotting
   5. Heparin is an anticoagulant

G. Blood types
   1. Four major types, determined by presence or absence of an antigen on the surface of the red blood cell
      a. A
      b. B
      c. O
      d. AB
   2. Inherited from parents
   3. Antibody – a protein in the plasma that will inactivate a foreign substance that enters the body
      a. Someone with type A blood has *b* antibodies
      b. Someone with type B blood has *a* antibodies
      c. Someone with type AB blood has no antibodies
      d. Someone with type O blood has *a* and *b* antibodies
   4. Universal donor – O
   5. Universal recipient – AB
   6. Red cells may also contain Rh factor