Medical Terminology: Day 1a: Lecture

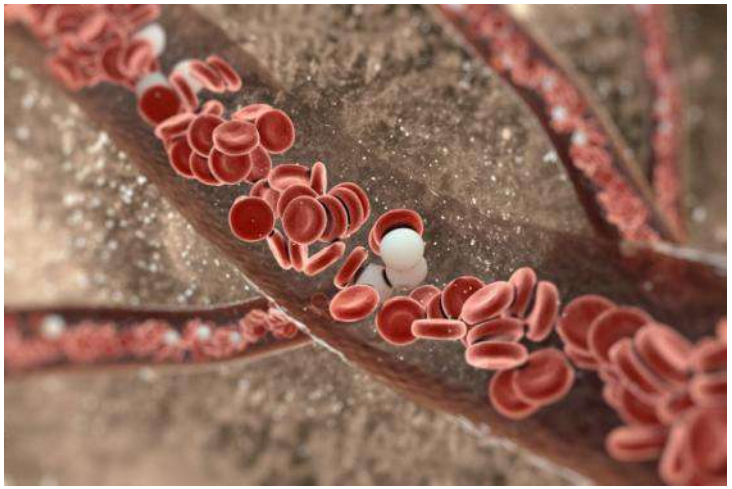
Chapter 5: The Blood and the Lymphatic and Immune Systems

You will need:

- **Notebook/binder**
- **Pen/pencil/highlighter**
- **Textbook**

Fluid Systems of the Body

- **Blood**—part of the **circulatory** or **cardiovascular system**
- **Lymph**—part of the **lymphatic system**



vitstudio/Shutterstock.com

Why do we discuss the blood and lymph together?

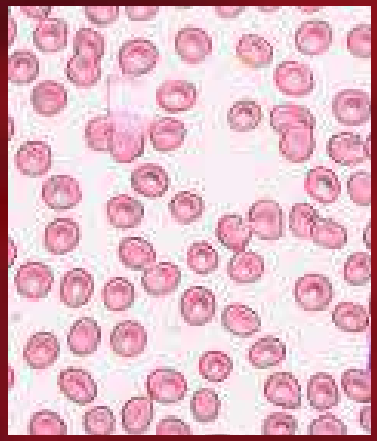
The Blood System

The Blood (Hem/o or hemat/o)

- Blood is composed of 2 major elements:
  - 55% liquid plasma (liquid component)
  - 45% formed elements
    - Red blood cells
    - White blood cells
    - Platelets

https://www.verywellhealth.com/what-is-a-universal-recipient-3157299

Erythrocytes



Erythrocytes

(erythr/o = red + -cyte = cell)

- Also called red blood cells (RBC's)
- Approximately 44%; Live about 120 days
- Manufactured in the bone marrow; a new RBC is called a blast
- As the blast matures, the nucleus is replaced by hemoglobin (hem/o = blood + -globin = protein) which is the iron containing portion of erythrocyte
- Hemoglobin transports oxygen from the lungs to the tissues of the body

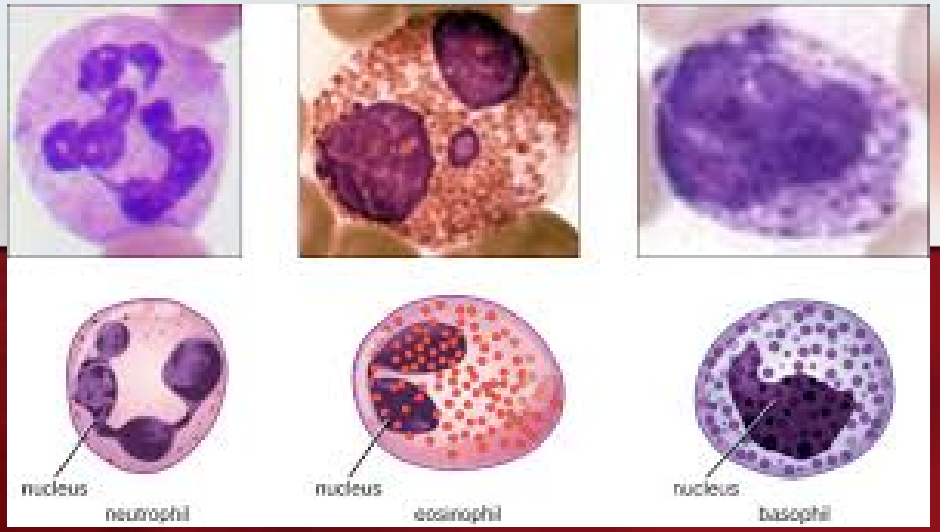
Leukocytes

Leukocytes (leuk/o = white + -cyte = cell)

- Also called white blood cells (WBC's)
- Manufactured mainly in the bone marrow
- < 1%
- Protect body against infection

Leukocytes:

There are five types of leukocytes:



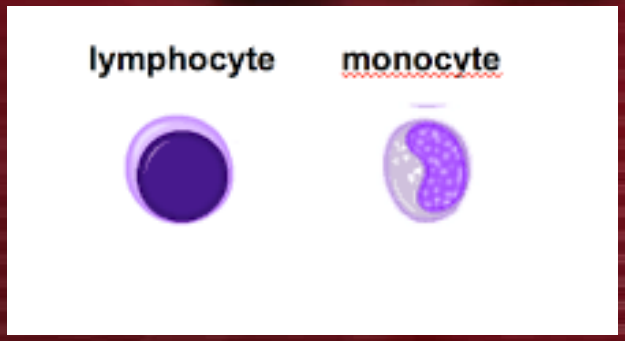
Granulocytes

- Neutrophils – majority of WBC's, fight infection by *phagocytosis* (engulfing & swallowing germs). Elevated count indicates infection (strep, staph, etc..)
- Eosinophils – secrete chemicals to attack disease-causing parasites; increase in response to allergic conditions or hypersensitivity (ex - allergic reaction, asthma, etc
- Basophils – contain histamine (released during inflammatory response) and heparin (aids in coagulation); causes erythema, edema, fever, and pain

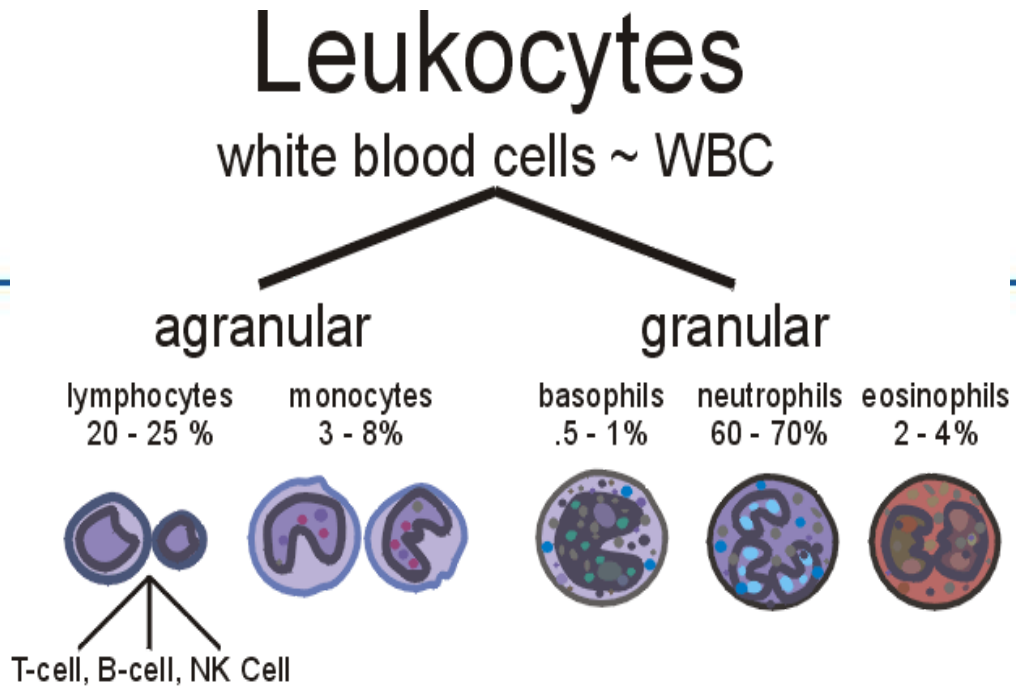
Leukocytes Cont'd.

Agranulocytes

- Lymphocytes – formed in red bone marrow, lymph nodes, and spleen; immune surveillance to detect and destroy foreign cells in the body
- Monocytes –ingest and dispose of dead or dying cells and tissues; an elevated count usually indicates a chronic (long-term) condition
  - When monocytes move from the bloodstream into the tissues, they are called *macrophages (large eater)*; macrophages are typically found in the spleen, liver, and connective tissues.



Leukocytes



- Types include
  - granulocytes (polymorphonuclear) – **using the word parts on pg. 113 – 114, *paraphrase (put in your own words) what this means***
  - agranulocytes (mononuclear) - ***paraphrase (put in your own words) what this means***

(Continued)

Medical Terminology:
Day 1b: Lecture/Activity

Chapter 5: The Blood and the Lymphatic and Immune Systems

You will need:

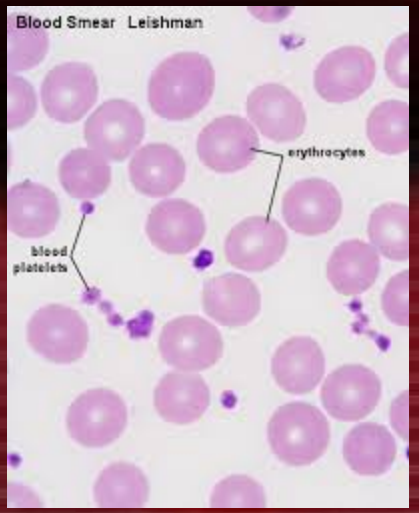
- **Notebook/binder**
- **Pen/pencil/highlighter/marker**

Thrombocytes

Thrombocytes

(thromb/o = clot + -cyte = cell)

- Also known as platelets
- < 1%
- Smallest formed elements in the blood
- When blood vessel is damaged, platelets become sticky and clump together to form a clot (this is called coagulation)



Blood

Plasma

- Liquid part of blood; contains salt, sugar, nutrients, wastes and hormones
- 91% water, 9% proteins

4 Key proteins in plasma

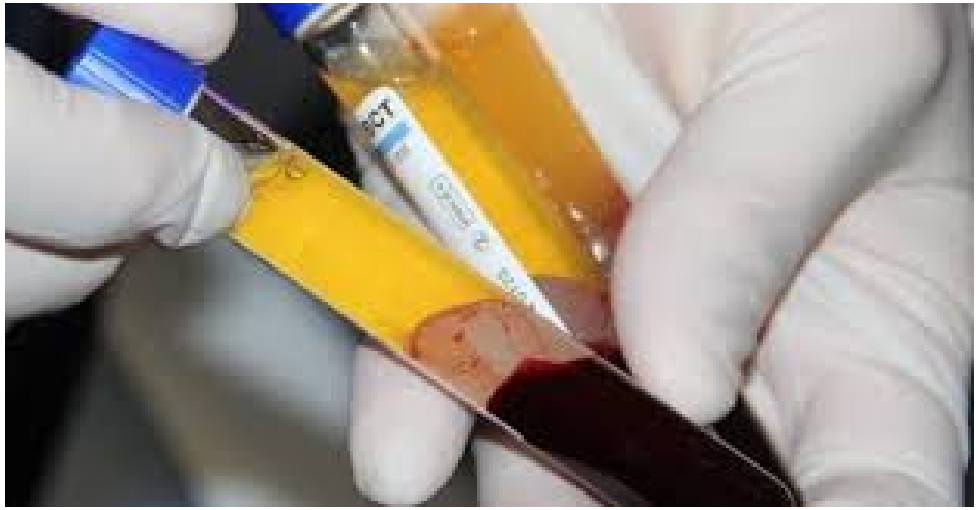
1. Albumin- helps maintain water balance in blood
2. Globulin-
    1. Alpha & Beta globulins transport lipids (fats) throughout the body
    2. Gamma globulins act as antibodies
3. Fibrinogen- formed in liver; creates “bridges” between platelets
4. Prothrombin- formed in liver; converted to thrombin when injury occurs to a blood vessel; activates fibrinogen to create fibrin

http://www.bloodservices.ca/centreapps/internet/uw_v502_mainengine.nsf/resources/Blood+Process/$file/Step6_150.jpg

Create a model of your blood:

Step 1:

Pour 2-2.5 mL vegetable oil into the cup- this represents the plasma which is slightly yellowish in color and makes up 55% of blood.



Create a model of your blood:

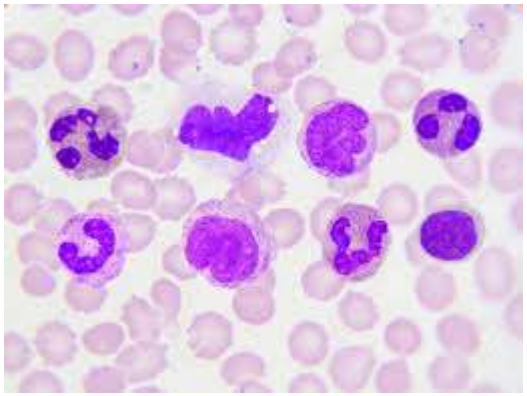
Step 2:
Add approximately 3 oz. red hots- these represent the red blood cells which make up 44% of blood.
Mature cells will be *denucleated* and carry the hemoglobin which binds to oxygen.

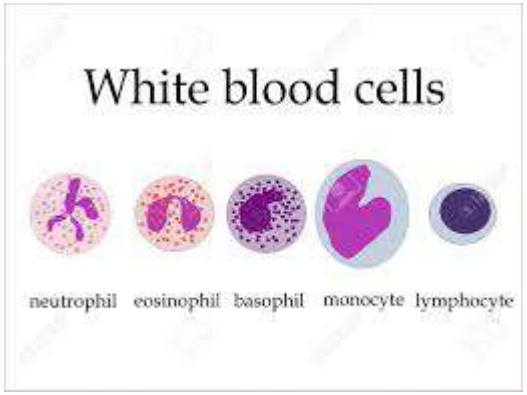
Create a model of your blood:

Step 3:

You will now receive a lima bean which represents the White Blood Cell. WBCs make up less <1% of your blood.

Draw the nucleus of your white blood cell using marker or pen. What type of *lymphocyte* do you have?

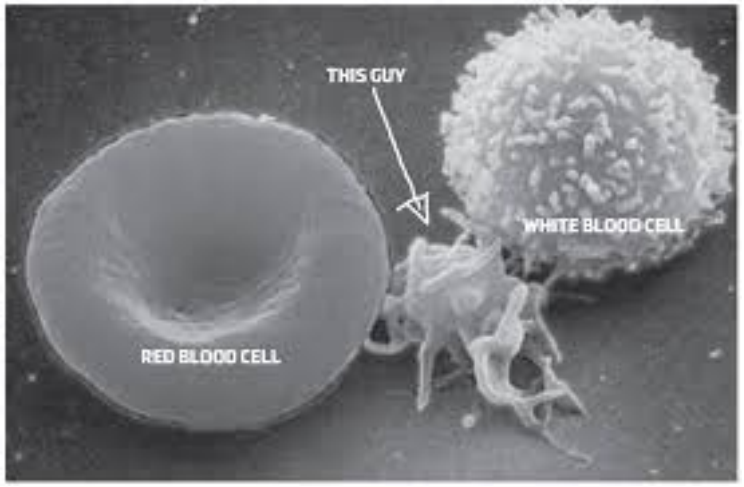




Create a model of your blood:

Step 4:
Now gather a thin layer of lentil beans (approximately 30-40) to represent the platelets. Compare the size of the 1 lima bean to the size of 30-40 lentils. Do they take up about the same amount of space.

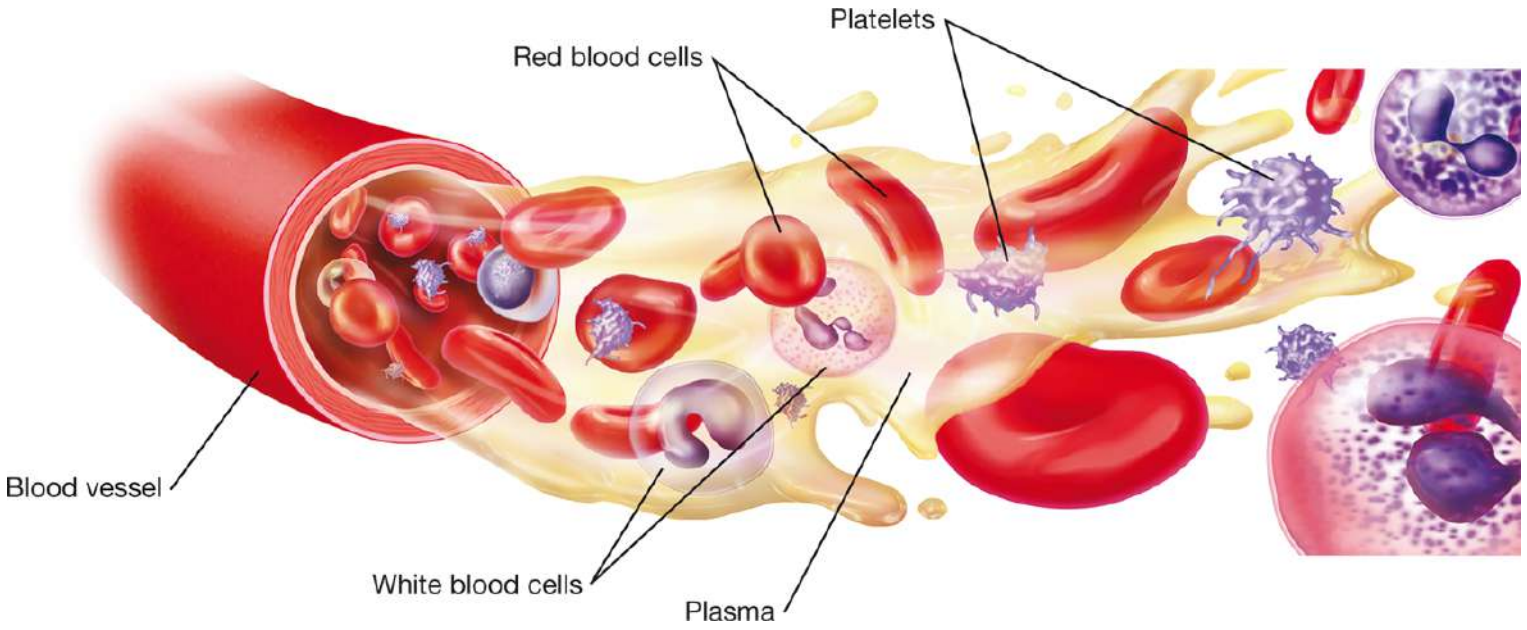
Together, both the WBC and PLT make up 1% of blood.



Create a model of your blood:

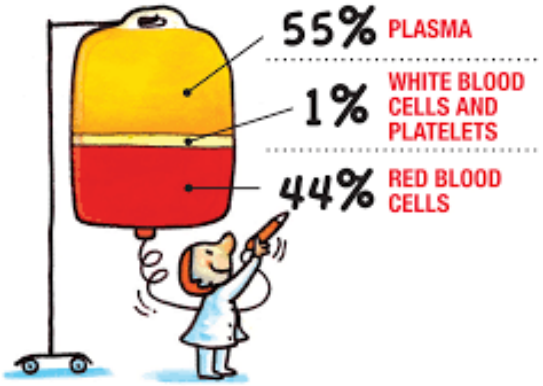
Step 5:

Secure the lid of your cup and gently shake to mix the components of your blood.



The Blood Cell Types

Step 6: Create a drawing in your notes to show the cell types and ratios. Use your model as a guide. Include color and *labels*.



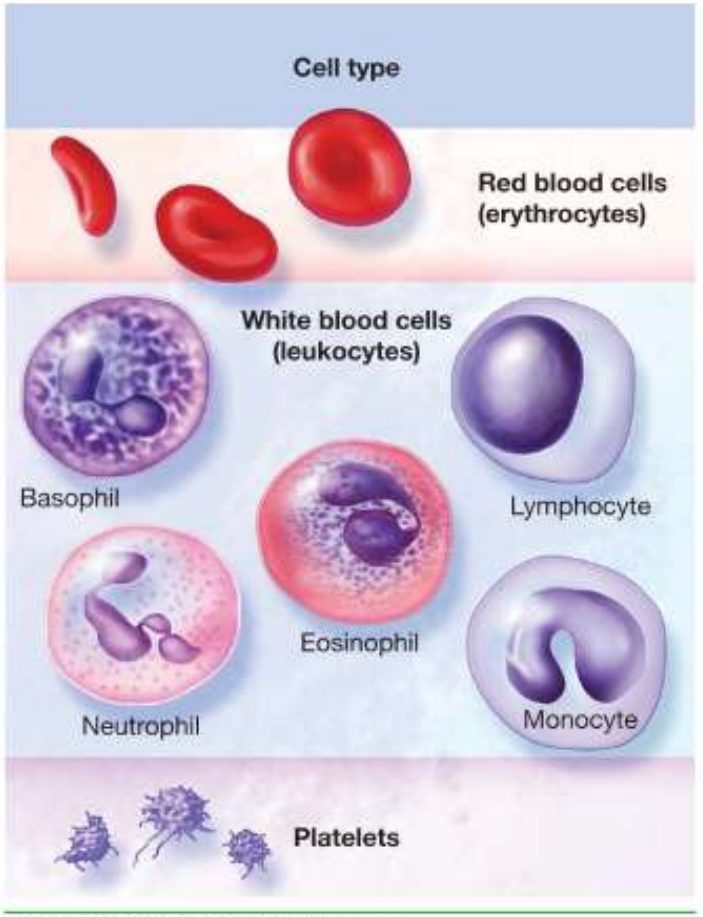


Figure 5.2 The blood cell types.

Medical Terminology:
Day 2a: Lecture

Chapter 5: The Blood and the Lymphatic and Immune Systems

You will need:

- **Notebook/binder**
- **Pen/pencil/highlighter**
- **Textbook**

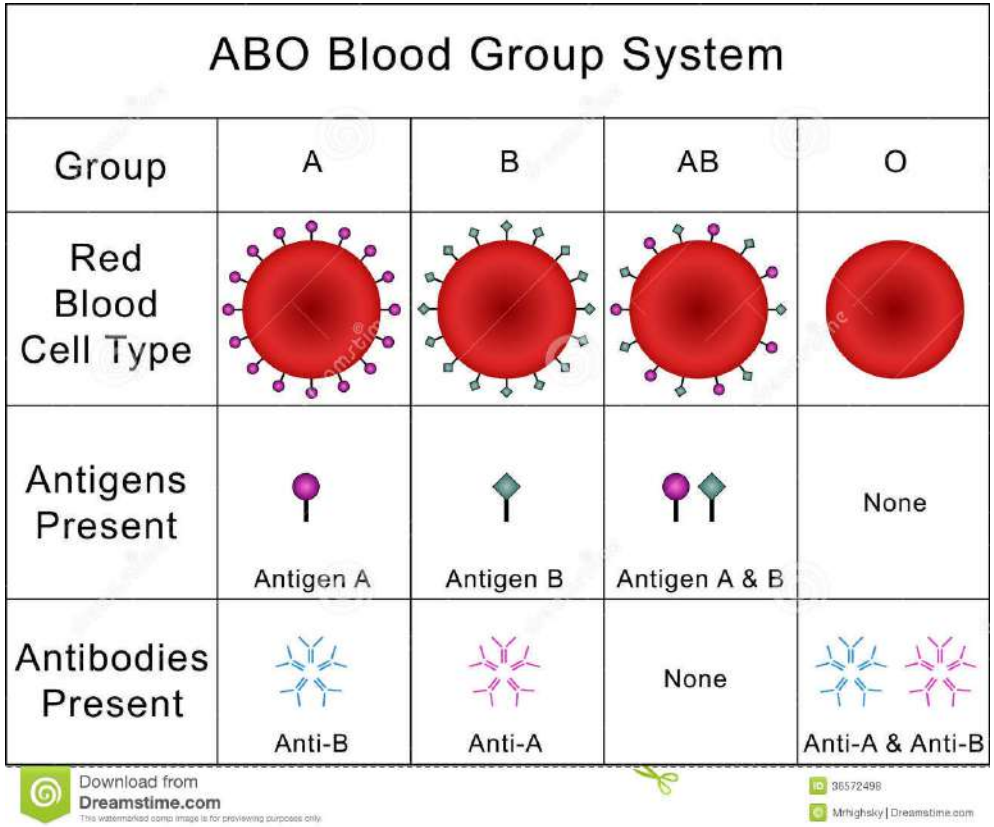
Remember This?

Write your answer on your whiteboards

- *What are the two major elements of the blood?*

  formed elements (blood cells) and plasma

Blood Types



- Four major types: A, B, AB, and O
  - Groups are based on whether A and/or B antigens are present on red blood cells
- In type O, both A & B antigens are absent
- In type AB, both A & B antigens are present

Blood Types Cont'd.

Blood Type	Can Donate To	Can Receive From
A	A, AB	A, O
B	B, AB	B, O
AB (universal recipient)	AB	A, B, AB, O
O (universal donor)	A, B, AB, O	O (only)

Rh Factor

The Rh Factor

- People are either Rh positive or Rh negative
- If you are Rh positive, you have the Rh antigen
- If you are Rh negative, you do not have the Rh antigen

It is important to know Blood Type and Rh factor if a patient is going to receive blood

Treatments / Procedures

Blood Transfusion

- Transfusing whole blood or blood components (packed cells, etc..) from a donor to a recipient; Blood is tested for diseases like HIV and Hepatitis before transfusion so the disease is not spread to the recipient of the blood.

Type & Crossmatch

- The blood must be carefully matched (A, B, AB, or O as well as Rh+ or Rh-) or the patient may suffer a severe reaction.

True Blood - Overview

- True Blood: Crash Course A&P #29
- After the video clip, write a 3 – 2 – 1 on your notecard
  - Three (3) things you learned
  - Two (2) things you found interesting
  - One (1) question you still have ***OR*** one (1) conclusion you reached

Blood System Disorders

Leukemia (leuk/o = white + -emia = blood condition)

- progressive increase in the number of abnormal leukocytes; malignant (harmful) disorder

Anemia (an- = without + -emia = blood condition)

- Deficiency of red blood cells or hemoglobin

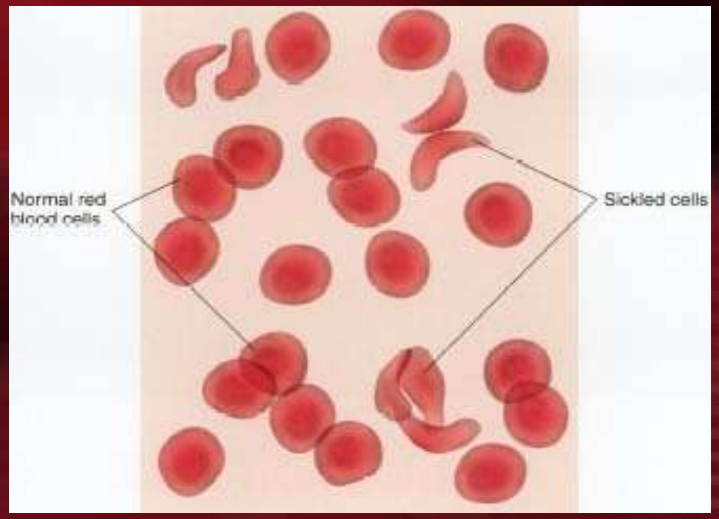
Iron Deficient Anemia

- Develops if not enough iron is available to the bone marrow to make hemoglobin. Caused by inadequate iron intake, pregnancy, breast feeding, or chronic (long term) blood loss.

Blood System Disorders

Sickle Cell anemia

- genetic disorder that causes abnormal hemoglobin
- abnormally shaped red blood cells (sickled instead of round)
- interferes with normal blood flow through the body



http://www.humanillnesses.com/original/images/hdc_0001_0003_0_img0234.jpg

Diagnostic Tests

Pulse Oximeter

- External monitor that is applied to the finger to measure oxygen in blood saturated with oxygen
- Normal is above 96% (blood saturated with oxygen)

Arterial Blood Gases (ABG)

- Measurement of gases in dissolved in liquid part of blood including oxygen and carbon dioxide

Career Opportunities

- Hematologist

  (hemat/o = blood + -ologist = specialist)

  - specializes and treats disorders of the blood

- Phlebotomist

  (phleb/o = vein + -tomy = incision)

  - Takes patient blood samples and prepares them for testing in the lab

http://healthcare.maricopa.edu/images/PHLEB.jpg

- Medical Technologist (MT)

  - Works under the supervision of pathologist to study tissues, fluids, and cells in the human body

Medical Terminology: Day 2b: Assignment

Chapter 5: The Blood and the Lymphatic and Immune Systems

Google Classroom:

Blood Word Construction & careers

Medical Terminology:
Day 3a: Lecture

Chapter 5: The Blood and the Lymphatic and Immune Systems

You will need:

- **Notebook/binder**
- **Pen/pencil/highlighter**
- **Textbook**
- **glue stick, scissors, or tape**

Your Turn

What are the meanings of the following word parts?

- *agglutin/o*
  clumping
- *iatr/o*
  treatment
- *lymphaden/o*
  lymph node
- *mono-*
  one; single
- *pro-*
  before; forward
- *-globulin*
  protein
- *-pheresis*
  removal
- *-stasis*
  stoppage of flow

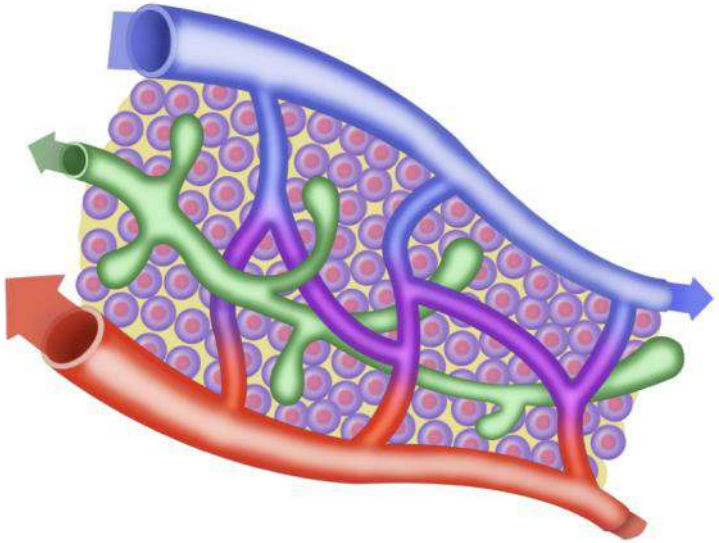
What is Immunity?

Write your answer on your whiteboards.

Lymphatic & Immune System

Functions of the Lymphatic System

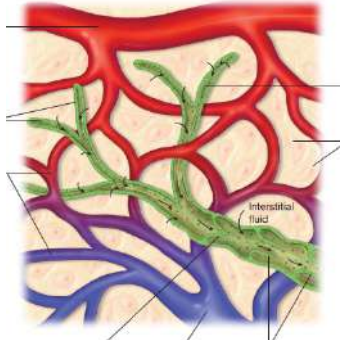
- Manufactures and transports **lymph**
- Removes wastes, germs, toxins, and other substances from the body
- Controls fluid balance



Structures of the Lymphatic System

- **Lymphatic fluid** – also called *interstitial fluid*, removes waste from cells, filtered by lymph nodes before re-entering circulatory system; contains leukocytes and plasma

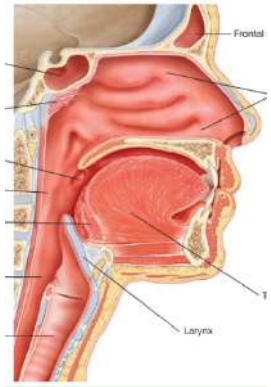
- **Lymphatic vessels –** have valves, always flow toward the thoracic (chest) cavity
  - Insert the labeled picture of the lymphatic vessels



- **Lymph nodes –** location of lymphocyte production; nodes filter lymph fluid of harmful substances; swollen lymph nodes may mean there is a disease process

Structures of the Lymphatic System

- **Tonsils –** small masses of lymphatic tissue located in the *pharynx* (throat) and nasal cavity that trap pathogens entering through the mouth and nose



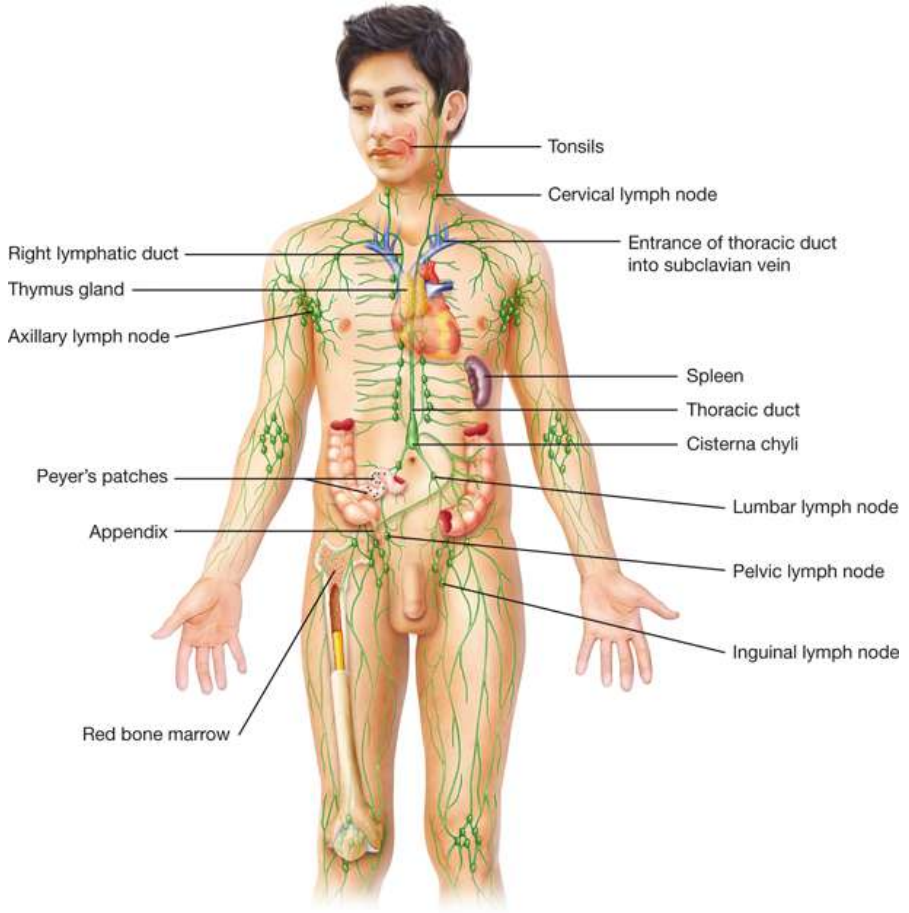
- <u>3 types of tonsils:</u>
  - Palatine tonsils on either side of the throat
  - Lingual tonsils at the base of the tongue
  - Adenoids, or pharyngeal tonsils, in the nasopharynx

***Secure the diagram of the tonsils in your notebook at this time and label using Figure 5.6 on page 121

Structure of the Lymphatic System

Using pg. 118, label the structures of the lymphatic system and secure the diagram in your notebook.

When finished, use pgs. 119-121 to help describe the function of each part.



Structures of the Lymphatic System

- **Thymus –** located in the *mediastinum*, the area between the lungs; secretes *thymosin*, a hormone that stimulated the bone marrow to produce T cells

- **Spleen –** filters blood by *hemolysis;* makes lymphocytes and stores thrombocytes; reservoir for blood which can be released when the body suffers blood loss
  - A person can live without their spleen, however, it weakens the immune system and make the person more susceptible to infection

Structures of the Lymphatic System

- **Liver-** filters blood through *hemolysis* and stores healthy erythrocytes

- **Peyer's patches-** small bundles of lymphatic tissue in the walls of the small intestines; protect the body against harmful invaders that may be ingested

Your Turn

Define each disease classification and identify the meanings of its word parts:

- *endemic*

  en- = within; dem/o = people; -ic = pertaining to

  definition: disease restricted to population

- *ischemic*

  isch/o = to hold back; -emic = pertaining to blood condition

  definition: condition caused by lack of blood flow

Medical Terminology: Day 3b: Lecture

Chapter 5: The Blood and the Lymphatic and Immune Systems

Google Classroom:

Analyzing Diagnostic and Treatment Terms

Medical Terminology:
Day 4a: Lecture

Chapter 5: The Blood and the Lymphatic and Immune Systems

You will need:

- **Notebook/binder**
- **Pen/pencil/highlighter**
- **Textbook**

Remember This?

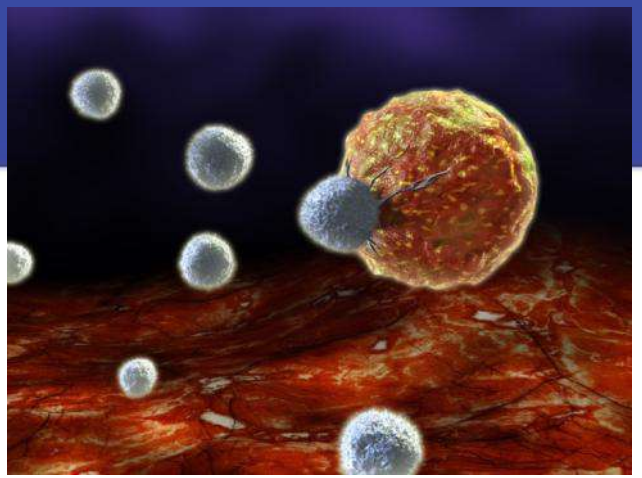
- *What are the names and locations of the three types of tonsils?*

  palatine tonsils (either side of the throat); lingual tonsils (base of the tongue); adenoids or pharyngeal tonsils (nasopharynx)

- *What is the function of the spleen?*

  The spleen filters out and destroys worn-out erythrocytes in a process called *hemolysis*

Structure of the Immune System



T cells attacking a cancer cell

Use page 122 - 124 of your book to fill in missing info

T cells

- Cytotoxic cells (T8 cells)- attach and destroy
- Helper cells (T4 cells)- aid B cells to recognize antigens and stimulate antibodies
- Natural killer cells (NK cells)- target pathogenic cells by recognizing certain sugars on their surfaces
- Suppressor cells- slow down B or T cells when infection is under control or destroyed

Structure of the Immune System

Use page 122 of your book to fill in missing info:

B lymphocytes (B cells)

- Immunoglobulin A (IgA)- found in respiratory and GI tract; secreted in saliva, tears, and breast milk
- Immunoglobulin D (IgD)- found in blood plasma; attach to surface of B cells as antigen receptors
- Immunoglobulin E (IgE)- secreted by plasma cells in the skin, tonsils, respiratory and GI tracts; stimulate histamine release
- Immunoglobulin G (IgG)- found in blood plasma; main defense against infectious invaders; only immunoglobulin that crosses the placenta to provide fetal immunity
- Immunoglobulin M (IgM)- bind to B-cell receptor sites in plasma; act as a powerful *agglutinating* agent

Types of Immunity

- **Immune Response** – activated when a foreign substance (antigen) enters the body, proteins (antibodies) bind to the antigen to mark it so that other cells in the immune system can destroy the antigen

- **Types of Immunity**

1. Natural Immunity – passed from mother to fetus before birth; protects you from certain diseases because of your species, race, or gender
2. Acquired Active Immunity – development of antibodies following a disease or vaccination (ex. chicken pox)
3. Acquired Passive Immunity – short-term, produced in a body other than your own (ex. IgG, antitoxins, bone marrow transplant, breast milk, etc.)

Remember This?

- *What is the difference between an antibody and an antigen?*

  An antigen is a substance that is harmful, or perceived as harmful, to the body; an antibody is a protein manufactured by the immune system when the immune system detects an antigen

Remember This?

- *Which type of antibody is responsible for producing inflammatory and allergic responses?*

  immunoglobulin E (IgE)

- *Which type of leukocyte can become a macrophage?*

  monocyte

The Inflammatory Response

Inflammation & the Immune System

- Write a summary of the inflammatory response based on the video clip using the following words:
  - Macrophage
  - Cytokines
  - Bacterium or antigen
  - T cells
  - B cells
  - Autoimmune

Medical Terminology: Day 4b: Assignment

Chapter 5: The Blood and the Lymphatic and Immune Systems

Google Classroom:

Blood/Lymph/Immune word surgery

Medical Terminology:
Day 5a/b: Project

Chapter 5: The Blood and the Lymphatic and Immune Systems

Project: **Find your assigned project topic on Google Classroom. Use a 5x8" index card to create your presentation. Be sure to research completely and make it stand out by using color and detailed pictures. You are the expert on your topic and will teach it to your peers next class.**

Medical Terminology:
Day 6a: Lecture

Chapter 5: The Blood and the Lymphatic and Immune Systems

DISEASES AND TREATMENTS

We will complete note-taking and prepare for a presentation of our topics.

Your Turn

The victim of an auto accident is in serious condition and has lost a lot of blood. What laboratory test would the physician order to determine blood-type compatibility before giving the patient a blood transfusion?

(type and) crossmatching

Your Turn

Define each disease or condition and identify the meanings of its word parts:

- *polycythemia*

  poly- = many, much; cyt/o = cell; hem/o = blood; -ia = condition
  definition: disorder of excessive RBC production

- *mononucleosis*

  mono- = one, single; nucle/o = nucleus; -osis = abnormal condition
  definition: acute illness marked by increased atypical lymphocytes and monocytes

Pathogenic Organisms

- **Pathogenic Organisms** (Path/o = disease + genic = creation or reproduction)

1. Bacteria – one-celled microscopic organism (ex. Staph or strep)

http://www.aceium.com/images/fungus.jpg

2. Fungus – parasitic plant

3. Yeast – type of fungus

4. Parasite – plant or animal living in another organism (example malaria)

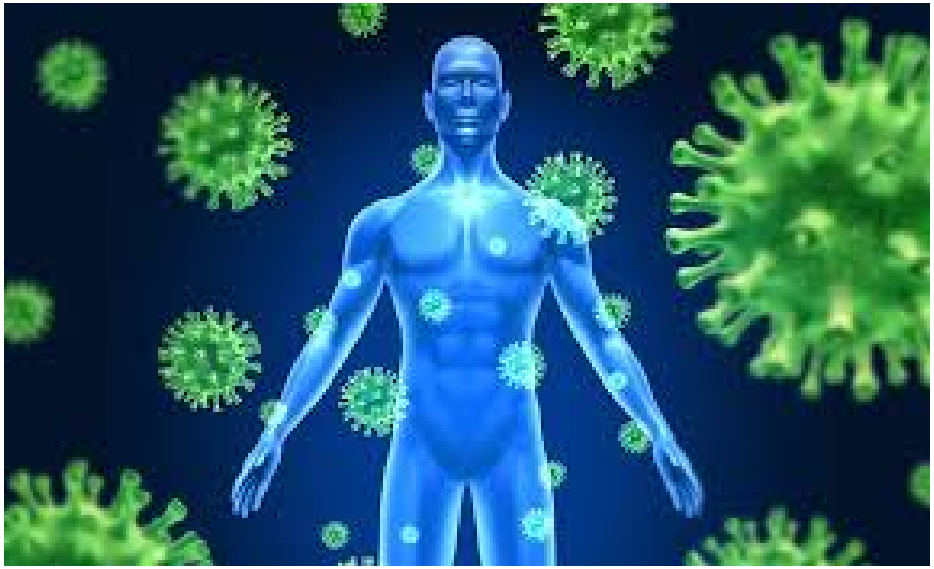
5. Virus – invade cells, reproduce, and spread to other cells

   Examples of viruses: chickenpox, mono, measles, rabies

Treatments / Medications

- **Medications to treat infections**

1. Antibiotics – used to treat bacterial infections (anti = against + bi/o = life + -tic = pertaining to)
2. Antivirals – used to treat viral infections



Your Turn

Define each type of drug and identify the meanings of its word parts:

- *antineoplastic*

  anti- = against; neo- = new; -plastic = pertaining to formation

  definition: drug that blocks growth of a new tumor

- *antiviral*

  anti- = against; vir/o = virus; -al = pertaining to

  definition: drug used to treat viral infections

Cancer

- **Types of Cancer:**

1. Carcinoma – malignant tumor in the epithelial layer of tissue (carcin = cancerous + -oma = tumor)
2. Sarcoma – malignant tumor in the connective tissue (sarc- = flesh)
3. Lymphoma – malignancy in the lymphatic system

www.innohepusa.com/.../Lymphomashoulder.jpg

4. Blastoma – malignancy of immature cells (blast = immature)

Tumors

- **Terms related to tumors:**

1. Neoplasm – new, abnormal tissue formation
2. Benign – not malignant, favorable recovery
3. Malignant – harmful, tends to spread, become worse or life threatening
4. Metastasize – cancer that spreads from one place to another

Cancer Treatments

- **Cancer Treatments**

1. Surgery – removing the malignancy (tumor) plus some of the surrounding normal tissue

2. Chemotherapy – use of toxic chemical agent and drugs to destroy malignant cells

3. Radiation – treatment of cancer through x-rays

http://www.srhc.com/services/oncology/image/Clinac.jpg

Cancer Treatments

"What is cancer?"

Cancer Treatment Centers of America®

Career Opportunities

Career Opportunities

1. Allergist/Immunologist- physician who diagnoses and treats allergies and immune system diseases, such as asthma, eczema, and food allergies.
2. Oncology Nurse – specializes in caring for patients with cancer; administer chemotherapy, radiation therapy, antibiotics, and blood transfusions to patients.
3. Epidemiologist- investigates the cause of disease and works to control its spread; collect data on diseases, perform statistical analyses of the data, and interpret the results.

Your Turn

Identify the meanings of the following common medical abbreviations:

- *baso*

  basophils

- *PLT*

  platelet; platelet count

- *STAT*

  immediately

Medical Terminology:
Day 6b: Present

PROJECT PRESENTATION

You will earn up to 3 additional points for the following:

1. **Eye contact with audience**
2. **Speak loudly and clearly**
3. **Knows content of assigned topic (do not read it from the card)**

If you do not present to the audience you will lose 2 points off your total grade.

Check your notebook for the following materials:

- Notes on the 4 components of blood- 10 points
- Drawing of the 4 components of blood- 10 points
- Notes on ABO and Rh factor- 10 points
- Notes on structures of the lymphatic system- 10 points
- 3 pictures incorporated into notes- 10 points
- Notes on immunity and the T & B cells- 10 points
- Notes on pathogenic organisms- 10 points
- Notes on careers (blood and immune)- 10 points
- Organized notebook/binder for med term- 20 points

Focus notes checklist

- Circle vocabulary
- Highlight main ideas
- Chunk notes with color outlines
- ~~Strikout~~ unimportant information
- Write the Essential Question for your notes
- Write a 3-5 sentence summary of the topics covered

Medical Terminology:
Day 7a: Prepare

Chapter 5: The Blood and the Lymphatic and Immune Systems

- **Notebook preparation**
- **Complete missing work**
- **Review questions at the end of Chapter 5**

Check your notebook for the following materials:

- Notes on the 4 components of blood- 10 points
- Drawing of the 4 components of blood- 10 points
- Notes on ABO and Rh factor- 10 points
- Notes on structures of the lymphatic system- 10 points
- 3 pictures incorporated into notes- 10 points
- Notes on immunity and the T & B cells- 10 points
- Notes on pathogenic organisms- 10 points
- Notes on careers (blood and immune)- 10 points
- Organized notebook/binder for med term- 20 points

Focus notes checklist

- Circle vocabulary
- Highlight main ideas
- Chunk notes with color outlines
- ~~Strikout~~ unimportant information
- Write the Essential Question for your notes
- Write a 3-5 sentence summary of the topics covered

Medical Terminology:
Day 7b: Review

Grab your notes and be ready to review!!!

THIS IS JEOPARDY!!!

Medical Terminology:
Day 8a: Assessment

1. **If your notebook has not been checked place it on the back table.**
2. **Clear your desk of all items except your computer and log into google classroom.**

I will open the EXAM when everyone has completed the first 2 steps.

*****If you finish your exam, you may complete the vocabulary crossword puzzle using only your memory for additional points (each correct answer worth a ½ point). These must be turned in at the end of the time frame and late work will not be accepted.**