Blood Cells Review Slides
Important Information

• **Granulocytes** include the neutrophils, eosinophils, and basophils. It shouldn't surprise you to learn that their cytoplasm is often filled with granules. These are the work horses of acute inflammation (and other processes). Make sure you learn the neutrophil. In pathology and immunology, you'll call this same cell the PMN (polymorphonuclear leukocyte). Eosinophils are involved in allergic reactions and parasitic infections. Another cell to mention here (although it is *NOT* a granulocyte) is the Mast Cell. It's very similar to the basophil: both release histamine (and other mediators). Some think that the mast cell is derived from the basophil. Just remember that the basophil circulates and the mast cell is found in peripheral tissues. Other than that, they are quite similar.

**Monocytes** include the monoctye and the macrophage. The monocyte circulates in the blood until it receives the signal to extravasate into the peripheral tissue. Once in the tissue, it matures into the macrophage. It can also mature even further into other cells, but that is beyond the scope of this course. The monocyte/macrophage is the work horse of chronic inflammation.

**Lymphoctyes** are often overlooked when we consider blood, but they are white blood cells. Indeed, they originate in the bone marrow and are derived from the same stem cell as the rest of the erythrocytes and leukocytes. These are the T-cells and B-cells that direct the immune system and produce antibodies, respectively. They are the central cells in our cell-mediated and humoral (antibody) defense mechanisms. Also keep in mind that the B-cell can mature into the plasma cell.

If you remember nothing else... Know that as a rule of thumb, **bacterial infections cause granulocytosis** and **viral infections cause lymphocytosis**. There are exceptions to this, but this is a very basic (and important) concept. You'll learn more about why this is in immunology.
Fill out the following diagram
Fill out the following diagram
Indicate the following structures and their functions
• High power view of erythrocytes with scattered platelets. Erythrocytes stain pink with eosin, the acid dye of the stain, due to their high content of haemoglobin (a basic protein.) Pale staining regions denote biconcave disk shape. Note that erythrocytes shed their nuclei during development and remain anucleate thereafter. Average life span is about 120 days.

**Functions**
The erythrocyte is highly adapted for the function of oxygen and carbon dioxide transport.

Platelets are involved in various functions, such as clotting and vascular repair, that help maintain homeostasis.
Label the following diagram

(a)  (b)  (c)  (d)  (e)

Some become

Some become
Label the following diagram

- Eosinophils (a)
- Neutrophils (b)
- Basophils (c)
- Monocytes (d)
- Lymphocytes (e)

- Granular leukocytes
- Agranular leukocytes
- Wandering macrophages (tissues)

Some become Plasma cells
Identify the formed Elements
Identify the formed elements

- Neutrophil
- Erythrocyte
- Platelet
- Eosinophil
In this picture, find: RBCs, 2 neutrophils, an eosinophil, a basophil, a monocyte, a lymphocyte, and a platelet.
In this picture, find: RBCs, 2 neutrophils, an eosinophil, a basophil, a monocyte, a lymphocyte, and a platelet.
Identify the following formed elements
Identify the following formed elements:

- Nonspecific granules
- Neutrophil
- Eosinophil
- Platelets
- RBC
Identify the following formed elements
Identify the following formed elements

- Lymphocytes
- Monocytes
- Basophils
Indicate the cell type, structures, and its functions
Indicate the cell type, structures, and its functions

- Neutrophils (12-15 µm diameter) also known as Polymorphonuclear Neutrophils (PMN’s) comprise 45-75% of circulating leukocytes.

**Functions**

These short-lived cells are involved in the phagocytosis of bacteria. They die after one use and do not re-enter circulation.
Indicate the cell type, structures, and its functions
Indicate the cell type, structures, and its functions

- Eosinophils (12-15 µm diameter) comprise up to 7% of the circulating leukocyte count.

Functions

Eosinophils are associated with allergic reactions and parasitic infections, ingestion of antigen-antibody complexes, and some phagocytosis of bacteria.
Indicate the cell type and its functions
Indicate the cell type and its functions

- Basophils (12-15 µm diameter) comprise less than or equal to 2% of circulating leukocytes and are difficult to find. Dark purple cytoplasmic granules often obscure the nucleus.

**Functions**

Basophils are associated with allergic reactions and initiate immediate hypersensitivity reactions.
Indicate the cell type and its functions. Is this considered large or small for this cell type?
Indicate the cell type and its functions. Is this considered large or small for this cell type?

- Lymphocytes (8-18 µm diameter) comprise 16-45% of the circulating leukocyte population. They consist of T-cells (70-85%), B-cells (10-15%), and natural killer cells (10%).

Small “inactive” lymphocytes is the correct answer. Small lymphocytes are more common. They consist of a round, deeply stained nucleus and a narrow rim of pale basophilic cytoplasm. Larger lymphocytes may be natural killer cells or “activated” B-cells en route to tissues where they differentiate into plasma cells. Large lymphocytes may display a slightly indented nucleus with more cytoplasm than is seen in the small lymphocyte.

**Functions**

Lymphocytes play a central role in numerous immunological functions such as cellular immunity and humoral immunity.
Name the formed elements
Name the formed elements

Notice the small lymphocyte is about the same size as a RBC
Name the formed elements
Name the formed elements

The medium to large lymphocyte is about twice as large as a RBC
Name the cell type
Name the cell type

Small Lymphocyte
Name the cell type
Name the cell type

Medium to Large Lymphocyte
Indicate the cell type and its functions
Indicate the cell type and its functions

- Monocytes (12-17 µm diameter) comprise 4-10% of circulating leukocytes.
- Characteristic features include:
  - kidney-shaped nucleus containing "lacy" chromatin
  - abundant pale-gray or blue staining cytoplasm with some fine azurophilic granules imparting a "ground glass" appearance

Functions

These cells act as mobile macrophages that ingest various materials after leaving the blood. They are long-lived and can engage in multiple phagocytic events.
Name the formed elements
Name the formed elements

- Neutrophil
- Monocyte
Name the Cell Type
Happy Neutrophils