

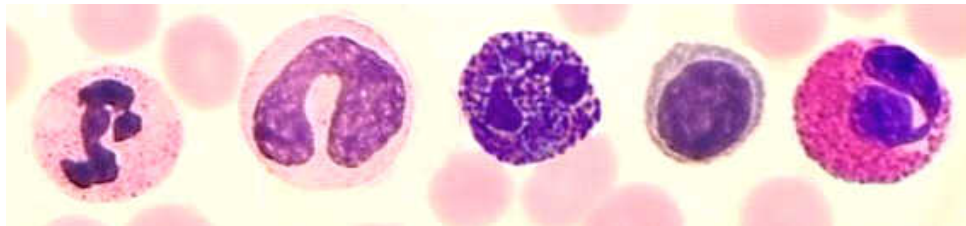
Lab 11.1

Due to our time constraints, you will perform this lab at home. The following web site has multiple slide images of blood. <http://www.edu-graphics.com/marcia/pages/BloodCell.html> Please note that some of the images are a little blurry when you click on them to enlarge them. You will go there and follow your lab instructions. The advantage is that you have multiple images to look through to find the different leukocytes (white blood cells) to sketch and identify.

Since leukocytes are not easy to capture in a blood slide and even harder to get an example of each, I found information on-line at <http://www.scientificpsychic.com/mind/whitecells.html>. I have copied it below. Please print this out, read it, answer the question at the bottom, and include it with your lab. Use the images to sketch and label one of each for your data. You can either add them to the red blood cells you sketch from the slide images on-line or sketch each one separately. Either way, make sure to include and label each one in your data with their proper name.

Visit the above web site to view a video of a neutrophil chasing and destroying a bacteria. It is pretty cool. (Scroll to the bottom.)

The Hematologist



After many years of looking through a microscope at human blood slides, a hematologist in a hospital laboratory is very excited that he found five different types of leukocytes (white blood cells) in a row. The hematologist gives you the following hints so that you can identify the white cells:

1. The lymphocyte is immediately to the right of the basophil.
2. The neutrophil is immediately to the left of the monocyte.
3. The eosinophil is not adjacent to the monocyte, the neutrophil, or the basophil.

Can you name the white cells from left to right? After you make your choices, the answers and details about each are on the next page.

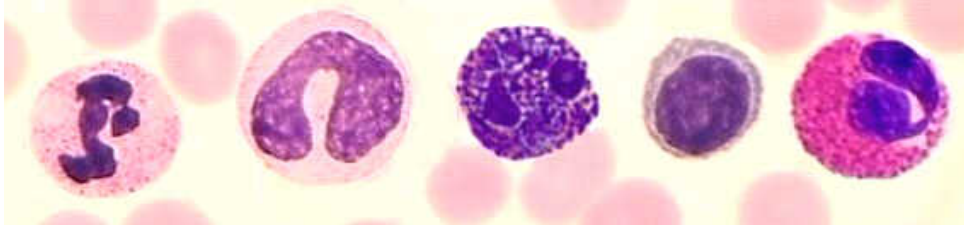
YOUR ANSWER: _____

Check it on next page & make corrections.

Answer:

The logic puzzle can be solved by letting the letters N, M, B, L, and E represent the neutrophil, monocyte, basophil, lymphocyte, and eosinophil, respectively. From Clue 1 we know that L is to the right of B; this is the sequence BL. Clue 2 tells us that NM is another sequence. Clue 3 only allows the sequences LE and EL, but EL is not possible because of Clue 1. Combining BL and LE, we now have the sequences BLE and NM. From Clue 3 we know that E is not adjacent to N, therefore the sequence of the lymphocytes is NMBLE.

The white cells are:



1) neutrophil, 2) monocyte, 3) basophil, 4) lymphocyte, 5) eosinophil.

The background shows some erythrocytes (red blood cells) which have no nucleus.

Microscopic blood analysis can be very useful for identifying or diagnosing many types of diseases such as anemia, malaria, syphilis, heavy metal poisoning, leukemia, appendicitis, etc.

Leukocytes are the first line of defense of the immune system. Leukocytes are derived from bone marrow stem cells and have three main categories: Lymphocytes, Phagocytes, and Auxiliary Cells. Neutrophils, basophils, and eosinophils are called *granulocytes* because they have granules in their cytoplasm.

Lymphocytes

There are two types of lymphocytes: T-Cells and B-cells. T-cells develop in the thymus, a lymphatic organ in the chest behind the breastbone, whereas B-cells develop in the adult bone marrow. T-cells produce cytokine proteins which are interpreted by phagocytes as commands to destroy the material that they have taken up. The T-lymphocytes act against tumor cells and cells infected with viruses. B-cells produce antibodies that help phagocytes to recognize foreign material. Lymphocytes have agranular clear cytoplasm that stains pale blue, whereas the nucleus stains dark purple. Lymphocytes are smaller than the three granulocytes. Lymphocytes account for 25-35% of the white blood cells. A relative increase in the proportion of lymphocytes is typical of infectious mononucleosis or a chronic infection.

Phagocytes

Named from the Greek word "phagein" (to eat), phagocytes are cells that engulf foreign particles, including infectious agents, such as bacteria. Monocytes, neutrophils, and eosinophils are the main phagocytic cells. They search and embrace foreign particles, and then destroy them. **Neutrophils** account for 50-70% of all leukocytes. Elevated numbers of neutrophils are usually due to an acute infection such as appendicitis. **Eosinophils** account for less than 5% of the white blood cells. Eosinophil levels may increase due to parasitic diseases, bronchial asthma, or hay fever. **Monocytes** are agranular and bigger than other leukocytes. These phagocytic cells defend the body against viruses and bacteria and account for 3-9% of all leukocytes.

Auxiliary cells

Basophils, along with mast cells and platelets, secrete inflammatory mediators which attract leukocytes to the point of infection. **Basophils** represent less than 1% of all leukocytes. The large basophilic granules stain deep blue, and contain histamines that cause vasodilation and heparin that acts like an anticoagulant.