PROFICIENCY TESTING SERVICE
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PARTICIPANT STATISTICS **THIRD QUADRIMESTER 2016**

ADVANCED HEMATOLOGY WITH MANUAL DIFF

		Specimen 1				Specimen 2				
Name	**Line No.**	**Range & Type**		**Mean**	**SD**	**Range & Type**		**Mean**	**SD**	**No. of Labs**
PBS, Basophils %	1	0-4	C	0	1.3	0 - 8	S	3.3	1.5	11
PBS, Eosinophils %	1	0 - 9	S	4	1.3	8-18	C	12.7	1.5	11
PBS, PMN (Bands/Segs) %	1	51 - 61	S	56	1.4	53 - 64	S	58.7	1.9	11
PBS, Lymphocytes %	1	21 - 47	S	34	4.5	12-29	S	20.7	2.7	11
PBS, Monocytes %	1	0 - 9	C	4	0	0 - 12	S	3.3	2.7	11
PBS, Abnormal/Other %	1	0 - 15	S	2	4.5	0 - 10	S	1.3	3	11

RBC Morphology

Specimen 1		
Polychromatophilic RBC	6	
Total Population	**6**	

Intended result - Polychromatophilic RBC

Specimen 2		
Nucleated RBC, any stage	6	
Total Population	**6**	

Intended result - Nucleated RBC

WBC Morphology

Specimen 1		
Monocyte, any stage	3	
Monocyte, normal	1	
Abnormal, would refer	1	
Degenerated WBC (smudge cell)	1	
Total Population	**6**	

Intended result - moncyte normal

Specimen 2		
Lymphocyte, normal	6	
Total Population	**6**	

Intended result - Lymphocyte, normal

*Due to a lack of participant consensus, Specimen 1 was not evaluated this event.

Platelet Estimate

Platelets adequate	4	
Platelet, normal	1	
Platelets increased	1	***
Total Population	**6**	

Intended result - Platelets normal/adequate

Correct responses are defined as those reflecting agreement among 80% or more of all participants or referees. Unacceptable responses are indicated by "*****" on the Flagging line of each specimen.

Quad 3 2016

Sample 16Q3-2: *History: A 65-year-old man is admitted to the hospital with a two-week history of shortness of breath, dizziness, and swelling in his lower legs. His past medical history is significant for diabetes mellitus, viral hepatitis (type unknown at admission), hemolytic anemia, and chronic obstructive pulmonary disease. His CBC results are as follows: WBC 17.5, Hgb 8.2, Hct 25.5%, Plts 344,000/µL.*

RBC Morphology – Specimen 1

The cells to be identified are **polychromatophilic RBCs**. Polychromatophilic red cells are immature red cells that stain diffusely blue-gray or blue-pink due to the presence of increased amounts of residual RNA. They lack the nucleus of a more immature RBC and also lack the typical area of central pallor that would be seen in a mature RBC. Polychromatic RBCs are typically larger than a mature RBC and might be mistaken for macrocytic RBCs. However, macrocytic red cells would be expected to have the typical staining characteristics of a mature RBC rather than appearing blue-gray. The presence of these cells correlates with an increased reticulocyte count (which requires use of a supravital stain, such as new methylene blue, for quantitation). A small number of polychromatophilic RBCs (or reticulocytes) are typically present in the peripheral blood and develop into mature RBCs within 2-3 days. An increase in these cells as well as the presence of nucleated RBCs indicates increased erythropoietic activity of the bone marrow, either due to increased peripheral destruction of red cells (hemolysis) or acute blood loss (bleeding).

WBC Morphology – Specimen 1

The cells to be identified are **monocytes.** Monocytes are the largest mature WBC in the peripheral blood and normally comprise approximately 2-8% of circulating white cells. The cellular outline is often irregular and the cytoplasm may mold itself around surrounding RBCs. The single large eccentrically-placed nucleus can have a variety of shapes, ranging from ovoid to lobated to band-shaped. The nuclear chromatin is less condensed than that of a lymphocyte or neutrophil, often appears lacy and no nucleolus is apparent. These cells have abundant blue-gray to pink-gray cytoplasm that may contain fine azurophilic granules. Since these are active phagocytic cells, it is not unusual to see intracytoplasmic vacuoles. An increased number of circulating monocytes is associated most commonly with chronic infections (syphilis, tuberculosis, bacterial endocarditis). However, monocytosis can also be seen in chronic inflammatory disorders, such as collagen vascular disorders and inflammatory bowel disease, as well as in association with acute monocytic leukemias. Monocytes eventually leave the circulation within 1 to 3 days to migrate to tissues where they develop into macrophages.

Sample 16Q3-2: *History: A 65-year-old man is admitted to the hospital with a two-week history of shortness of breath, dizziness, and swelling in his lower legs. His past medical history is significant for diabetes mellitus, viral hepatitis (type unknown at admission), hemolytic anemia, and chronic obstructive pulmonary disease. His CBC results are as follows: WBC 17.5, Hgb 8.2, Hct 25.5%, Plts 344,000/µL.*

RBC Morphology – Specimen 2

The cells to be identified are **nucleated RBCs**. Since red cell maturation occurs in the bone marrow, immature RBCs are not often seen in the peripheral blood. If the NRBC enters the circulation prematurely from the bone marrow, one or more of the maturation stages may be evident. In such instances, the stages typically seen are the late polychromatophilic normoblast or the orthochromic normoblast. The cytoplasm is blue-gray, changing to gray-pink as hemoglobinization occurs. In the polychromatophilic normoblast, the nucleus occupies much of the cell, while in the later orthochromatic stage, the nucleus becomes more pyknotic and eccentrically placed. Eventually the nucleus is observed at the periphery of the RBC membrane and is extruded. Although NRBCs bear some resemblance to lymphocytes, there are important features that can be used to distinguish between these cells. A lymphocyte is typically round or ovoid with a nucleus that occupies the majority of the cell (N:C ratio ranges from 5:1 to 2:1); the cytoplasm is blue. In contrast, the NRBC has an N:C ratio of approximately 1:2, with an often eccentric nucleus surrounded by abundant cytoplasm. Although a small number of NRBCs are normally present in neonates, their presence in the blood of adults is consistent with bone marrow replacement or infiltration of the bone marrow, compensatory erythropoiesis (such as due to severe anemia or hemorrhage), extramedullary hematopoiesis (chronic hemolytic anemia, myelofibrosis, leukemia), and disorders associated with hypoxia or hyposplenism. The number of NRBCs in the circulation depends on the severity of the anemia and the ability of the bone marrow to respond. Keep in mind that the presence of NRBCs will affect the WBC count in automated cell counters, as they will be “counted” as lymphocytes or other WBCs, depending on the analyzer. All new analyzers typically flag such results so that the operator knows to review a peripheral smear. One of the most common practices is to correct the WBC count if 1-2 NRBCs/100 WBCs are seen on the peripheral smear, and again, the new analyzers perform these calculations for you.

WBC Morphology – Specimen 2

The cells to be identified are **lymphocytes**. Most lymphocytes are small and slightly larger than a red cell. The nuclear:cytoplasmic (N:C) ratio is high (5:1 to 2:1), therefore, the nucleus occupies the majority of the cell. It is round or ovoid, may be indented or notched, and is composed of tightly condensed chromatin. The thin rim of blue-gray cytoplasm may contain fine azurophilic granules; these contain lysosomal enzymes. It is important to not confuse a small lymphocyte with a nucleated RBC (NRBC). Above Cell #1 is an NRBC – note the lower N:C ratio (more cytoplasm), the gray cytoplasm, and the pyknotic nucleus of the NRBC. Likewise, there is an NRBC to the left of Cell #e; it is smaller than the lymphocyte and contains more cytoplasm. Approximately 10% of circulating lymphocytes are large and contain more cytoplasm with less condensed nuclear chromatin; a nucleolus may be seen. Occasionally, very large lymphocytes can be present that contain prominent azurophilic cytoplasmic granules. These “large granular lymphocytes” are natural killer cells. The number of circulating lymphocytes varies with age, with higher percentages present in newborns than in adults. An increase in the number of lymphocytes can be seen in infections, particularly viral infections (influenza, rubella, HSV, CMV, HIV, EBV), autoimmune disorders and vasculitis, and certain leukemias (acute and chronic lymphocytic leukemia). Often overlooked is the association of various medications, such as Dilantin, with increased lymphocyte counts.