Spotlight on hematology

Interpretation of the red blood cell count MQZH 2014-02

Introduction

Microscopic examination of red blood cells is important even in today's age of automated hematology analysis (hemogram). It provides us with information regarding specific abnormalities of erythrocyte shape, possible erythrocyte inclusions, changes in color, or presence of nucleated red cell precursors (erythroblasts). This information completes the attending physician's findings and frequently contributes to performing additional, targeted tests e.g. when anemia is present. This focus shows the step-wise development of red blood cell findings using the proficiency testing survey specimen MQ 2014-2 H3b. The blood picture is derived from a 53-year-old woman with thalassemia minor.

1. Measure and assess the complete blood count from EDTA blood

1.1 Hemogram					
Leucocytes	8.13	4.0-10.0 G/l	MCV	63.0 ↓	80-100 fl
Thrombocytes	132 ↓	150-400 G/l	MCH	18.3 ↓	27.0-32.0 pg
Erythrocytes	5.86 ↑	f 3.9-5.2 T/l m 4.2-5.7 T/l	MCHC	290 ↓	315-365 g/l
Hemoglobin	107 ↓	f 120-160 g/l m 140-180 g/l	RDW	15.5	< 16 %
Hematocrit	0.37	f 0.37-0.47 l/l m 0.41-0.53 l/l			

1.2 Interpretation			
☒ Anemia (Hb)	☐ normocytic	☒ microcytic	☐ macrocytic
☒ Erythrocytosis (Ec)	☐ normochromic	☒ hypochromic	☐ hyperchromic

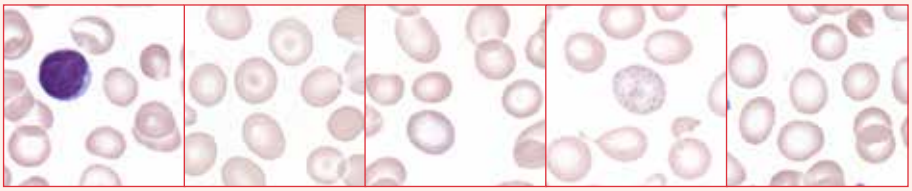
Evaluation statement according to hematogramm:

MICROCYTIC HYPOCHROMIC ANEMIA AND ERYTHROCYTOSIS

2. Microscopic evaluation of erythrocyte morphology

With pathological findings or when there are specific questions, erythrocytes in the blood smear are microscopically examined.

2.1 Microscopic evaluation of erythrocytes in at least five fields of view at 1000 X magnification.



2.2 In addition to the morphological findings by microscopy

Size:	Contents/color	Shape:	Cell structures/inclusions:
Microcytes +++	hypochromic ++	Poikilocytosis +	Basophilic strippeling (+)
Anisocytosis ++	Polychromasia +	Target Cells ++	
		Ovalocytes +	
		Akanthocytes +	

Assessment statement from hematogramm added to the microscopic findings:

RED BLOOD CELL PICTURE WITH MICROCYTIC-HYPOCHROMIC ANEMIA AND ERYTHROCYTOSIS. MINOR POIKILOCYTOSIS WITH FEW OVALOCYTES, FEW ACANTHOCYTES AND MANY TARGET CELLS. RARE COARSE BASOPHILIC STIPPLED ERYTHROCYTES.

Evaluation of Hamatogramm values

Anemia

Anemia is present when the hemoglobin concentration is decreased.

RDW

«red cell distribution width»
The RDW value describes the distribution width of the erythrocyte volume, i.e. the presence of erythrocyte anisocytosis.

Erythrocyte indices

MCV
Mean Cellular Volume

→ normocytic
↓ microcytic
↑ macrocytic

MCH
mMean Corpuscular Hemoglobin mass per cell (Note: when assessing chromasia, the MCV must also be taken into account)

→ normochromic
↓ hypochromic
↑ hyperchromic

MCHC
Mean Cell Hemoglobin Concentration in the cell

→ normochrom
↓ hypochrom
↑ hyperchrom

Good to know ...

- Normal indices do not exclude isolated erythrocytes with deviating Hb levels or size in the blood picture. However, they are to be considered „benchmarks" in the semi-quantitative assessment.
- Other morphological abnormalities of erythrocytes (abnormal shape or cellular structure) generally do not affect the indices values.
- With practice laboratory equipment, the MCHC is rarely abnormal. Decreased values can be found with highly hypochromic anemia, and elevated values with spherocytosis, or autoimmune hemolytic anemia.
- Pathological MCHC values that repeatedly occur may indicate poor device settings. In this case, the hematocrit and hemoglobin settings of the hematology instrument should be checked.

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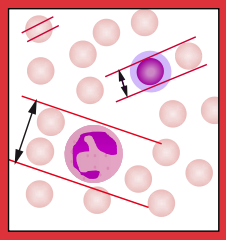
Microscopic evaluation of hemoglobin content and shape



Evaluation of hemoglobin content and size of erythrocytes by microscopy:

- RBC pallor approximately 1/3 of the cell diameter = normochromic
- Two normocytes side by side correspond approximately to the diameter of one neutrophil.
- One normocyte corresponds approximately to the core diameter of a small lymphocyte.

Semi-quantitative assessment

Microscopic evaluation of erythrocytes in at least five fields of view at 1000 X magnification. The red blood cells must be isolated, the central concavities should be visible. Usually approximately 200 cells per field of view are seen. This number can be higher when modern microscopes are used; therefore we are providing percentages here.

3-10%	Low, discreet, few	+
10-20%	Clear, many	++
20-50%	Significantly elevated	+++
>50%	Severe, extreme	

Always pathological are:

- Teardrop forms
- Fragmentocytes
- Sickle cell
- Megalocytes
- Basophilic stippling
- Howell-Jolly bodies

These cell forms are reported as of one percent:

<3%	isolated	(+)

About
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Morphological evaluation of the erythrocytes

The values of the microscopic examination are semi-quantitative. The indexes are taken into account for evaluation. The RDW value can be used to confirm anisocytosis.