

Blood Cell Examination

Complete blood count

CBC is a very common screening examination taken at every admission to hospital, as well as in suspected infectious or hematologic disease.

CBC includes:

- White Blood Cells (WBC or Leu) + "differential" – i. e. the percentage of Lymphocytes, Monocytes and Neutrophilic, Basophilic and Eosinophilic granulocytes.
- Red Blood Cells (RBC pr Ery).
- RBC parameters (volume, Hb content and concentration per cell).
- Hemoglobin (Hb) and Hematocrit (Hct).
- Platelets (Pt or Thr) .

Workflow and used methods

- Blood is taken by a phlebotomist to a tube with EDTA and sent into laboratory.
- Number of cells is counted by the principle of flow cytometry. Flow cytometry is able to determine not only the number of cells in each type, but also volumes of cells. Certain abnormal cells might be identified abnormally (schistocytes, non-mature forms of leucocytes). If presence of abnormal cells is suspected, manual counting under microscope should be performed.
- Hb concentration is determined by absorption spectrophotometry (colorimetry).
- Hct is determined after centrifugation of the sample as a ratio (percentage) of packed cell volume (RBC + WBC + Plt) to whole volume of blood.
- Other RBC parameters (MCV, MCH, MCHC) are calculated by simple formulae.

Physiological count

RBC and Hb

	men	women	Units
Ery:	5±0.7	4.6±0.7	10⁶ /μL (× 10¹² /L)
Hb:	150±20	140±20	g/L (also expressed in g/dL)
Hct:	0.46 ±0.06	0.43±0.06	(or × 100 in %)

- **MCV** (mean corpuscular volume) = $\text{Hct} / \text{Ery} = 90 \pm 5 \text{ fL}$;
 - *divides anemia into microcytic, normocytic and macrocytic/megaloblastic.*
- **MCH** (MC hemoglobin) = $\text{Hb} / \text{Ery} = 31 \pm 3 \text{ pg}$;
 - *divides anemia into hypochromic and normochromic.*
- **MCHC** (MC hemoglobin concentration) = $\text{MCH} / \text{MCV} = \text{Hb} / \text{Hct} = 34 \pm 3 \text{ g/dL}$.
- **B-reticulocytes** 0.3–1.8%;
 - *generally divides anemia into those of insufficient production and those of increased loss.*
- **B-Leu: 4 000–10 000/μL**;
 - (child – about 25 % more; toddler – about 50% more).
 - neutrophilic granulocytes 30–85% (children less).
 - lymphocytes 15–50% or 1500–4000/μL (children more – up to 10,000).
 - monocytes 1–12%
 - eosinophilic granulocytes 3±3%
 - basophilic granulocytes 1±1%
- **B-Plt 150,000–350,000/μL**

Nomenclature of changes from physiological values

Type of Cell	Increase	Decrease
Red Blood Cells (RBC)	erythrocytosis or polycythemia	anemia
White Blood Cells (WBC)	leukocytosis	leukopenia
lymphocytes	lymphocytosis	lymphocytopenia
granulocytes	granulocytosis	granulocytopenia or agranulocytosis
neutrophils	neutrophilia	neutropenia
eosinophils	eosinophilia	eosinopenia
Platelets	thrombocytosis	thrombocytopenia
All cell lines	—	pancytopenia

Links

Related articles

- Blood tests preceding blood transfusion. Laboratory indicators of hemolysis
- Blood Groups

External links

Sources