

Anemia (pediatrics)

Markers of red blood count

- Hemoglobin Hb, unit g/l, (g/dl)
- hematocrit HTC, given in %,
- number of PE erythrocytes, expressed in millions / mm³,
- reticulocytes = early forms of erythrocytes, normal up to 2%, in children <1 week up to 5%,
- MCV = mean erythrocyte volume = HTC / PE, unit fl,
- MCH = mean Hb content in erythrocytes = Hb / PE, unit pg,
- MCHC = mean Hb concentration in erythrocytes = MCH / MCV = Hb (g / dl) / HTC,
- RDW = red cell distribution width, predicts anisocytosis, norm 13 to 15,
- sTfR = soluble transferrin receptors (the most reliable marker in sideropenic anemia, not affected by inflammation in the body).

Pathophysiological classification of anemias

Anemia from erythrocyte loss

- extravascular: posthemorrhagic anemia;
- intravascular: hemolytic anemia.

Anemia from a disorder of erythrocyte production or Hb

- in the absence of substances (Fe, vitamin B12, folic acid);
- from bone marrow depression;

thumb|right|Příznaky anémie

Red blood cell parameters predicting anemia

age group	Hb g/l	HTC	MCV (fl)
newborns	< 140	< 0,44	< 100
infants	< 100	< 0,32	< 70
toddlers and preschoolers	< 105 až 110	< 0,32	< 73
younger schoolchildren	< 115	< 0,33	< 75
elder schoolchildren	< 120	< 0,34	< 77

Differential diagnosis of sideropenic anemia and anemia of chronic diseases

Sideropenic anemia	mikrocytes	elevated RDW	decreased Fe	increased CVK	decreased ferritin	elevated sTfR	iniciálně mikrocytóza
Anemia of chronic diseases	normocytes	normal RDW	decreased Fe	decreased CVK	elevated ferritin	normal sTfR	iniciálně hypochromie

Hemolytic anemia

Hemolytic anemias are mostly normocytic, thalassemia is microcytic. In the laboratory we find anemia, reticulocytosis, increased unconjugated bilirubin, increased urobilinogen in urine, hyperplasia of the erythrocyte lineage in the bone marrow, increased Fe, increased LDH (isoenzymes LDH 1 and LDH 2), decreased haptoglobin (intravascular hemolysis in plasma, free H which forms complexes with haptoglobin). After depletion of the haptoglobin capacity, the remaining free Hb in the form of dimers passes through the glomerular membrane. Hemoglobinuria is found in intravascular hemolysis. In hemoglobinuria / myoglobinuria, the discrepancy between a markedly positive blood test on urine chemistry and a finding in urinary sediment, which may be completely normal, is no exception. The Coombs test predicts the presence of autoantibodies (Coombs direct test = detection of incomplete erythrocyte-bound Ig, Coombs indirect test = detection of incomplete free Ig in plasma).

Diagnosis according to erythrocyte morphology

- *schistocytes*: hemoglobinopatie, bakteriální toxiny, paraziti, porušená cirkulace, HUS;
- *spherocytes + positive direct Coombs*: autoimmune hemolytic anemias (cold Ig = virus infections, warm Ig = autoimmune disorders);
- *spherocytes + negativ direct Coombs*: hereditary spherocytosis;
- *eumorf erythrocytes*: hepatal/renal insufficiency, m. Wilson;
- *Heinz bodies in erythrocytes*: deficit G-6-P dehydrogenase;
- *morfologicky bizar erythrocytes*: deficit of pyruvatkinase;
- *target cells + bazofil spots in erythrocytes*: β-thalassemia minor.

Pancytopenia

At least 2 of the 3 criteria must be met:

- trombocytes< 20 000,
- granulocytes< 500,
- retikulocytes< 0,02 %.

Etiology

- ▪ idiopathic;
- léky: cytostatics, antiepileptics, antithyroidal substances, chloramphenicol;
- toxins: benzen, insecticides, heavy metals
- infections: hepatitis virus, EBV, Parvovirus B19.

References

Source

- HAVRÁNEK, Jiří: *Hematologie - obecný úvod*. (upraveno)

Related articles

- Anémie z nezralosti
- Krev
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