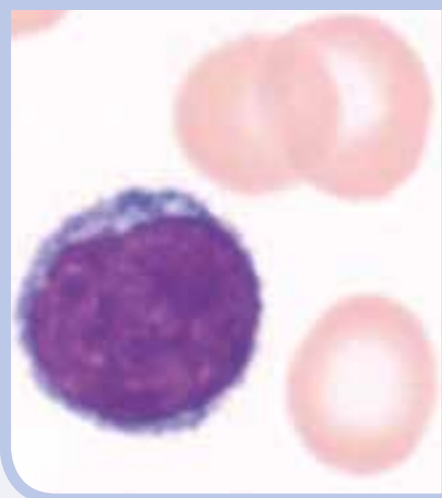


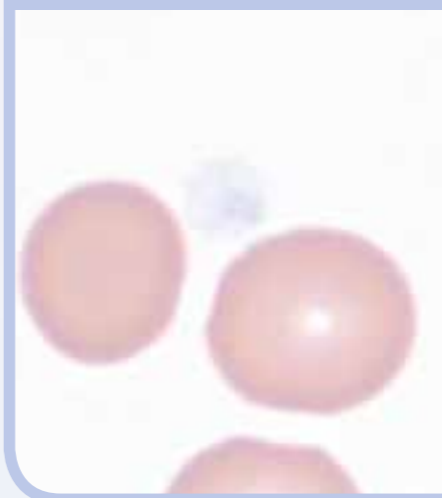



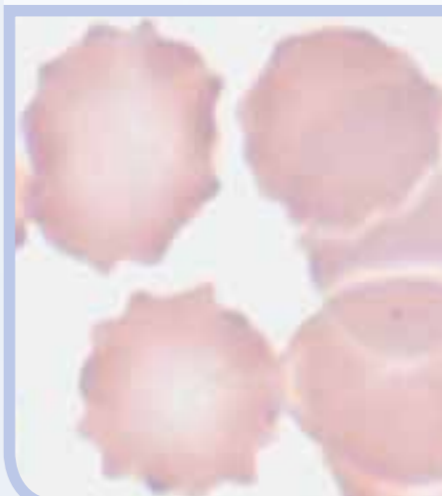

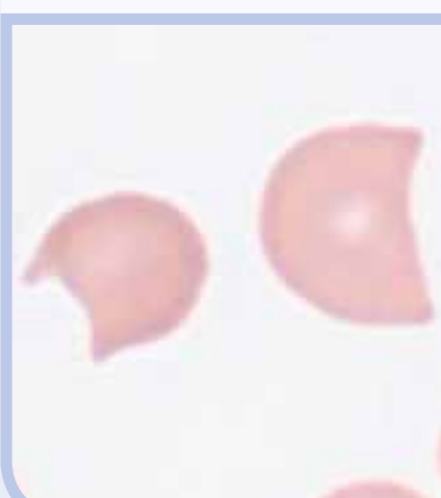

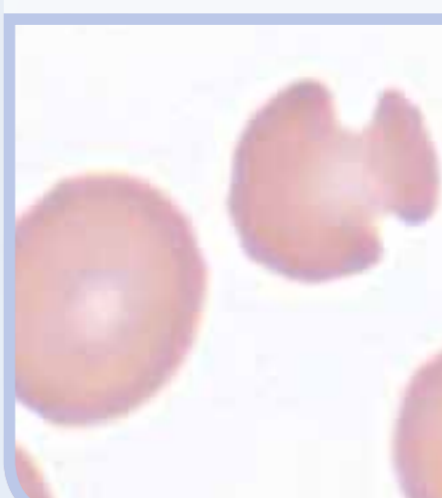
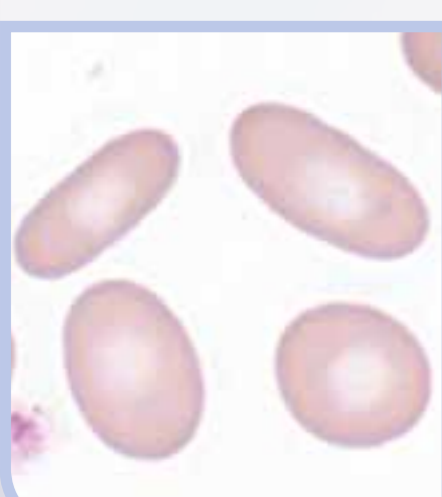
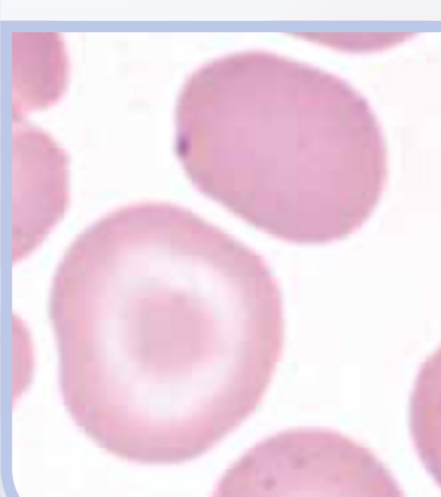


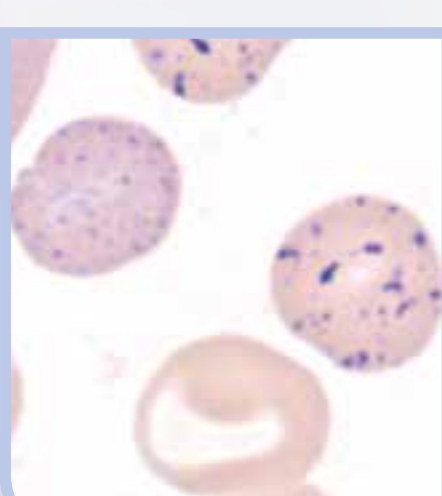


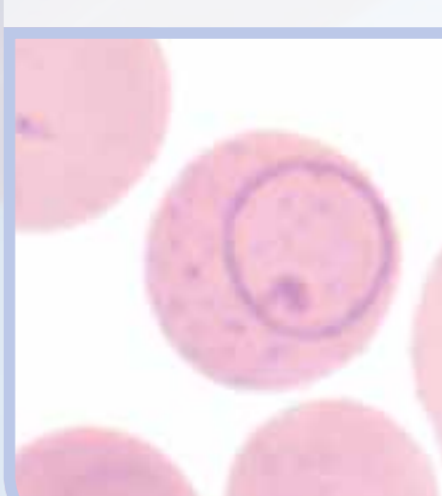
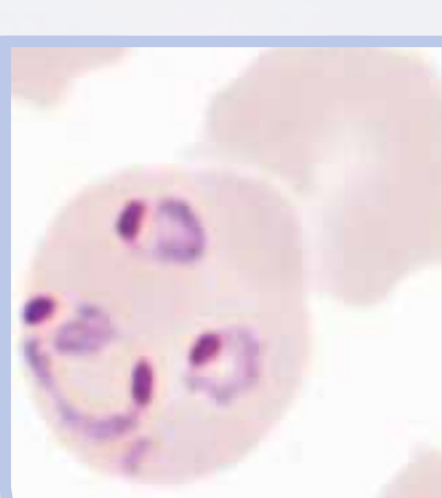
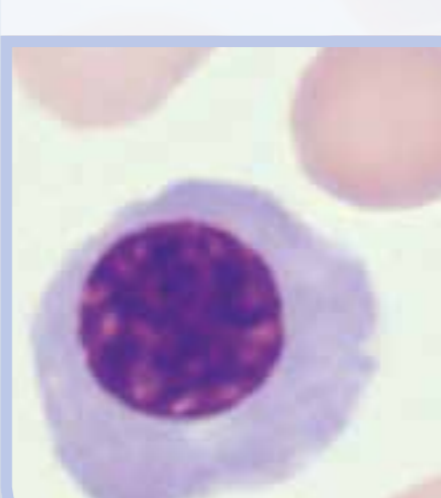

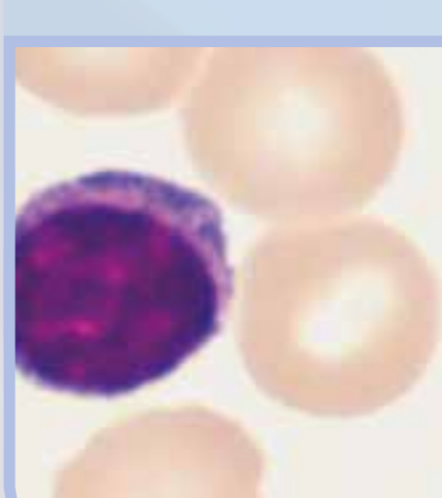


Red blood cell abnormalities

as seen with May-Grünwald-Giemsa (MGG) staining

<p>Microcyte</p>  <p>Description Ø < 7 µm, in the smear smaller diameter than the nucleus of a small lymphocyte, often hypochromic</p> <p>Incidence Iron deficiency</p>	<p>Macrocyte</p>  <p>Description Large red blood cell, Ø 10 µm, central pallor present</p> <p>Incidence Reticulocytes are always macrocytes and reflect the regeneration of erythropoiesis.</p>	<p>Megalocyte</p>  <p>Description Large red blood cell, oval shape, no central pallor, always hyperchromic</p> <p>Incidence Vitamin B12 or folate deficiency</p>	<p>Microspherocyte</p>  <p>Description Small red blood cell, Ø < 6 µm, normal volume, no central pallor</p> <p>Incidence Hereditary spherocytosis</p>
<p>Hypochromic red blood cell</p>  <p>Description Central pallor > 1/3 of the cell surface, often microcytic</p> <p>Incidence Iron deficiency anaemia</p>	<p>Anulocyte</p>  <p>Description Pronouncedly hypochromic red blood cell with small, peripheral ring of haemoglobin, always hypochromic</p> <p>Incidence Iron deficiency anaemia</p>	<p>Polychromatic red blood cell</p>  <p>Description Blue-tinged red blood cell with remnants of diffusely distributed RNA, often macrocytic</p> <p>Incidence Reticulocytosis, unspecific with severe anaemia</p>	<p>Echinocyte</p>  <p>Description Crenated red cell with evenly distributed and uniformly sized spicules</p> <p>Incidence Artefact. <i>In vitro</i> phenomenon and <i>in vivo</i> with acidosis and pH hyperosmolarity</p>
<p>Acanthocyte</p>  <p>Description Membrane spikes of irregular size, unevenly distributed</p> <p>Incidence Hepatopathy, post splenectomy</p>	<p>Fragmented red cell</p>  <p>Description Red blood cell with intact convex and damaged concave side, pointed ends let the cell appear as helmet cell</p> <p>Incidence Red blood cell fragmentation syndrome, findings of ≥ 5% and marked thrombocytopenia can point to thrombotic-thrombocytopenic purpura (TTP). This result is a lab emergency and should be communicated by phone.</p>	<p>Sickle cell</p>  <p>Description Red blood cell with pointed ends, usually crescent shape, apparently hyperchromic</p> <p>Incidence In peripheral blood only observed with homozygous HbS disease, sickling in heterozygous disease only under oxygen deficiency in cell suspension</p>	<p>Pincer cell</p>  <p>Description Mushroom-shaped red blood cell, no central pallor</p> <p>Incidence Hereditary spherocytosis, band 3 gene defect, MCHC > 36 g/dL</p>
<p>Elliptocyte (ovalocyte)</p>  <p>Description Elongated shape with round ends, normal central pallor</p> <p>Incidence Hereditary elliptocytosis, two types: haemolytic, non-haemolytic</p>	<p>Target cell</p>  <p>Description Round, central Hb concentration due to dome-shaped hernia of the membrane, followed by an empty zone, then peripheral Hb ring</p> <p>Incidence Thalassaemia, post splenectomy</p>	<p>Stomatocyte</p>  <p>Description Central pallor appears slit-like, straight or mouth-like</p> <p>Incidence Hepatopathy, hereditary stomatocytosis</p>	<p>Teardrop cell</p>  <p>Description Teardrop or pear shape</p> <p>Incidence Extramedullary haematopoiesis with primary myelofibrosis</p>
<p>Basophilic stippling</p>  <p>Description Numerous small, coarse, blue granules, unevenly distributed, due to denatured ribosomes (RNA)</p> <p>Incidence Unspecific in severe anaemia, especially with MDS, AML – especially in FAB AML-M6, pernicious anaemia, lead poisoning, hereditary pyrimidine 5'-nucleotidase deficiency</p>	<p>Pappenheimer body</p>  <p>Description Dark blue, granular, mostly irregularly shaped, solitary or multiple inclusions found at cell periphery, Ø max. 1 µm, frequently associated with Howell-Jolly bodies, biochemically: iron protein complexes</p> <p>Incidence Post splenectomy</p>	<p>Howell-Jolly body</p>  <p>Description Round residual nucleus of purple-brown colour, circular, not refractive, eccentrically placed, frequently associated with acanthocytes, target cells, Pappenheimer bodies</p> <p>Incidence Post splenectomy, severe anaemia with intact spleen function, e. g. pernicious anaemia, MDS</p>	<p>Cabot ring</p>  <p>Description Round to oval or loop-like, fine, red-purple inclusion; point of origin: remnants of mitotic spindle</p> <p>Incidence Unspecific, with severe anaemia, e. g. thalassaemia</p>
<p>Plasmodium falciparum inclusions</p>  <p>Description Ring type: brown nucleole, ring-shaped blue cytoplasm, infested red blood cell not enlarged, no granulation or pigmentation, multiple parasites common</p> <p>Incidence Malaria tropica, > 5% parasite infestation = severe malaria tropica. Plasmodium falciparum must be detected in the blood smear!</p>	<p>Erythroblast</p>  <p>Description Erythroblasts (E) in peripheral blood of adults are always pathological (physiological only in first month of life). In the blood smear, E are not included in WBC differential but counted on top per 100 WBC.</p> <p>Incidence Associated with diseases showing increased erythro- and haematopoiesis and in extramedullary haematopoiesis</p>	<p>Rouleaux</p>  <p>Description Linear arrangement of red blood cells simulating a 'stack of coins'</p> <p>Incidence Hypergammaglobulinaemia, monoclonal and polyclonal, hyperfibrinogenaemia</p>	<p>Normocytic red blood cell</p>  <p>Description Diameter: 7 µm, equals the diameter of the nucleus of a small lymphocyte. Colour: haemoglobin colour (pink – red); shape: round or oval, central pallor 1/3 of the cell surface; no inclusions.</p> <p>Incidence Physiological red blood cell</p>

Abbreviations: Ø – diameter, RNA – ribonucleic acid, DNA – deoxyribonucleic acid, MDS – myelodysplastic syndrome, AML – acute myeloid leukaemia, BM – bone marrow, Hb – haemoglobin, WBC – white blood cells