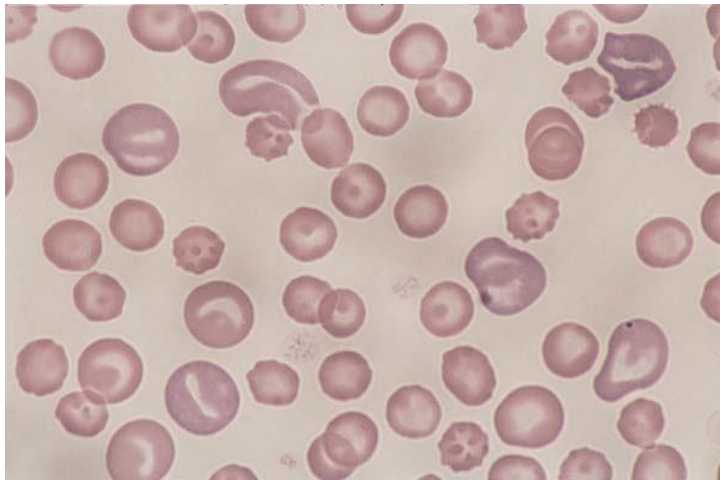
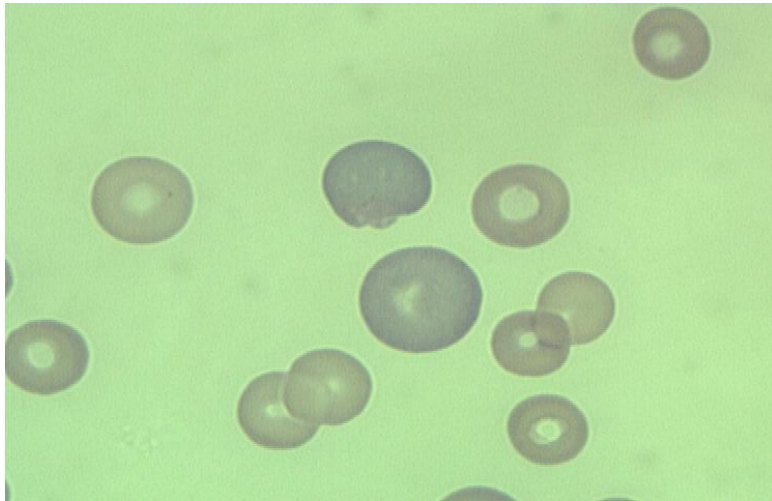
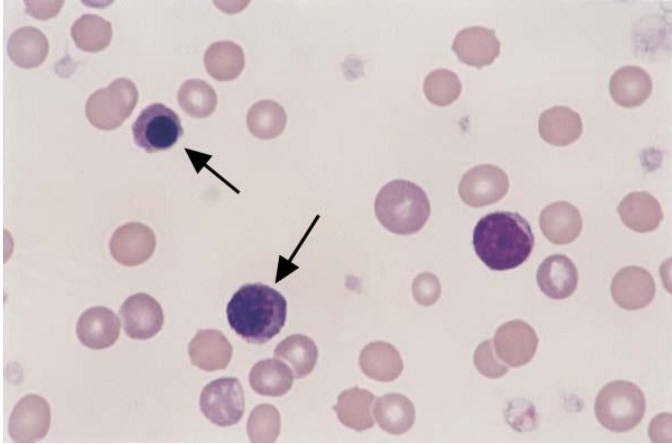


Morphology of RBC in stained Blood Smears

- 1) Polychromatophilic cells –are those that pick up uniformly blue stain with Romanowsky stain or Wright stain. The presence of such RBC in a film is referred to as polychromasia.



- 2) Erythroblasts –with nuclei (nucleated RBC). These cells will disappear normally after few weeks of age in circulation

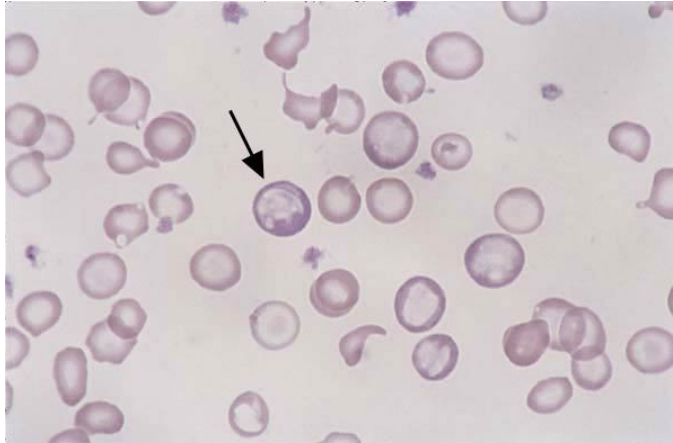


- 3) Cells with eccentrically placed inclusion bodies known as Howell-Jolly bodies eg. in cats and horses. They are regenerative bodies when stained with NMB. These H-J bodies (nuclear remnants indicate chemical or drug toxicity eg . phenothiazine in horse

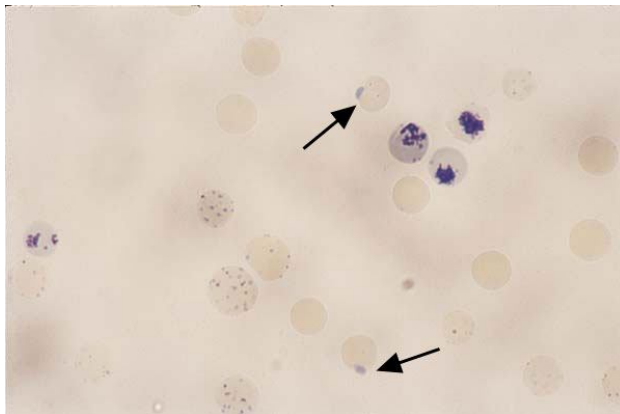


- 4) Anisocytosis: this describes the presence of variation in the size of RBC

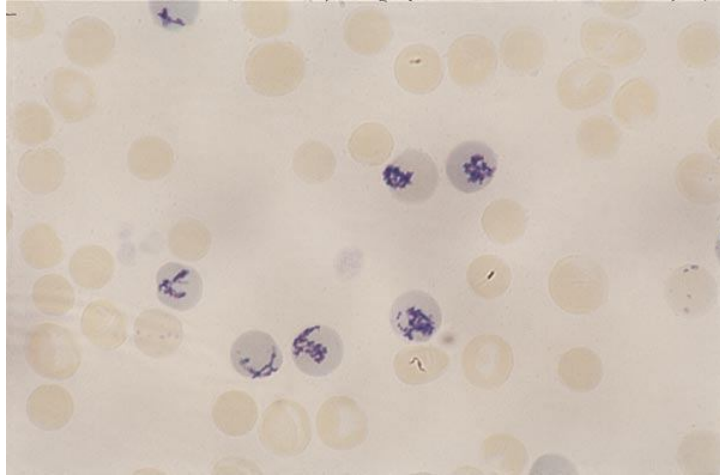
- 5) Poikilocytosis: this describes the presence of variation in the shape of the RBC not due to handling or making of the smear



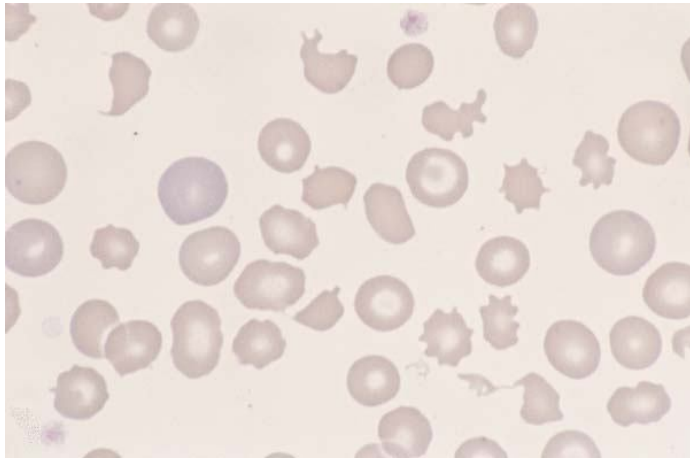
- 6) Schistocytes-fragments of RBC eg. in DIC(disseminated intravascular coagulation)
- 7) Spherocytes –small rounded cells that are deeply stained without central pallor eg. in immune-mediated haemolytic anaemia.
- 8) Heinz-Bodies-pieces of oxidized haemoglobin appearing as protrusion (nose-like projection) from the side of RBC. They appear as pale circular structures common in haemolytic anaemia caused by toxic materials like onion, benzocaine copper which inflict oxidative injury on the RBC



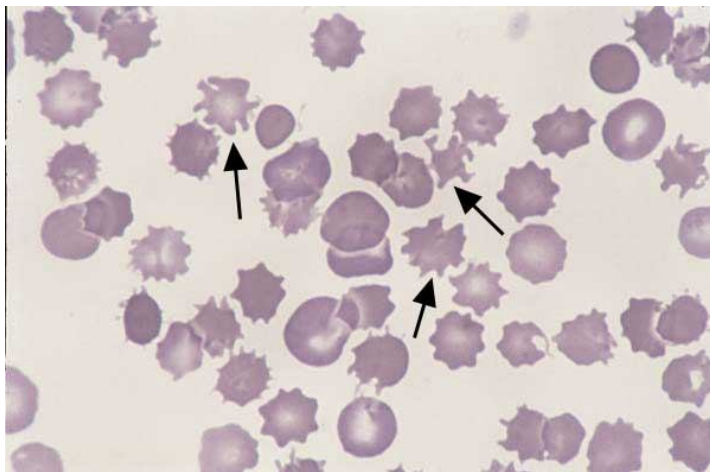
- 9) Distemper inclusions- viral nucleocapsids which stain pink or blue
- 10) Reticulocytes (immatured RBC) will show strips network or short chains of ribosomes in the RBC. They appear as pale yellow cell with basophilic precipitates of RNA. Best viewed at 100X. increased reticulocyte-reticulocytosis



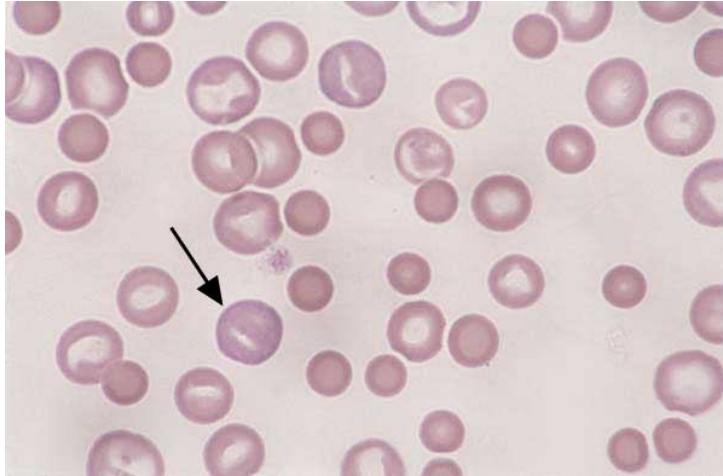
- 11) Anisocytosis and poikilocytosis result from the marked presence of macrocytic cells, spherocytes, schistocytes, microcytes and acanthocytes.



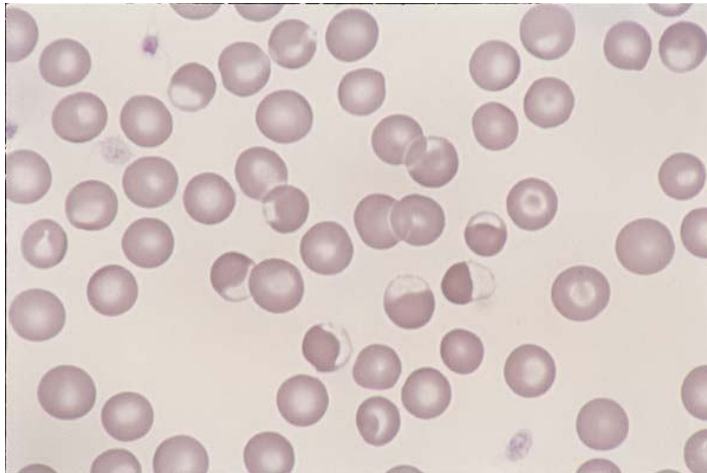
- 12) Acanthocytes- RBC with 2-10 blunt elongated fingerlike surface projections. It is associated with haemangiosarcoma in the liver.



- 13) Elliptocytes – oval shaped RBC
- 14) Dacryocytes- tear drop shaped RBC
- 15) Stomatocytes –cup shaped RBC



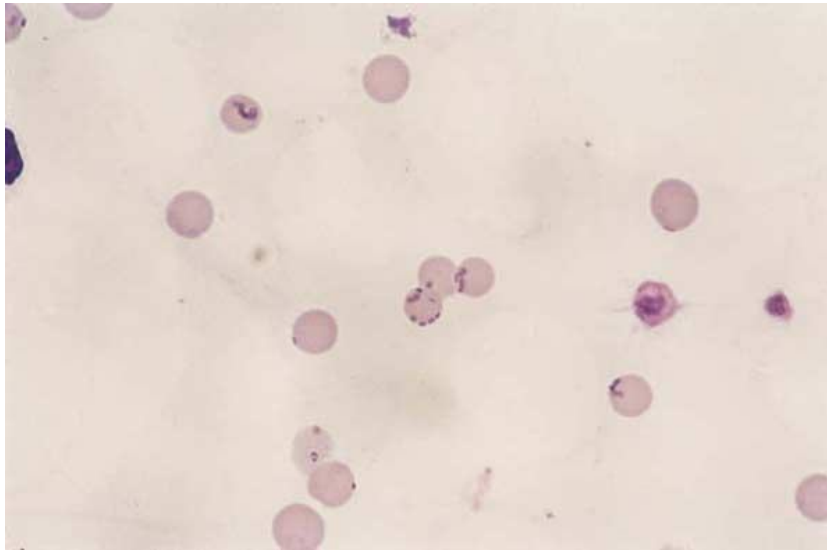
- 16) ECCENTROCYTES (blister cells) –RBC with haemoglobin concentration at one pole with an unstained area at the other end.eg. in haemolytic diseases, membrane defect



- 17) Borr-cells(Echino elliptocytes)-elongated RBC with ruffled margins
- 18) Crenation : presence of RBC covered by short spiky surface projections. Most are artifact and can be confused with ecanthocytes. It can be differentiated from ture poikilocytes for it is uniformly affecting almost all RBC in a given film area as opposed to scatted RBC on the

blood film.staining of wet blood film will produce **REFRACTORY BUBBLES** on the surface of the cells.

Parasite like haemobartonella should not be confused with stain aggregates which are ppts. of stains along the sides of the RBCs. The aggregate do not resemble any of the parasites and vary in size. They appear as refractile(jewel) when focused at 100x



Haemolytic Anaemia:

Results from defect on the RBC (inherent & acquired) or defect in microvasculature through which the RBCs circulate.

Intravascular haemolysis- within the vessels

Extravascular haemolysis- outside the vessels eg by macrophages in the spleen & liver.

Some haemolysis occur both intravascularly and extravascularly.eg. haemobartonellosis, Babesiosis, pyruvate kinase def. Pyruvate kinase(PK) is an enzyme in the glycolytic pathway essential for the production of ATP. ATP is essential to maintaining RBC membrane stability. PK def. is a hereditary disease in Dogs.

Microangiopathic haemolysis-mechanical intravascular shoring of RBC while passing through abnormally tortuous capillary beds eg in glomerulonephritis, DIC and haemangiosarcoma.

Turbulent flow of blood- large vessels eg in heartworm disease and TRAUMATIC disruption of red cell in heart disease.

Some characteristics features seen in Anaemias

- Usually accompanied by mild pancytopenia
- Anaemia appear generally as Normocytic Normochronic to macrocytic normochronic
- presence of occasional megaloblasts in blood films
- presence of occasional giant but fully haemoglobinized RBC
- presence of occasional RBC with bizarre and or multiple nuclear fragments (inclusion bodies)

Ineffective erythropoiesis[Maturation Defect Anaemia(MD)]

a) Nuclear defect (megaloblastic anaemia)

- Failure of the precursor nuclei to divide and mature at the same rate as the cytoplasm.

Asynchrony of nuclear/cytoplasmic maturation.

a) Cytoplasmic defect

- iron defect
- lead defect
- Vit. B6

-Large cells with immature pale nuclei with irregular chromatin clumps

-cytoplasm is too haemoglobinized for the degree of nuclear maturation

Cytoplasmic Defect: failure of haemoglobin formation. The RBC continues to divide, in the presence of mature nucleus.

Hypercellular red cell Bone marrow (BM). Small metarubricytes.

The RBC continue to divide to smaller cells because they never acquire full complement of haemoglobin.

Normal reticulocytes produce/release at slow rate.

Blood film=microcytic,hypochromic anaemia

b/c of small RBC with increased area of central pallor

- fragile RBC=poikilocytosis
- low polychromesia

Normocytic normochronic anaemia

- 1) Anaemia due to inflammatory disease and neoplasia. The anaemia is accompanied with hyperplasia of the white blood cells. BM (bone marrow) smear will be with erythroid hypoplasia, granulocytic hyperplasia.
- 2) Anaemia with selective Erythroid Hypoplasia
eg. -low erythropoietin production
-Hypothyroidism (reduced oxygen demand by peripheral tissue)
- Selective RBC precursor cells destruction as in toxic or immune-mediated mechanism.

In general bone marrow hypoplasia(aplastic anaemia)

- severe anaemia
- severe leucopenia
- +/- thrombocytopenia

Aetiology –toxic or immune-mediated destruction of precursor cells
-myelophthisic anaemias

Toxic materials:- infection agents-FeLV, ehrlichiosis

- Toxic chemicals- Estrogen , drugs
[griseofulvin in cat]
- Ionizing radiation

Myelophthisic anaemia (occupation of the Bone marrow (BM) by other abnormal cells & connective tissues)

- a) Neoplastic diseases
- b) Non-neoplastic diseases

1) Most common are:

- haematopoietic
- lymphoid leukemia, lymphosarcoma
- Granulocytic leukemia.

2) myelofibrosis [conn. tissue replacement of BM]

- by -estrogen toxicity
- ionizing radiation

Blood Films:

- i-non regenerative anaemia
- ii-presence of poikilocytes

Polycythaemic –increased in circulation of RBC is characterized by increase in PVC, Hb, RBC values than normal range values. Polycythaemia can be:

- a) Relative: When there is a decrease in plasma volume due to dehydration.
- b) Transient: Here polycythaemia is due to excitement and is usually just for about an hour after which RBC values return to normal.
- c) Absolute: due to increased BM[bone marrow] production of RBC.