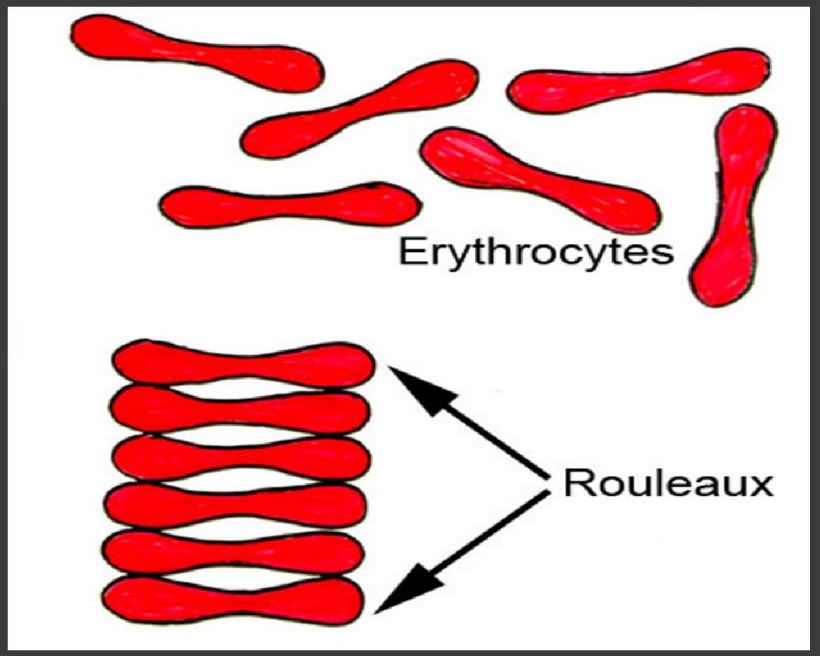
ESR

- It is non specific test indicate changes in plasma protein concentration due to infection or tissue injury.
- If anticoagulated blood is allowed to stand undisturbed, the RBC will gradually settle to the bottom of the tube leaving a clear layer of plasma.

- RBC possess a net –ve charge that makes RBC repulse from each other .So , when suspended in normal plasma sedimentation is happen as single cells that sticks on each other i.e Rouleaux formation.



Factors affecting ESR:

1-Plasma protein

- (macromolecules) as Fibrinogen and globulin → High ESR
- Albumin → Low ESR

- **2-RBC size& nb**

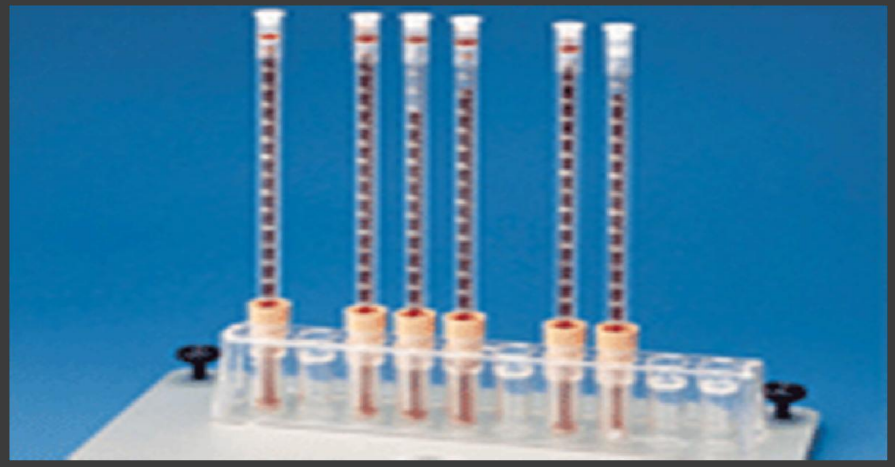
- **3-Technical factors**
- Not in Vertical position → High ESR
- High Temperaturs → High ESR
- Vibration → Low ESR

2 methods : 1-westergren
2- wintrobe

- The recommended method is westergren method.
- The test is performed on venous blood.
- It is conventional to set up sedimentation rate tests at RT (18-25^{0}C).
- This test measures the rate of settling of RBC in diluted plasma after 1 hour.
- The usual practice is to collect the blood directly into the trisodium citrate tube.

- The test can be carried out equally well with anticoagulated blood with EDTA within 24 hrs then add to it Trisodium citrate.

- The blood will draw it up into the westergren tube to 200mm mark, place the tube exactly vertical and leave undisturbed for exactly 60 min. (free from vibration and no exposed to sunlight).



- westergren Tube:

30 cm in length and 2.40 to 2.70 mm in diameter.

Bore size is 0.05mm

- ESR results influenced by:

1-age

2-sex

3-menstrual cycle

4-drugs

Normal range:

men	< 70 years	10-14 mm/hour
	> 70 years	30 mm/hour
women	< 70 years	12 – 20 mm/hour
	> 70 years	35 mm/hour

High ESR

- TB
- Disseminated lupus erythromatosis
- malignancy
- Rheumatic arthritis

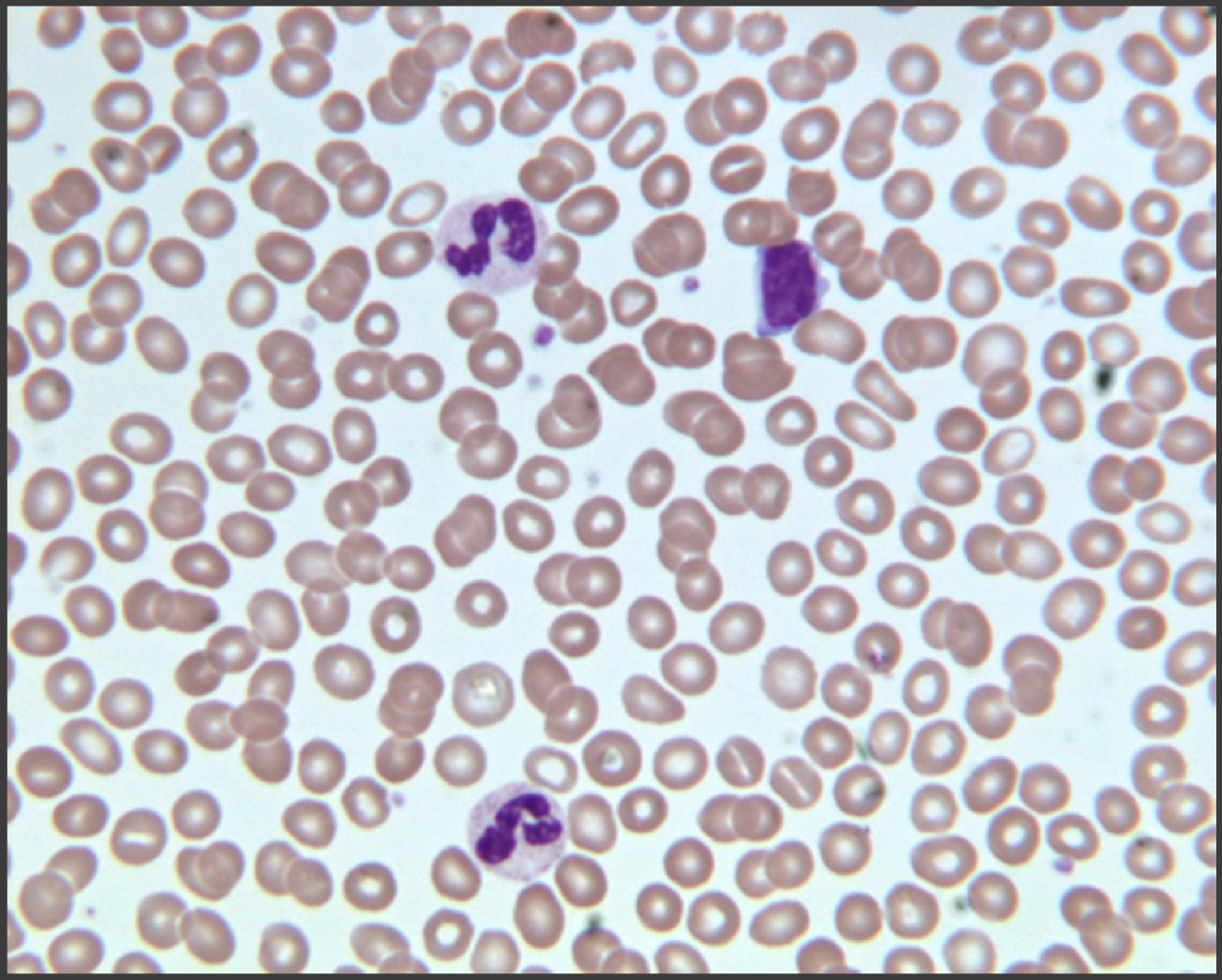
Low ESR

- Polycythemia
- Hypofibrinogenaemia
- Congestive cardiac failure

Normal blood film:

- normocytic, normochromic
- the platelets nb & shapes are normal
- the WBC (5 types) are normal in size & shapes.

Normal blood film:



Iron deficiency anemia

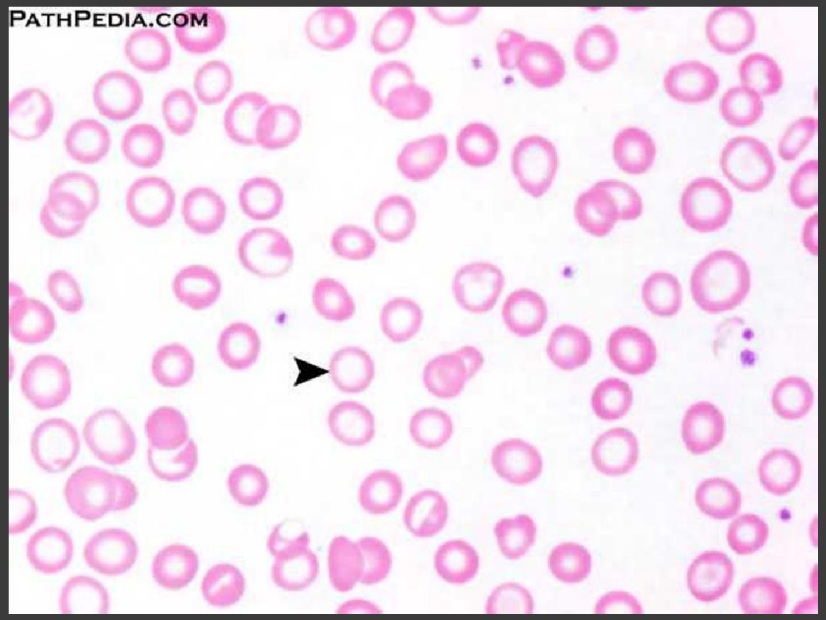
- ***Microcytic,hypochromic(ring shape)***

General test:

- *.Hb* ↓ ,PCV ↓ ,*MCV* ↓,*MCH*↓

Specific test:

- Serum iron ↓
- Serum feritin ↓
- TIBC ↑
- SerumTransferin Receptor ↑
- Bone marrow iron stores :absent
- Erythroblast iron: absent

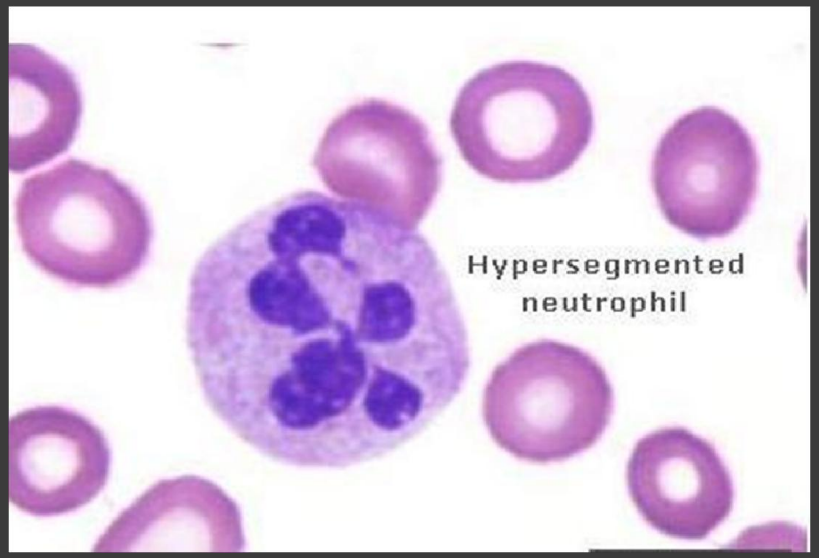


Megaloblastic anemia: causes: ↓ folic acid- ↓ Vit B12

- The anaemia is macrocytic (MCV > 95 fl)
- WBC and platelets is reduced in severe anemia
- Hypersegmented neutrophil (more than 5 lobes)

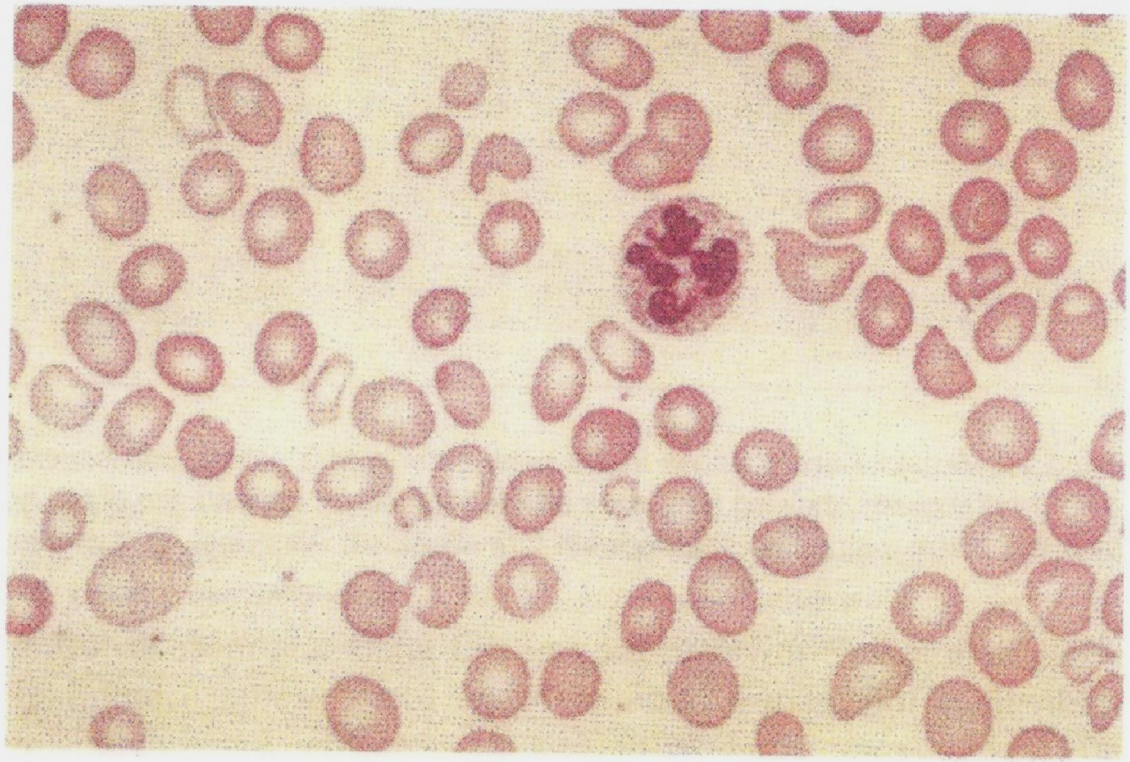
- General test:

Hb ↓ ,PCV ↓ ,MCV ↑



- **Confirmatory test:**
  - Serum and red cell folate assay ↓
  - Serum Vit B12 assay ↓
  - BM examination to find megaloblastic changes.

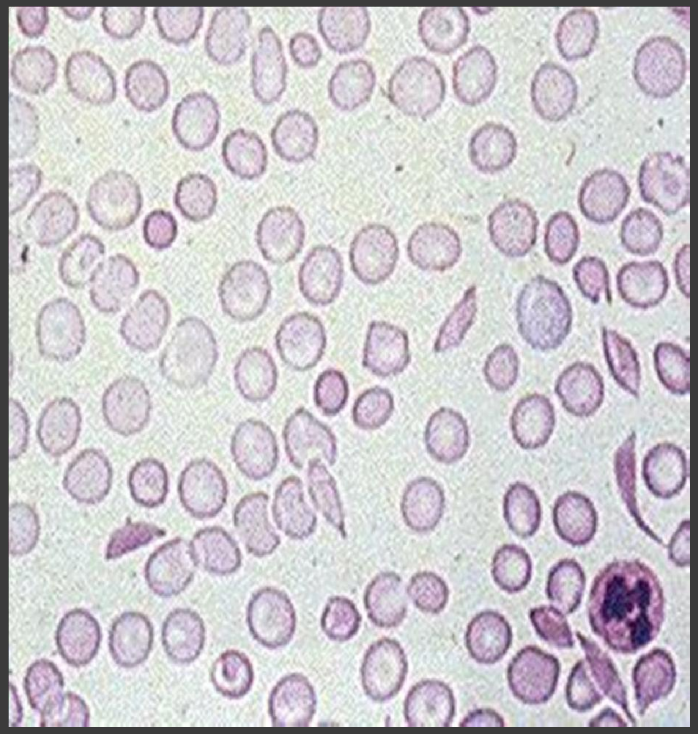
- BM is hypercellular and the erythroblasts are large because there is defect in DNA synthesis and show failure of nuclear maturation.these changes are called megaloblastic changes.



Megaloblastic anaemia showing macrocytes

Sickle cell anaemia

sickle cell-target cell



Sickle cell anaemia

Specific Test

Screening Test:

1- solubility test

2- sickling test

Confirmatory Test:

Hb electrophoresis

Hereditary hemolytic anaemia

- Hereditary hemolytic anaemia: is increase RBC destruction due to intrensic red cell defect.
- RBC enzyme
- RBC membrane
- Hb synthesis

RBC membrane

- It is a phospholipid bilayer.

50% of membrane is protein.

40% of membrane is fat.

10% of membrane is carbohydrate.

- the Proteins of cell membrane are:

integral- peripheral

the peripheral are:

α andβ Spectrin-Actin-Protein 4.1-Ankyrin

Defects of these peripheral proteins lead to:

- Abnormal shape of RBC membrane

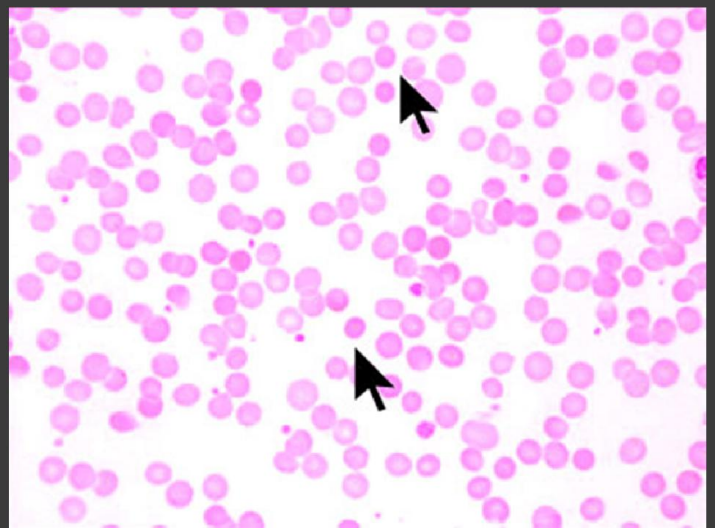
e.g:

Hereditary spherocytosis

Hereditary elleptocytosis

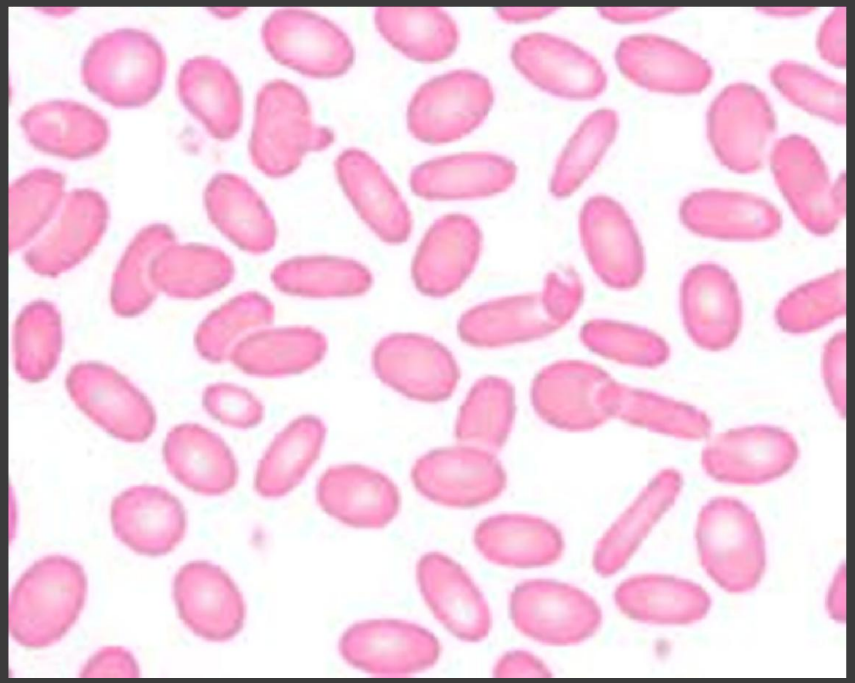
Hereditary spherocytosis

- Defect in α spectrin and ankyrin
- The ratio of surface area to volume is decrease.
- It becomes rounded and smaller than normal RBC = microspherocyte



Hereditary elleptocytosis

- Defect in α and β spectrin(failure of self association.



Hereditary Spherocytosis and Hereditary elleptocytosis

- Hb ↓
- RBC Count ↑
- MCV ↓
- MCH ↑ or normal
- MCHC ↑
- Retic count ↑ (5 – 20%)due to BM activation
- osmotic fragility ↑
- Direct coombs Test – ve

Thalassemia

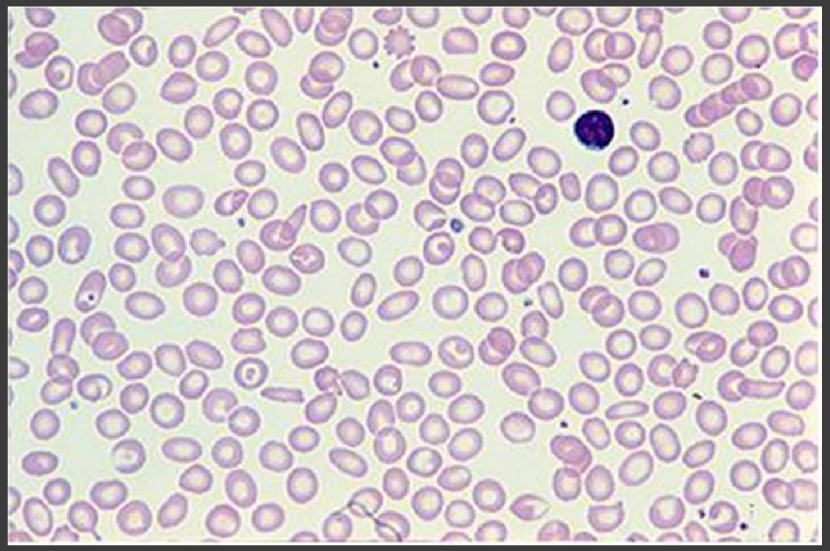
- It is agenetic disorder (Hb abnormalities)
- Hb :haem + globulin
- Globulin chain: 4 polypeptide chains($2^{\alpha}2\beta$)

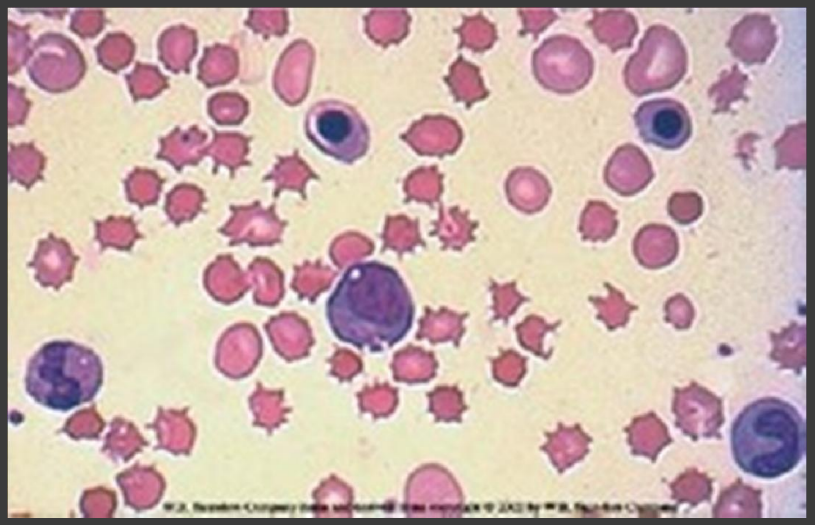
- α thalassemia :defect in α chain.
- β thalassemia : defect in β chain.

THALASSEMIA

- Hypochromic –microcytic cells with target cells and poikilocyte.

Late normoblast (nucleated RBC)





Thalasemia :

- Hb ↓
- Retic ↑
- MCV ↓
- Bone marrow iron stores :present
- erythroblast iron :present
- confirmatory test:

  Hb electrophoresis

  we can't detect if α, B from blood film only from Hb electrophoresis.