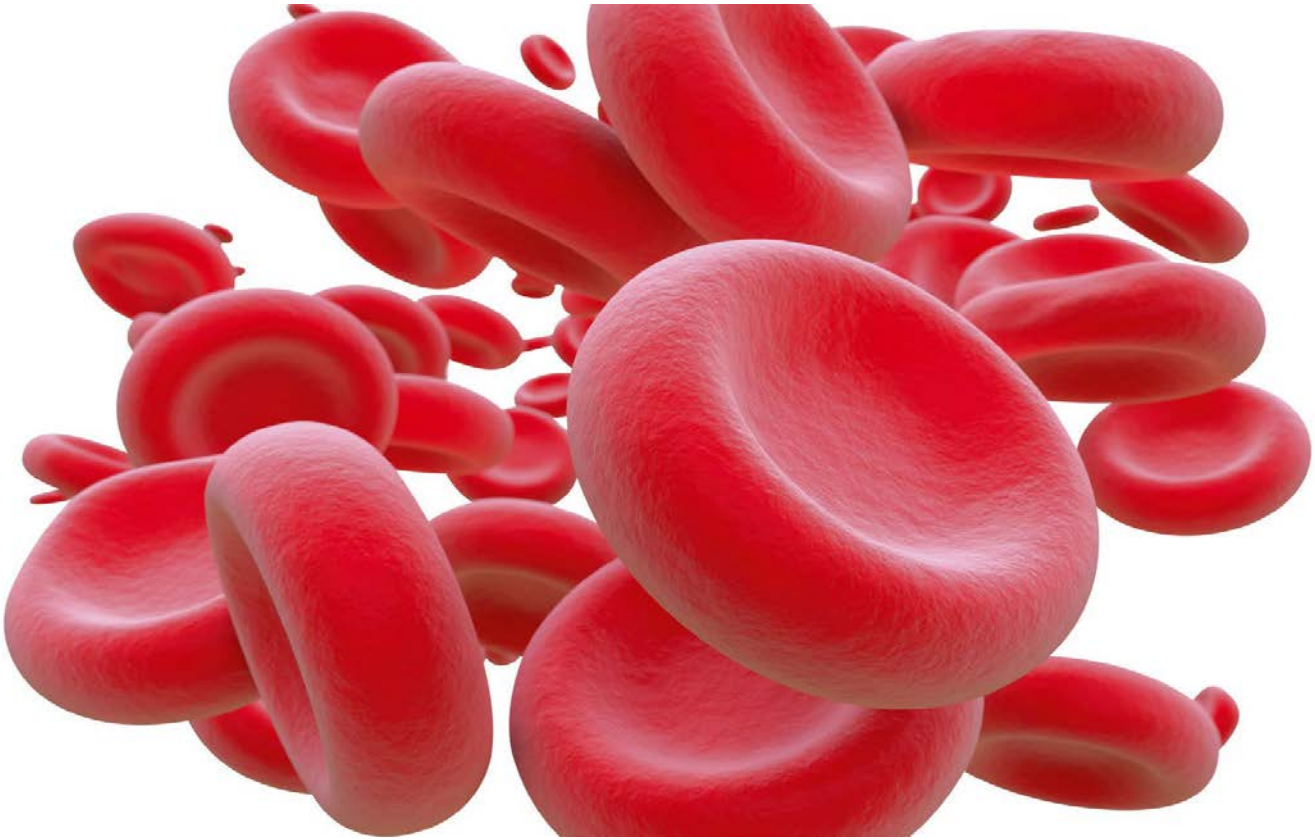
Anemia
Lab 8



What is anemia?

- **It is a reduction in the oxygen carrying capacity of blood.**

Classification of anemia:

- **According to etiology:**

1.Increase RBC loss (bleeding)

2.Increase red cell destruction (hemolysis)

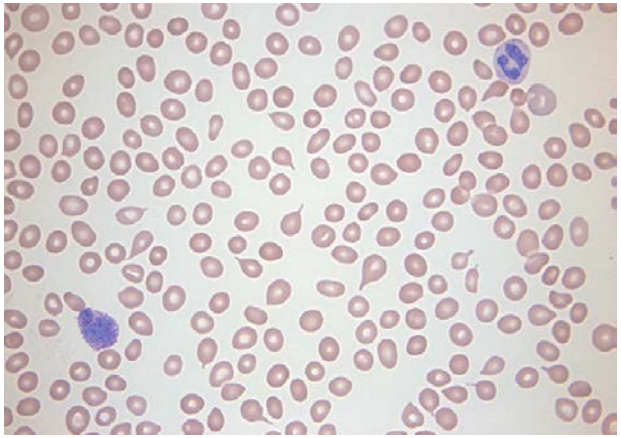
3.Decrease red cell production

- **According to morphology:**

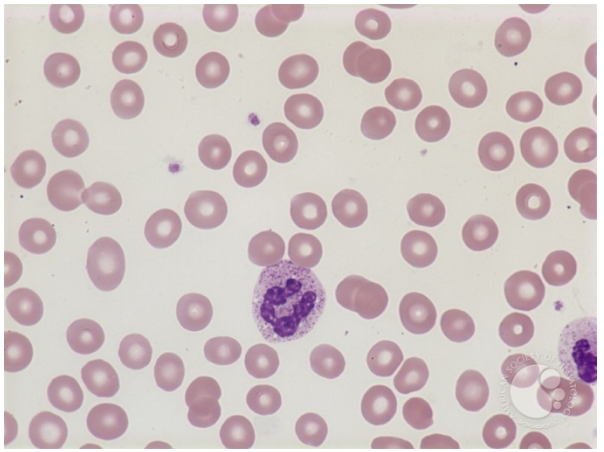
1.Cell size (normocytic, microcytic, macrocytic)

2.Degree of hemoglobinization reflected by the color of the cell (normochromic, hypochromic)

3.Shape of the cells: normal shape, spherocyte, sickle cell shape



Microcytic anemia



Normocytic normochromic

Figure 1: Simplified illustration of different types of anemia; see descriptions below.

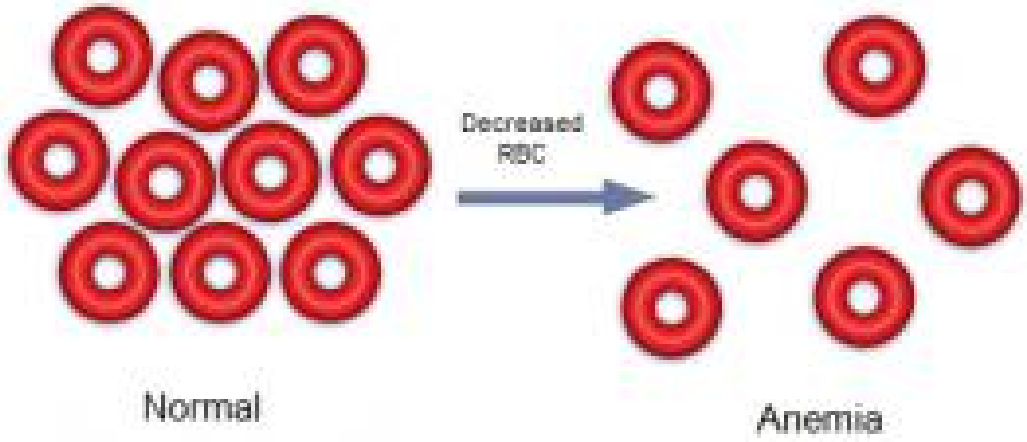


Figure 1a: Normochromic normocytic anemia

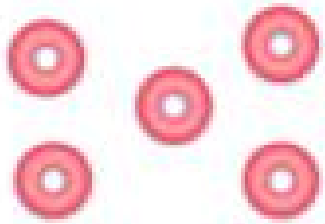


Figure 1b: Microcytic hypochromic anemia

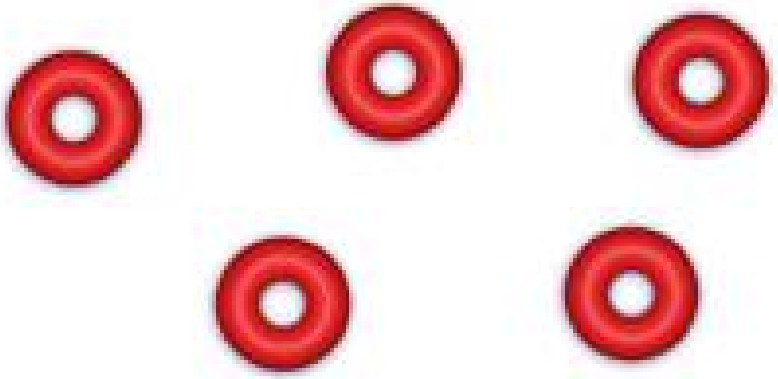


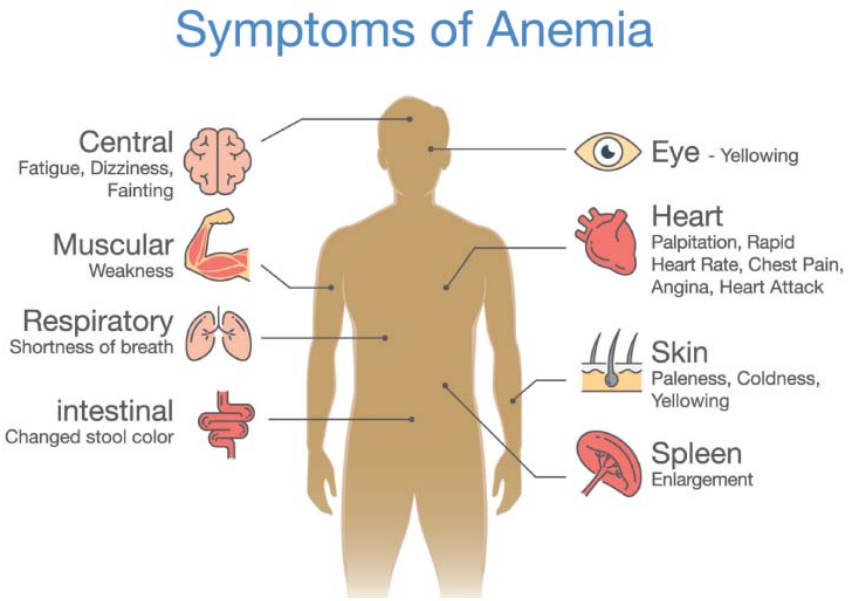
Figure 1c: Macrocytic normochromic anemia

- **Clinical presentation:**

a. **Pallor, tiredness, palpitation, change in skin, hair and fingers, decrease in concentration**

b. **Jaundice and change in color of urine and stool with loin pain (intravascular hemolytic anemia)**

c. **Jaundice and splenomegaly (extravascular hemolytic anemia)**



Hemolytic anemia

- **Normal RBCs have a life span of about 120 days. If RBC destructed earlier, hemolytic anemia will occur.**

Clinical characteristics of hemolytic anemia:

a. **Increase rate of RBC destruction**
b. **Compensatory increase in erythropoiesis result in reticulocytosis (new RBC)**
c. **Retention by the body products of red cell destruction e.g. bilirubin**

d. Almost invariably hemolytic anemia associated with erythroid hyperplasia in the bone marrow and increased retic count in the peripheral blood

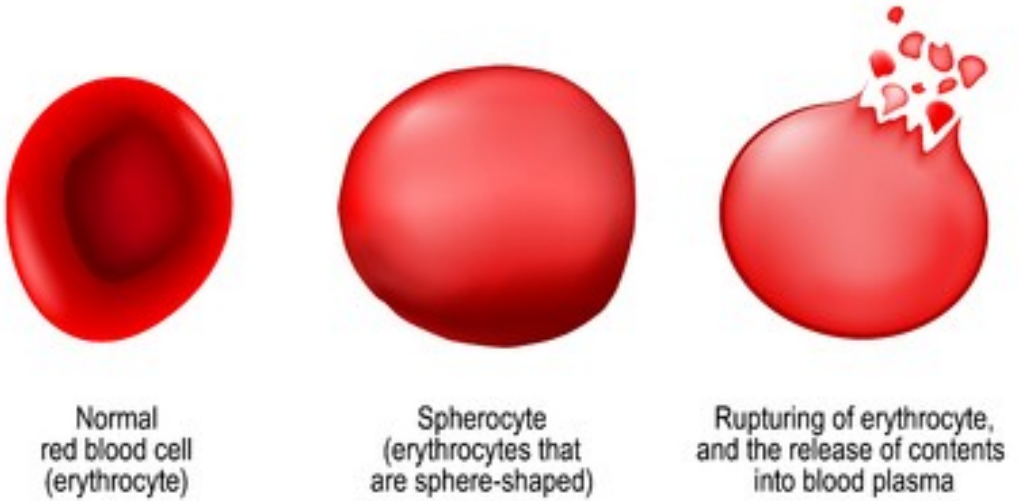
e. Increase retic count in peripheral blood

Examples of hemolytic anemia:

1. Hereditary spherocytosis:

It is characterized by autosomal dominant inherited defect in RBC membrane that renders the cells spheroidal less deformable and vulnerable to splenic sequestration and destruction (extravascular hemolysis).

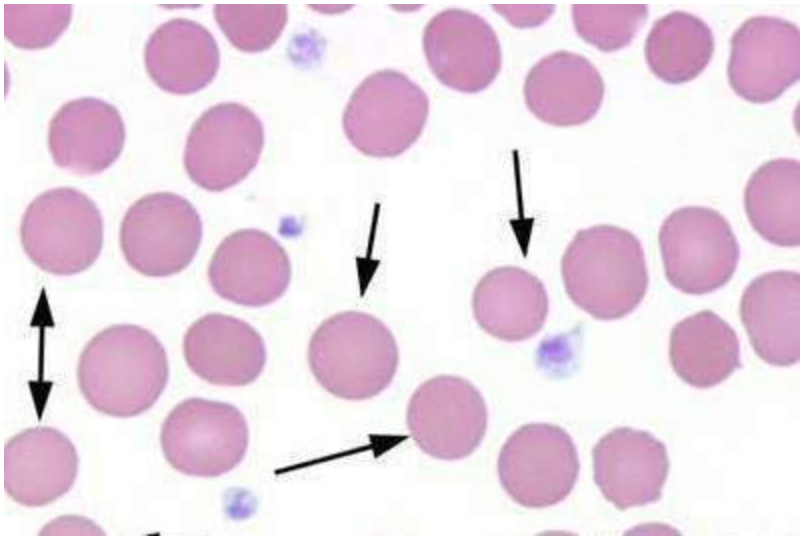
Hemolysis

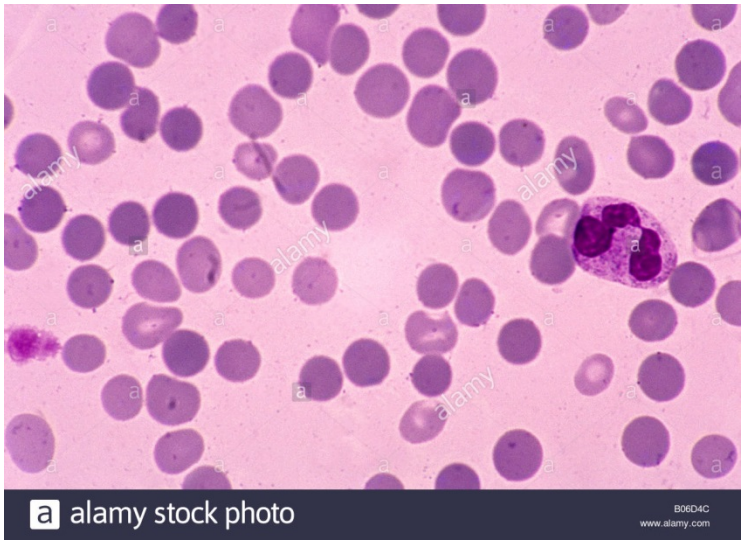


Normal
red blood cell
(erythrocyte)

Spherocyte
(erythrocytes that
are sphere-shaped)

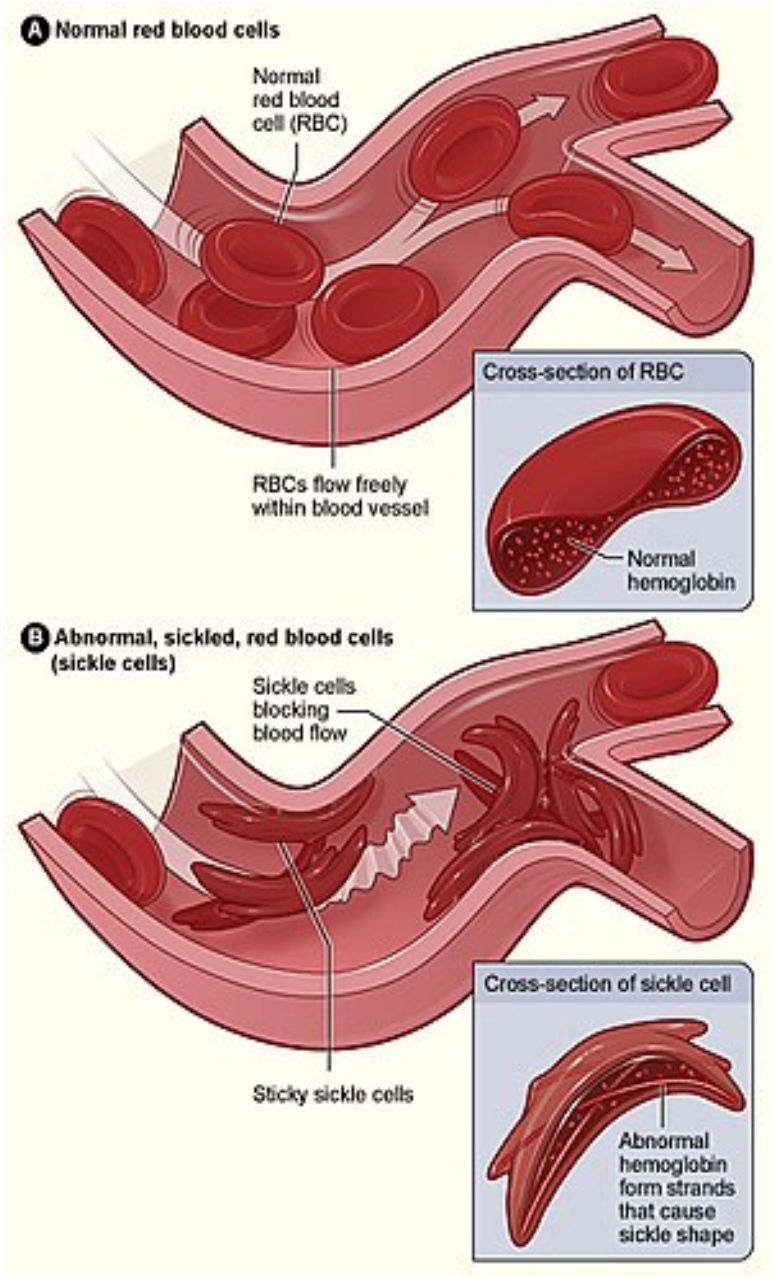
Rupturing of erythrocyte,
and the release of contents
into blood plasma

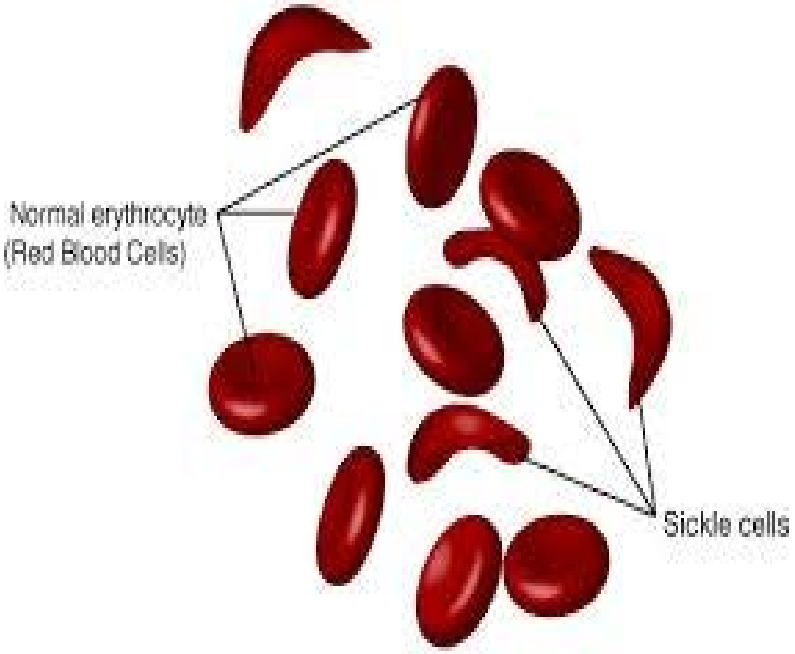


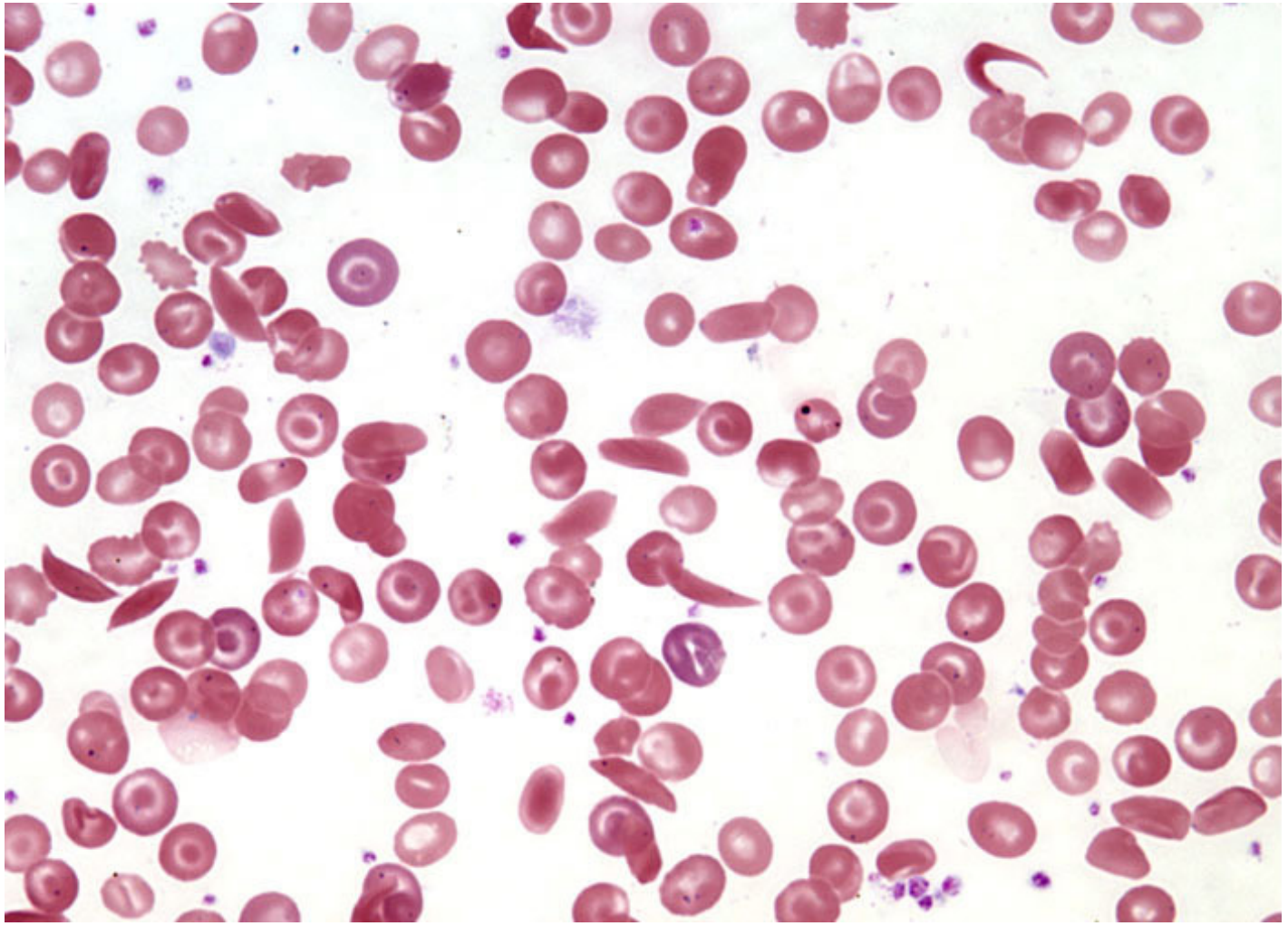


2. Sickle cell anemia:

- **In Sickle cell anemia HbS will produced by substitution of valin for glutamic acid of β chain.**
- **Upon deoxygenation HbS molecules undergo polymerization (crystallization) these polymers distort RBC which assume an elongated crescentic or sickle shape (sickling) and become sticky less deformable then destructed by splenic macrophages. Sickling initially reversible then with recurrent episodes it become irreversible. The hemolysis is extravascular hemolysis.**


A Normal red blood cells
Normal red blood cell (RBC)
RBCs flow freely within blood vessel
Cross-section of RBC
Normal hemoglobin
B Abnormal, sickled, red blood cells (sickle cells)
Sickle cells blocking blood flow
Sticky sickle cells
Cross-section of sickle cell
Abnormal hemoglobin form strands that cause sickle shape


Normal erythrocyte (Red Blood Cells)
Sickle cells



Sickle cell anemia

Anemia due to diminished erythropoiesis

1. **Anemias caused by an inadequate dietary supply of substances that are needed for hemopoiesis particularly iron, folic acid, and vit B12**
2. **Disorders that suppress the bone marrow RBC production like that occur in aplastic anemia, leukemia, lymphoma and cancer metastasis .**

1. Iron-deficiency anemia:

- **Causes:**

a. **Low iron intake**
b. **Malabsorption syndromes**
c. **Increase demands**
d. **Chronic blood loss**

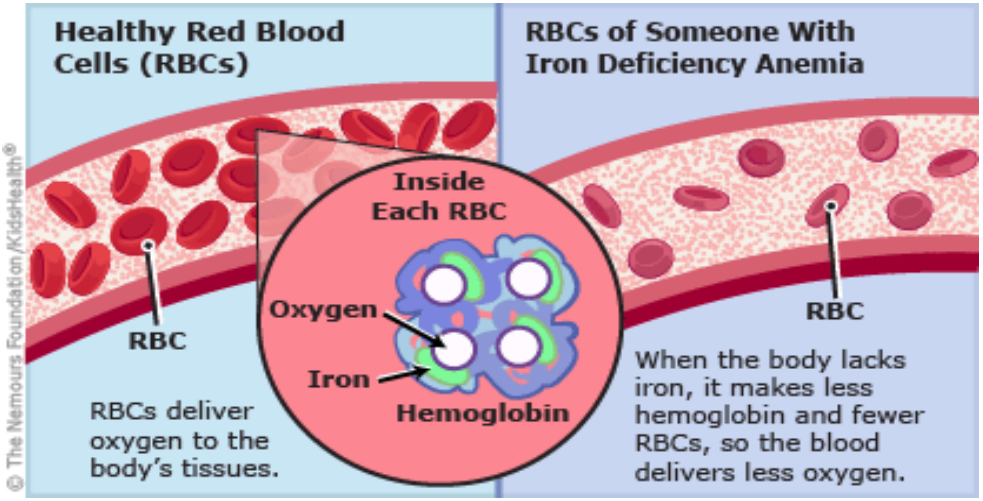
- **Diagnostic features:**

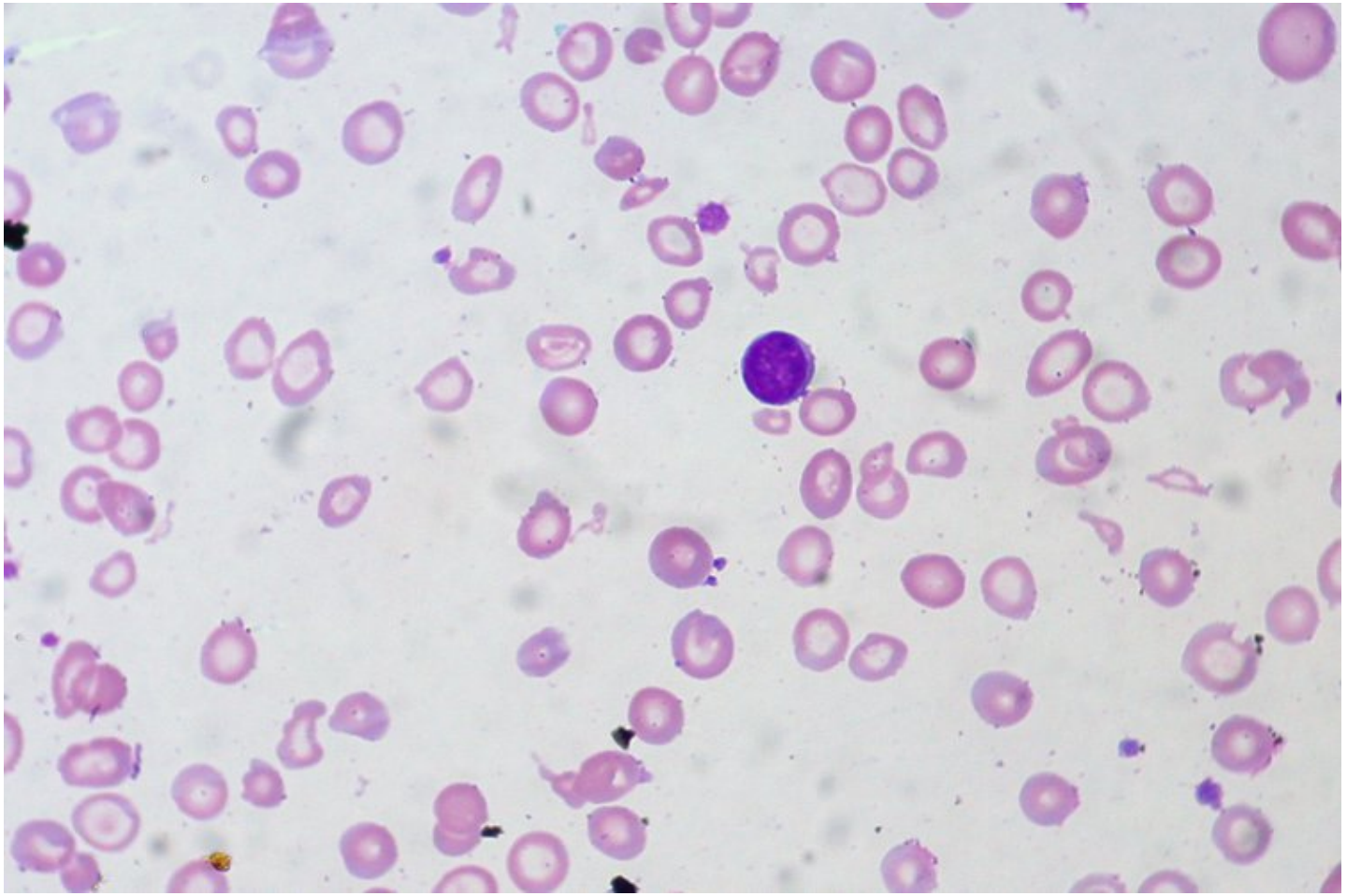
1. Hypochromic microcytic anemia

2. Low serum iron and low serum ferritin

3. Low transferrin saturation

4. Increase total iron binding capacity

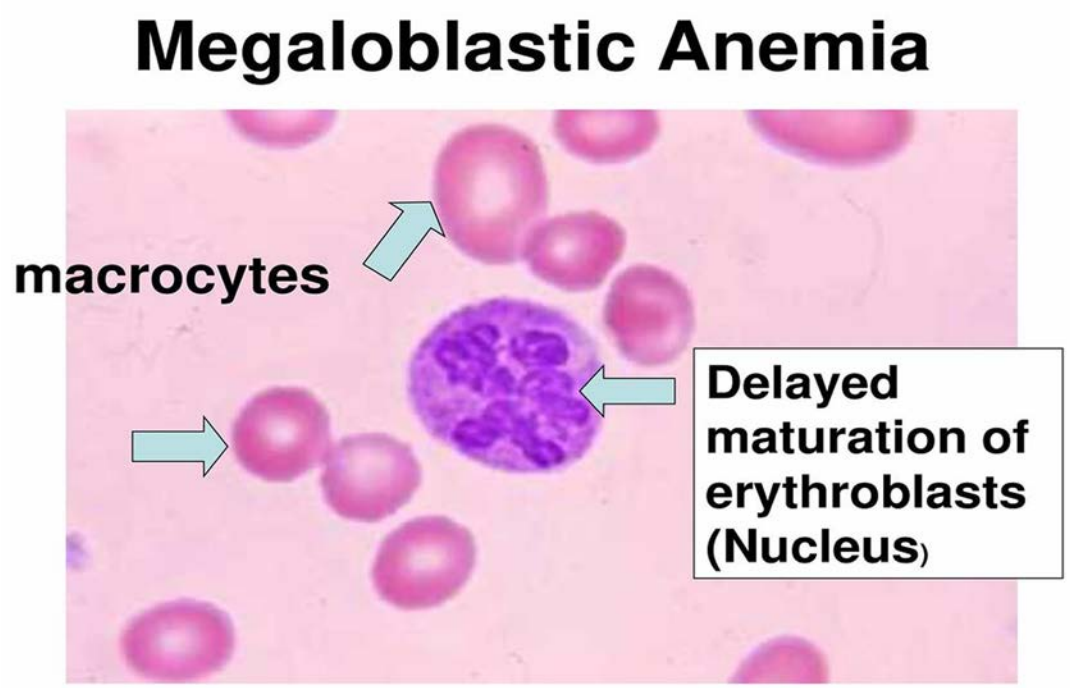


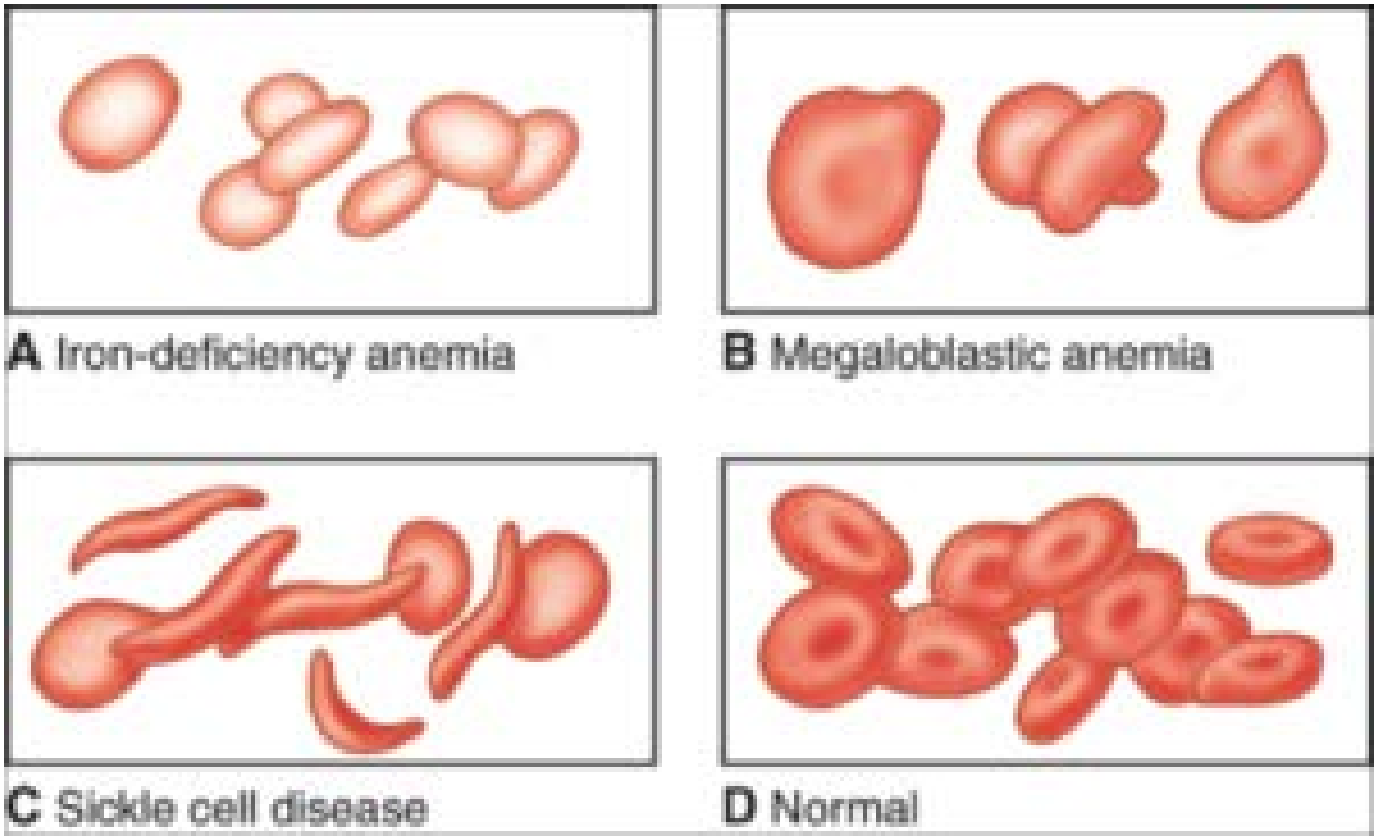


Iron deficiency anemia

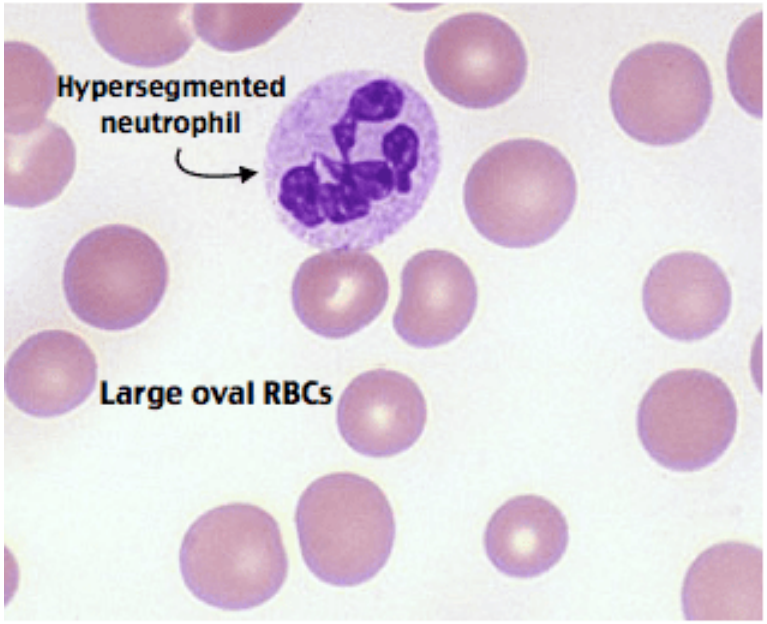
2. Megaloblastic anemia:

- **This type of anemia occurs due to deficiency of either folic acid or vit.B12 or both. These vitamins are required for DNA synthesis. The RBC size increase (macrocyte).**

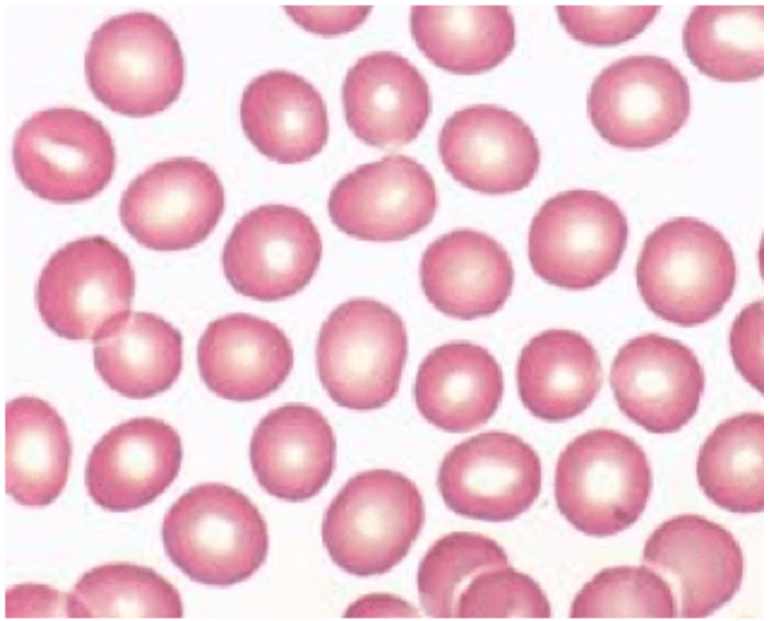



A Iron-deficiency anemia
B Megaloblastic anemia
C Sickle cell disease
D Normal

Megaloblastic anemia



Normal Blood Smear

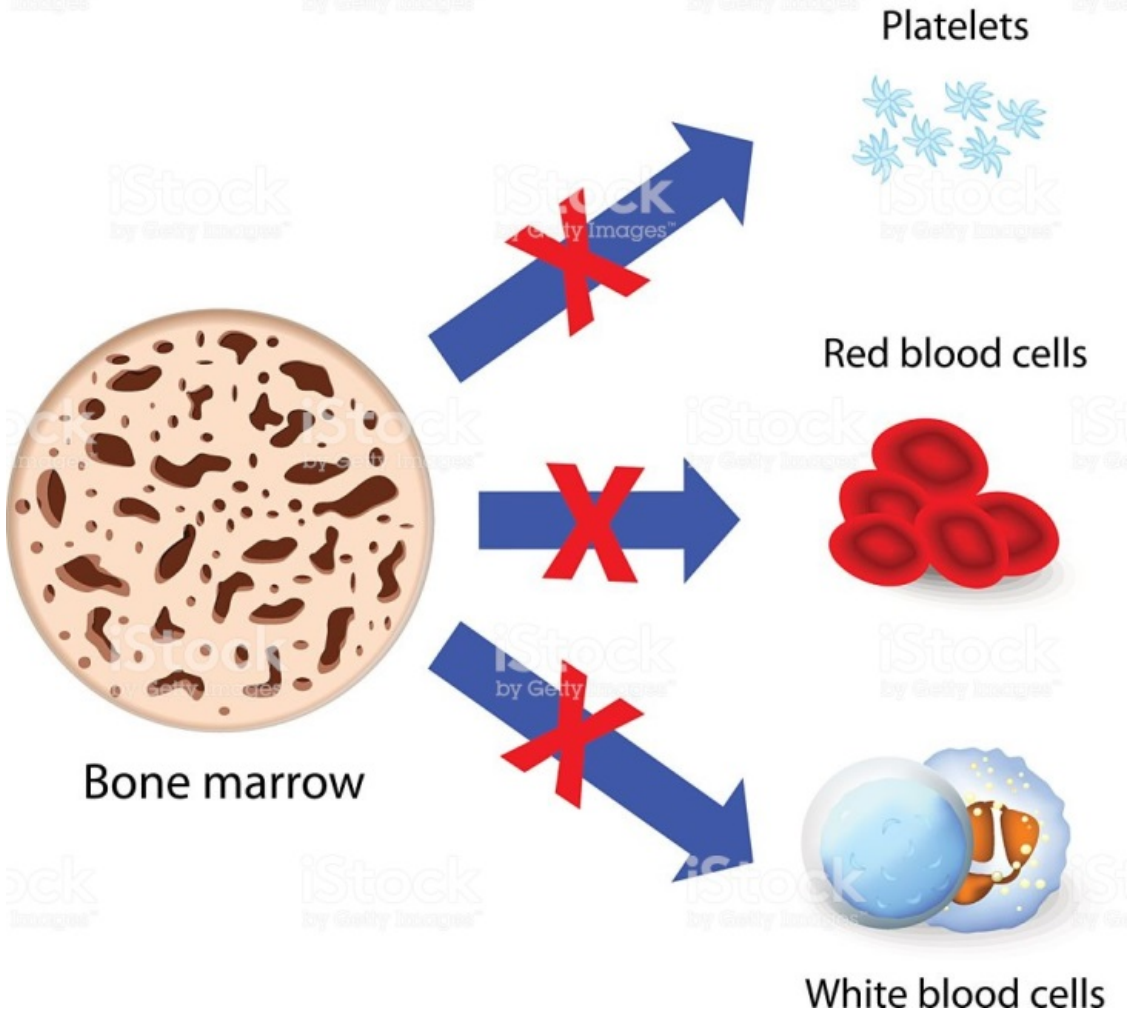


3. Aplastic anemia:

- **It is a disorder in which multipotent bone marrow stem cells are suppressed leading to marrow failure and pancytopenia.**
- **Etiology :**

1. **Primary (idiopathic) 50% of cases.**
2. **Secondary to bone marrow damaging agent e.g anti neoplastic drug (chemotherapy), benzene, antibiotics like chloramphenicol. Viral infection also an important cause for AA : e.g EBV**

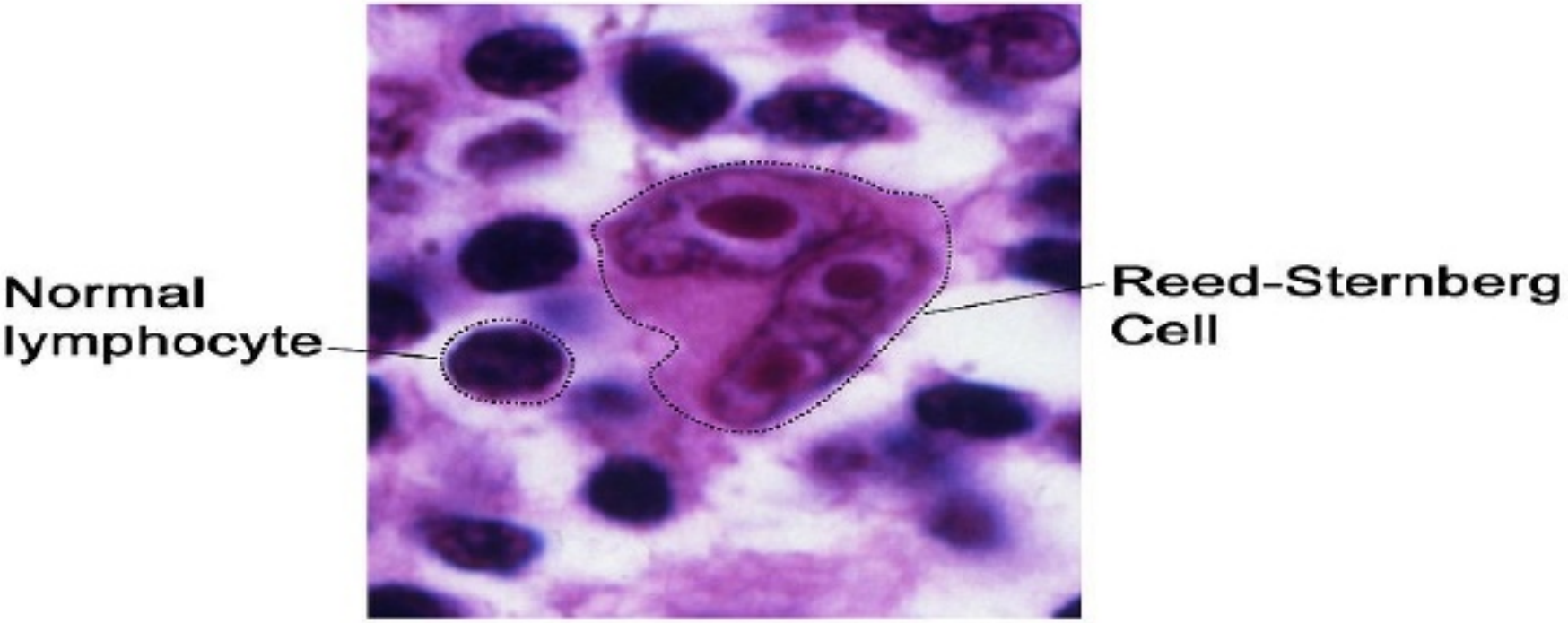
APLASTIC ANEMIA



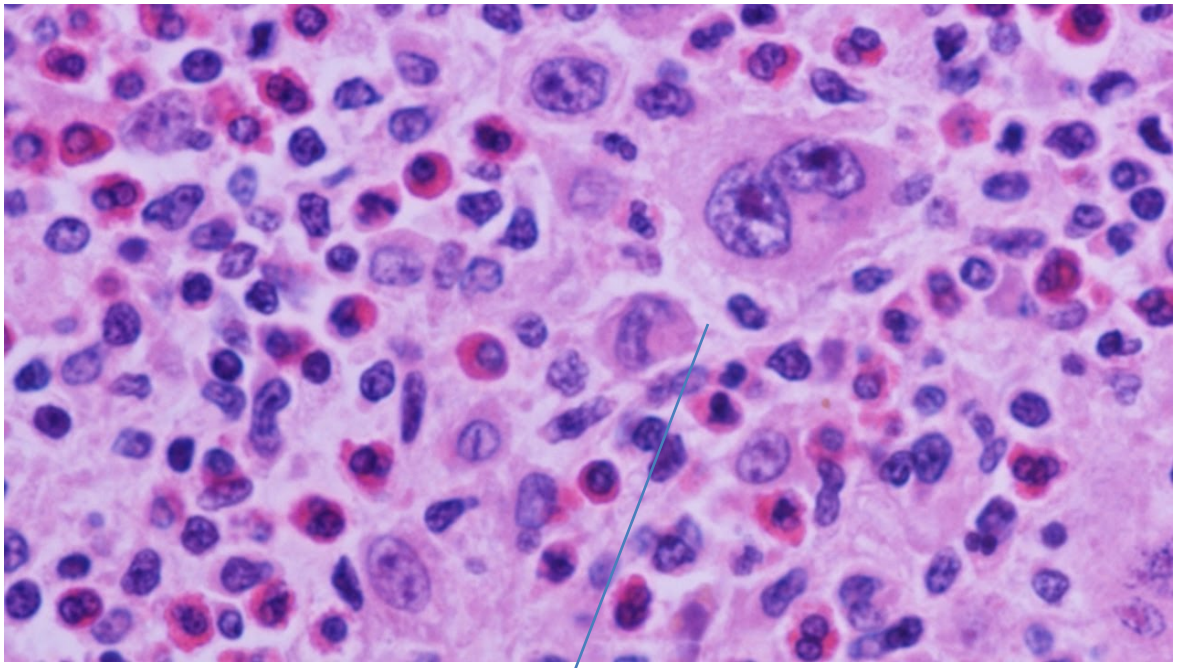
Lymphoma:

- **It is neoplasia of lymphocytes (T lymphocytes & B lymphocytes) which called hodgkin and non-Hodgkin lymphoma.**

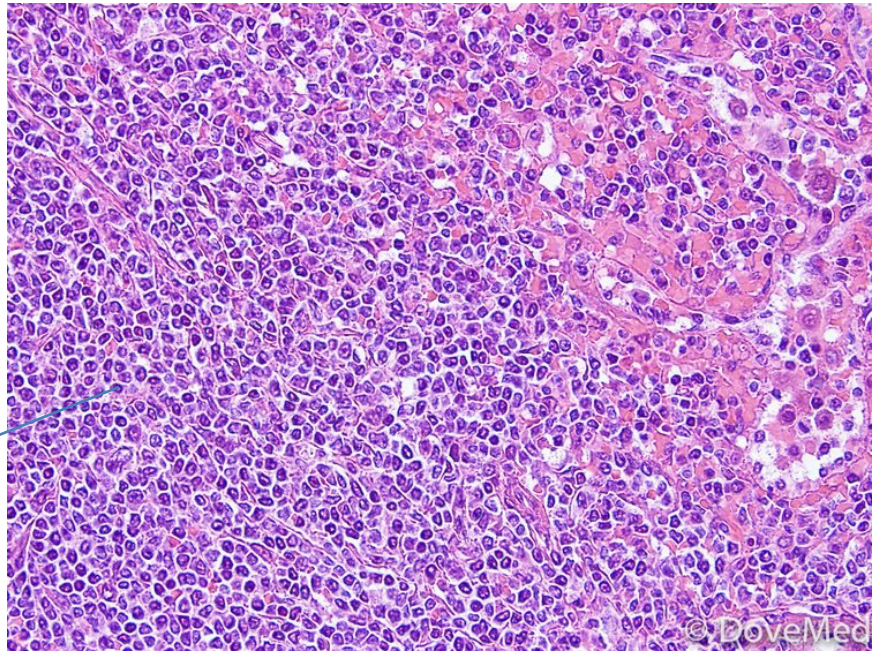
Reed-sternberg cell



- Reed-Sternberg cell; photograph shows normal lymphocytes compared with a Reed-Sternberg cell, which are large, abnormal lymphocytes that may contain more than one nucleus. These cells are found in Hodgkin lymphoma



Hodgkin’s lymphoma



Non Hodgkin’s lymphoma


THANK YOU