HEMOLYTIC ANEMIAS

By

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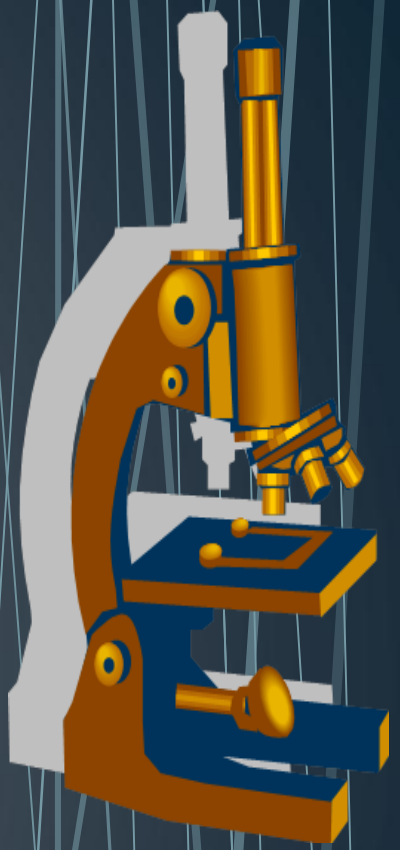
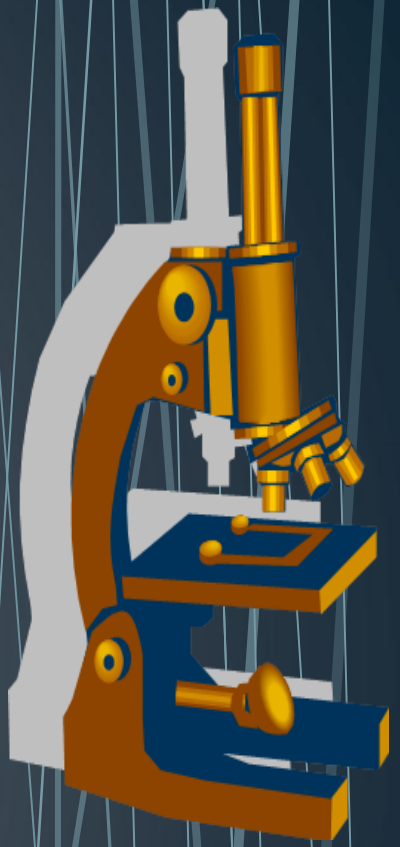


HEMOLYTIC ANEMIAS

INCREASE RED CELL DESTRUCTION

REDUCED RED-CELL LIFE SPAN



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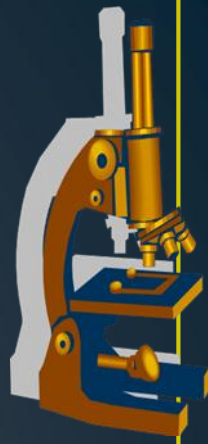
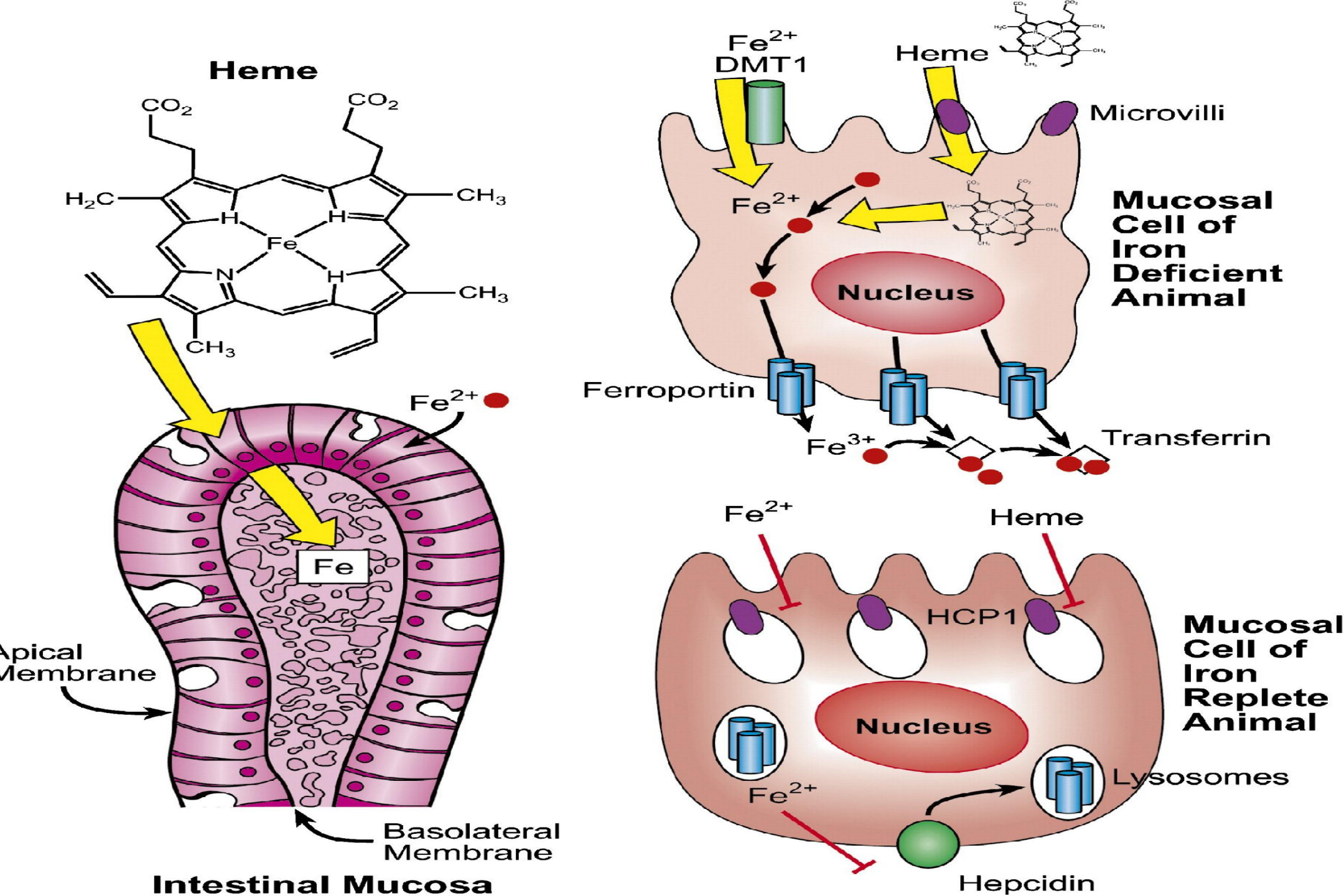
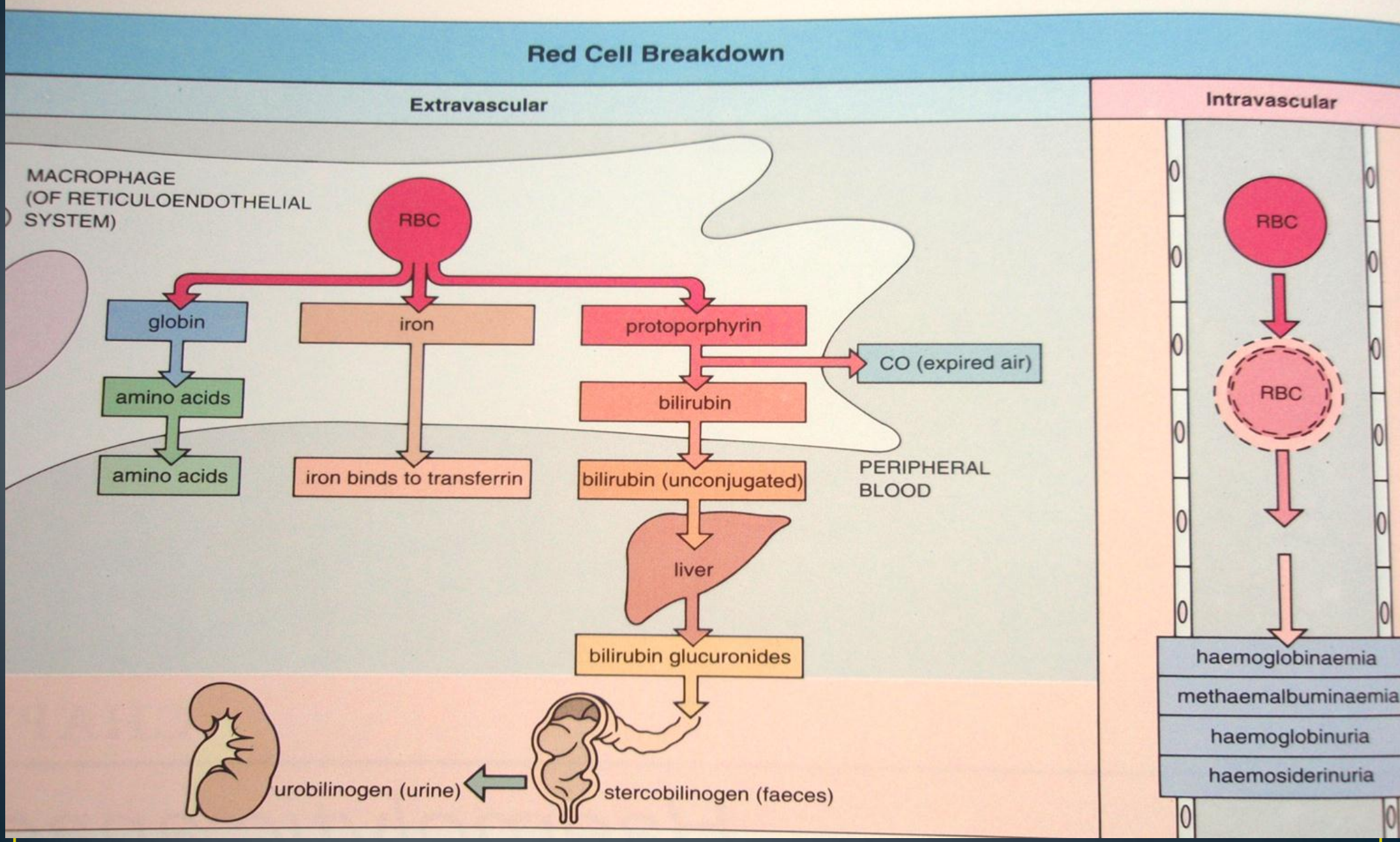


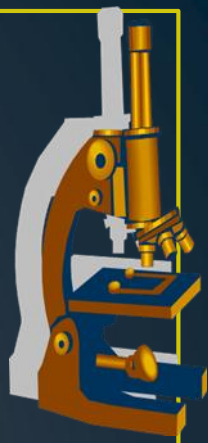
- *A red blood cell survives 90 to 120 days in the circulation; about 1% of human red blood cells break down each day*
- *The spleen is the main organ which removes old and damaged RBCs from the circulation*


Heme
CO_2
CO_2
H_2C
CH_3
H
H
Fe
N
H
CH_3
CH_3
Fe^{2+}
Fe
Apical Membrane
Basolateral Membrane
Intestinal Mucosa
Fe^{2+} DMT1
Heme
Microvilli
Fe^{2+}
Nucleus
Mucosal Cell of Iron Deficient Animal
Ferroportin
Fe^{3+}
Transferrin
Fe^{2+}
Heme
HCP1
Nucleus
Mucosal Cell of Iron Replete Animal
Lysosomes
Fe^{2+}
Hepcidin

Red Cell Breakdown

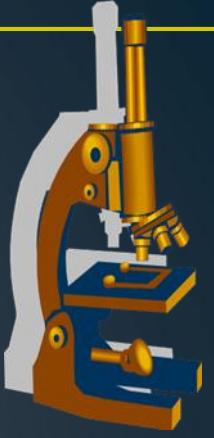


Lab. diagnosis of hemolytic anemias



- Anemia decrease Hb, RBCs, Ht
- Reticulocytosis
- Indirect hyperbilirubinemia
- Increase urobilinogen
- Increased level of lactate dehydrogenase (LDH)
- Absence or reduced of free serum haptoglobin

Intravascular hemolysis



- *laboratory signs of*
- *- hemoglobinemia free plasma Hb Increase*
  - hemoglobinuria
  - hemosiderynuria smoky urine

Complications of increased, chronic hemolysis

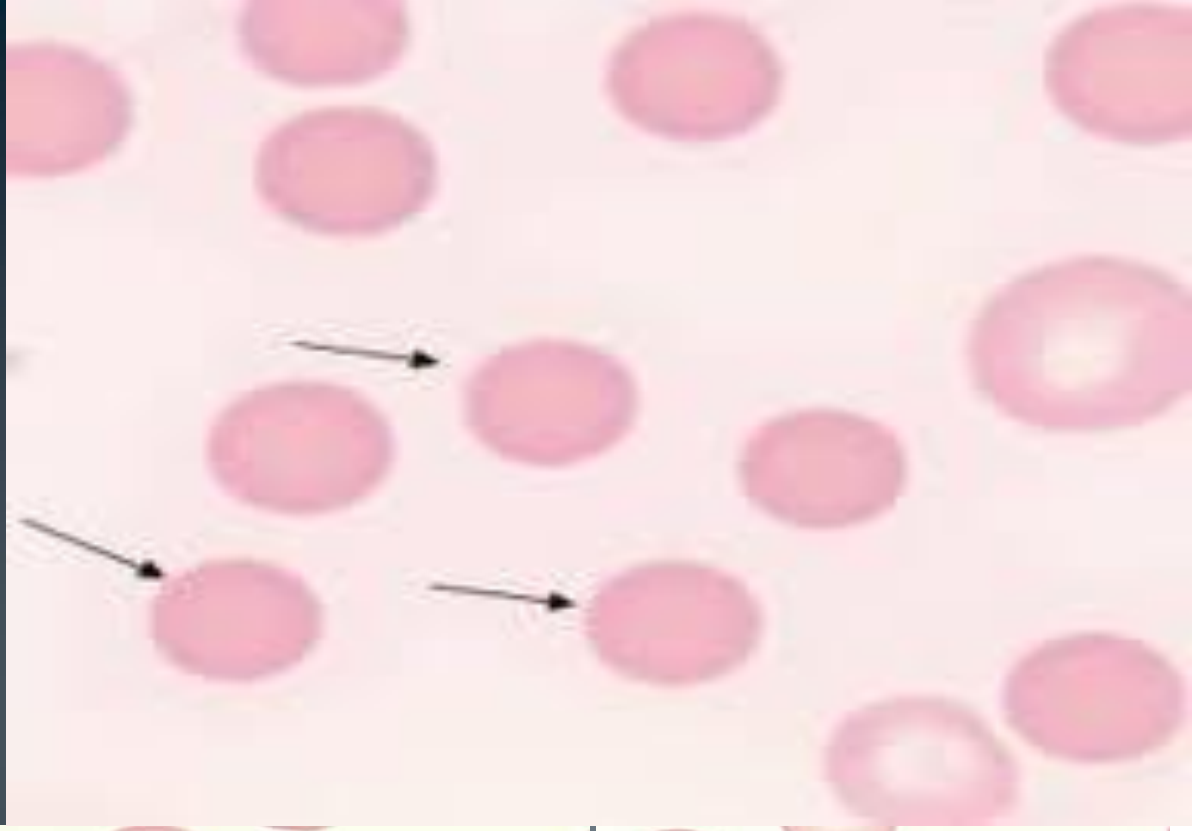
- *Folinic acid deficiency*
- *Gallstones*
- *Thrombosis*
- *Hemolytic crisis*

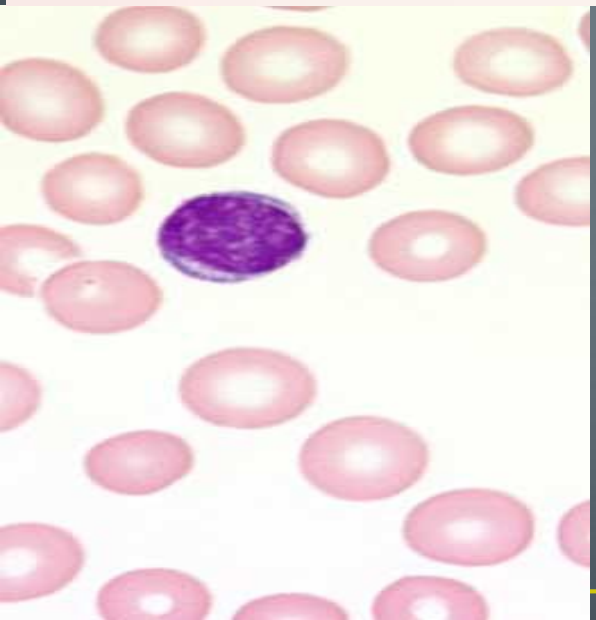
  - rapid destruction of large numbers of red blood cells

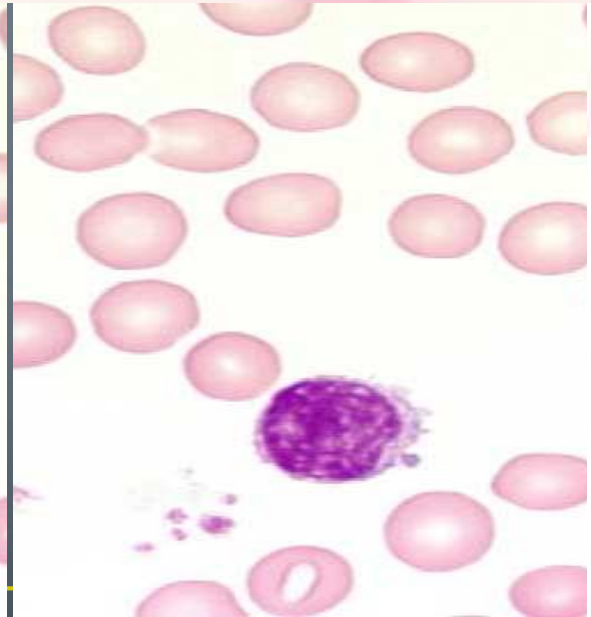
  - Aplastic crisis

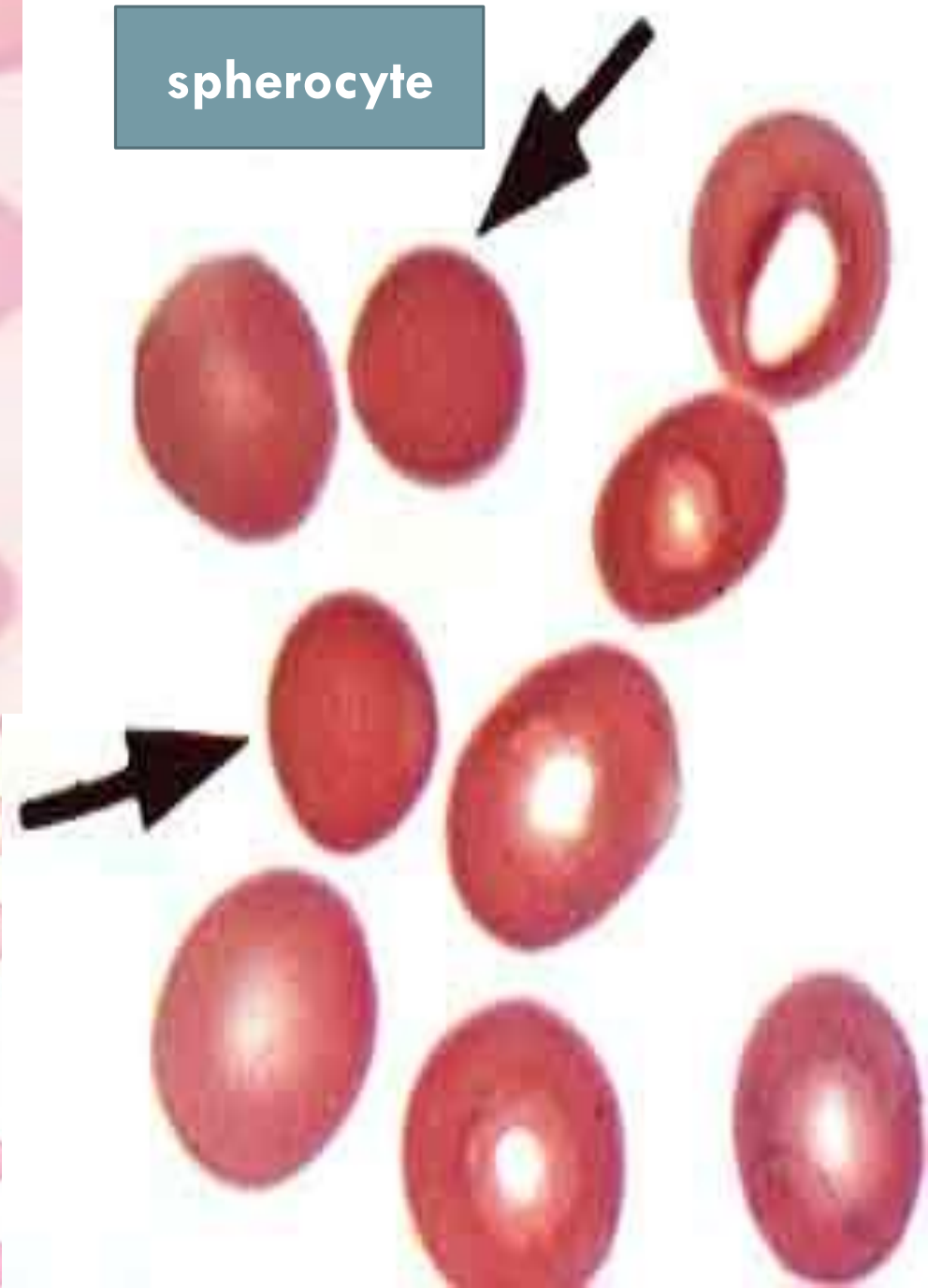
Hereditary membrane defects

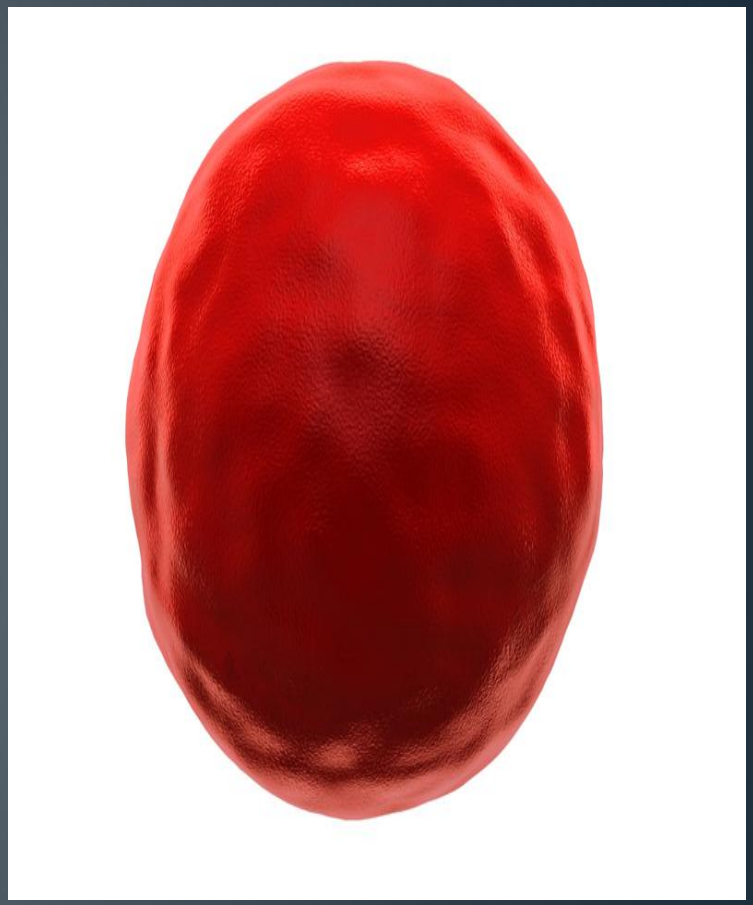
1. ***Spherocytosis***
   - ***The most common defect of red cell membrane protein (1/2000 birth)***
   - ***Inheritance - autosomal dominant***
   - ***Deficient of membrane protein causes change of shape (round, no central pallor)***
   - ***Clinical features: jaundice, gallstones, splenomegaly,***
   - ***Laboratory features: anemia, hyperbilirubinemia, reticulocytosis, ↑ LDH***
     - blood smear -spherocytes
     - abnormal osmotic fragility test
   - Treatment - splenectomy








spherocyte



Hereditary metabolic defect

- *Glucose-6-Phosphate-Dehydrogenase (G6PD) deficiency*
  - *Hemolysis is induce by infections, drugs*
  - *Hemolysis is intravascular*

- *Pyruvate kinase (PK) deficiency*

Hereditary membrane defects

Hereditary Hemoglobinopathies

- *Thalassemias*
  - *Alpha thalassemia*
  - *Beta thalassemia: major, minor, (trait), intermedia*
  - *Delta/Beta thalassemia*
  - *Hereditary persistentce of fetal hemoglobin*
- *Sickle cell anemia*

A. *Immune hemolytic anemias*

1. Autoimmune hemolytic anemia

2. Alloimmune hemolytic anemia

B. Nonimmune hemolytic anemias

1. Chemicals

2. Bacterial infections, parasitic infections (malaria)

3. Hemolysis due to physical trauma , valve replacement,microangiopathic hemolytic anemia)

4. Hypersplenism

5. Paroxysmal nocturnal hemoglobinuria (PNH)

Autoimmune hemolytic anemia - AIHA

- **caused by warm Abs** : *Connective tissue disorders, dr or infection*
- *caused by cold-reactive antibodies (30%) in temp. < 37°C eg.(4°C) - infections, CLL, NHL*

Laboratory findings:

CBC

DAT & IDAT .

According the cause.

Alloimmune hemolytic anemia

- *Rh & ABO in neonatal hemolytic anemia*
- *Transfusion of incompatible blood*

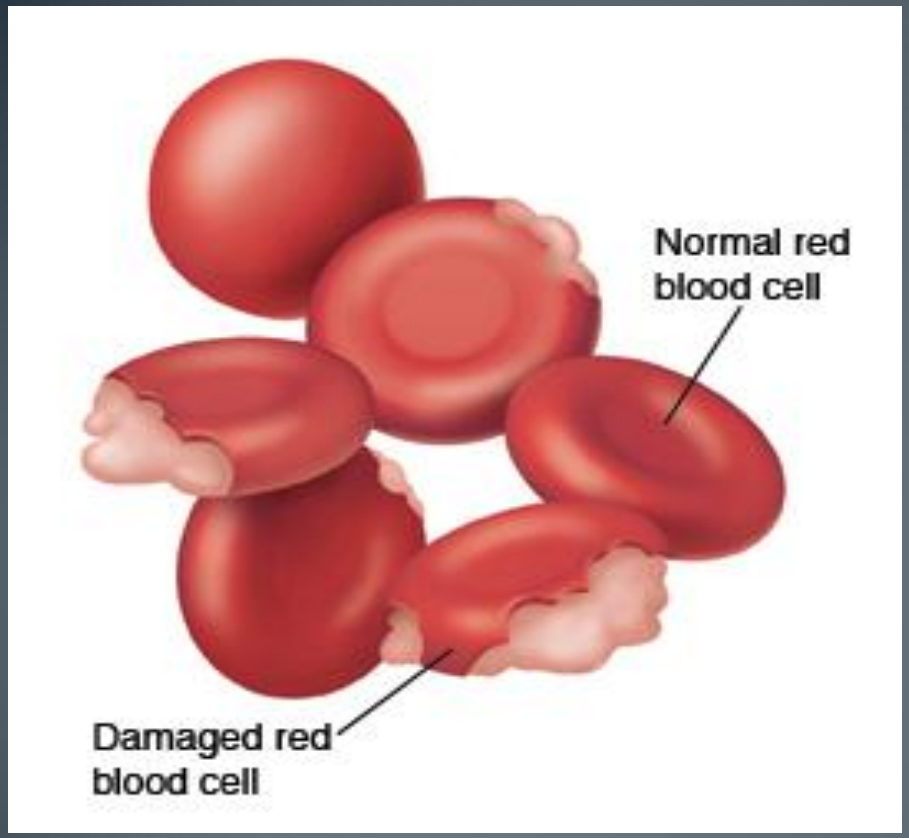
- *After transplantation of bone marrow or organs*

Classification of microangiopathic hemolytic anemia

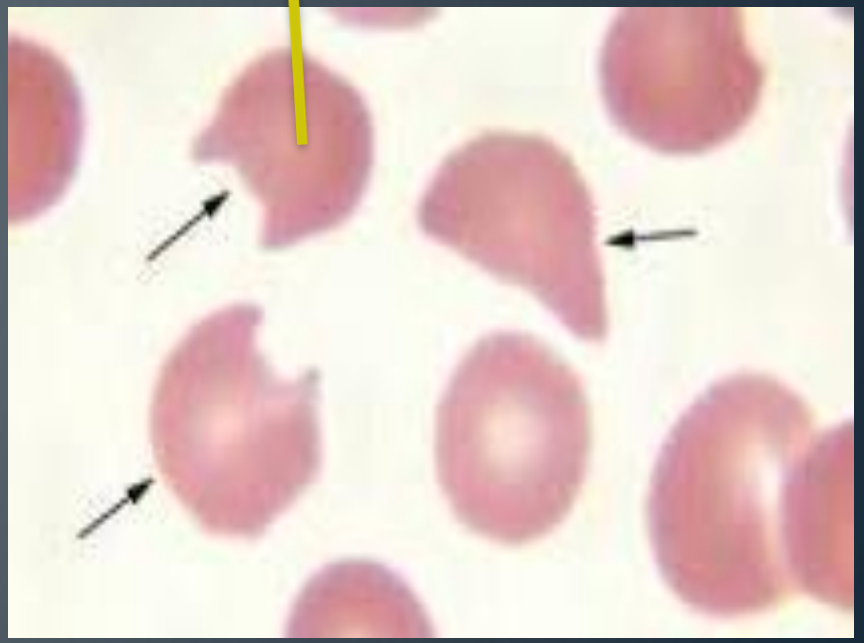
- *Thrombotic thrombocytopenic purpura (TTP)*
- *Hemolytic uremic syndrome (HUS)*

Pathogenesis of microangiopathic hemolytic anemia:

- *Intravascular hemolysis caused by fragmentation of normal red cells passing through abnormal arterioles*
- *Arterioles are changed by deposition of platelets and fibrin*
- *Microvascular lesion* cause organ demage (kidney, CNS)



Schistocyte



AE Microangiopathic hemolytic anaemia

Underlying disease

- *Invasive carcinoma*
- *Complication of pregnancy*
- *Serious infection*
- *Drugs*

C/P of microangiopathic hemolytic anaemia

- ***Symptoms:***
  - *Related to the primary disease*
  - *Related to organs demage*
- *Laboratory findings of intravascular hemolytic anemia*
- *Blood film: schistocytes*

Paroxysmal nocturnal hemoglobinuria (PNH)

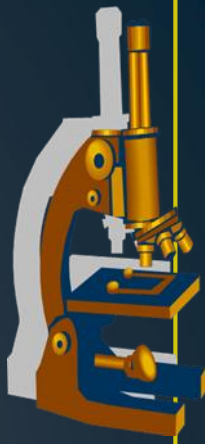
- an acquired clonal disease, arising from a somatic mutation in a single abnormal stem cell

- deficiency of the GPI (glycosyl-phosphatidyl-inositol) anchor on the surface of hematopoietic cells

- red cells are more sensitive to the lytic effect of complement

- intravascular hemolysis

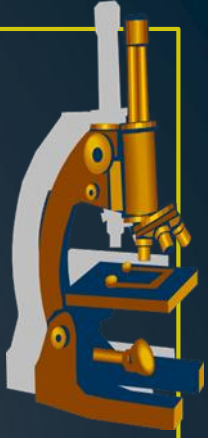
Paroxysmal nocturnal hemoglobinuria (PNH)



Symptoms

- Irregularly hemoglobinuria *occurs with dark brown urine in the morning*
- *Hemolysis is released by infection, surgery or other events*
- *Increased risk of thrombosis*
- *Renal failure*
- *Neurologic manifestation - headaches*

Paroxysmal nocturnal hemoglobinuria (PNH)



Laboratory Findings:

- *Hemoglobinuria*
- *Hemosiderinuria*

- *Pancytopenia*
- *Chronic urinary iron loss*
- *Serum iron concentration decreased*

- *Positive Ham's test (acid hemolysis test)*
- *(CD59, CD55) by FCM*

Paroxysmal nocturnal hemoglobinuria (PNH)

Treatment

- washed RBC transfusion
- iron therapy
- allogenic bone marrow transplantation

Monoclonal antibody