PATHOLOGY OF BLOOD AND LYMPHATIC SYSTEM

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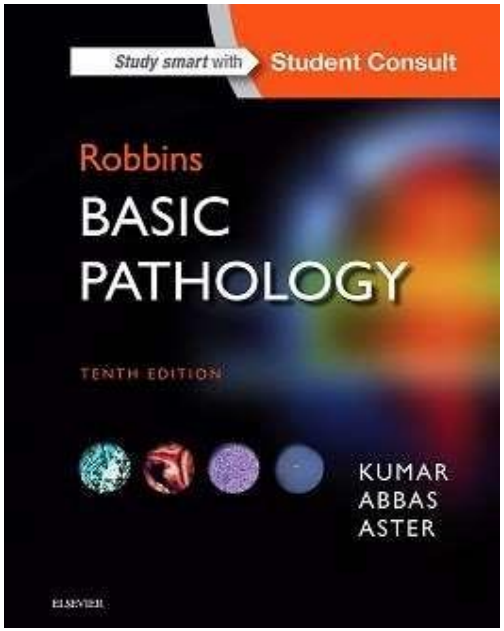
- First Semester 2021/2022
- Reference: Robbins Basic Pathology 10th ed



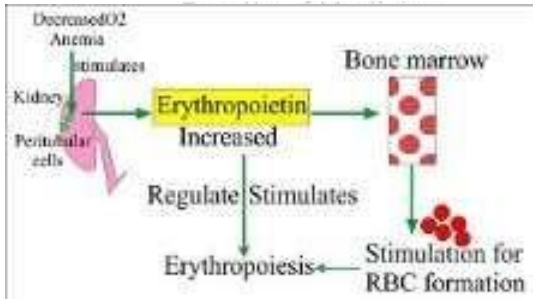
ANEMIA

DEFINITION

- Reduction of oxygen carrying capacity of blood secondary to decrease in red cell mass
- Leads to tissue hypoxia
- Practically, measure by Hemoglobin concentration, and Hematocrit

ANEMIA AND ERYTHROPOIETIN

- Anemia triggers production of erythropoietin
- Causes compensatory erythroid hyperplasia in bone marrow (BM)
- In acute anemia, production can increase by 5x or more in healthy people
- In severe cases, causes extramedullary hematopoiesis in secondary hematopoietic organs (spleen, liver and lymph nodes)
- Exceptions: anemia of renal failure, anemia of chronic inflammation



CLASSIFICATION ACCORDING TO CAUSE

١) Blood loss

٢) Diminished RBC production

- Iron deficiency anemia
- Anemia of chronic inflammation
- Megaloblastic anemia
- Aplastic anemia
- Pure red cell aplasia
- Myelophthisic anemia
- Myelodysplastic syndrome
- Anemia of renal failure
- Anemia of hypothyroidism

(3Increased destruction

(hemolytic anemia(

☐Extrinsic factors (infection, antibody, mechanical)

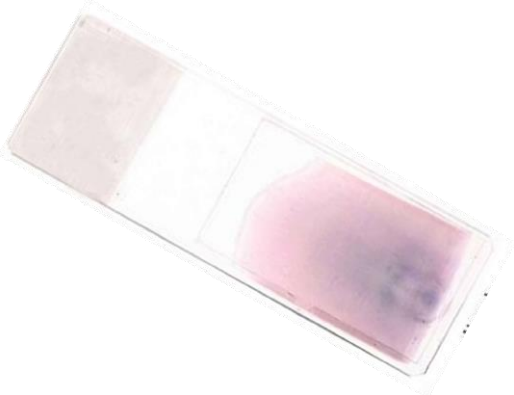
☐Intrinsic RBC abnormalities:

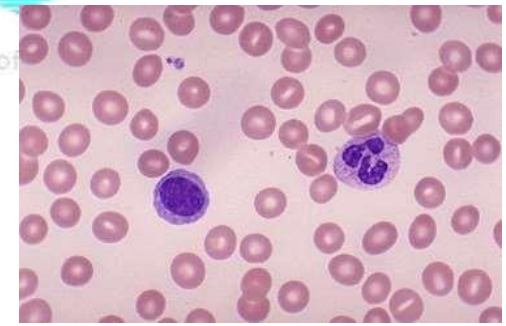
1)Hereditary (membrane, enzyme, Hg abnormalities)

2)Acquired (Paroxysmal nocturnal hematuria)

CLASSIFICATION ACCORDING TO MORPHOLOGY BLOOD FILM

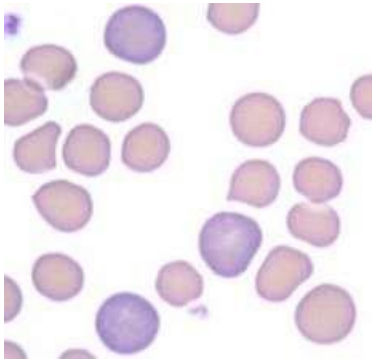
- Size: normo, micro, macrocytic (MCV)
- Color: normo, hypochromic (MCH)
- Shape: anisopoikelocytosis (spherocytes, sickle, schistiocytes) (RBC distribution width)
- Hypochromic microcytic anemia usually reflects impaired Hg synthesis
- Macrocytic anemia reflects stem cell disease and maturation





RBC INDICES

- Can be directly measured, or automated
- Slight variation is present between labs, geographic areas
- Sex, age, race, mobility status have effect
- Reticulocyte count: helps differentiate hemolytic anemia (high) from aregenerative anemia (low)



	Units	Men	Women
Hemoglobin (Hb)	g/dL	13.2–16.7	11.9–15.0
Hematocrit (Hct)	%	38–48	35–44
Red cell count	$\times 10^6/\mu L$	4.2–5.6	3.8–5.0
Reticulocyte count	%	0.5–1.5	0.5–1.5
Mean cell volume (MCV)	fL	81–97	81–97
Mean cell Hb (MCH)	pg	28–34	28–34
Mean cell Hb concentration (MCHC)	g/dL	33–35	33–35
Red cell distribution width (RDW)		11.5–14.8	

*Reference ranges vary among laboratories. The reference ranges for the laboratory providing the result should always be used in interpreting a laboratory test.

CLINICAL FEATURES OF ANEMIA

- Dizziness
- Fatigue
- Pallor
- Headache

Adaptive changes:

- Tachycardia
- Tachypnea
- Increased redcell 2,3-diphosphoglycerate

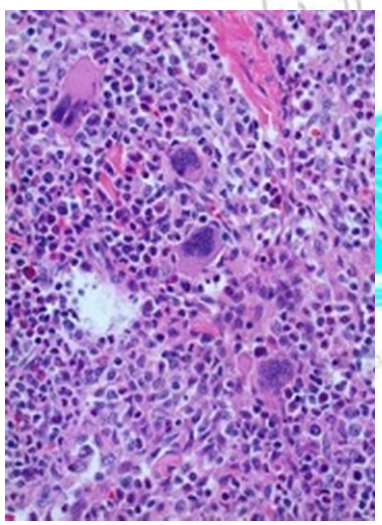
If the patient has heart or lung diseases, symptoms will be worse

CLINICAL SYMPTOMS IN SPECIAL TYPES OF ANEMIA

- Chronic hemolytic anemia: jaundice, pigmented gall bladder stones, red urine

CLINICAL SYMPTOMS IN SPECIAL TYPES OF ANEMIA

- Extramedullary hematopoiesis: splenomegaly, hepatomegaly
- Thalassemia major and sickle cell anemia: growth retardation, bone deformity, secondary hemochromatosis (damage to heart, endocrine glands)

ANEMIA OF ACUTE BLOOD LOSS

- Symptoms are related to decreased intravascular volume,
- If loss is >20% of blood volume, patient might have hypovolemic shock and death
- Body responds by shifting fluid from interstitial to intravascular space, causing dilutional anemia and worse hypoxia (stays 2-3 days)
- Erythropoietin secretion is stimulated, activating BM erythropoiesis (needs 5-7 days)
- In internal hemorrhage, iron is restored from extravasated RBCs and used again in erythropoiesis
- In external and GIT hemorrhage, iron is lost, which complicates anemia
- The anemia is normochromic normocytic, with reticulocytosis

ANEMIA OF CHRONIC BLOOD LOSS

- Occurs when the rate of RBC loss exceeds regeneration
- Mostly occurs in gastrointestinal diseases, also in excessive menstruation
- Results in iron deficiency, anemia appears hypochromic and microcytic, lowreticulocytes