Blood disorders

Anemia

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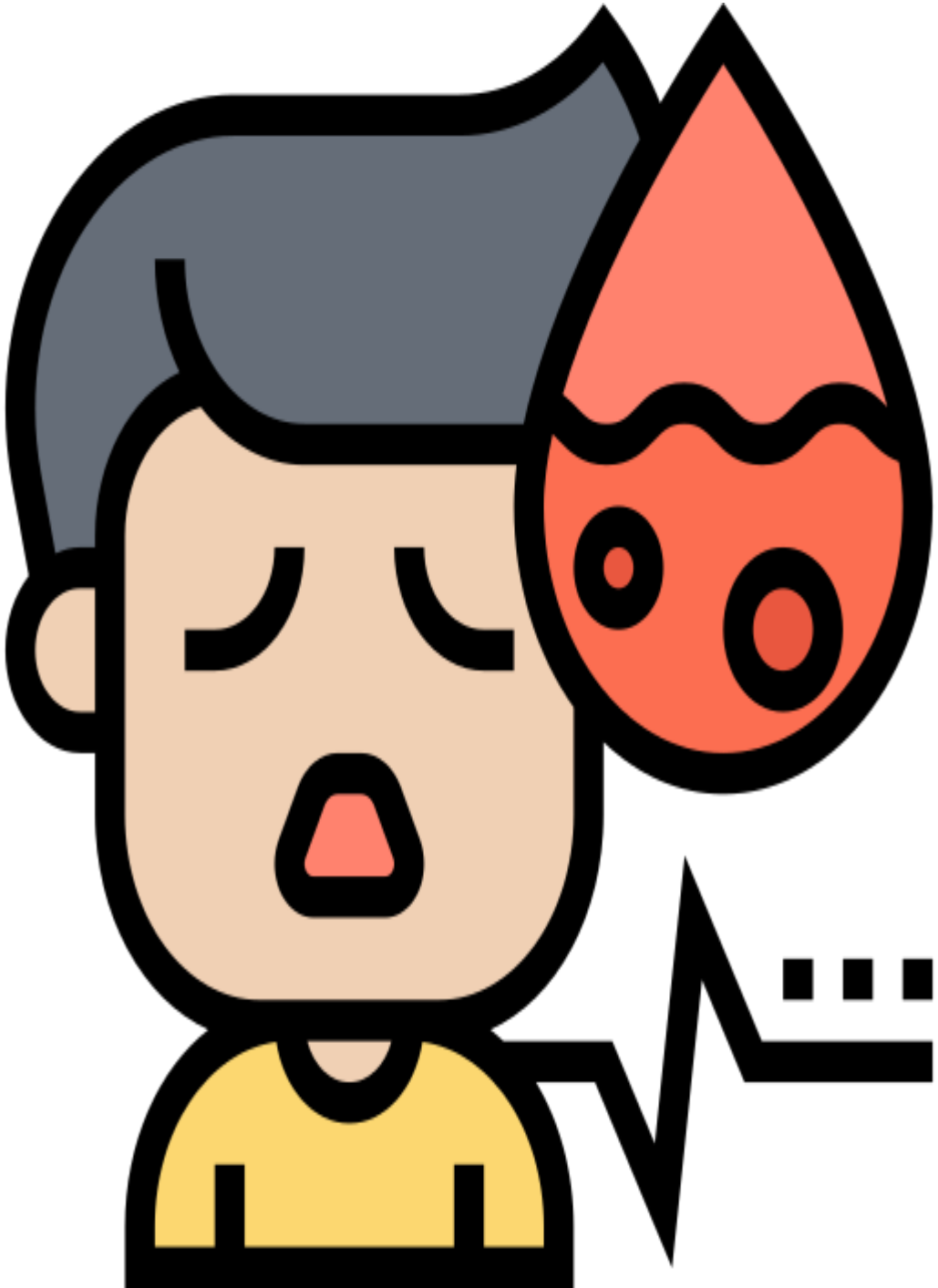
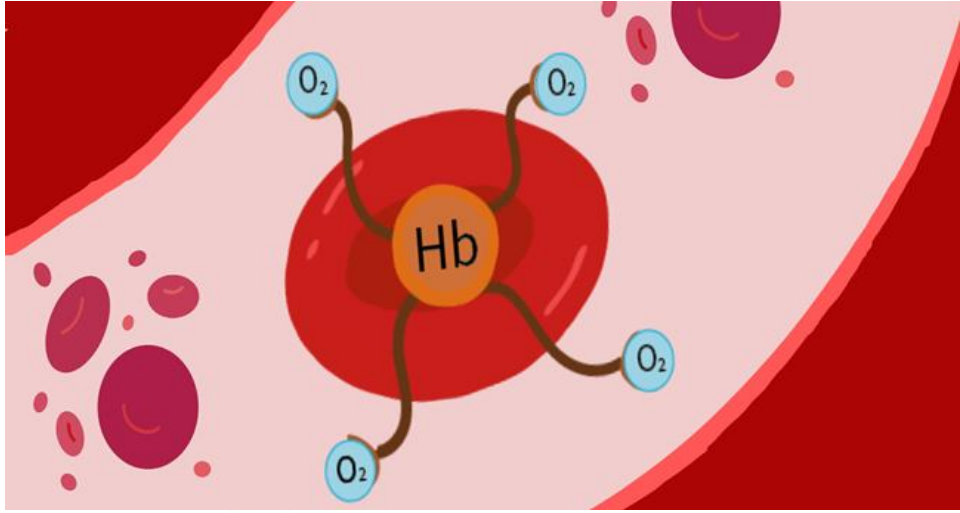


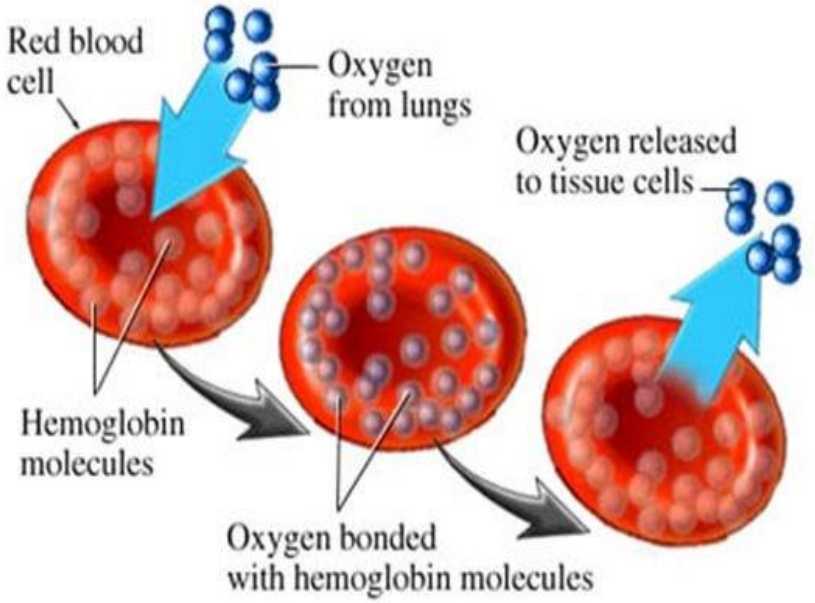
Lecture outlines

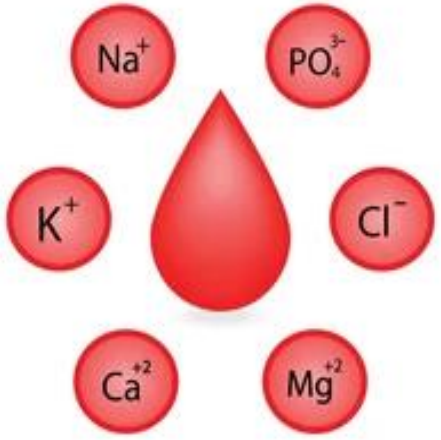
- **Overview about blood components**
- **Anemia and it’s types**

What Does Blood Do?

- Transportation
  - Oxygen
  - Nutrients
  - Hormones
  - Waste Products
- Regulation
  - Fluid, electrolyte
  - Acid-Base balance
- Protection
  - Coagulation
  - Fight Infections

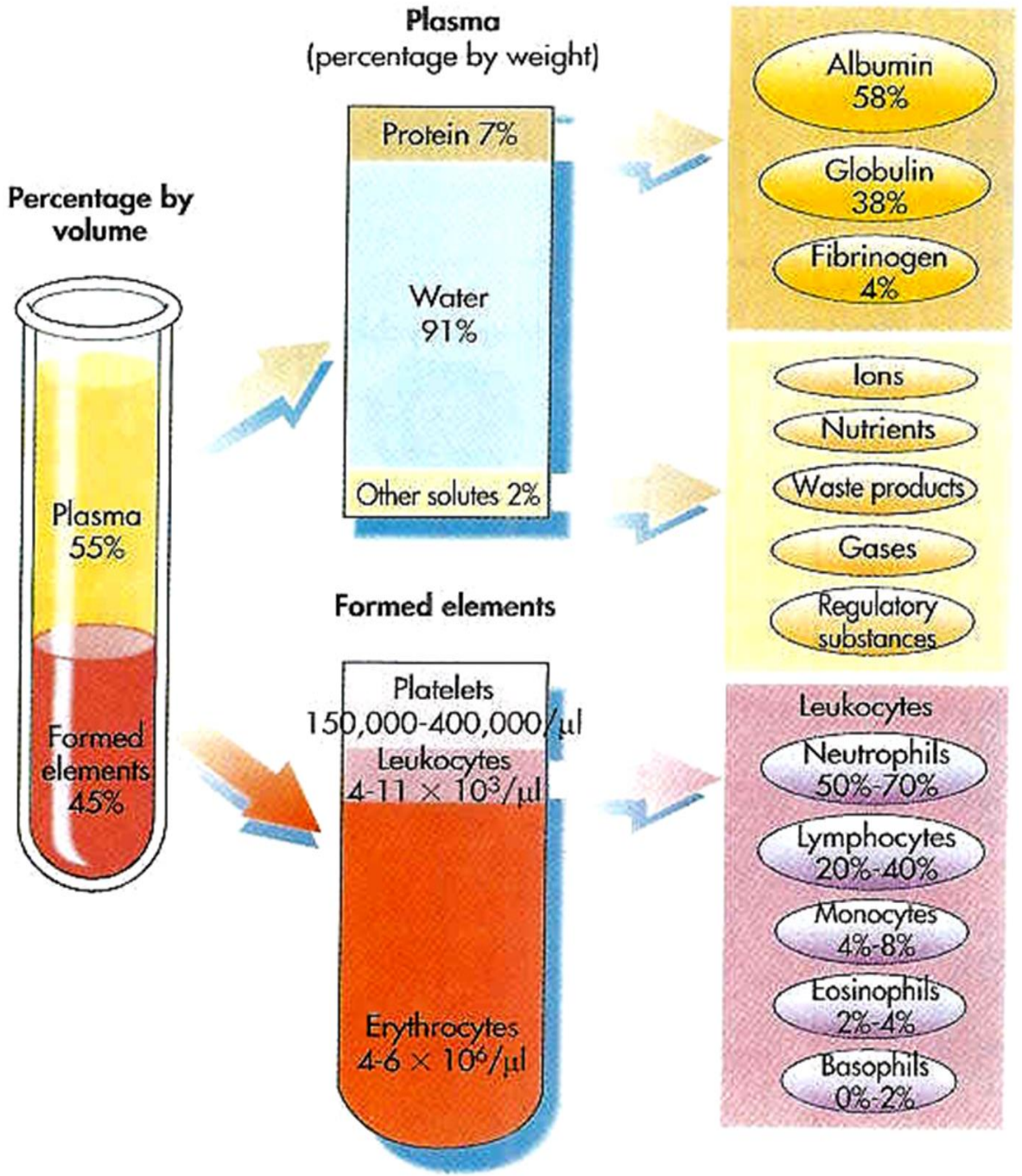






Components of Blood

- Plasma
  - 55%
- Blood Cells
  - 45%
  - Three types
    - Erythrocytes/RBCs
    - Leukocytes/WBCs
    - Thrombocytes/Platelets



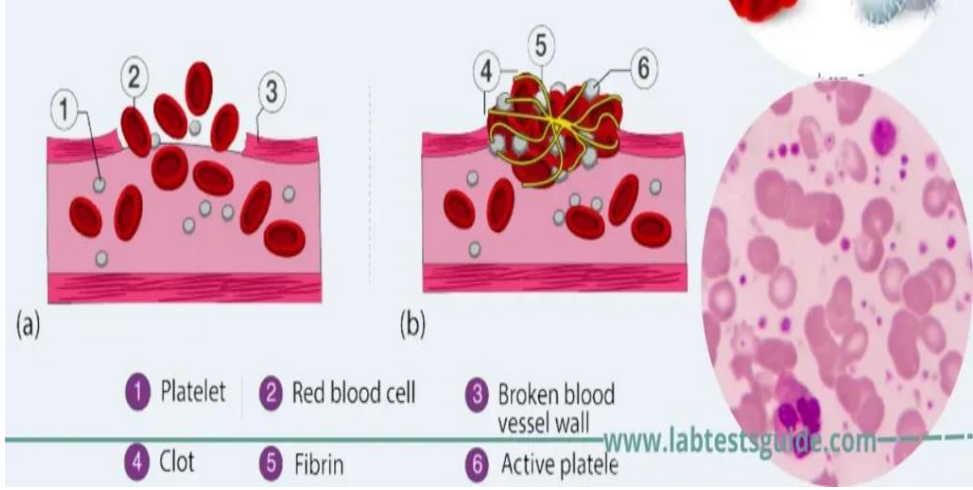
Erythrocytes/Red Blood Cells

- Composed of hemoglobin
- **Erythropoiesis** means RBC production
    - Stimulated by hypoxia
    - Controlled by *erythropoietin* (Hormone synthesized in kidney)
- **Hemolysis** means destruction of RBCs
    - Releases bilirubin into blood stream
    - Normal lifespan of RBC = 120 days

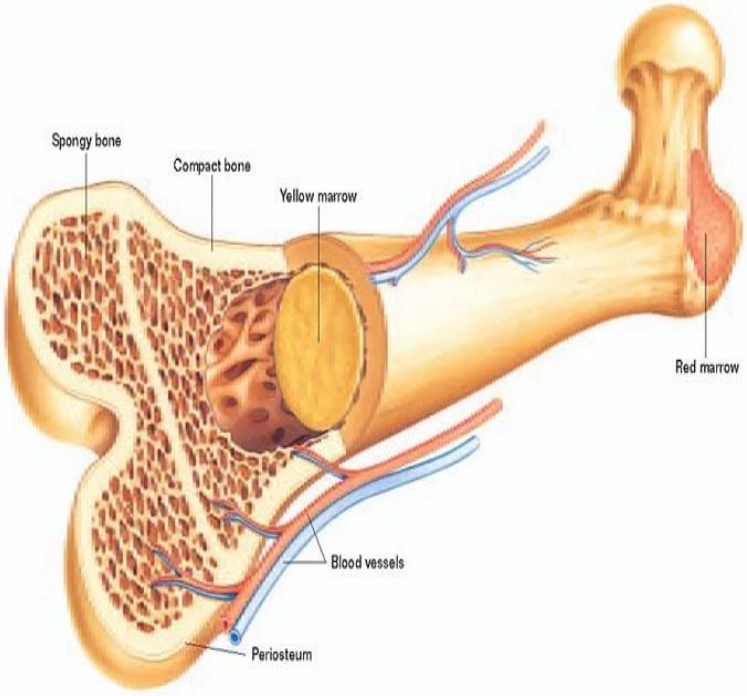
Types and Functions of Leukocytes/WBCs

Type	Cell Function
Granulocytes	
Neutrophil	Phagocytosis, **early phase** of inflammation
Eosinophil	Phagocytosis, parasitic infections
Basophil	Inflammatory response, allergic response
Agranulocytes	
Lymphocyte	Cellular, humoral immune response
Monocyte	Phagocytosis; cellular immune response

- Thrombocytes/Platelets:
  Must be present for clotting to occur
  Involved in hemostasis

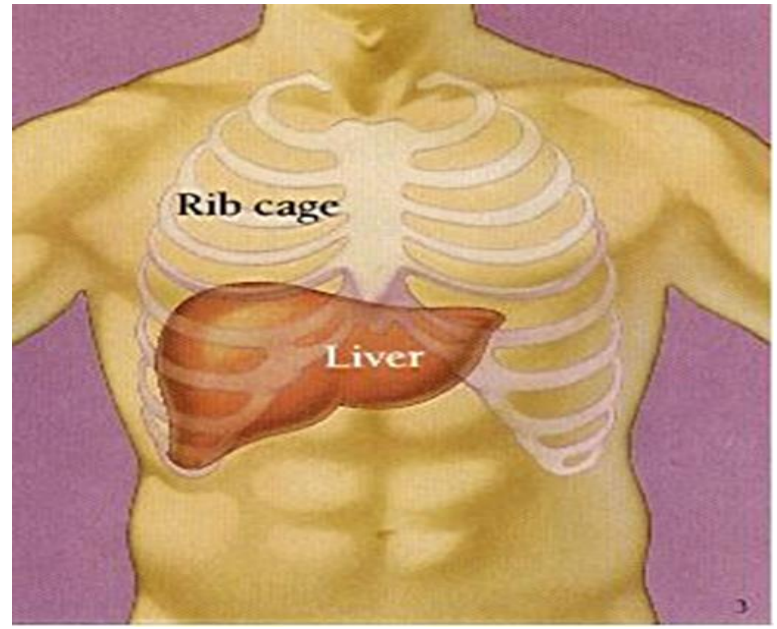


- **Bone marrow:** the primary function of bone marrow is to **produce blood cells**, this process is called Blood cell production (Hematopoiesis).



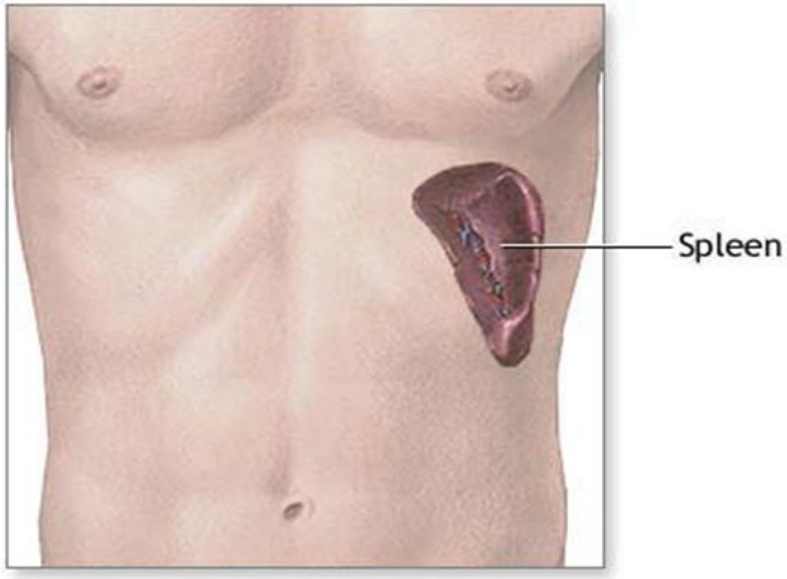
Liver

- Synthesis plasma proteins including **clotting factors** and **albumin**
- Liver clears damaged and non-functioning RBCs/erythrocytes from circulation



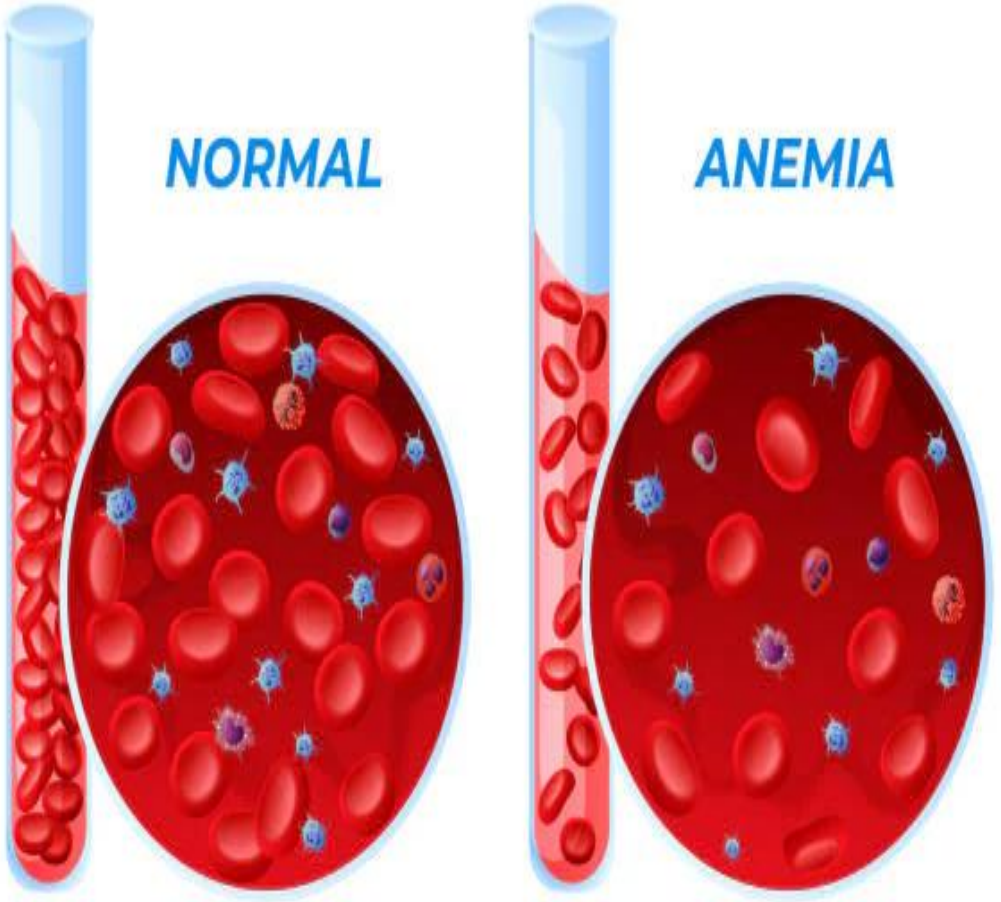
Functions of Spleen:

- ✓ Produces fetal RBCs
- ✓ Filter and reuse certain cells
- ✓ Immune function: Lymphocytes, monocytes
- ✓ Storage function: 30% platelets stored in spleen



Anemia

Is a condition characterized by a lower-than-normal hemoglobin concentration. Fewer than the normal number of red blood cells (RBCs), also called **erythrocytes**, are present in the circulation. Subsequently, less oxygen reaches the tissues, causing a variety of signs and symptoms. Rather than a disease state, **anemia is a sign of an underlying disorder**.



Classification of Anemias

1- Hypoproliferative (Resulting from Defective RBC Production)

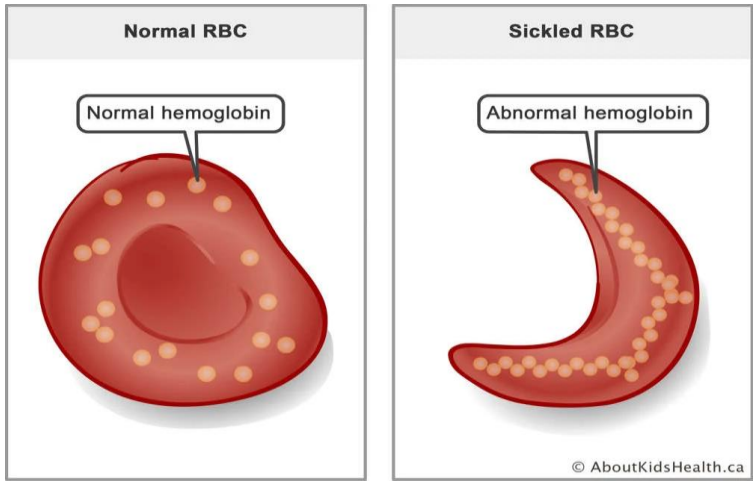
- Iron deficiency (microcytic)
- Vitamin B12 deficiency (megaloblastic)
- Folate deficiency (megaloblastic)
- Decreased erythropoietin production (e.g., from chronic kidney disease)
- Cancer/inflammation
- Aplastic anemia

2- Bleeding (Resulting in RBC Loss)

Bleeding from gastrointestinal tract, epistaxis (nosebleed), trauma, bleeding from genitourinary tract (e.g., menorrhagia)

3- Hemolytic (Resulting from RBC Destruction)

- Altered erythropoiesis (Sickle cell disease)
- Hypersplenism (hemolysis)
- Drug-induced anemia
- Autoimmune anemia
- Mechanical heart valve–related anemia



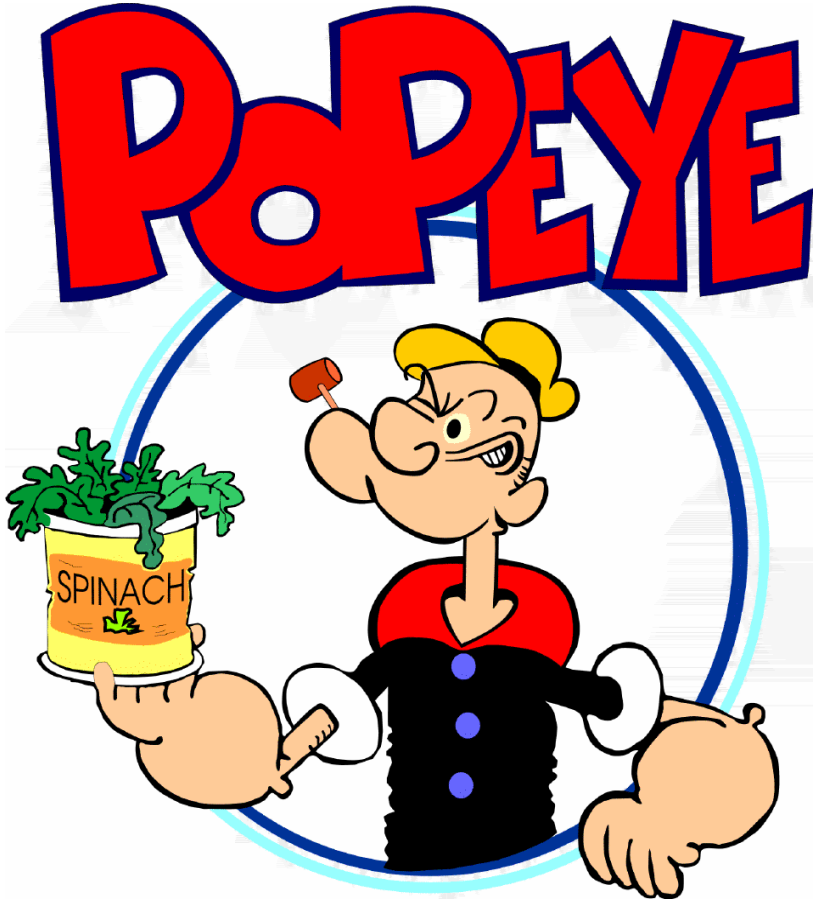
Most Common Clinical Manifestations

1. Pallor.
2. Fatigue, weakness.
3. Dyspnea.
4. Palpitations, tachycardia.
5. Headache, dizziness, and restlessness.
6. Slowing of thought.

Iron-Deficiency Anemia

Etiology

1. Inadequate dietary intake
2. Malabsorption
   - Absorbed in duodenum
   - GI surgery
3. Blood loss
   - 2 ml blood contain 1mg iron
   - GI, GU losses
4. Increased iron demand
   - (Pregnancy and lactation, children)



Diagnostic Finding for Iron-Deficiency Anemia

- **Red blood cell:** With iron deficiency anemia, red blood cells are smaller and paler than usual.
- **Hematocrit:** This is the percentage of blood volume made up by red blood cells. Standard levels mainly are between 35.5% and 44.9% for adults assigned female at birth and 38.3% to 48.6% for adults assigned male at birth. These values may change depending on age.
- **Hemoglobin:** Lower than standard hemoglobin levels mean anemia.

Normal Range of hemoglobin as 13.2 to 16.6 g/dL for **male**, 11.6 to 15.0 g/dL for **female**. The ranges for children vary depending on their age and sex.

- **Ferritin:** This protein helps store iron in the body. A low level of ferritin most often means a low level of stored iron.

Cobalamin (Vitamin B12) deficiency (Megaloblastic)

- **Causes of cobalamin deficiency:**
  - Gastric mucosa not secreting IF
  - GI surgery →loss of IF-secreting gastric mucosal cells
  - Long-term use of H_2-histamine receptor blockers cause atrophy or loss of gastric mucosa.
  - Nutritional deficiency
  - Hereditary defects of cobalamine utilization

✓**If the cause is related to Intrinsic factor (IF), which required for cobalamin/ Vitamin B12 absorption, it is known as pernicious anemia.**

Folate deficiency (Megaloblastic)

- Folic Acid Deficiency also causes megablastic anemia (RBCs that are large and fewer in number)
- Folic Acid required for RBC formation and maturation
- Causes
  - Poor dietary intake
  - Malabsorption syndromes
  - Drugs that inhibit absorption
  - Alcohol abuse
  - Hemodialysis

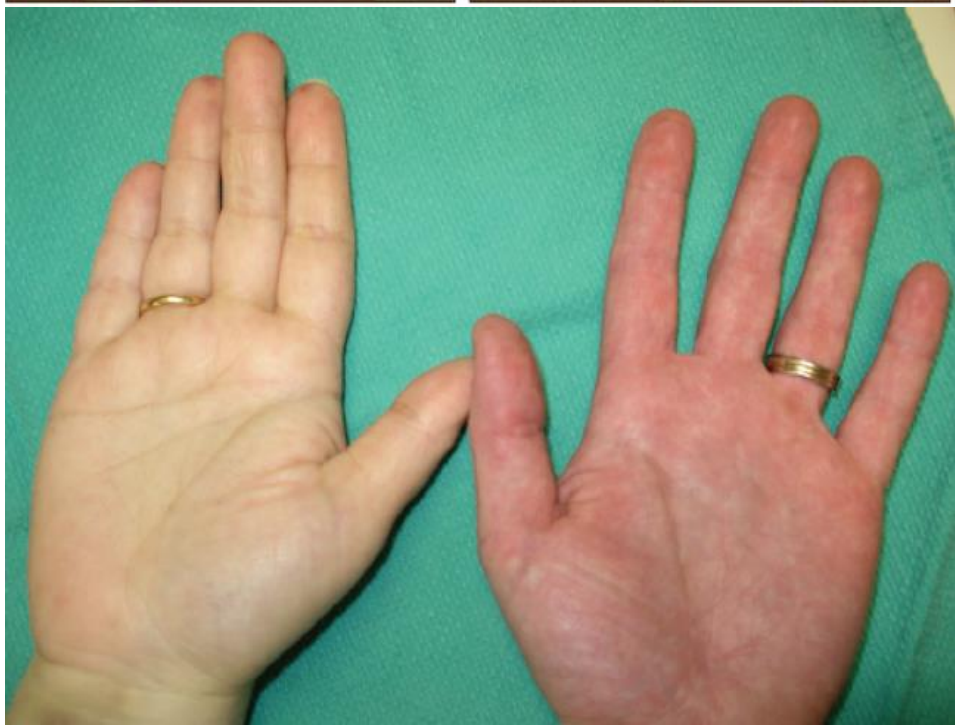
Aplastic Anemia

- Aplastic anemia is a rare disease caused by a decrease in or damage to bone marrow stem cells, damage to the microenvironment within the bone marrow, and replacement of marrow with fat. Stem cell damage is caused by the body's **T cells**, which mediate an attack on the bone marrow resulting in aplasia (i.e., markedly reduced hematopoiesis).
- Aplastic anemia is a life-threatening condition associated with bone marrow failure evidenced by **pancytopenia** (i.e., anemia, neutropenia, and thrombocytopenia; lower-than-normal counts of erythrocytes, neutrophils, and platelets).

Nursing Process for Patient with Anemia

- **Assessment:**

The health history and physical examination provide important data about the type of anemia involved, the extent and type of symptoms it produces, and the impact of the symptoms on the patient's life. Weakness, fatigue, and general malaise are common symptoms, and pallor of the skin and mucous membranes (conjunctivae, oral mucosa) are common signs.



Nursing Diagnoses

Based on assessment data, major nursing diagnoses may include:

- Fatigue associated with decreased hemoglobin and diminished oxygen-carrying capacity of the blood
- Impaired nutritional status associated with inadequate intake of essential nutrients
- Activity intolerance associated with inadequate hemoglobin and hematocrit Impaired ability to manage regime associated with prescribed therapy

Nursing Interventions

Managing Fatigue

- Assisting the patient to prioritize activities to establish a balance between activity and rest that is acceptable to the patient.
- It is also important to assess for other conditions that may contribute to fatigue, such as pain, depression, and sleep disturbances.

Maintaining Adequate Nutrition

- A well-balanced diet should be encouraged.
- Dietary education involving family members when possible should be individualized to address specific needs and include cultural preferences for food preparation and selection .
- Dietary supplements (e.g., vitamins and iron) may be prescribed.
- In some cases, excessive use of supplements will not improve the anemia and may be harmful. For example, patients with anemia who receive long-term transfusion therapy are at risk for iron overload from their transfusions. In this situation chelation therapy is implemented to reduce accumulation of excess iron.

- **Managing Activity Intolerance**
- Patients with severe anemia, with acute blood loss from hemorrhage or
- severe hemolysis, may not tolerate decreased blood volume. Lost volume can be replaced with transfusions or intravenous fluids based on symptoms and laboratory test results according to doctor’s description .
- Supplemental oxygen may be needed, especially if there is underlying cardiac or pulmonary disease.
- Monitoring the patient’s vital signs and pulse oximetry, especially with activity, is an important nursing action.

- **Promoting Effective Management of Prescribed Therapy**

It is important that patients understand the purpose of these therapies, and how to manage side effects of treatment. Nurses play an important role in promoting adherence to the prescribed plan by educating patients and family caregivers about ways to incorporate the therapeutic plan in daily activities.


Thank
you!