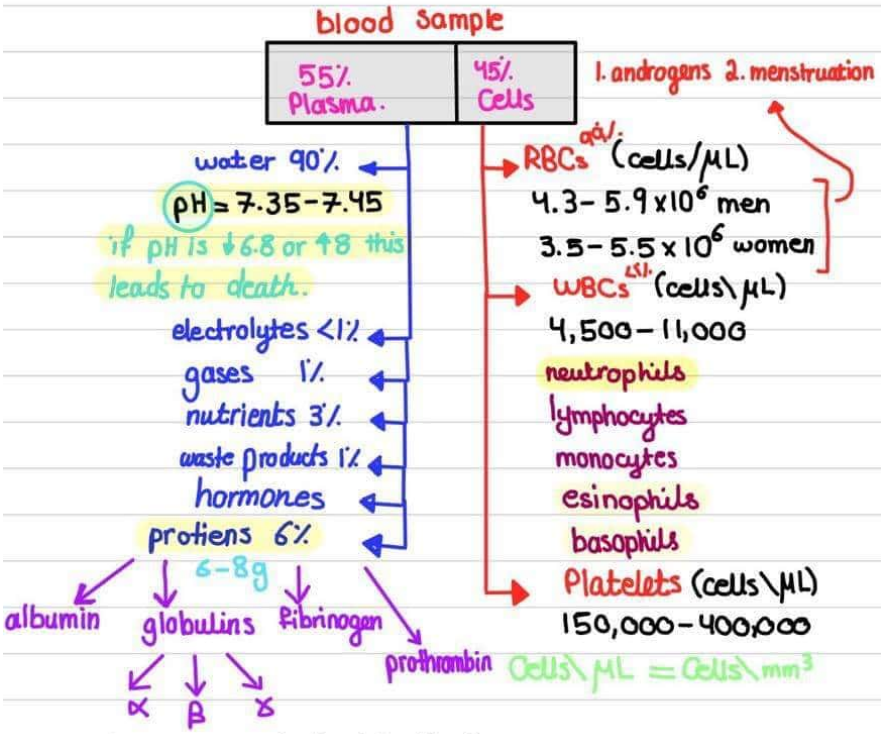
INTRODUCTION

- body fluid ⇒ 65% of body weight
  blood volume ⇒ 8% of body weight



Functions of plasma protiens

1- transport (α, β globulins)
2- defense (γ globulins)
3- reserve body protiens
4- viscosity (fibrinogen & globulins)
5- osmotic function (albumin)
6- blood clotting (fibrinogen & prothrombin & α2 globulin & β globulins)

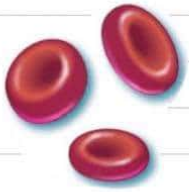
- protiens are made of amino acid
  - essential (diet)
  - non-essential (body)
- protiens
  - complete (all) eggs
  - in-complete (X) vegetables

blood distribution

veins > arteries > lungs ----

1. sex males > females
2. pregnancy ↑
3. muscular exercise ↑
4. Posture 🧍 ↓
5. blood pressure ↓
6. Altitude ↑
7. Adrenaline injection ↑

RBCs

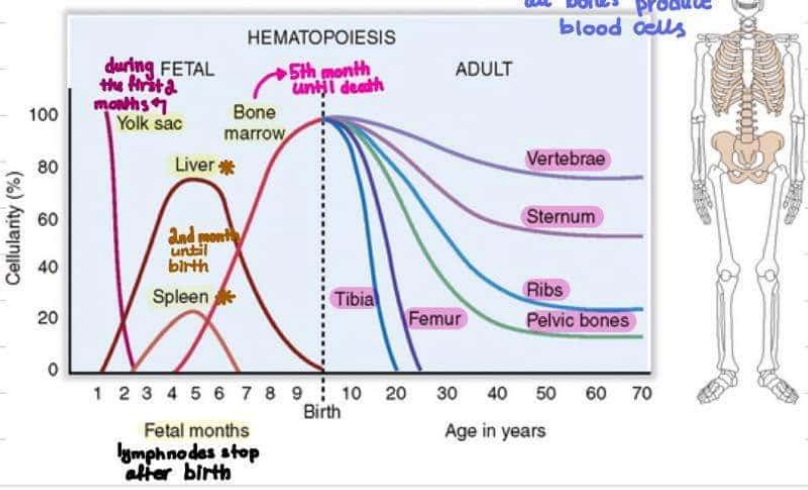


1- MCV 80-90 μm³\fL
2- Surface area 135 ± 16 μm²
3- diameter 7.5-8.5 μm

RBCs count, hematocrit (PCV) ~45%
2% of plasma is trapped within the RBCs

PRODUCTION OF RBCS

(erythropoiesis)



before 18-20 years all bones produce blood cells

Veganism — Malabsorption (gastric, intestinal)

Vitamine B12 deficiency

- → megaloblastic anemia (pernicious)
- → neutrophils are affected
- → Hb synthesis is normal (MCV ↑)
- → RBCs count is low

inadequate dietary intake — malabsorption — increased requirements

folic acid deficiency

- → megaloblastic anemia (produces cells similar to cells of vit B12 deficiency).

REGULATION OF ERYTHROPOIESIS

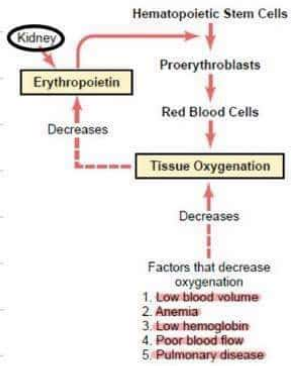
→ the number of blood cells remains constant
production = destruction

effects

- rarely reversible melanin skin pigmentation
- megaloblastic anemia
- macrocytosis
- neuropathy (B12 deficiency)
- Sterility in severe anemia

Factors

1. O2 supply
   hypoxia → RBCs ↑



2. vitamines
   vitamine B12, folate, vitamine C

a. **vitamine B12** (from diet) (2-3 mg is sufficient for 3-4 years)
extrinsic factor, cyanocobalamine, maturation factor

Stomach + intrinsic factor → lower ileum → bone marrow, liver

* maturation of RBCs * DNA formation
* formation of myelin sheaths

b. **folic acid**

* has no role in myelin sheaths
* the jejunum has an enzyme (carboxypeptidase) that facilitates absorption

IRON METABOLISM

→ total quantity of iron in the body 4-5g
normal iron intake 20mg\day
10-20% of ingested iron is absorbed
no regulated pathway for iron excretion

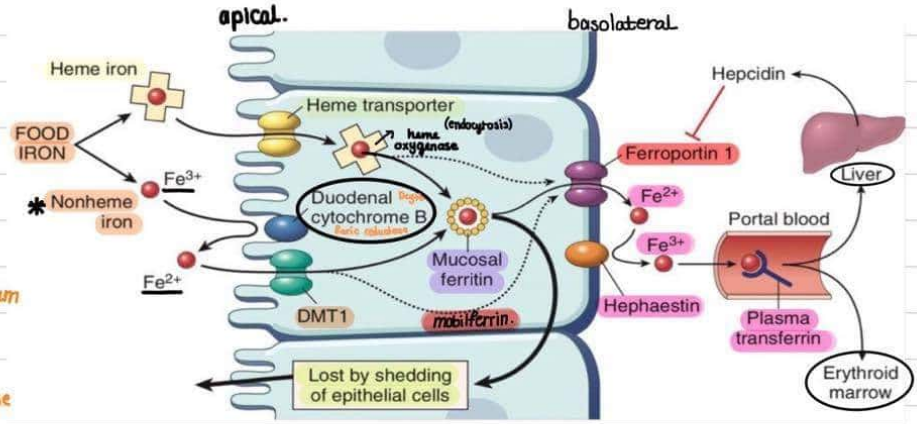
→ iron: 1- oxidized ferric Fe^{3+} (+salts, not soluble at pH >3)
2- reduced ferrous Fe^{2+} ✓ (+salts, soluble at pH as high as 9) ← absorbic acid (vit C)

dietary iron: 1- heme iron (meat) ✓
2- non-heme iron (plants)

iron movement

the absorption of non-heme iron → duodenum

absorption of iron duodenum > jejunum > ileum
↑ most iron comes from jejunum because it is longer.



daily iron requirments

adult male post-menopausal female	0.5-1 mg\day (urine, sweat, feces)	
menstruating female	1-2 mg\day (urine, sweat, feces + menses)	
pregnant female	1.5-3 mg\day (urine, sweat, feces + pregnancy)	
children (overage)	1 mg\day (urine, sweat, feces + growth)	
female (age 12-15)	1-2.5 mg\day (urine, sweat, feces + menses + growth).	

Factors favoring
ferrous form
acids [HCl, vitC]
Solubilizing agents
iron deficiency
↑ erythropoiesis
pregnancy

Factors reducing
ferric form
alkalis [pancreatic]
precipitating agents
iron excess
↓ erythropoiesis
tea.

iron deficiency ← blood loss
Poor diet, malabsorption, increased demands

distribution of body iron

Hemoglobin (65%)
ferritin + hemosiderin (30%)
myoglobin (3.5%)
heme enzymes (0.5%)
transferrin bound iron (0.1%)

hemoglobin sythesis

in erythroblasts 65%
in reticulocytes 35%

heme 4% carries O_2, CO
globin 96% CO_2, H^+, 2,3-BPG

16 g /100 mL blood [males]
14 g /100 mL blood [females]

1- glycine + Succinyl CoA → (ALA synthase; ↑ erythropoietin, ↓ heme; vit B6) → 2- protoporphyrin + iron → heme
3- globin (ribosomes) + heme
4- 2 α 2 β

hypochromic microcytic anemia
- ↑ lack of iron
- ↑ lack of iron release from macrophages
- ↑ failure of Protoporphyrin Synthesis → Sideroblastic
- ↑ failure of globin Synthesis → thalassemia