By: Nadine Alloom

plasma proteins

* concentration ≈ 7l.

- **Albumin** 41g — OPPP — regulate tissue fluid formation and blood volume
- **globulin** 2.7l g (alpha α_1, α_2; Beta β_1, β_2; gamma γ) — immunity by gamma globulin
- **fibrinogen** .3l g — blood viscosity (prevent rapid outflow of blood through vessels
- **prothrombin** 40% = mg — Blood coagulation

OPPP

By albumin 25 – 30 mm Hg

→ reabsorbtion force

→ let fluid pass from tissue space to blood

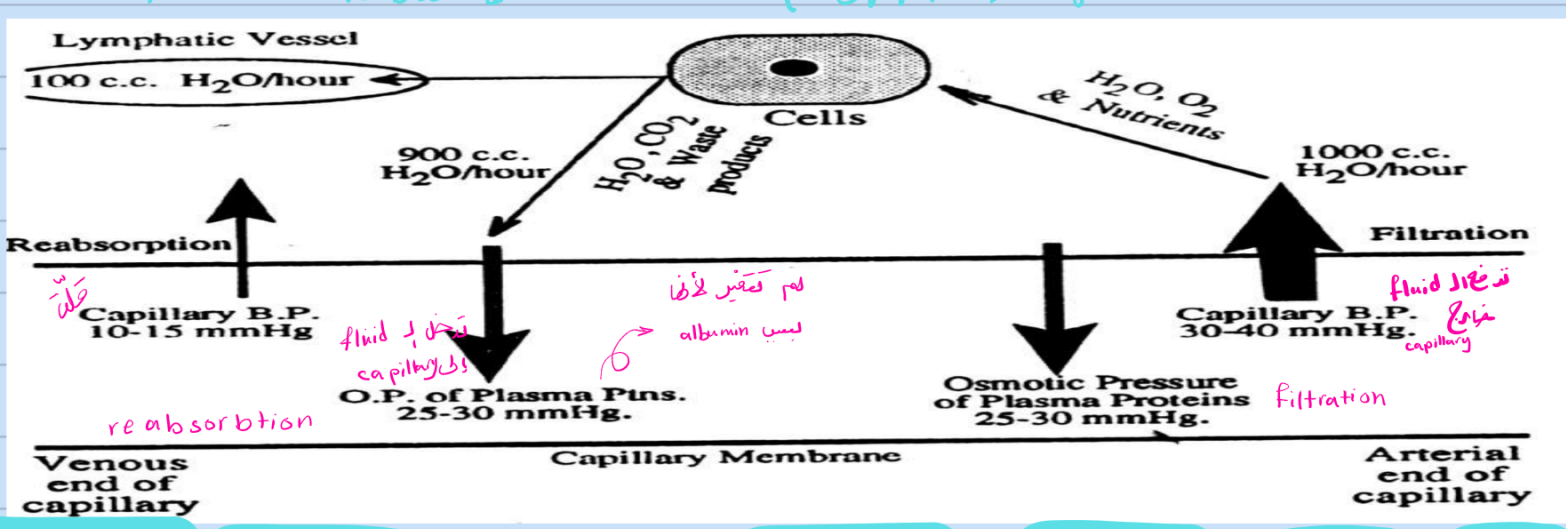
→ Antagonize filtration force

(capillary hydrostatic pressure at arterial end of capillary [30-40 mm Hg])

(capillary hydrostatic pressure at venous end of capillary [10-15 mm Hg])

* fluids are filtered at arterial end (hydrostatic pressure > OPPP)

* fluids are reabsorbed at venous end (OPPP > hydrostatic pressure)



Blood viscosity * 5 times more than water *

* important to produce peripheral resistance and maintenance of blood pressure

* prevent rapid flow of Blood from artery to vein at diastole

Non specific fun. all types make them

1- absorbtion and transport for many substanses as vitamans and hormones.

and this is importance because it prevents loss of substance in urine, and it serves as reservoir

2- buffering action 15l of buffering capacity of blood

when adding strong acid buffer react with it by its base

when adding strong base buffer react with it by its acid

The final result : the pH still constant

3- Diet reserve

Plasma proteins are used in staruation as diet

4 capillary permeability

plasma proteins decrease permeability

(it decrease the pores of the capillary)

WBC, platelet

WBC count = 4000 – 11000 /mm³

Types

- neutrophils → 60%
- lymphocyte → 30%
- monocyte → 6%
- Esinophils → 3%
- Basophils → 1%

neutrophils : protect body from foreign substance

1- migration — هجرة الـ neutrophils عبر الأوعية الدموية
2- margination — تجمع الـ neutrophils على جدار الوعاء الدموي
3- diapedesis — خروج الـ neutrophils من جدار الوعاء الدموي
4- ameboid movement — حركة الـ neutrophils بأقدام كاذبة
5- chemo taxis — المواد التي تجذب الـ neutrophils للوصول للجسم الغريب

* lymphocytes

T : cellular immunity
adhere to foreign antigen and destroy it

B: humoral immunity
secrete γ globulin which defence agains bacterial infection

* monocyte (macrophages)

phagocytosis + repair tissue after damage

* Esinophils :

- anti allergic
- anti parasite

* Basophils

produce :

heparine (anti coagulant)

histamine (produce allergy)

Hemostasis

stoppage of bleeding

1- vasoconstriction
immediately after injury

due to :
1- nervous reflexes sympathetic
2- myogenic contraction
3- releasing serotonin, thromboxane A2

2- formation of platelet plug
- adhesion → platelet adhere to the collagen
- activation → platelet secrete A2, ADP, serotonin
- aggregation → platelets adhere to each other

injury → exposure of sub endothelial collagen
platelet adhere to collagen

then platelets secrete serotonin, TA2, ADP
مادة لزجة تساعد على تجمع الـ platelets مع بعض

3- Blood coagulation — Forming of network of soluble fibrin threads
شبكة من خيوط الفايبرين اللاصقة للذوبان

* intrensing injury

- no tissue damage

injury → colagen
XII → XII a
XI → XI a
IX → IX a (with VIII a) → X → X a

* extrensing injury

- tissue damage (factor III)
VII → VII a
X → X a

important

4- clot retraction — soluble fibrin threads becomes insoluble

prothrombin activator (X_a, V_a, Ca^{+2}, lipid bilayer) → convert prothrombin to thrombin

thrombin convert fibronegen to fibren

RBCs (Erythrocyte)

circular biconcave non nucleated discs

4.5 – 5 M/mm³ in females → due to menstruation and estrogen

5 – 5.5 M/mm³ in males → due to testosterone

7 M/mm³ in newborn → due to intra uterine O_2 lack (hypoxia)

HB content

35% of RBCs weight

Do you know?
RBCs represent a store of iron ... Because milk is poor of this mineral in the first 4 – 6 months

12 – 16 gm/dl in females

14 – 18 gm/dl in males

19 gm/dl in newborn → due to intra uterine hypoxia (O_2 lack)

Characters

1 – flexible : it can squeeze in small vessels but it can't absorb more water (it may be ruptured !)

2 – Bi concave : it can carry O_2 and CO_2 more, the surface area is increased and HB remains distributed in the center and absorb water (without rupture)

Forms of hemoglobin

- oxy HB — with O_2
- deoxy HB — without O_2
- Carboxy HB — with CO
- Carboamino HB — with CO_2

Types of hemoglobin

- Adult (A1) — the main in adult HB, contains 2α, 2β
- A2 (2-3)% of the adult HB, contain 2α, 2 delta
- Fetal (HbF) (.8-2)% of the adult HBs contain 2α, 2δ
- Glycocylated (A1C)

abnormal HBS

Because of congenital abnormality in β-globin, it cause cycle cell anemia

valine amino acid in β chain in the Hb is attached to glucose ... So, we can consider it as an indicator of control diapetes in last 3 months.

it is increased in poorly controlled diabetes

Erythropoiesis

تصنيع كريات الدم الحمراء

Factors affecting Erythropoiesis:

1 – hypoxia : decrease O_2 supplying to tissues — The most important

2 – healthy Kidney : secretes 85% of erythropoietin (as a response to hypoxia)
↳ secretes anemia and androgen hormones too

3 – healthy liver : secretes 15% of erythropoietin hormone
↳ store globulin, iron, vitamin B_{12}, folic acid and copper

4- Healthy bone marrow: the site of RBCs formation in adult.

5- Healthy diet * vitamin B_{12} and folic acid ⇒ RBCs maturation
* Factors and vitamin C ⇒ HB synthesing
* copper and cobalt ⇒ HB synthesing needs small amounts of them

6- hormones: androgen, thyroxin General metabolic stimulant
cortisol, adrenaline, nor adrenaline

How it occurs!

Decrease RBCs → Decrease O_2 → Hypoxia → stimulates → Kidney and liver → they produce
→ 15% Erythropoitein
→ 85%

Erythropoiesis

Erythropoitein is responsible for producing RBCs in the bone marrow

ANEMIA

Morphologically:-

Microcytic hypochromic	Normocytic normochromic	Macrocytic (megloblastic)
Size is small, pale (is not as red as normal)	Size and colour are normal, but the amount is small	the size is bigger than normal
iron deficiency	Plastic, hemorrhagic hemolytic anemia	Vitamin B_{12} or folic acid deficiency (megaloblastic) (pernicious)

Iron deficiency anemia

- Because of iron deficiency
- Decrease iron intake (انخفاض المدخول)
- Decrease iron absorbtion
  - Decrease HCL (ضعف لا متصاص)
    - intestinal disease
- increase of utilization (زيادة الاستهلاك)
- Blood loosing (hemorrage) (نزيف)

Treatment
oral ferrous iron

Megalloblastic

- Because of Vitamin B_{12} Defficiency
* Manifestation (الأعراض)
- خلايا دم حمراء كبيرة الحجم وهذا يؤدي إلى نقص Platelets and WBCs

2- Denegration of peripheral and spinal nerve → -peripheral neuritis (التهاب الأعصاب الطرفية)
- subacute denegration of spinal cord (تنكس (أقل من حاد) للحبل الشوكي)
(يسبب مشاكل في الحركة والإحساس)

3- atrophy of digestive mucosa (ضمور بالغشاء المخاطي للجهاز الهضمي)
and hepatosplenomegally (تضخم الكبد والطحال)
(يؤدي إلى مشاكل في الامتصاص والهضم)