بسم الله الرحمن الرحيم

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Plasma proteins

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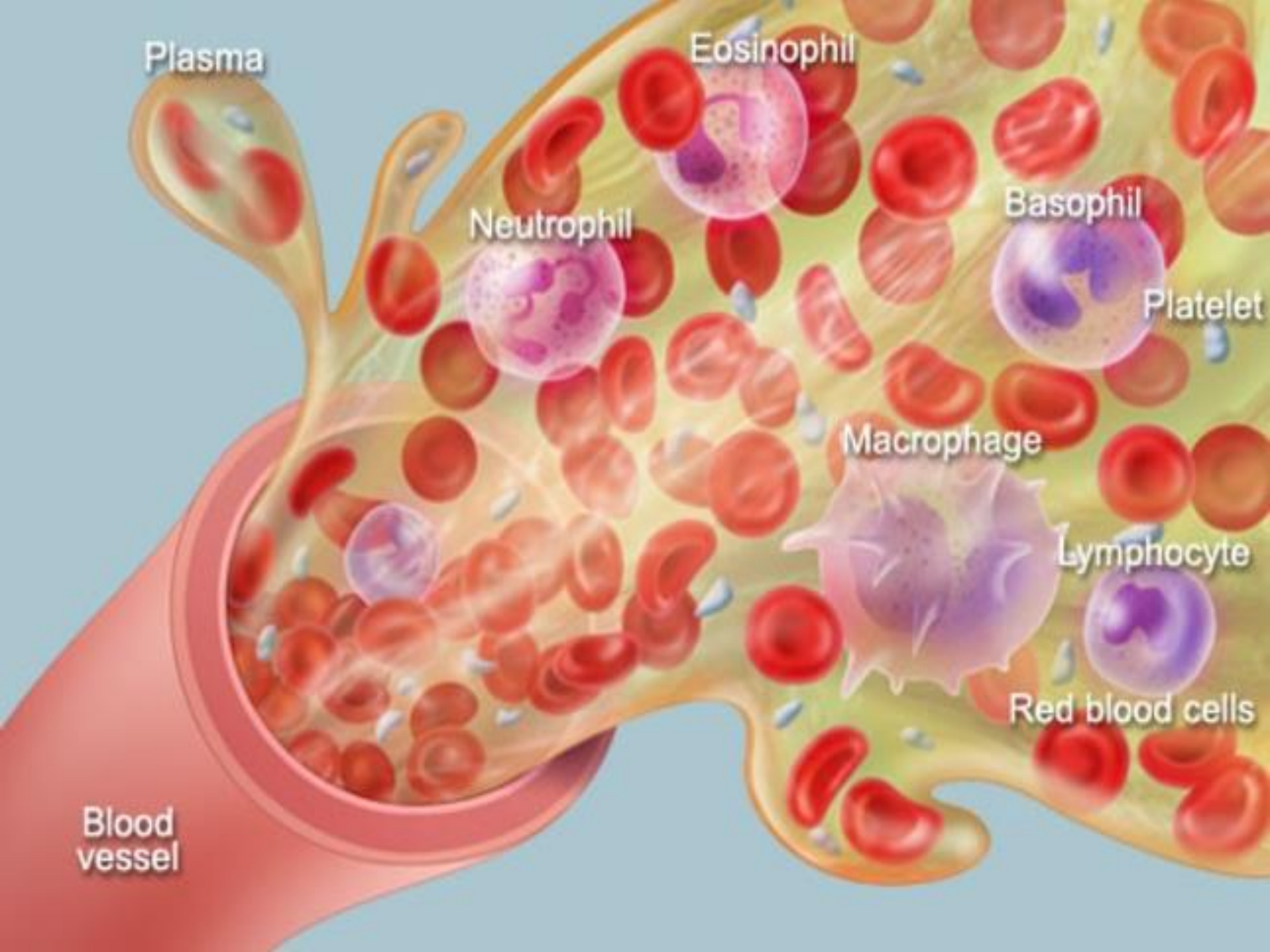

Plasma
Eosinophil
Neutrophil
Basophil
Platelet
Macrophage
Lymphocyte
Red blood cells
Blood vessel

General functions of blood

1-The major transport medium in the body

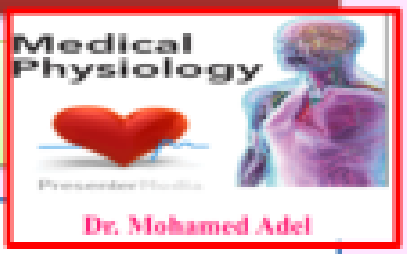
- Blood acts as a carrier for many substances e.g. glucose & O2.

General functions of blood

2- Hemostatic functions

- **Hemostasis:** means stoppage of bleeding when a blood vessel is injured due to presence of clotting factors.

General functions of blood



3- Homeostatic function

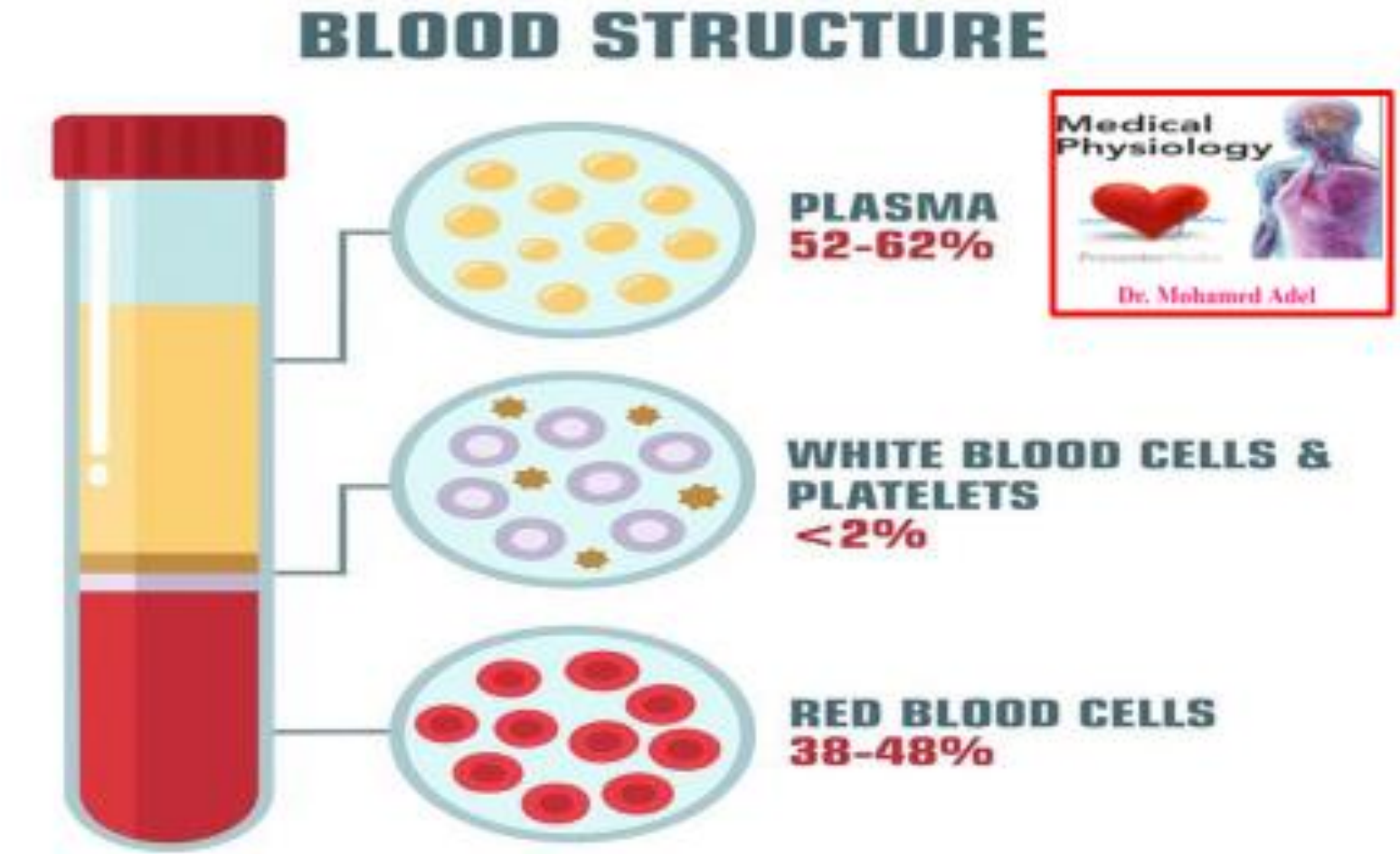
- Keeping the components of the internal environment constant due to continuous exchange of substances between the interstitial fluid & blood.

General functions of blood

4- Defensive function

- White blood cells defend the body against various microorganisms through phagocytosis & formation of antibodies.

Composition of blood



Composition of Blood

- **Cells: 45%**
  - RBCs
  - White blood cells
  - Platelets
- **Plasma: 55%**
  - **Water, 90%**
  - **Solids, 10%**
    - **Organic, 9%**
      - Plasma proteins
      - Other organic (urea, creatinine, glucose, vitamins).
    - **Inorganic ,1%**
      - Na^+
      - K^+
      - HCO_3^-

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Plasma proteins

A) Concentration

- 6- 8 gm / 100 ml plasma.

B) Types

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	Concentration
Albumin	3.5 → 5.0 gm%
Globulins (α, β, γ)	2→3.5 gm%
Fibrinogen	400 mg%
Prothrombin	10 mg%

Sites of synthesis of plasma proteins

- Albumin, fibrinogen, prothrombin & globulin (Except γ- globulin) are synthesized in liver.

- γ globulins are synthesized by plasma cells in lymphoid tissues.

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Plasma proteins

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C) Sites of synthesis

a) Liver:

- Synthesizes albumin, fibrinogen, prothrombin and **50- 80%** of globulins (α and β not gamma globulins).

b) Lymphoid tissues (Spleen, bone marrow, and lymph nodes):

- **Plasma cells** synthesize γ globulin (**20-50% of globulins**).

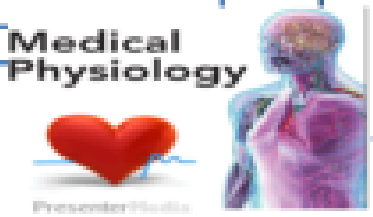
Functions of plasma proteins

Specific functions

1. Osmotic function
2. Defensive functions
3. Viscosity of plasma
4. Blood clotting

Non specific functions

5. Buffering functions
6. Carrier functions
7. Regulation of capillary permeability
8. Protein reserve



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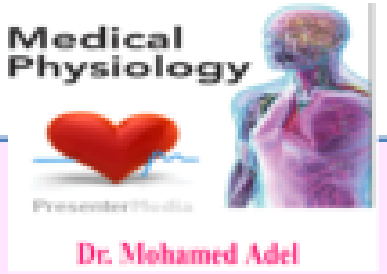
Osmotic pressure of plasma

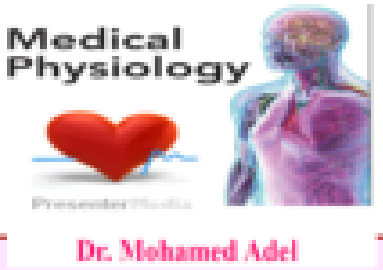
- **Plasma proteins** exert **osmotic pressure (O.P.)** of about 28 mmHg which pull the water inside the capillary.
- **O.P.** is produced mainly by albumin.
- **O.P.** helps **reabsorption of tissue fluid**.



Functions of plasma proteins

2- Defensive function

- **Gamma globulins** are the antibodies that protect the body against the micro-organisms and their toxins.



Functions of plasma proteins

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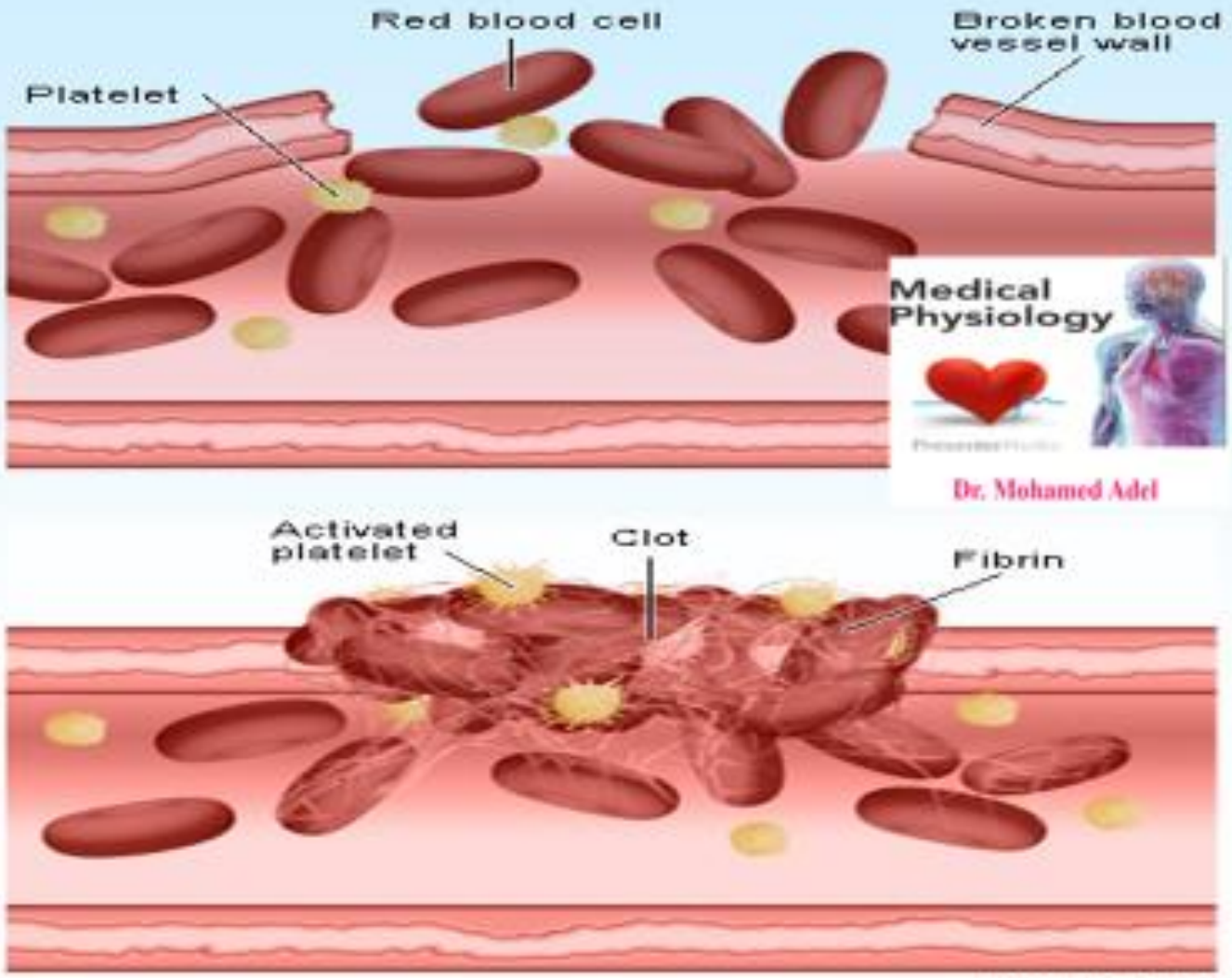
3- Blood viscosity

- Fibrinogen is the main plasma protein responsible for it because of its elongated molecules and large molecular weight.

Blood Clot


Red blood cell
Broken blood vessel wall
Platelet
Medical Physiology
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Activated platelet
Clot
Fibrin
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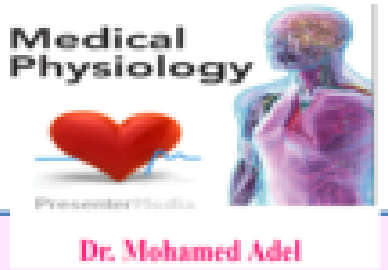
Functions of plasma proteins

4- Blood coagulation

- Is the function of fibrinogen & prothrombin.

Clotting factor number I

Clotting factor number II



Buffering function

	pH	$[H^+]$nmol/l
Arterial blood	7.4	40
Venous blood	7.37	44

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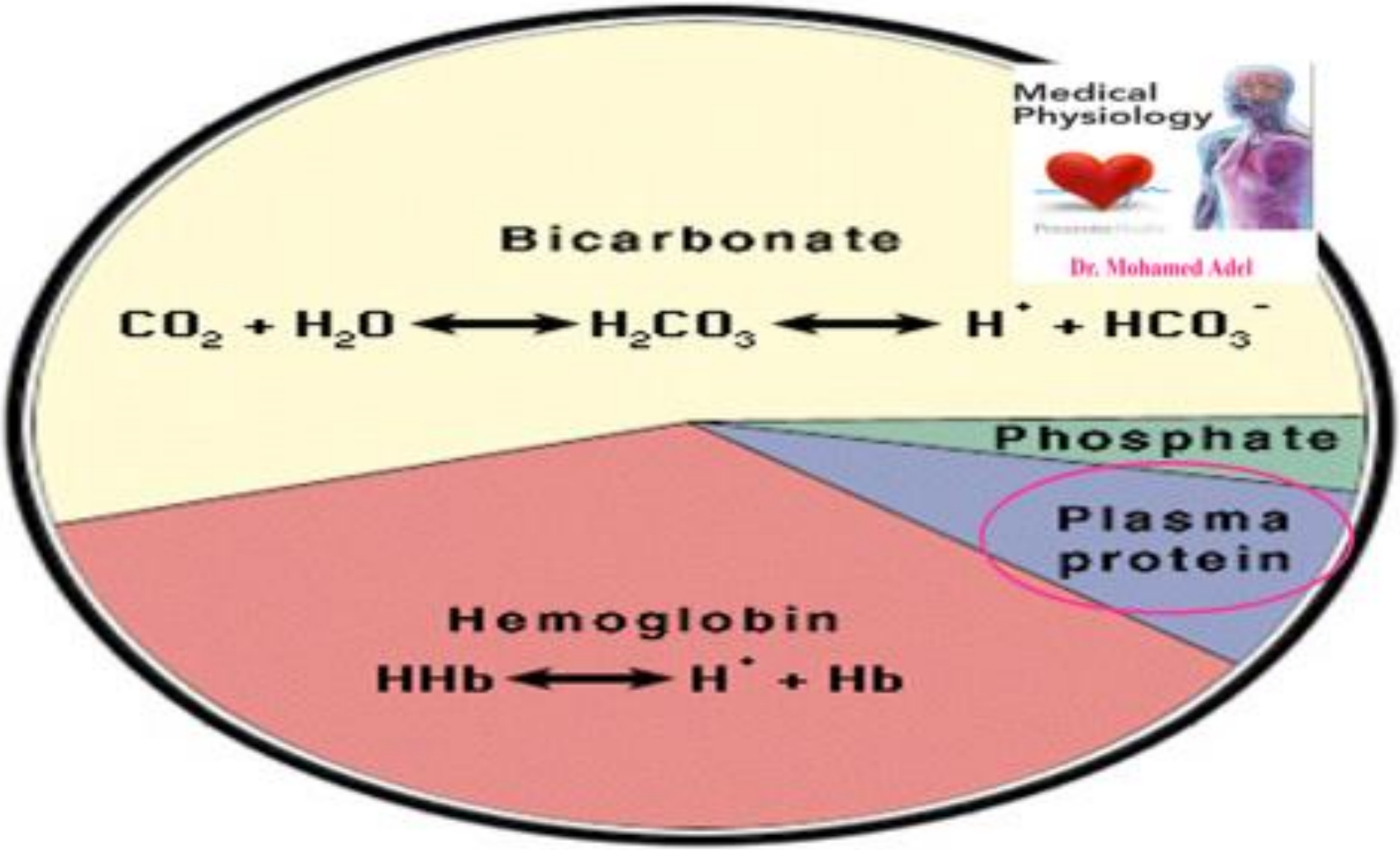
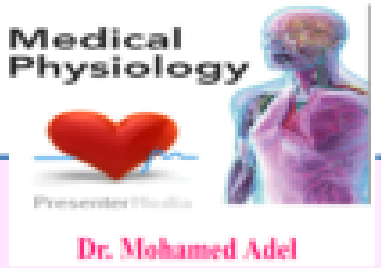
Contribution of buffer systems to total buffering in whole blood.



Buffering function

- **At normal PH of blood (7.4)**, plasma proteins are present in the form of: **proteinic acid (weak acid) and Na^+ proteinate (salt).**
- Thus, it acts as a **buffer system preventing** excessive changes in PH.



Lactic acid (relatively strong) + Na-proteinate → Na lactate + Proteinic acid (weak acid)

NaOH (strong alkali) + Proteinic acid → Na-proteinate + H2O

6) Carrier Function

- **Plasma proteins carry:**

1. **Vitamins** e.g. Vitamin B12 (Carried by Transcobalamine).
2. **Minerals** e.g. Iron.
3. **Hormones** e.g. Thyroxin & cortisol.

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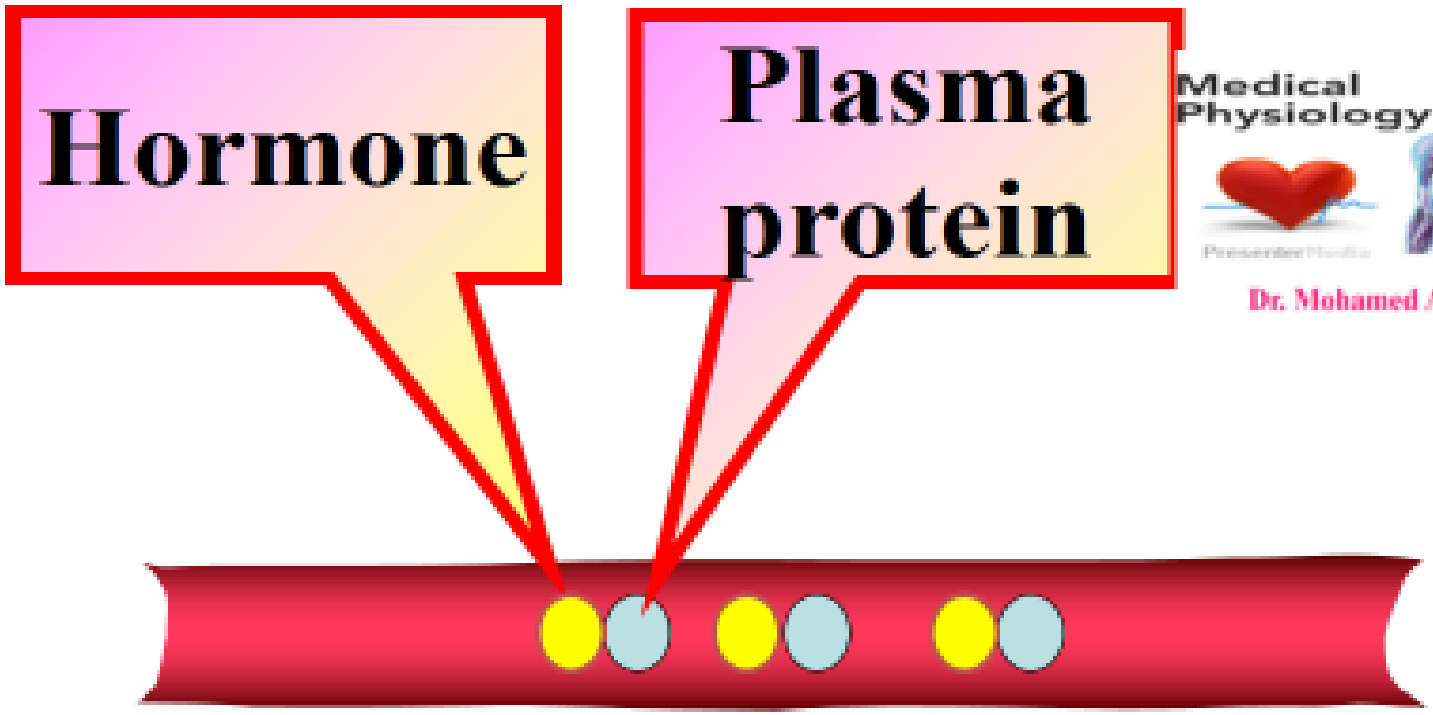
- **This prevent loss of these substances in urine.**



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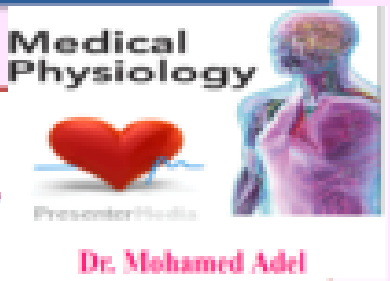
Carrier function

Functions of plasma proteins



7- Control of capillary permeability

- The pores in capillary walls are partially blocked by plasma proteins. Thus, decrease plasma proteins is associated with increased capillary permeability.

ADD:

- **Decrease the plasma proteins due to liver or kidney disease leads to accumulation of fluid in the interstitial spaces, a condition called edema.**

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Thanks!