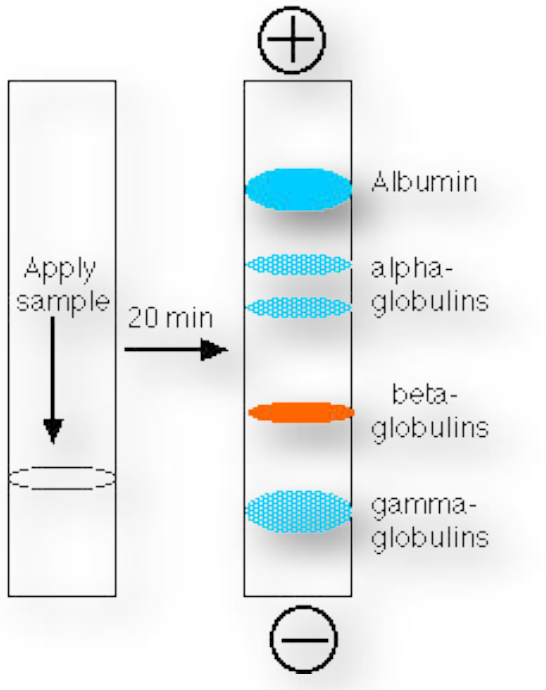
Plasma Proteins



Learning Objectives:

At the end of this lecture student should be able to discuss-

- Types of plasma proteins
- Characteristics of plasma proteins
- Functions of plasma proteins
- Hypoproteinemia and oedema

Plasma proteins

Plasma contains ~ 7% protein,

Normal total plasma protein is about 6.3- 8.4 g/dl

Classes of Plasma Proteins

Albumins	- 60%
Globulins (α, β, γ)	- 35%
Fibrinogen	- 4%
Other proteins	- 1%

Site of synthesis of Plasma Proteins

- Liver - 90% plasma proteins
- Plasma cell (B lymphocytes) -γ globulin
- Peptide hormones – Endocrine glands

Liver dysfunction - ↓ plasma proteins

A:G ratio (normal): 0.8-2.0., Decreased in liver dysfunction and chronic inflammatory conditions.

Plasma protein - Albumin

- Forms - 55%-60% of total plasma proteins
- Normal value - 3.5-5.0 g/dl
- Molecular Weight (MW)- 66,500 D (lightest)
- Structure - a single peptide chain of 585 amino acids

Plasma protein - Albumin

- Major function: Plasma Colloid Osmotic Pressure

- Carrier

Hypo-albuminemia

- Liver disease,
- Malnutrition
- Chronic infection

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Plasma protein - Globulin

- Forms – 35% of total plasma proteins

- Normal value - 2-3 g/dl;
- Molecular Weight (MW)-90,000-150000 D

- Type - Three types of globulin have been identified — alpha, beta, & gamma.

Fibrinogen

- Forms – 4%-6% of total plasma proteins

- Normal value - 0.3-0.4 g/dl; .• Molecular Weight (MW)-4,00,000-500000 D

- It is a plasma clotting factor, important for blood coagulation as can be converted into insoluble fibrin Molecules form clots, Produce long, insoluble strands of fibrin

- It also contributes to the viscosity of blood.

Other Plasma Proteins

1% of plasma proteins:

Regulatory proteins (cellular products) (1%):

Hormones,

Enzymes, and

Prohormones

Methods of plasma protein separation

Common methods of protein separation into:
albumin, globulins (alpha, beta & gamma) and fibrinogen by –

- Electrophoresis
- Salting out
- Ultracentrifugation
- Affinity chromatography
- Fractional precipitation method
- Immune electrophoresis

Hypo-proteinemia

- Liver failure
- Nephrotic syndrome
- Malnutrition
- Malabsorption
- Severe burns
- Infection (↑catabolism)
- Genetic

Functions of plasma proteins

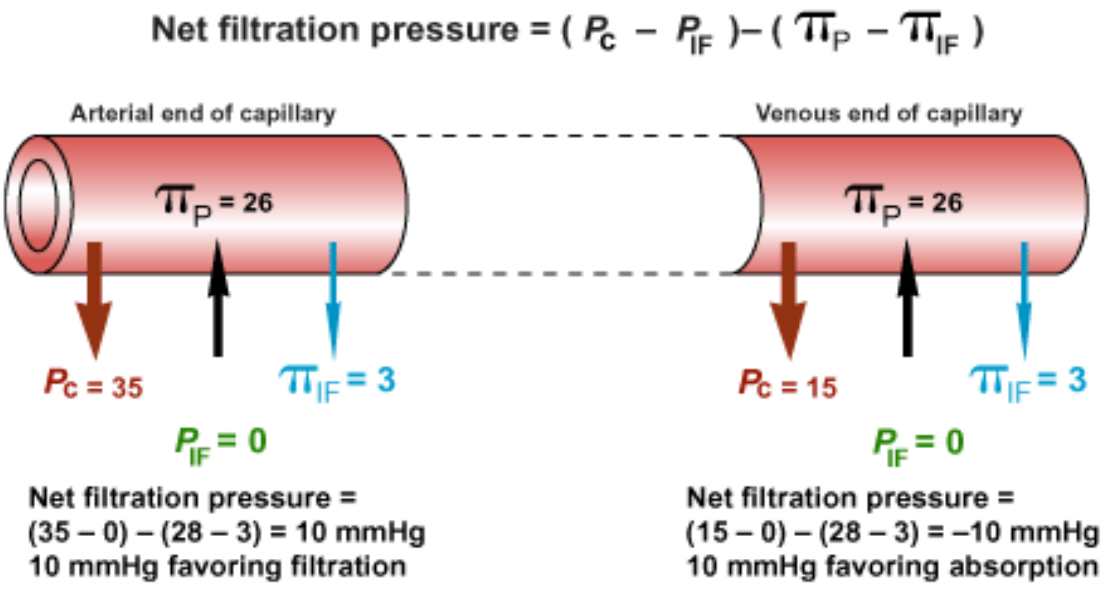
1. Colloid osmotic pressure in blood
2. Viscosity of blood
3. Buffer action
4. Clotting and fibrinolysis
5. Defense function body
6. Transport function
7. Plasma proteolytic enzyme system
8. Plasma protease inhibitor system
9. Nutritional reserve

Colloid osmotic pressure (oncotic pressure)

80% of plasma oncotic pressure is maintained by albumin.

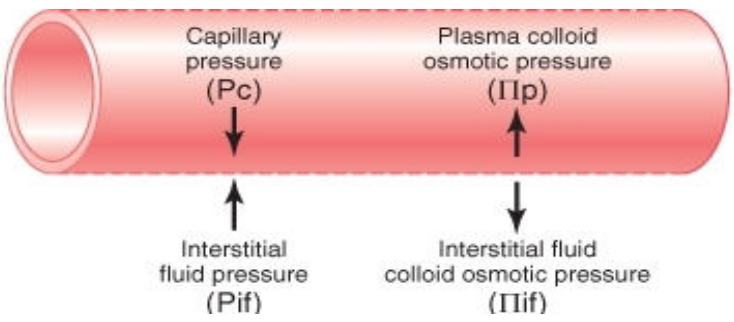
It is the opposing force to hydrostatic pressure.

Colloid osmotic pressure (oncotic pressure) and filtration of fluid



Edema

Due to disturbance in hydrostatic and/or oncotic pressure between intra-capillary and interstitial component.



Organ specific

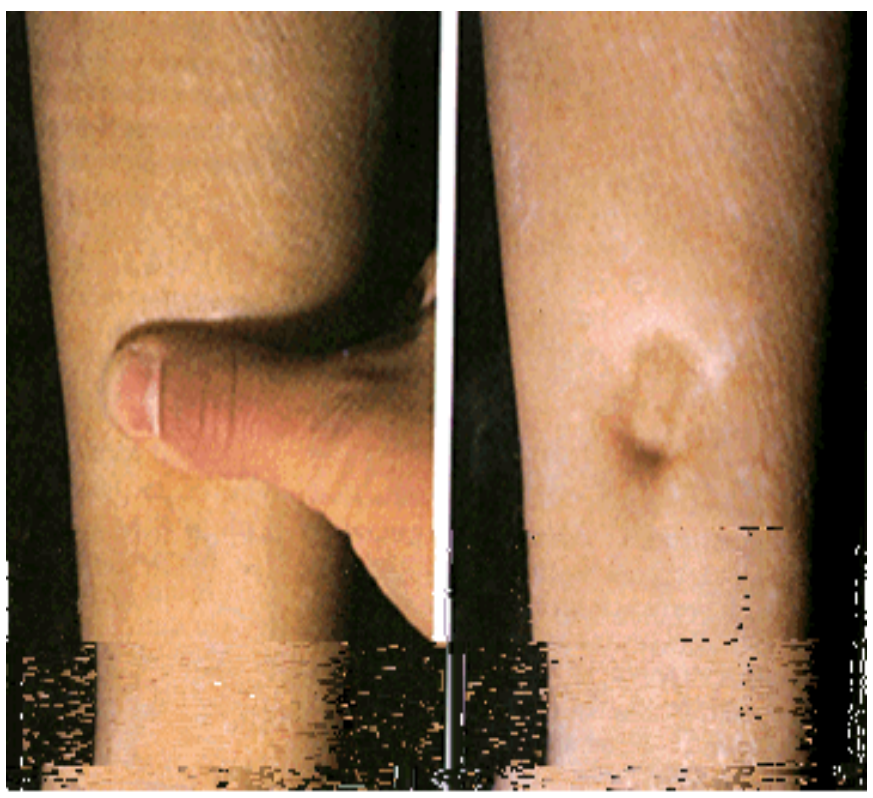
- Brain: Cerebral edema
- Lung: Intra-alveolar=pulmonary edema, intra-pleural=pleural effusion
- Peritoneum=ascites
- Severe generalized edema=anasarca
- Leg edema- deep venous thrombosis

Facial oedema

Edema ▪ Pitting ▪ Non pitting

Clinically

▪ Pitting ▪ Non pitting



Clinical Problem Based Question

A previously well 9 year old girl presents to your office with the chief complaint of facial puffiness. Her mother noticed this a few days ago and it seems to be worsening. She has no other symptoms, but about two weeks ago had "a bad cold.“ On examination HR 90/min, RR 20/min, BP 92/55 mm of Hg. Abdomen is soft, non-tender. Her face shows moderate puffiness and periorbital edema. The dorsal surfaces of his hands and feet also have mild pitting edema. Urinalysis shows 4+ protein, Blood -protein of 2 g/dL, serum albumin of 1.4 g/dL

Que.1 What is the provisional diagnosis?

Que.2 What is the cause of facial puffiness and feet edema?

Fill in Blanks

- ✓ Reduced plasma osmotic pressure leads to a net movement of fluid into the ---------- subsequent ----------plasma volume.

- ✓ ----------capillaries permeability results in increased capillary hydrostatic pressure, causing----------.

- **Patients having acute cardiac failure do not show oedema, because**

1.The plasma oncotic pressure is high
2.There is renal compensation
3.There is an increase in cardiac output
4.There is a fall in the systemic capillary hydrostatic pressure