

Body fluid Abnormalities
Microcirculation
Edema

Body fluid Abnormalities

1. Hypo-osmotic dehydration
2. Hypo-osmotic overhydration
3. Hyper-osmotic dehydration
4. Hyper-osmotic overhydration

Hypo-osmotic dehydration

- Addison's disease
- Overuse of Diuretics
- Vomiting & diarrhea

Hypo-osmotic overhydration

Due to excess ADH;

- Syndrome of inappropriate ADH secretion (SIADH)
- Ectopic ADH secretion; Bronchogenic cancer

Hyper-osmotic dehydration

- **Diabetes insipidus**
(decrease ADH secretion)
- **Excessive sweating**

Hyper-osmotic overhydration

- **Primary aldosteronism**
- **Cushing's syndrome**

Regulation of fluid exchange between body Compartments

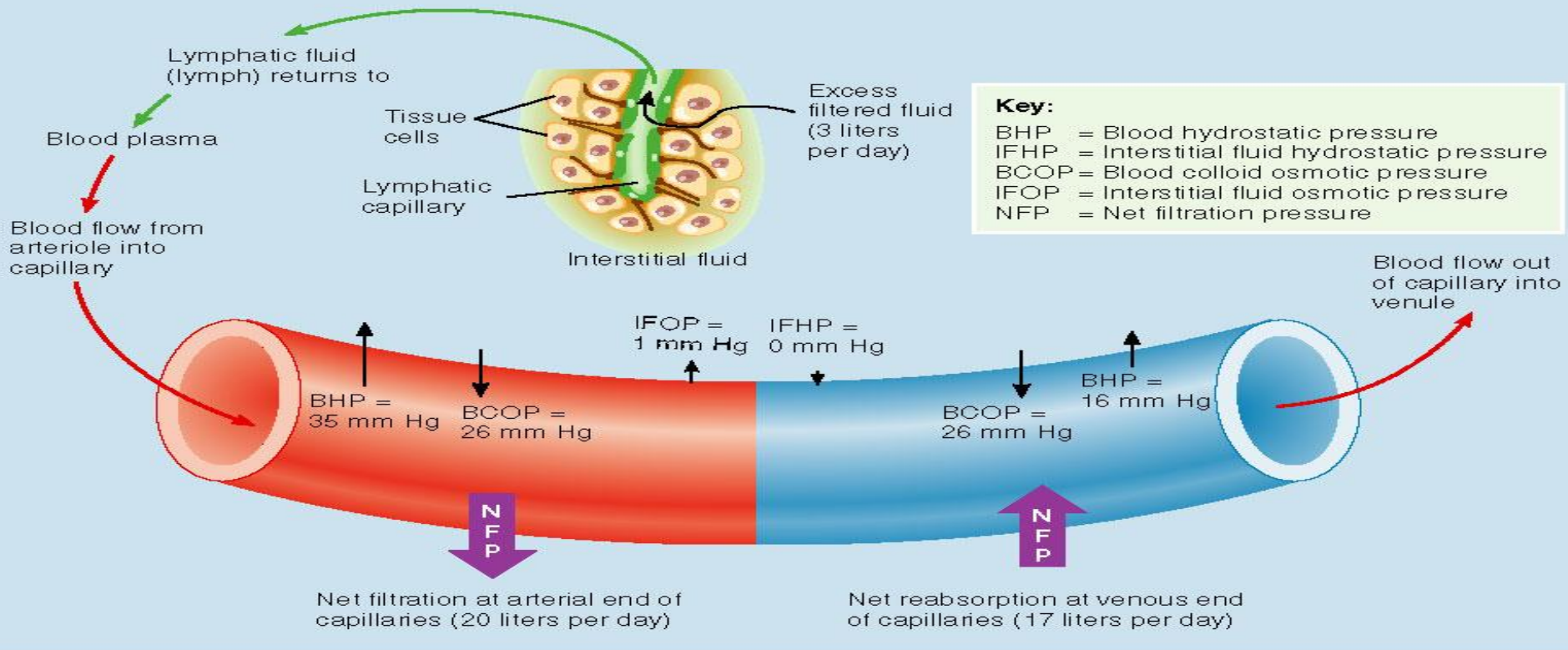
ICF & ECF;

- Determined by osmotic effect of solutes across the cell membrane.

Plasma & interstitial spaces

Colloid osmotic force & hydrostatic force across the capillary membrane.

Starling Equilibrium for capillary exchange



Net filtration pressure (NFP) = (BHP + IFOP) - (BCOP + IFHP)
 Pressures promoting filtration

(BCOP + IFHP)
 Pressures promoting reabsorption

Arterial end
$NFP = (35 + 1) - (26 + 0)$ $= 10 \text{ mm Hg}$
Net filtration

Venous end
$NFP = (16 + 1) - (26 + 0)$ $= -9 \text{ mm Hg}$
Net reabsorption

Result

Edema

- **EC edema**

(abnormal accumulation of fluid in the interstitial space)

- **IC edema** (cell swelling) due to;

Depression of cell metabolism

Lack of cell nutrition

Inflammation

Causes of EC edema

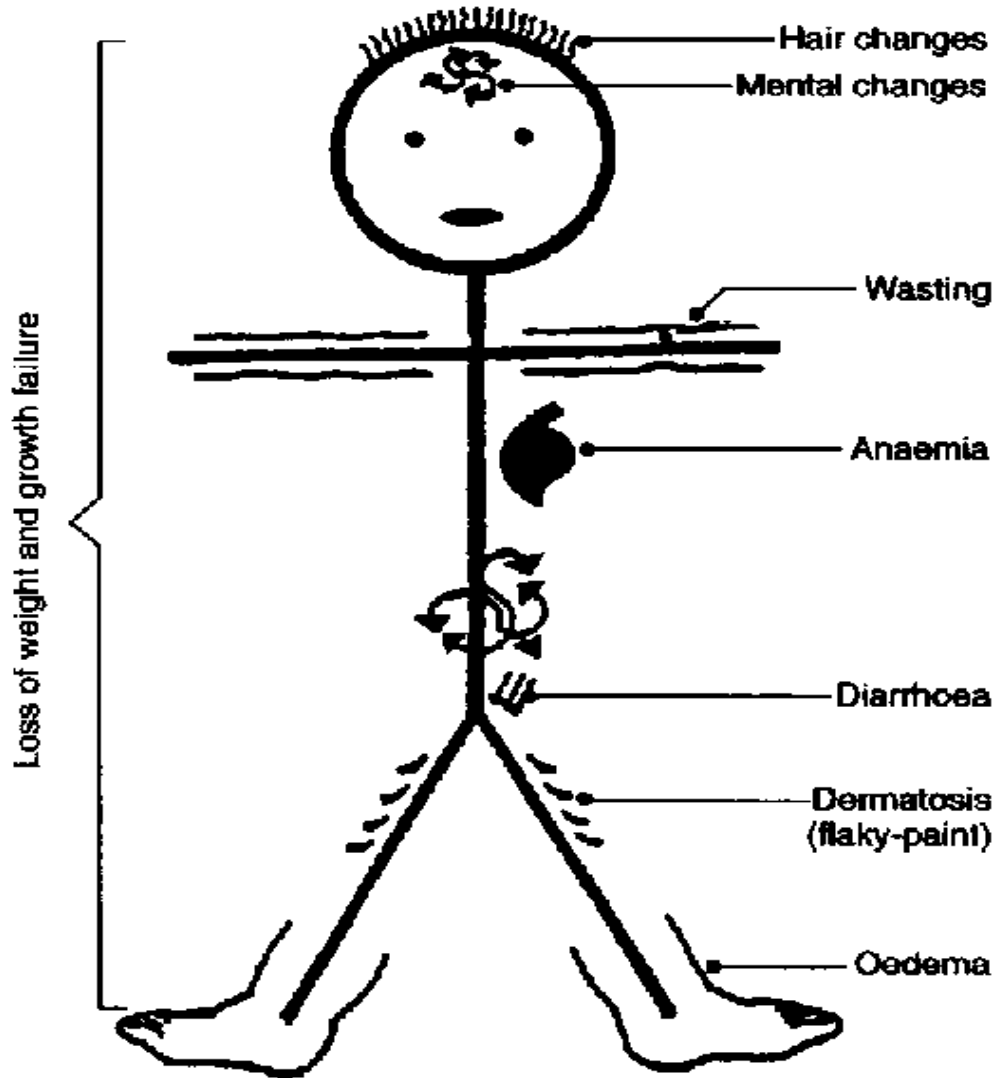
- **1. Increased capillary pressure;**
- Excess kidney retention
- High venous pressure
- Decreased arteriolar resistance

Causes of EC edema

2. Decreased plasma proteins:

- Loss of proteins by nephritic syndrome, burns....
- Failure to produce proteins; liver disease
- Starvation (malnutrition)

Malnutrition Kwashiorkor



Causes of EC edema

3. Increased capillary permeability;

- Immune reactions
- Infections
- Toxins

Causes of EC edema

4. Lymphatic blockage:

- After Radical mastectomy
- After Radiation therapy
- Filariasis/ Elephantiasis (Wuchereria Bancrofti)

Filariasis/ Elephantiasis



Consequences of hyponatremia;

- **1. rapidly occurring (acute) severe hyponatremia;** can lead to cerebral edema & seizures if plasma Na concentration falls below 115-120 mmol/ L rapidly.
- Brain can't expand more than 10% of its volume therefore will herniate to vertebral column leading to brain stem injury & death

Consequences of hyponatremia;

- **2. Slowly evolving (chronic) hyponatremia;**
over several days create movement of Na^+ , Cl^- , K^+ & even glutamate from neurons to EC fluid to prevent cerebral edema.
- Rapid correction of chronic hyponatremia will lead to osmotic injury of neurons and later demyelination of brain stem (Pons)

Central pontine myelinolysis;

- **Cause;** Rapid correction of chronic hyponatremia by hypertonic solution
- **Symptoms & signs;** acute para or quadraparesis, dysphagia, dysarthria, diplopia, loss of consciousness, locked-in syndrome.
- **Pathology;** Rapid myelinolysis of major motor pathways in the brain stem specifically in Pons

Treatment of chronic hyponatremia;

- Slow correction of hyponatremia in a rate of 10 mmol / L / 24 hrs it might take several days to reach normal level.