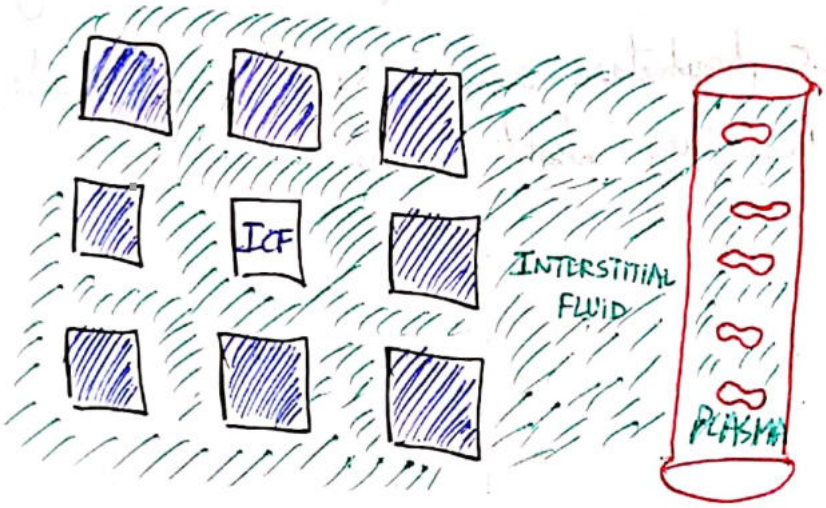
- 60% of body is made of water - distributed in compartments.

- Water in all the cells of body - ICF compartment

- Water outside and arround cells - Non circulating interstitial fluid ← part of ECF

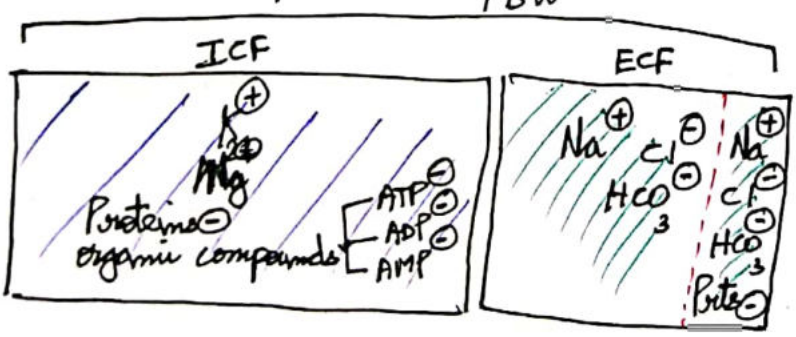
- Plasma of blood - circulating part of ECF



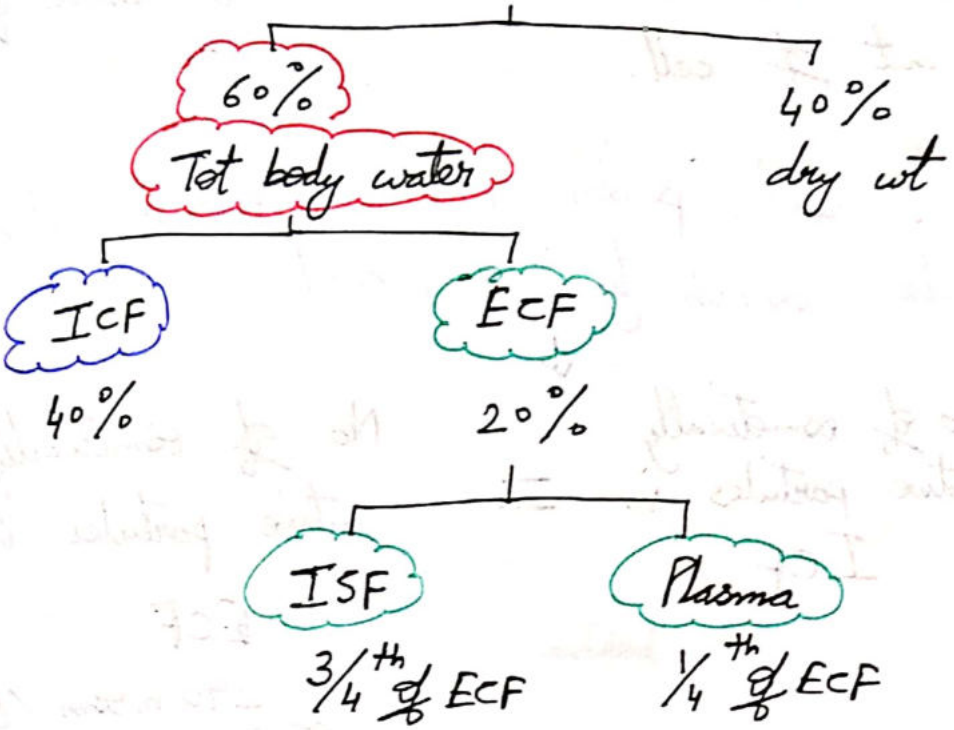
PLASMA + INTERSTITIAL FLUID = ECF

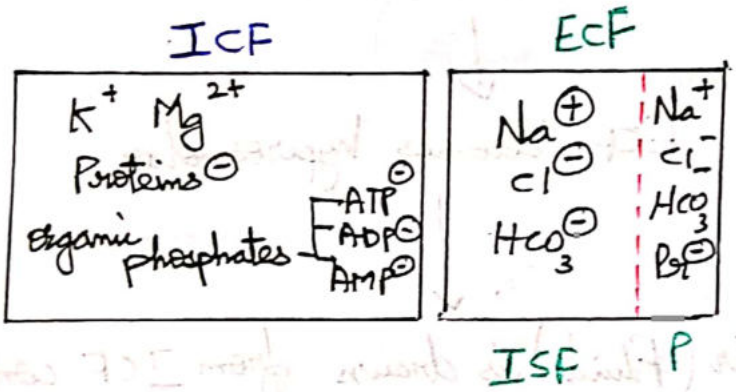
- conceptually - interstitial fluid is ultrafiltrate of plasma

-



- Tot Body weight





- Biological partition B/w Plasma & ISF is capillary membrane.
- Capillary mem is very permeable to Na^+ & Cl^-.

↓

$[Na^+]$ & $[Cl^-]$ is both ISF & Plasma is almost equal.

- But barrier b/w ECF & ICF is cell membrane which does not allow Na^+ & Cl^- to move freely in & out of cell.

- ** In a healthy person intra cellular & extra cellular osmolarity is equal.

↓

No of osmotically active particles in ICF = No of osmotically active particles in ECF

290 mosm/L ≈ 300 mosm/L

- Salty chips are taken → When more solute is added to ECF

↓

ECF becomes hyperosmolar

↓

Water (Fluid) is drawn from ICF compartment ie water moves from ICF to ECF

↓

Cells start shrinking

- Net movt of water stops when osmolarity on both sides becomes equal.

- In high grade fever or any dzz

→ Water is lost from ECF
Solutes are not lost

↓

ECF compartment is shrinking

↓

ECF becomes hyperosmolar

↓

Water moves from ICF to ECF

When H_2O is added to ECF

↓

ECF becomes diluted
(osmolarity is ↓)

↓

H_2O moves from ECF to ICF

↓

ICF (Cell) starts expanding &
ECF starts shrinking

↓

Net movt stops when osmolarity becomes equal.

- Isotonic / Iso osmolar saline = 300 mosm/L
  ↳ same osmolarity as body fluids

1 Litre of water must be added to 1 Litre of water to make it isotonic with our body fluids is 150 m mole → Normal saline

- half saline has 75 m mole of NaCl

-

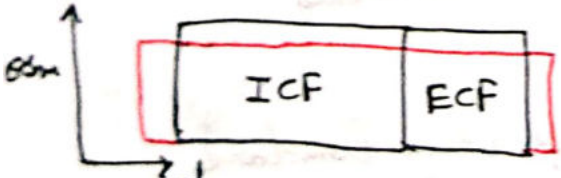
Intra Venous Saline

Hypotonic Saline 150 mosm/L

ECF osmolarity ↓
ECF becomes hypoosm

H_2O moves ECF → ICF

ICF osmolarity also falls ↓

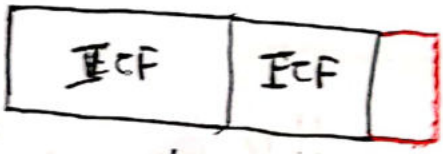


Both compartments expand

RBC's swell up
cells swell up.

Normal Saline 300 mosm/L

osmolarity does not change

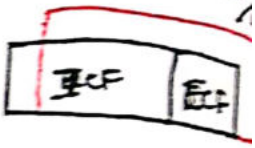


Solutes & H_2O are added to ECF

ECF expands

but no shifting of fluid B/W ICF & ECF

Hypertonic Saline 600 mosm



ECF osm ↑ hyperosmolar

H_2O from ICF to ECF

ICF osm ↑ but vol has gone down.

- Tot vol of fluid in any compartment of body depends on solute particles

(1) Vol of body fluid compartment mainly depends on osmotically active solute particles.

(ECF - Na Cl)

(2) Osmolarity :- conc of osmotically active substances per litre
units - mosm/L

Osmolality :- osmotically active particles per kg
units - mosm/kg

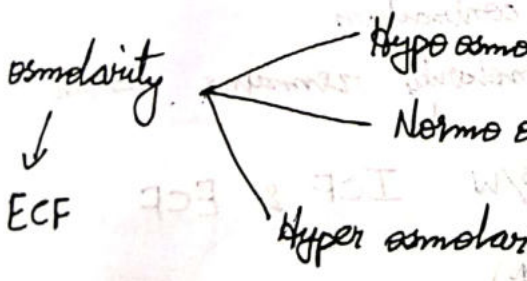
Practically 1 litre of water = 1 kg of water
[density = 1]

(3) In steady state :- situation in which an equilibrium is achieved B/W ICF & ECF and there is net net movt of H_2O between them.

(4) Volume contraction :- (↓) in ECF volume

(5) Volume expansion :- (↑) in ECF volume

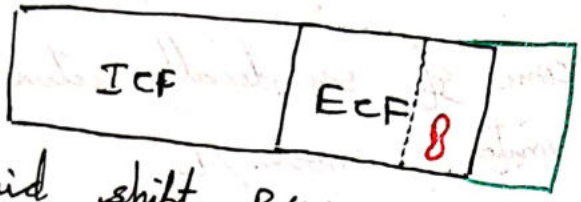
(6)



=> Changes in body fluids and Volumes in different clinical situations.

① Isotonic saline infusion :-

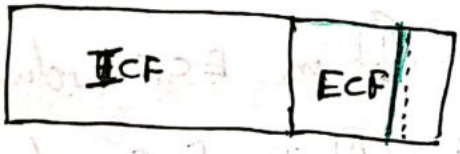
- ECF :- osmolarity remains same
  volume is ↑ - volume expansion



Isoosmotic Volume expansion

- No fluid shift B/W ICF & ECF
- Hematocrit :- depends on ① ECF volume
  ② Vol of RBC's
  In this case hematocrit ↓
- Plasma proteins are diluted [conc ↓]

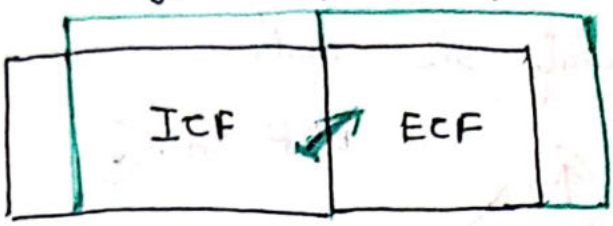
② Isotonic fluid loss :- diarrhea & vomiting, Isotonic with hemorrhage.



Iso osmotic volume expansion

- ECF :- volume contraction
  But osmolarity remains same
- No fluid shift B/W ICF & ECF
- Hematocrit :- ↑
  RBC's do not shrink or swell.
- Plasma pts get concentrated

Hypertonic fluid infusion.

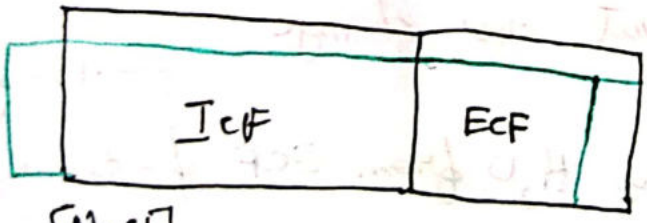


Hypertonic or hyperosmotic volume expansion

- Addition of more solute than water ie hyperosmolar fluid
- ECF osmolarity ↑
- fluid shift ICF ⟶ ECF
- ECF volume ↑
  ICF " ↓
- Hematocrit ↓ due to ↑ in ECF volume & also shrinkage of RBC's.
- Plasma prt conc ↓
- Arterial BP also ↑

(4) Adrenal insufficiency :- Addison's disease

- Aldosterone is deficient ⟶ more Na^+ is lost in urine.



[NaCl]

Hyposmolar Volume Expansion

- Solutes are being removed from ECF
- ECF osmolarity ↓
- fluid shift ECF ⟶ ICF

ECF volume ↓
ICF volume ↑

- ICF osmolarity also falls
- Hematocrit ↑ < ECF vol ↓
  RBC's are swollen

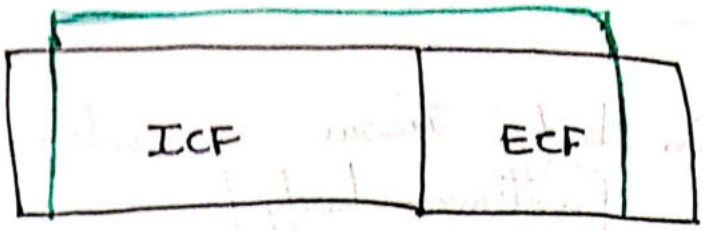
BP ↓

(5) Adding water to body ECF
- Tap water
- excess ADH → severe water retention
- ½ saline

hypoosmolar volume expansion

- Water is added to ECF
- ECF :- osmolarity ↓
  volume ↑
- fluid shift ECF → ICF
- ICF osmolarity ↓ volume ↑
- Hematocrit no change

(6) loss of more H_2O from ECF
- Excessive sweating in desert
- fever
- deficiency of ADH → diabetes insipidus.



- Water is removed from ECF
- ECF osmolarity ↑
  volume ↓
- fluid shift ICF → ECF
- ICF — volume ↓
  osmolarity ↑
- Hematocrit does not change.