



Physiology
team



5

HOMEOSTASIS II

Important
†

Extra
explanation

Girls
notes

Boys
notes

{وَأَيَّكَ نَسْتَعِينُ}

هل تُشْعُرُ أَنَّ أَعْبَاءَكَ فَوْقَ طَاقَتِكَ؟

هل تُحَسُّ بِالْتَعَبِ مِنْ زَحْمَةِ مَطَالِبِ الْحَيَاةِ؟

فَمَا شَرَعَ الْاسْتِعَانَةَ ، اسْتَعِنُ بِرَبِّكَ

(...) إِلَّا لِيُعِينَكَ

Mind map



Loss of hemostasis

**Abnormal stasis
of ICF and ECF**

Edema

Volume
contractions

Volume
expansion

diarrhea

Water
deprivation

Adrenal
insufficiency

Infusion of
isotonic NaCl

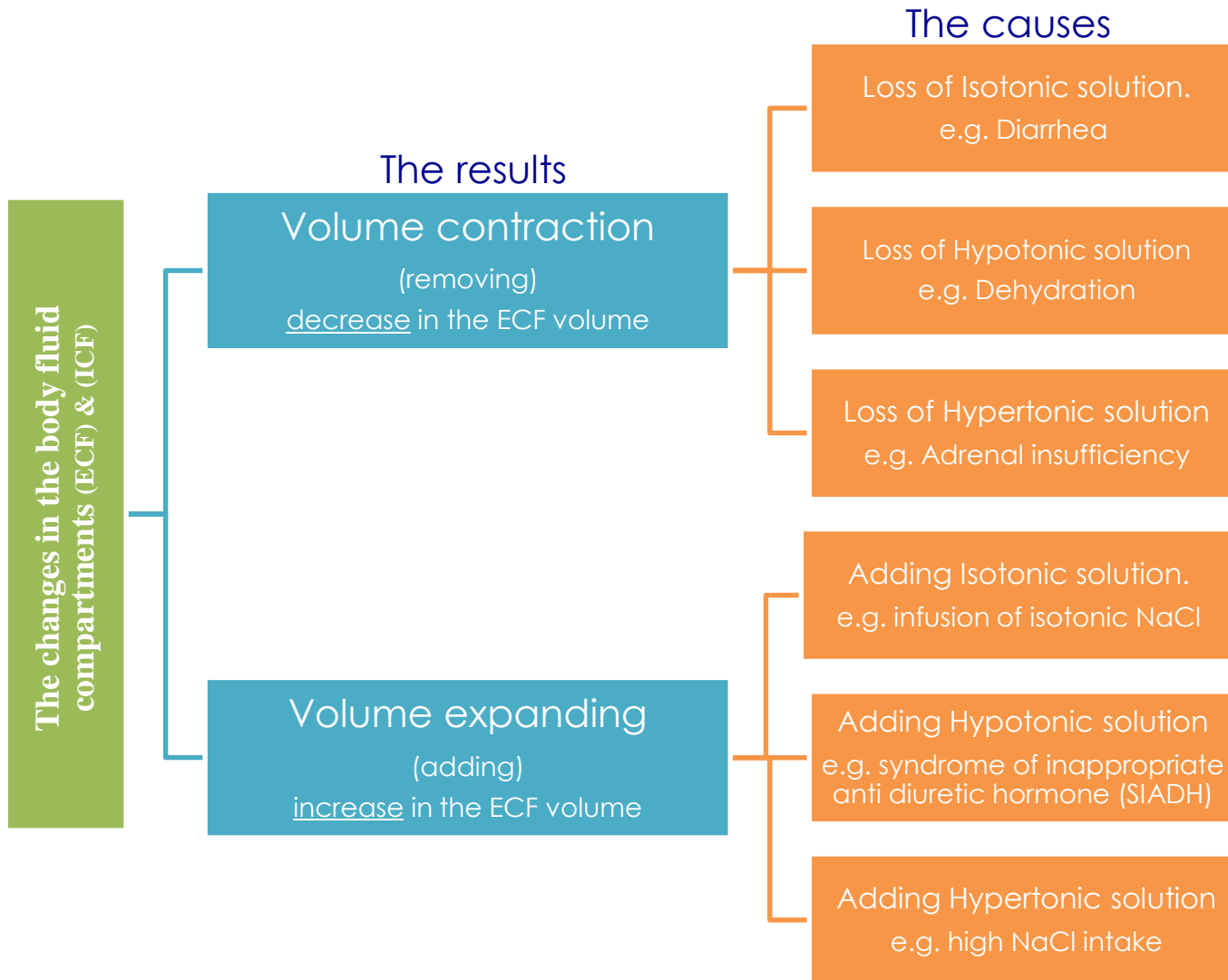
High NaCl
intake

SIADH

Extracellular
Edema

Intracellular
Edema

The changes in the body fluid compartments (ECF) & (ICF)



Extra explanation

So, If someone lost an isotonic solution via diarrhea there will be a decrease in his ECF volume

Volume contraction (removing)

decrease in the ECF volume

Loss of Isotonic solution.
e.g. Diarrhea

No change in osmolarity.

Decrease in ECF volume

Decrease in atrial pressure

- Decreasing in osmolarity will be equal. So, the osmolarity will be the same but the volume will change.
- The arterial pressure will decrease because the decreasing in the volume of ECF.

Loss of Hypotonic solution
e.g. Dehydration

Osmolarity in both ECF & ICF **increased**

volume in both ECF & ICF **decrease**.

Decreasing in osmolarity because the osmolarity of ECF increased due to lose high amount of NaCl (for example by excessive sweating). So, that leads to water movement from ICF to ECF.

Loss of Hypertonic solution
e.g. Adrenal insufficiency
i.e. Aldosterone deficiency.

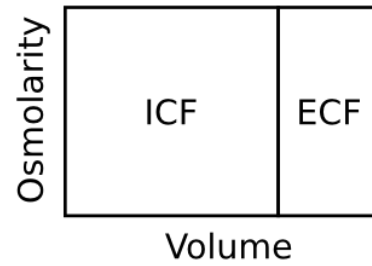
Na⁺ in the ECF **decrease**.

Osmolarity in both ECF & ICF **decreased**

ECF volume **decrease** & ICF volume **increase**.

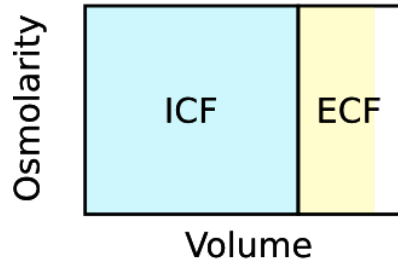
Adrenal is a gland that secretes Aldosterone, And it reabsorbs Na⁺ to bring it back to ECF. When insufficiency happened in adrenal gland. the amount of aldosterone will decrease & leads to a low amount of Na⁺ in ECF. According that water is moved from ECF to ICF.

Normal

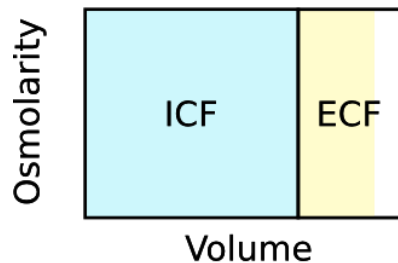


Secretory Diarrhea

Isoosmotic Volume-loss from ECF

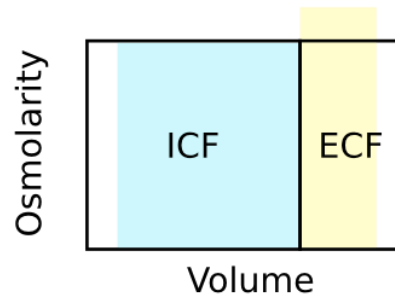


Water flow:
None

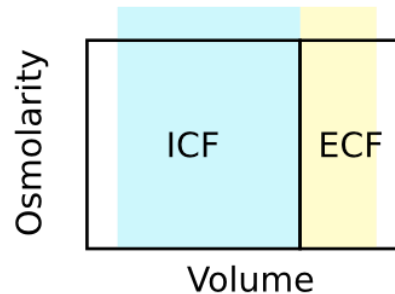


Diabetes Insipidus

Hyperosmotic Volume-loss from ECF

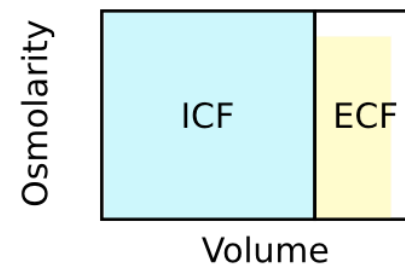


Water flow:
ICF → ECF

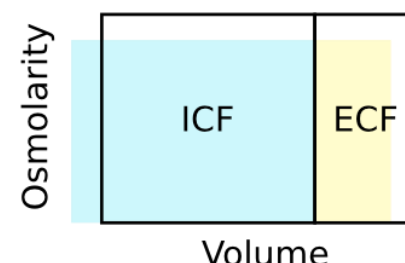


Adrenocortical Insufficiency

Hypoosmotic Volume-loss from ECF



Water flow:
ECF → ICF



Volume expanding
(adding)

increase in the ECF volume

Adding **Isotonic** solution.
e.g. infusion of isotonic NaCl

No change in osmolarity.
volume in ECF **increase**.
Isomotic expansion.

Happened only if adding an osmotic NaCl fluid that does not effect on the osmolarity of ECF. The volume will increase and ICF will remain the same.

Adding Hypotonic solution
e.g. syndrome of inappropriate anti diuretic hormone (SIADH)

Osmolarity in both ECF & ICF **decreased**
volume in both ECF & ICF **increase**.

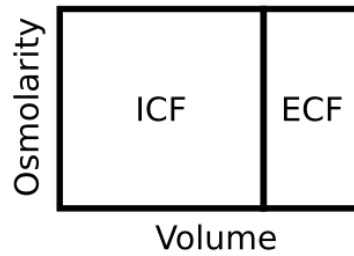
SIADH function is water reabsorption. If there is an excessive secretion of this hormone the water will go back to ECF. So, That will result in increasing of ECF volume and decreasing of osmolarity And ICF volume increase and osmolarity will decrease too.

Adding Hypertonic solution
e.g. high NaCl intake

Hyperosmotic volume expansion.
Osmolarity in both ECF & ICF **increase**.
ICF volume **decrease** & ECF volume **increase**.

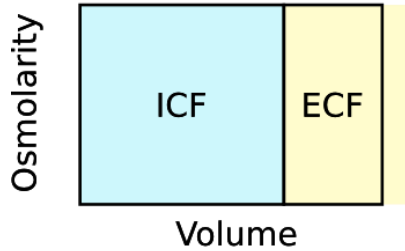
Increasing in osmolarity of ECF due to the High amount of NaCl. So, net movement of water will occur from ICF to ECF.

Normal

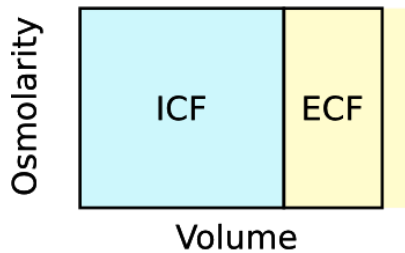


Isotonic Saline Infusion

Isoosmotic Volume-addition to ECF

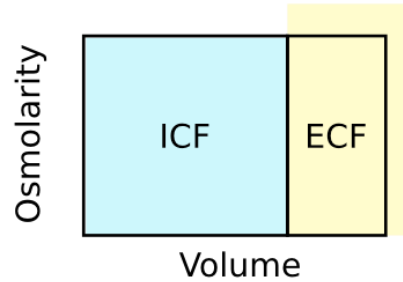


Water flow:
None

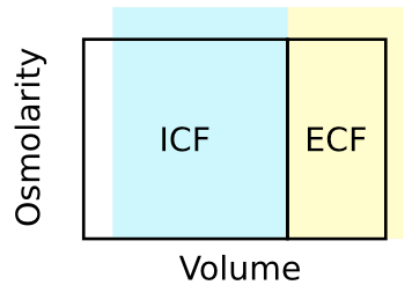


Hypertonic Saline Infusion

Hyperosmotic Volume-addition to ECF

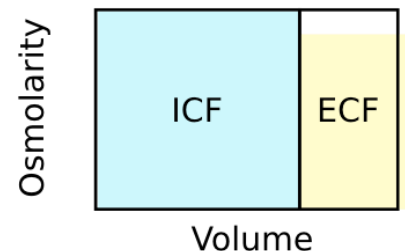


Water flow:
ICF → ECF

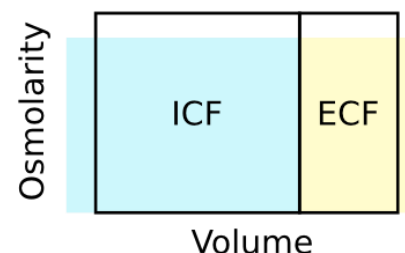


Glucose Infusion

Hyposmotic Volume-addition to ECF



Water flow:
ECF → ICF



1. If someone lost an isotonic solution during diarrhea
 - The body lost an isotonic solution that means the body lost 300 mOsm/L so the osmolality has been the same and didn't change but the volume of the fluids inside our body have decreased definitely.
2. During Dehydration

Decrease in ECF volume

Increase in ECF osmolality

Water move from ICF to ECF

Decrease in ICF Volume

Increase in ICF osmolality

Adding Hypotonic solution (syndrome of inappropriate anti diuretic hormone (SIADH)

Reabsorption of
water

Increase
volume of
ECF

Decrease
ECF
osmolality

Water
move from
ECF to ICF

Increase
ICF volume

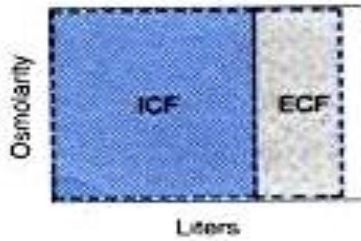
Decrease
ICF
osmolality

NORMAL STATE

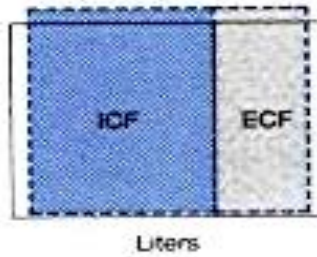


VOLUME CONTRACTION

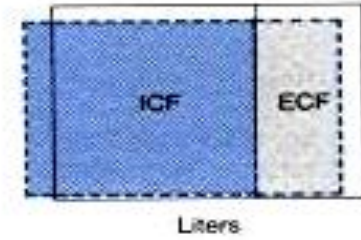
Diarrhea



Water deprivation

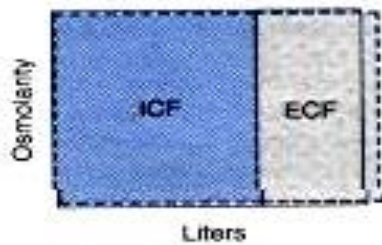


Adrenal insufficiency

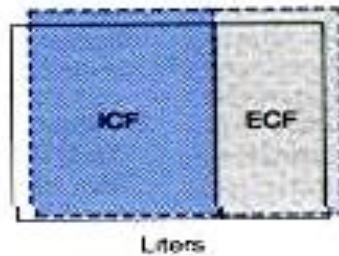


VOLUME EXPANSION

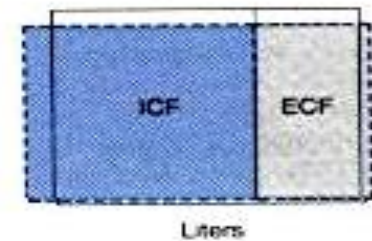
Infusion of isotonic NaCl



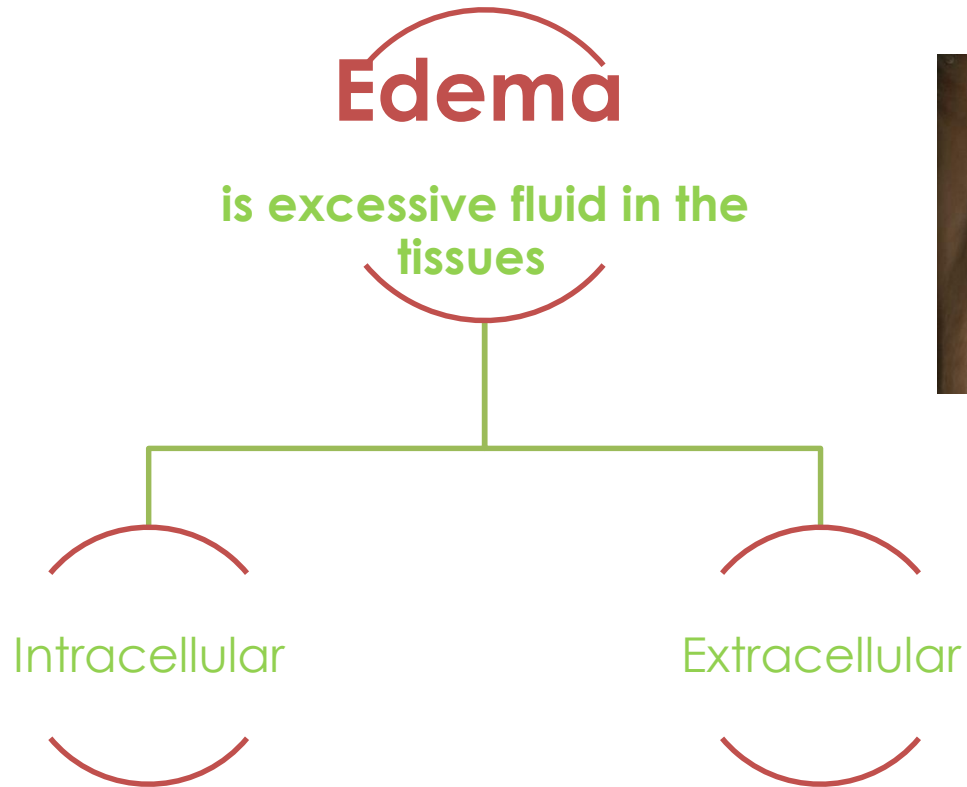
High NaCl intake



SIADH

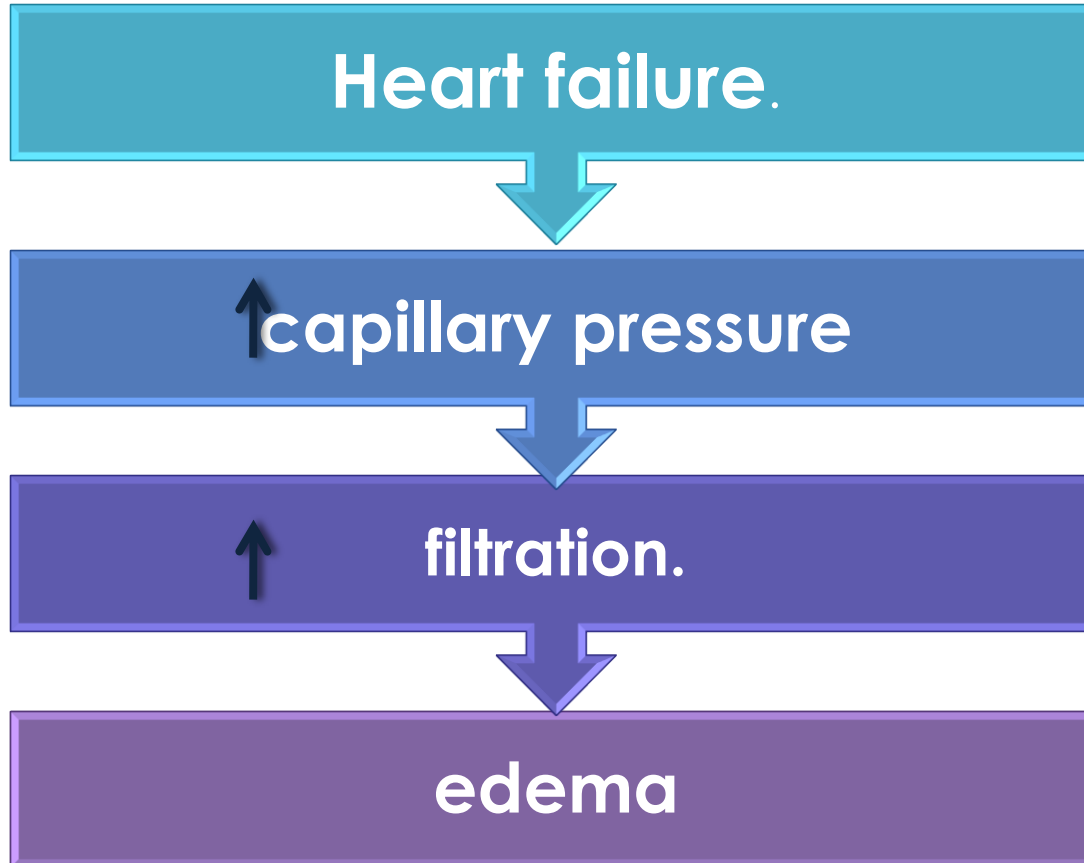


		ECF		ICF	
		Volume	osmolarity	Volume	osmolarity
Volume contraction	Diarrhea	↓	-	-	-
	Dehydration (water deprivation)	↓	↑	↓	↑
	Adrenal insufficiency	↓	↓	↑	↓
Volume expanding	infusion of isotonic NaCl	↑	-	-	-
	SIADH	↑	↓	↑	↓
	high NaCl intake	↑	↑	↓	↑



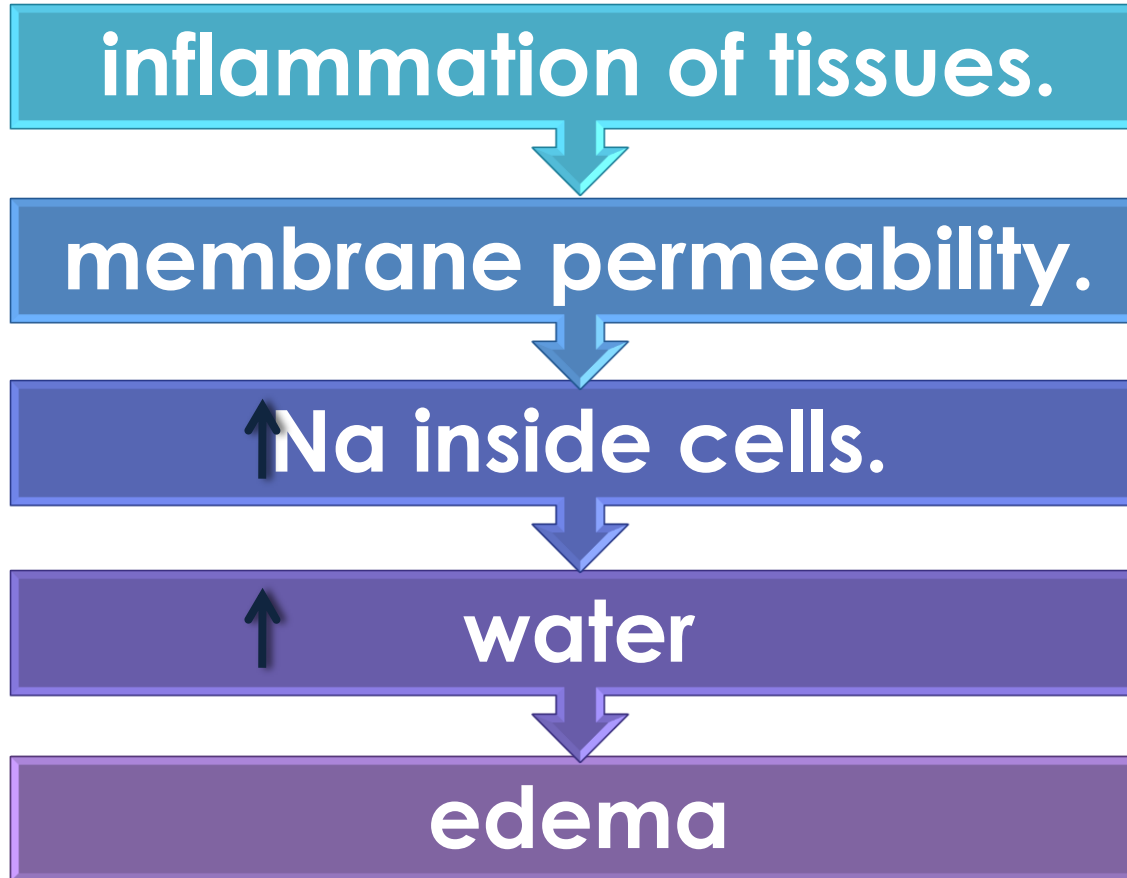
- Edema occurs mainly in the ECF compartment.
- common clinical cause is excessive capillary fluid filtration.

Extracellular Edema





Intracellular Edema:



Inflammation of tissues caused imbalance in cell membrane. So, when Na molecules enter the cell. Water molecules will across too.



Some Videos, websites



- 1) <http://bk.psu.edu/clt/bisc4/ipweb/systems/systems/fluids/index.html> (very helpful to understand edema)
- 2) <http://www.youtube.com/watch?v=XZxuQo3yIII>
(**Homeostasis in the Human Body**) (Homeostasis 1)
- 3) <http://www.pathwaymedicine.org/body-fluid-shifts>
- 4) <http://www.youtube.com/watch?v=xN-IIIhPKjs>
(**edema**)



Check your understanding!



Q1: increase in the ECF volume takes place in?

- A- Volume expansion
- B- Edema
- C- Volume contraction
- D- Dehydration

Q2: Which of these is an example of volume expansion ?

- A- Adrenal insufficiency
- B- Diarrhea
- C- SIADH
- D- Water deprivation



Check your understanding!



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Q3: Which of the following statement is true?

- A- Edema occurs mainly in ECF compartments
- B- Edema occurs mainly in ICF compartments
- C- Hyperosmotic fluid contains small NaCl
- D- Hyperosmotic fluid contains large Water

Q4: Infusion of isotonic NaCl causes?

- A- Increase in ICF osmolarity
- B- Increase in ECF osmolarity
- C- Increase in ICF volume
- D- Increase in ECF volume

Done by :

Reema Alnasser,
Rawan Ghandour,
Nouf Alharbi,
Asmaa Alrusis,
Razan Alsubhi

- Some note by: moath aleisa

ANSWERS			
Q1	Q2	Q3	Q4
A	C	A	D