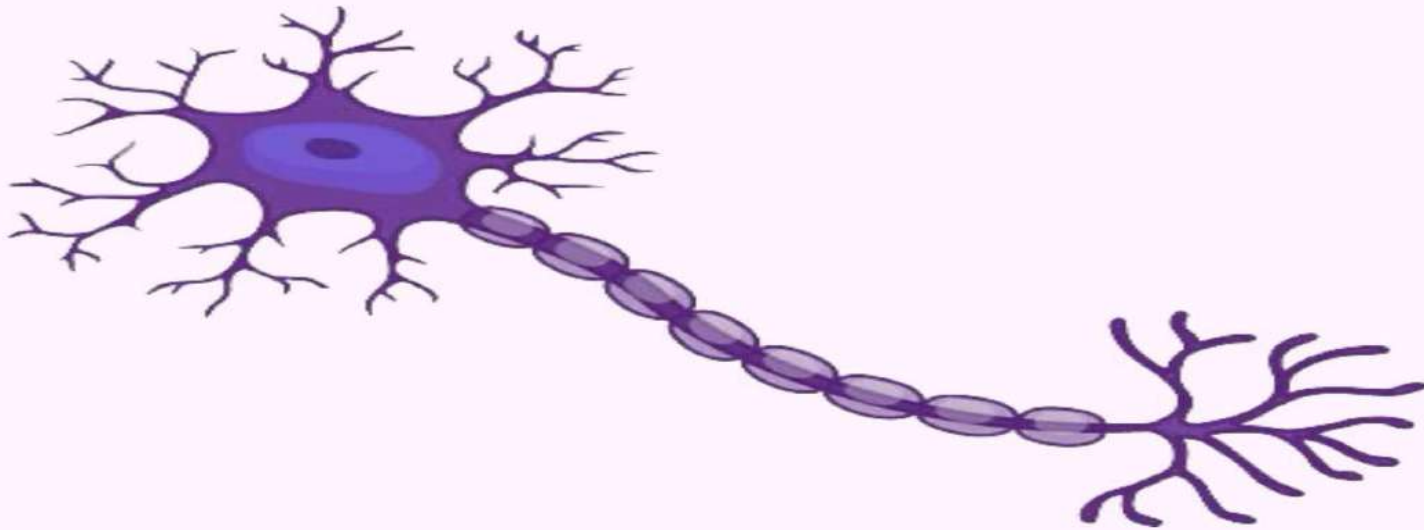




PHYSIOLOGY



LEC NO. : 4 , part 7
DONE BY : Nouf Al-amaush

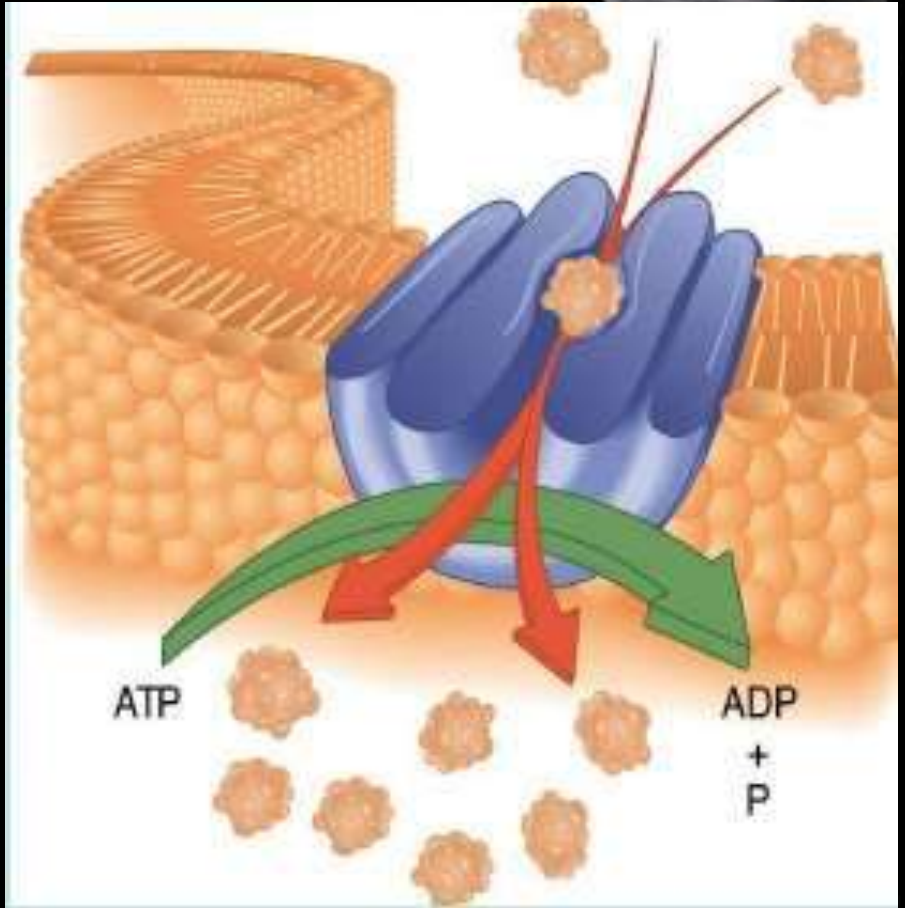
وَقُلْ رَبِّ زِدْنِي عِلْمًا

→ All the cells in the body without exceptions, they must have active transport system.

Active transport

→ we need to supply energy to drive the carrier from low con to high con.

- Transport of ions or molecules **against** their concentration gradient. *low concentration → high concentration*
- It is **carrier-mediated** (needs carrier). *كناح كناقد*
- Uses energy.
- Examples: transport of; **Na⁺, K⁺, Ca⁺⁺, H⁺, Cl⁻, I⁻ Glucose, amino acids.** *all of them can't move passively.*



The carrier is specific for the substance
 في هذا الناقل carrier للذاتة فارج يقدر يقبل Na⁺ و كذا.

← طرب سبي الهدف من دود Na⁺/K⁺ pump
 سيطرة عشان أمانك على negative resting membrane potential.

Sodium/Potassium Pump

Transport maximum \rightarrow \leftarrow

(primary)
ATP directly

های العصبی نه عبارت عن

****Are proteins which can transport Na^+ and K^+ from low conc to high conc area, it needs ATP. Transport reaches maximum when all transporters are being used (saturated). Very specific..!**

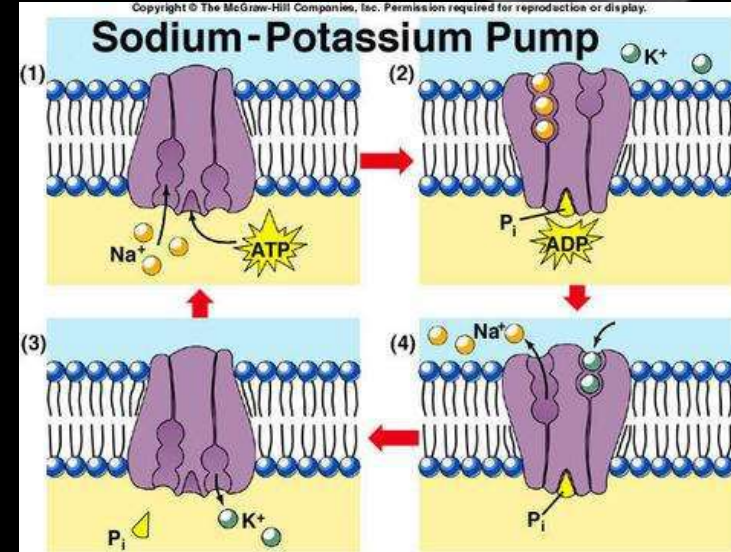
inside negative \rightarrow بوتاسیوم عشان کانظطع

3 Na^+ ions are removed from the cell as 2 K^+ ions brought into cell, with 1 ATP molecule is used. (it is electrogenic pump).

Na/K pump uses large amount of ATP produced by the cell (cells lining renal tubules use 90% of ATP for this pump).

\rightarrow factors are responsible for generation of the resting membrane potential.

- ① 3 Na^+ out and 2 K^+ in the cell (different ionic distribution)
- ② The selective impermeability of ions
- ③ The Na^+/K^+ pump.
- ④ The presence of large quantity of proteins (Amino acid are charged and they contribute)



renal tubules \rightarrow material are filtered
90% of them are reabsorbed
 \rightarrow لو خواته باک urine خلال ساعاته قلیله
یعنی الإنسان بسبب الجفاف
had a filtration بحیوید proximal convoluted tubule
ولماد السبب جداره یکنن جذا متحرک و غنی بالطاقة و الیونکات

-Importance of Na⁺ /K⁺ pump

1. Responsible for creating and maintaining the high K⁺ and low Na⁺ in the cytoplasm. These concentrations make cell resting membrane potential and generation of action potential possible. *Stimulation* *بمحفز* *ما ز قدّر لخالها*

2. The low Na⁺ conc. inside the cell provides the energy needed for secondary active transport (discussed later). *المحاذرة* *التحذير*

3. Prevents cell swelling “i.e. keeps cell volume constant”. *حافظ على* *مع الكلية و يمنعها من الانفجار*
→ maintaining the osmolality *انتفاخ*



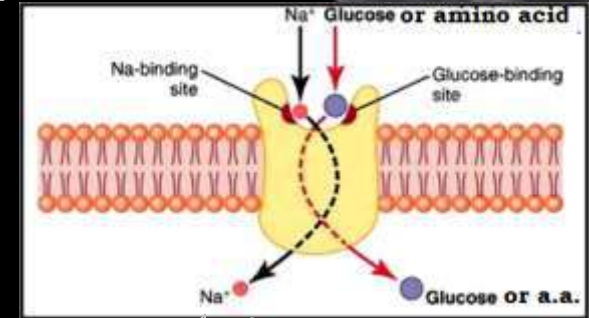
Secondary active co-transport

ما يحتاج ATP ما حركه
و إنما لأنها نقل اسفل
تاني

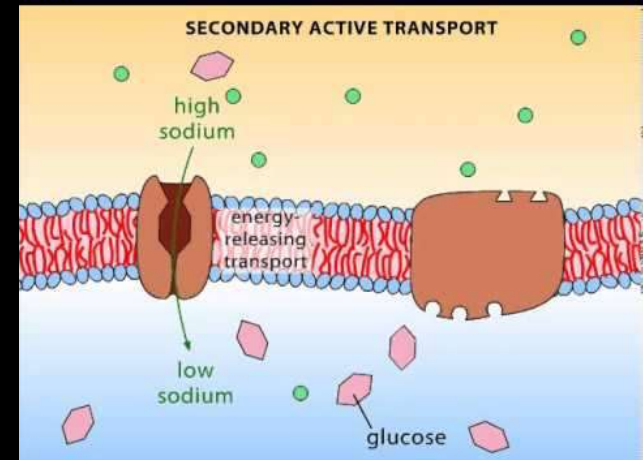
مع الخلو كز في عننا Na^+ ولازم الين مسوا

□ Na Co-transport of glucose or amino acid:

- Sometimes called symport.
- Both Na^+ and Glucose (or amino acid) have to be present.
- The energy available from Na^+ gradient is used as an energy source.
- Found in the epithelial cells of the intestine.



Transport of $Glucose$



The driver force for the carrier to go from high concentration of glucose to be absorbed into the cell is remained by the large gradient of sodium between inside and outside.

طيب atp استخدمتها؟

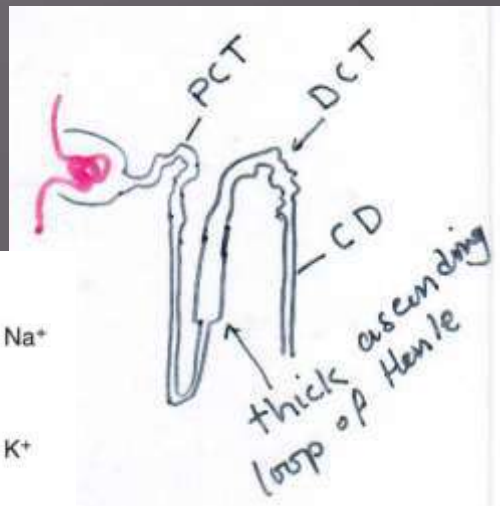
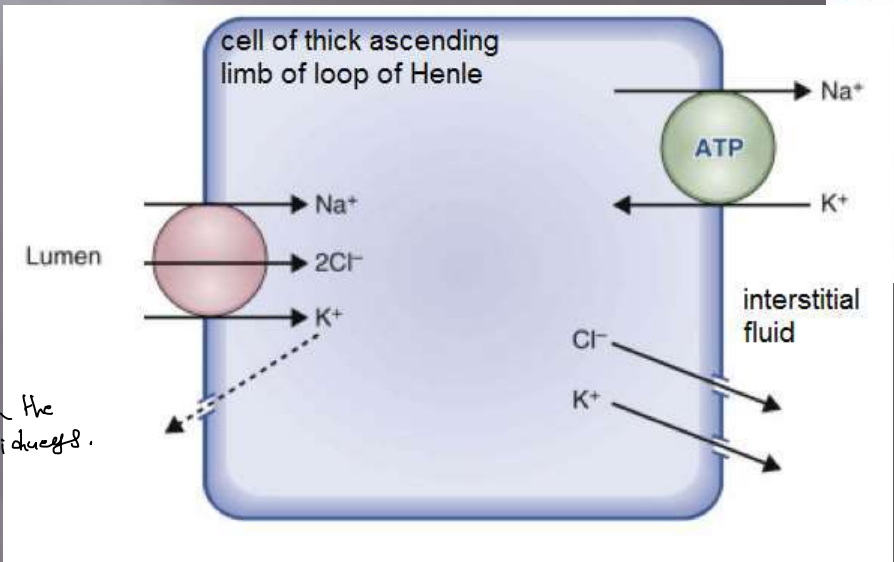
مش انا بدي high concentration gradient of Na برا و قليل جوا؟ عن طريق ضخ الصوديوم من برا الجوا الخلية و هاد

In the nephrons, we can't allow all the substances filter to exit to the urine, 90% are reabsorbed, in the wall of the nephrons we have co-transport system and active transport system

**** A co-transporter can carry more than 2 ions. For example, a co-transporter in cells of the ascending loop of Henle can carry 1 Na+, 2 Cl- and 1 K+.**

→ in the kidneys.

→ The carrier won't move unless the three ions are attached to the carrier.



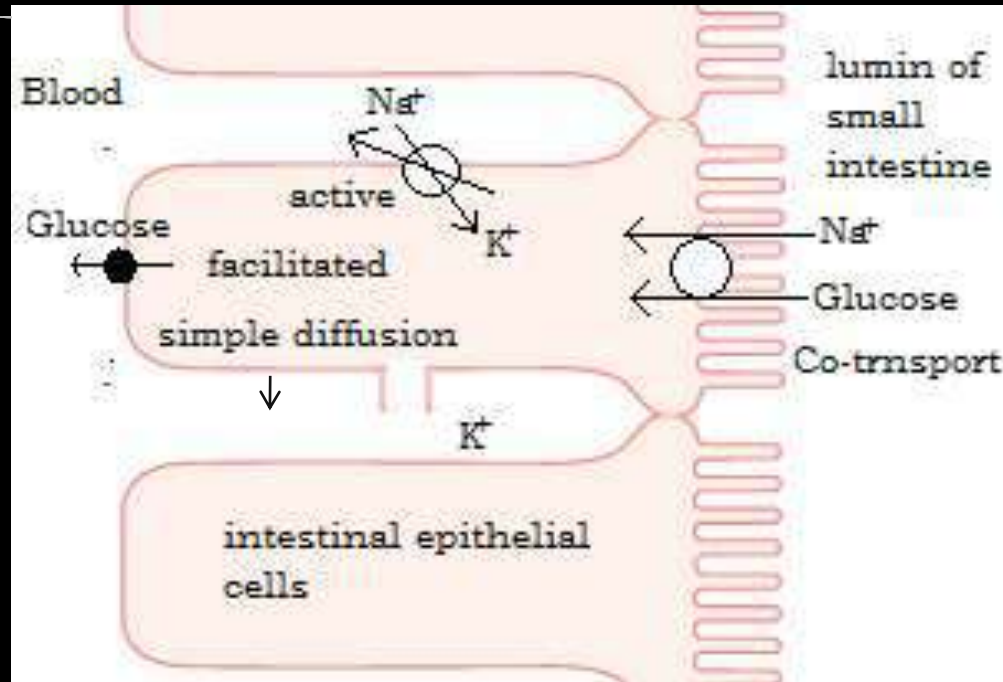
Comparison of simple diffusion, facilitated diffusion and active transport

Active transport	Facilitated diffusion	Simple diffusion	Property
yes	Yes	No	Requires special membrane protein
yes	yes	No	Highly selective
yes	yes	no	Transport saturation
yes	yes	no	Hormonal regulation
yes	no	no	Uphill transport “against concentration gradient”
yes	no	no	Requires ATP energy

Absorption of Glucose from small intestine needs all types of transportation

بہتر طرح تحریک ہر ترقیہ امتصاصہ الخلوک

→ we have different carriers of glucose and amino acids, but all of them has the same mechanism.



→ لیسی الخلوکوز یظہر عینے
Urine عند مرضیہ السکرے ؟

بسبب maximum transport
لأنه یحسب عینہ saturation
واللی ما یربطہ carrier ف
یح یطلع لك urine .

• Glucose transporters:

1- Sodium-Glucose transporter (SGLT) → found in the small intestine and renal tubules.

2- Facilitated diffusion glucose transporter (GLUT)

a. GLUT 1 Found in RBCs.

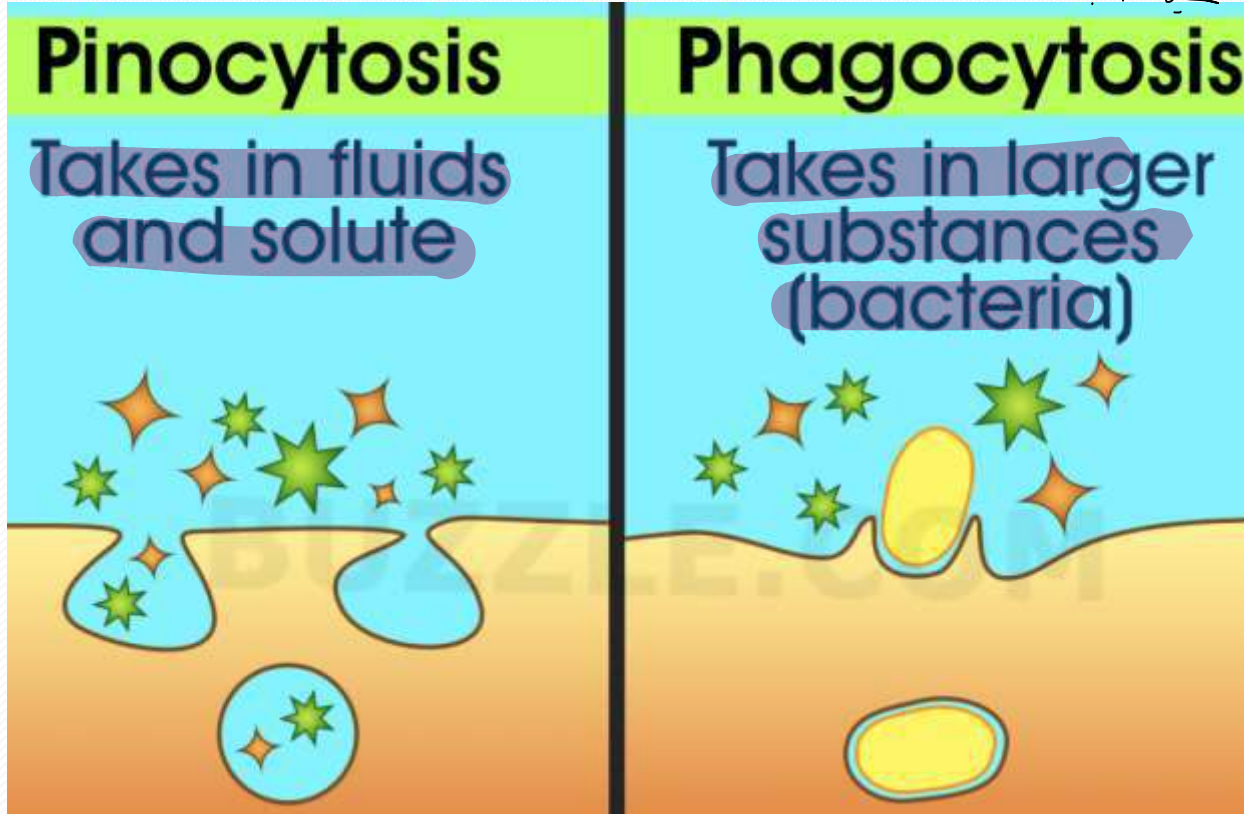
b. GLUT 2 : transports glucose of intestinal cells.

c. GLUT 4 found in muscle and adipose tissue << **insulin stimulates this type of transporters.**

أصله های وظیفه



As a principal it is similar
but you take in ions and



In the normal process of GI system, all substances must be broken down such as carbohydrates and proteins, but by phagocytosis large molecules can be taken into the cell.

Main transport system for immunoglobulins in infants since their immunity system is suppressed when born

As adults we can't absorb larger molecular weight compounds like aminoglobulin, but infants can because they rely on their mothers in immunity by phagocytosis.

Phagocytosis

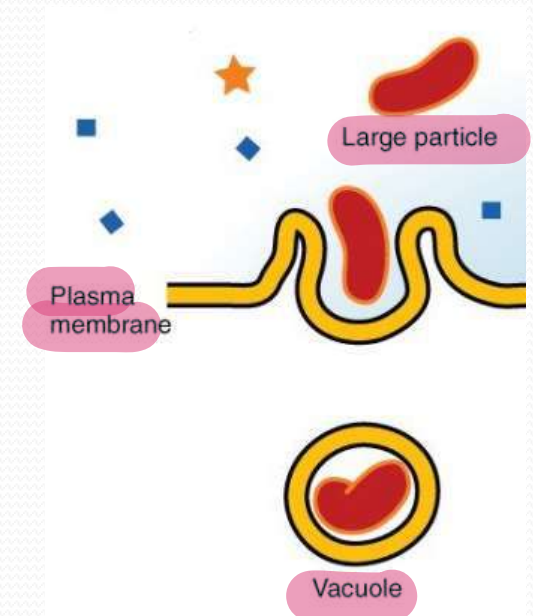
Phagocytosis involves large particles (bacteria, dead cells, or tissue debris) rather than molecules.

Tissue macrophages and some white blood cells have this ability *not all the cells have this ability*

Bacterium is usually already attached to a specific antibody

Antibody attached to bacteria binds to the phagocyte receptors *in the membrane of the cell.*

The point of attachment *ينحني إلى الداخل* invaginates inward forming vesicle inside the cell that contains the engulfed surround the bacteria.





End of lecture