لجان الدفعات

PHYSIOLOGY

MORPHINE ACADEMY

PHYSIOLOGY

FACULTY OF PHARMACEUTICAL SCIENCES
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LECTURE 1, PART (2): CELLULAR LEVEL OF ORGANIZATION

Objectives

* رح نحكي عن أجزاء الخلية ووظيفة كل وحدة

1. Discuss **cellular level of organization. (Continue in the next lecture)**
2. Describe **transport processes of solutes and water (Next lecture)**.

(Pages 60-84 of the reference)

THE CELLULAR LEVEL OF ORGANIZATION

- ***The cell*** **divides into three main parts: plasma membrane, cytoplasm, and nucleus.**

- The **plasma membrane:**

1. is the cell's flexible outer surface, separating the cell's internal environment from the external environment.

2. It plays a key role in communication among cells and between cells and their external environment.

THE CELLULAR LEVEL OF ORGANIZATION

- The **cytoplasm:** يتكون من → 1 cytosol (الجزء الـ fluid) ; 2 organelles

1. Consists of all the cellular contents between the plasma membrane and the nucleus.

2. It has two components: cytosol (intracellular fluid that contains water, dissolved solutes, and suspended particle) and organelles (include the cytoskeleton, ribosomes, endoplasmic reticulum, Golgi complex, lysosomes, peroxisomes, and mitochondria).

داخل الخلية

الحجم وظيفة معينة structures

THE CELLULAR LEVEL OF ORGANIZATION

- The **nucleus**:

1. The control center of the cell.

2. Contains DNA or the genetic material that dictates what the cell will do, controlling cellular structure and function.

* كل أجزاء الجسد الظاهرة وبعض الأمراض جاي من DNA اللي هو موجود بال nucleus

THE PLASMA MEMBRANE

- The basic structural framework of the plasma membrane is the **lipid bilayer** (**lipid molecules—phospholipids (75%), cholesterol (20%), and glycolipids (5%)**).

- The lipids are amphipathic molecules (polar heads and nonpolar tails).

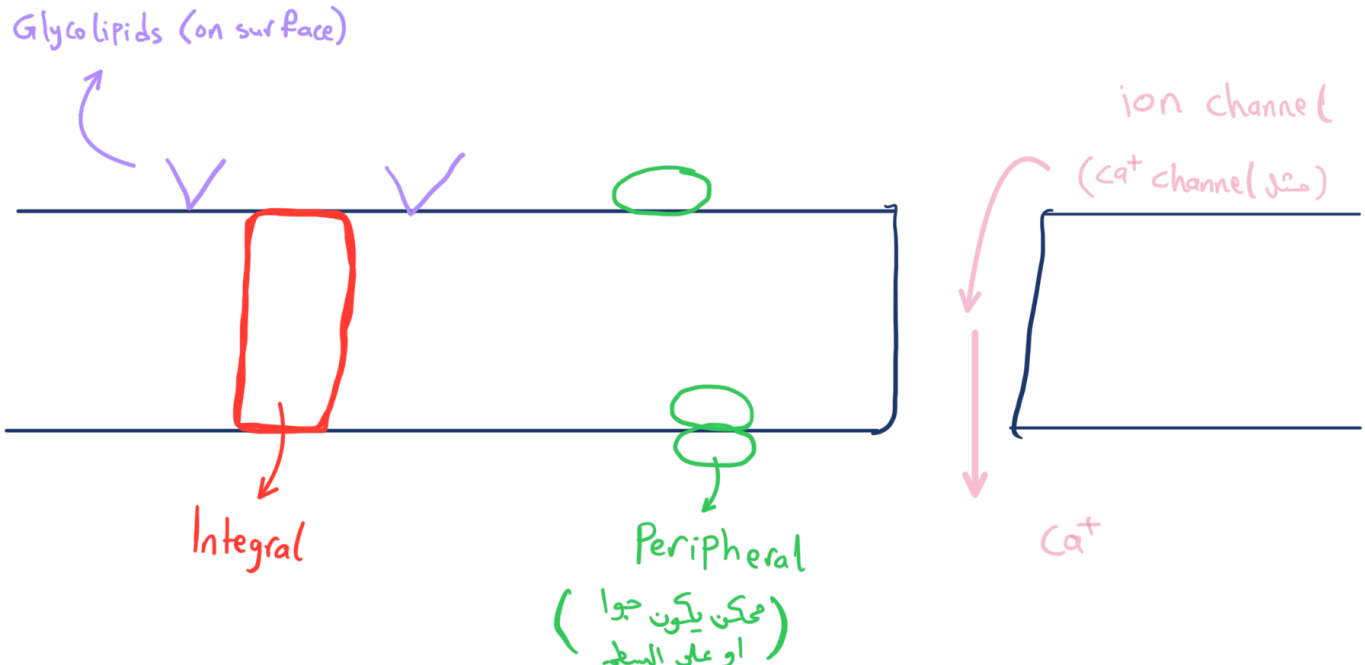
- Glycolipids appear only in the membrane layer that faces the extracellular fluid, which is one reason the two sides of the bilayer are asymmetric.

THE PLASMA MEMBRANE

- **Membrane proteins are classified as integral or peripheral according to whether they are firmly embedded in the membrane.**

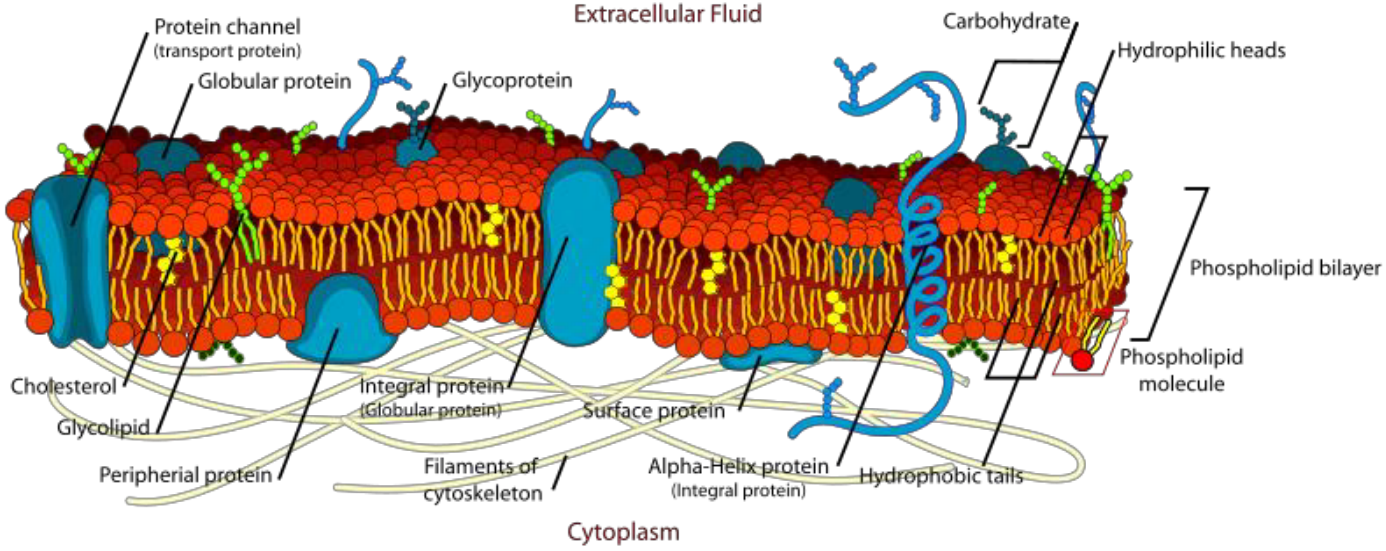
1. **Most integral proteins** are transmembrane proteins (span the entire lipid bilayer and protrude into both the cytosol and extracellular fluid).
2. **Peripheral proteins** are attached to the polar heads of membrane lipids or to integral proteins at the inner or outer surface of the membrane.

Extracellular



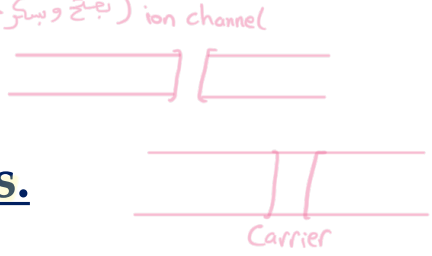
Intracellular

THE PLASMA MEMBRANE



Integral proteins (their functions are important!):

وظائفه ؛

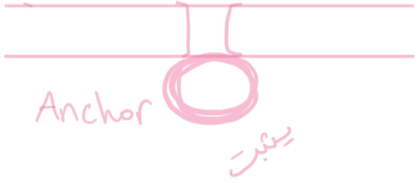


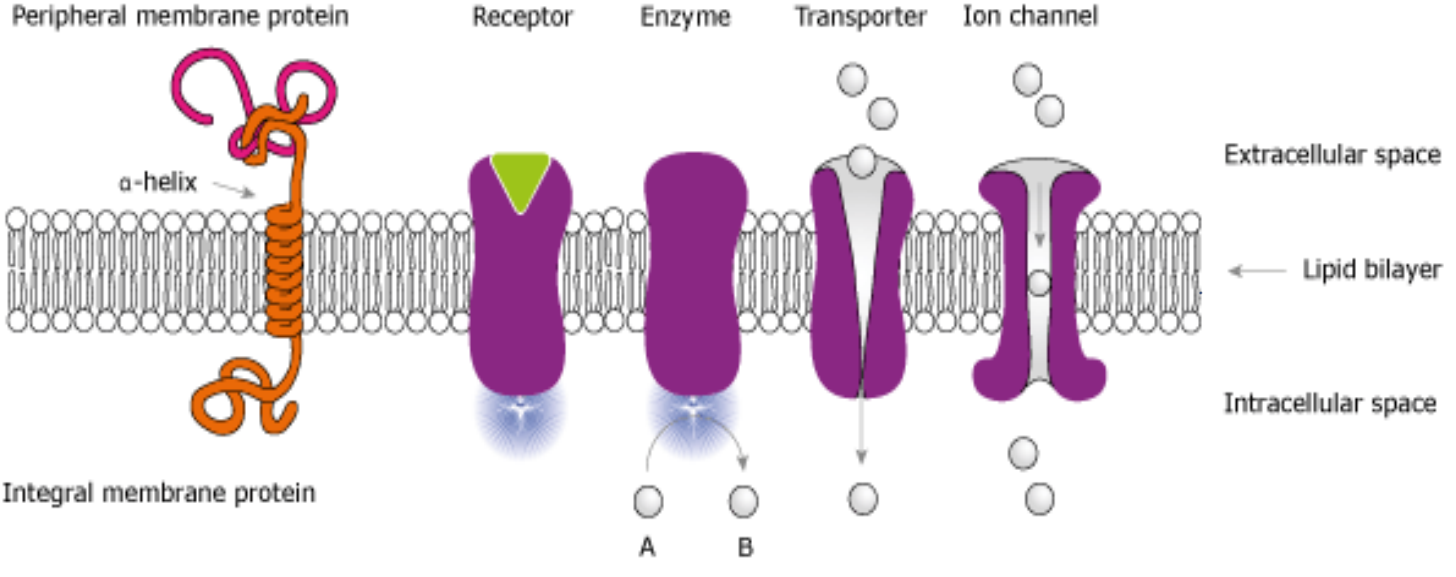
1. Forming **ion channels.**
2. Acting as **carriers or transporters.**
3. Are called **receptors**. (ممكن تكون لـ Hormones, enzymes, بروتينات معينة, أدوية [حسب نوعية الخلية])
4. Are **enzymes.**
5. Serving as **linkers.** (رابطة (ترتبط خلية مع خلية))
6. Serving as **cell identity markers.** (هوية الخلية (نقدر نميّز نوعية خلية معيّنة))

Peripheral proteins (their functions are important!):

1. Serve as **enzymes and linkers**.
2. **Support the plasma membrane**. دعم
3. **Anchor integral proteins**. يثبت
4. **Participate in mechanical activities**:

- Moving materials and organelles within cells. نقل materials و organells جوّا الخلية
- Attaching cells to one another. تربط خلية مع خلية




Peripheral membrane protein
Receptor
Enzyme
Transporter
Ion channel
α-helix
Extracellular space
Lipid bilayer
Intracellular space
Integral membrane protein
A
B

Membrane fluidity:

- Membranes are fluid structures.

Cell membrane is mainly lipids

- Most of the membrane lipids as well as many membrane proteins easily rotate and move sideways in their own half of the bilayer.

يعني ممكن Integral protien يقلب أو يدور جوا Cell membrane

Glyco lipids زي ← محب للماء

- However, it is difficult for hydrophilic parts of membrane molecules to pass through the hydrophobic core of the membrane. This difficulty contributes to the asymmetry of the membrane bilayer.

كاره للماء

لأنه بصير في زي تنافر بين hydrophilic و hydrophobic

Membrane permeability:

لازم تكون ذ ائبيته بالدهون عالية عشان يمرق

- The permeability of the plasma membrane to different substances varies.

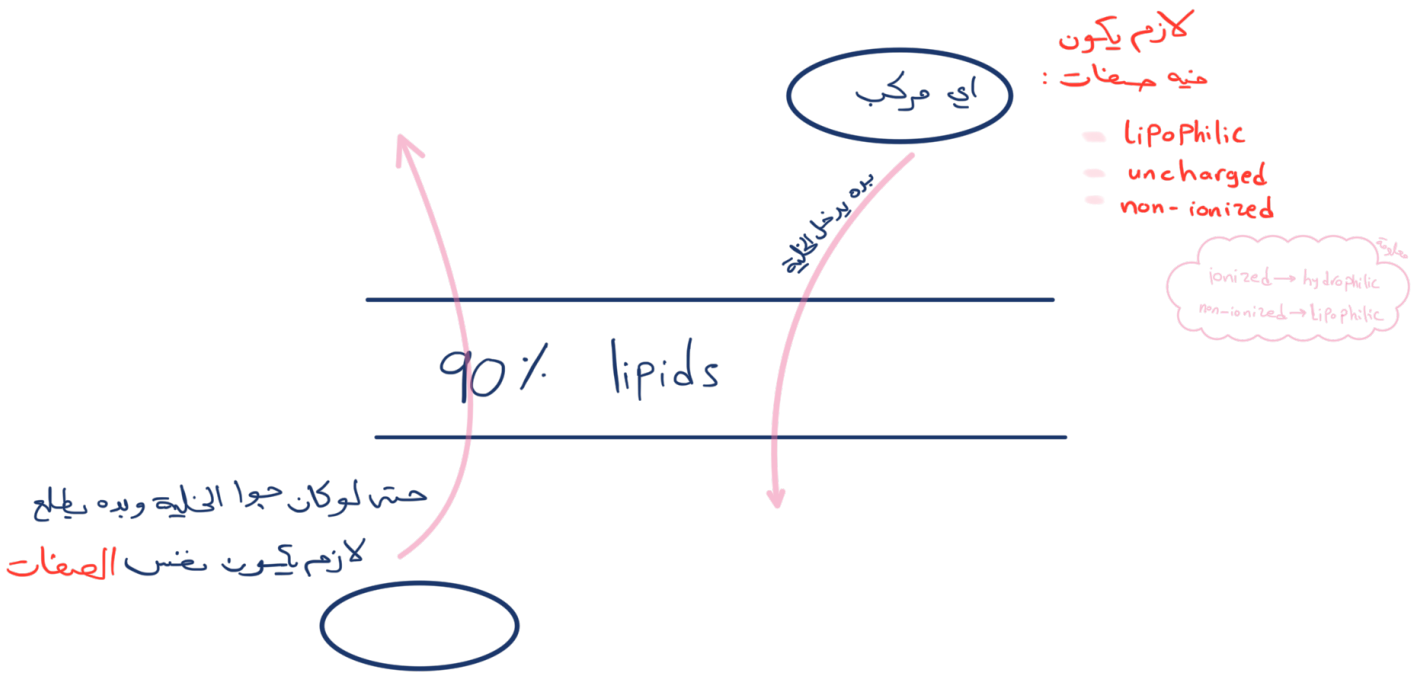
- **The hydrophobic interior of the plasma membrane allows nonpolar molecules** to rapidly pass through, but prevents passage of ions and large, uncharged polar molecules.

- Because **water and urea** are small polar molecules that have no overall charge, they can **move from one gap** (small gaps appear in the hydrophobic environment of the membrane's interior) to another until they have crossed the membrane without any assistance.

بدخل إللي بده ياه و بمنع دخول إللي ما بده ياه هيك (selective)

- **Transmembrane proteins that act as channels and carriers** (very selective) increase the plasma membrane's permeability to a variety of **ions and uncharged polar molecules** (need assistance).

مثلاً Ca^{+2} مستحيل يدخل بدون قنوات (لوكانت للخلية مش حاجة كالسيوم رفضل برا الخلية) بس لما تصير الخلية محاجه اله بتفتح القناة وبدخل


لازم يكون
منيه صفات :
lipophilic
uncharged
non-ionized
اي مركب
بيوه يوخل الخلية
90% lipids
ionized → hydrophilic
non-ionized → lipophilic
حتى لوكان جوا الخلية وبده يطلع
لازم يكون نفس الصفات

THE CYTOPLASM

Cytosol organelles

- **Cytoplasm** consists of all the cellular contents between the plasma membrane and the nucleus.

- It has two components:
- **(1) the cytosol,** is the fluid portion of the cytoplasm that surrounds organelles.
- **(2) organelles,** are tiny structures that perform different functions in the cell.

هو الجزء السائل

يكون حول العضيات

المهم وظائف معينة

THE CYTOPLASM

- **Cytosol:**

1. Contains **75–90% water** plus various dissolved and suspended components (i.e. glucose, amino acids, fatty acids, proteins, lipids, ATP, and waste products).

1. It is **the site of many chemical reactions** required for a cell's existence (i.e. glycolysis, maintenance of cell structures and for cell growth).

* Cytosol منه ATP لأنه يحتاج طاقة عشان يعمل chemical reactions

THE CYTOPLASM

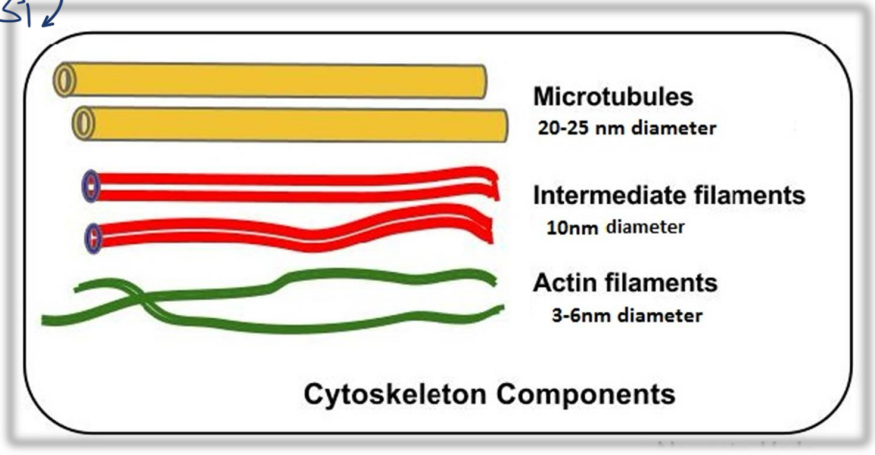
Organells 8

كل خلية فيها Skeleton يسمى Cytoskeleton

- The **cytoskeleton** is a network of protein filaments that extends throughout the cytosol (**microfilaments, intermediate filaments, and microtubules**).

1 2 3

أكبر حجم فيهم



filaments → خيوط أو شعيرات

THE CYTOPLASM

- **Microfilaments:**

1. Are the thinnest elements of the cytoskeleton.
2. They are composed of the proteins actin and myosin.
3. They have two general functions: help generate movement (muscle contraction, cell division, and cell locomotion) and provide mechanical support (basic strength and shapes of cells).

- **Intermediate filaments:**

1. Are thicker than microfilaments but thinner than microtubules.
2. They are found in parts of cells subject to mechanical stress.
3. They help stabilize the position of organelles such as the nucleus and help attach cells to one another.

THE CYTOPLASM

- **Microtubules:**

1. Are the largest of the cytoskeletal components.
2. They are composed mainly of the protein tubulin.
3. They help determine cell shape. بشكل شكل الخلية
4. They also function in the movement of organelles.

ممكن يكون الها دور في حركة ال organelles بالخلية

THANK YOU

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