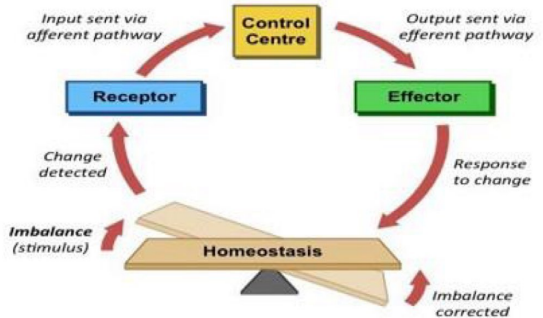
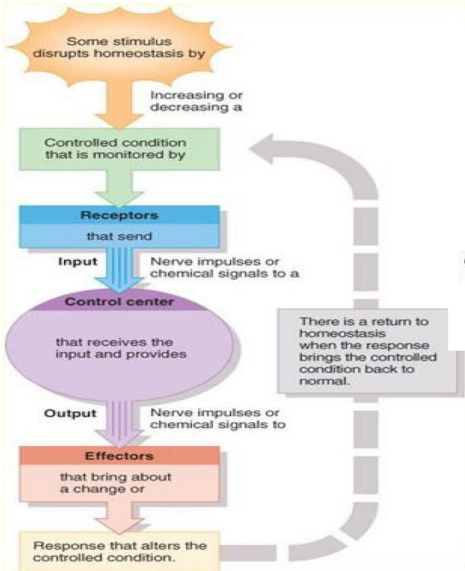
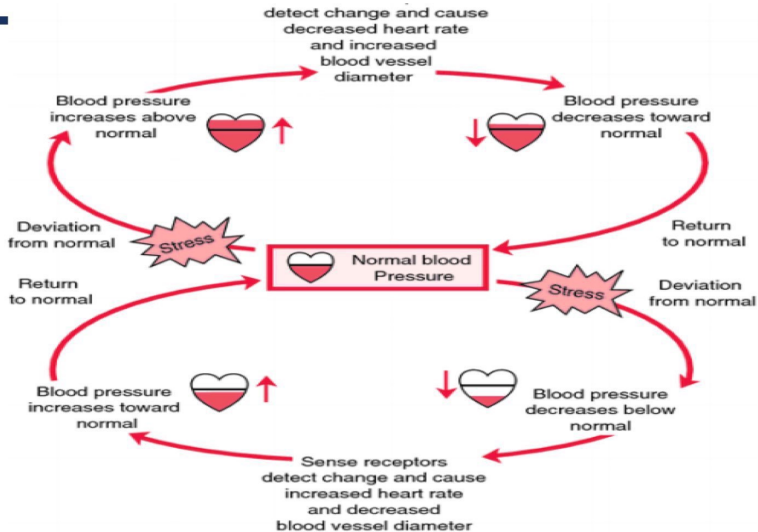




Group of receptors and effectors communicating with their control center forms a feedback system

-
- The feedback systems can be positive or negative feedback systems.
 - A negative feedback system reverses the change in a controlled condition.
 - Unlike a negative feedback system, a positive feedback system tends to strengthen or reinforce a change in one of the body's controlled conditions.
 - If the action of a positive feedback system is continued, it may produce life-threatening conditions in the body.
 - Unlike a positive feedback system, the action of a negative feedback system slows and then stops because the controlled condition returns to its normal state.



HOMEOSTATIC IMBALANCES

- Lifelong good health is not something that happens effortlessly.
- **Homeostasis can be affected by many factors which include,**
 - The environment and your own behavior.
 - Your genetic makeup.
 - The air you breathe, the food you eat, and even the thoughts you think.

HOMEOSTATIC IMBALANCES

- **Disease is a more specific term for an illness that is characterized by a recognizable set of signs and symptoms.**
- Local disease affects a specific region of the body.
- Systemic disease affects either the entire body or several parts of it.
- Subjective changes in body functions (**symptoms**) that are not apparent to an observer (i.e. headache, nausea, and anxiety).
- Objective changes that a clinician can observe and measure are called **signs**.

➡ مهم نعرف الاربع عناصر الي بترجع حالة عدم التوازن إلى توازن
1.receptor 2. Control center 3. Effector 4. Response

~ مثال : ارتفع ضغط شخص بسبب التوتر (stimulus) تقوم
المستقبلات الحسية باعطاء إشارات على شكل معلومات (nerve impulses) لل (control center) الدماغ ، يقوم الدماغ بتحليل تلك الإشارات ويعطي أمر بتقليل الضغط لل effector القلب ، وعندما يرجع لوضعه الطبيعي تحدث هنا الاستجابة.

➡ عنا نوعين من ال feedback systems :

Negative: slow down ضغطه عالي وبده يعمل

Positive: reinforce شخص ضغطه منخفض وبده يعمل

يتوقف عندما يصل للوضع الطبيعي Negative feedback system
اما ال Positive لا يتوقف .

➡ من الامثلة ع Positive: انقباضات الولادة

➡ في جسم الإنسان عدد Negative أكثر من ال Positive

➡ هالأ ال Positive feedback systems لانها ما بتتوقف لما توصل للحد الطبيعي وتظل ترتفع فأنا بحاجة ال negative حتى يرجعه للوضع الطبيعي وهيك العملية بينهم صارت عملية تكافلية.

➡ آخر سلايد الفرق

Symptoms: يختلف من شخص لآخر ولا يمكن قياسه او
ملاحظته مثل الصداع والم البطن

Signs : يمكن قياسه او ملاحظته مثل كمية السكر في
الدم



PHYSIOLOGY
FACULTY OF PHARMACEUTICAL SCIENCES
DR. AMJAAD ZUHIER ALROSAN

LECTURE 2

Objectives

1. Discuss **cellular level of organization.**
2. Describe **transport processes of solutes and water.**

(Pages 60-84 of the reference)

THE CELLULAR LEVEL OF ORGANIZATION

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

اي خلية تتكون من ٣ مكونات أساسية:

- The plasma membrane:

(semi-permeable)

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:

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).

THE CELLULAR LEVEL OF ORGANIZATION

- The **nucleus**: cell functions and shape ((تعد مركز الخلية، وتتحكم بال
لأنها تحتوي DNA))

1. Is a large organelle that has most of a cell's DNA.
2. Inside the nucleus, each chromosome that is a single molecule of DNA associated with several proteins, contains thousands of hereditary units called genes that control cellular structure and function.
((ال Glycolipids يتكون من glucose + lipids))

THE PLASMA MEMBRANE

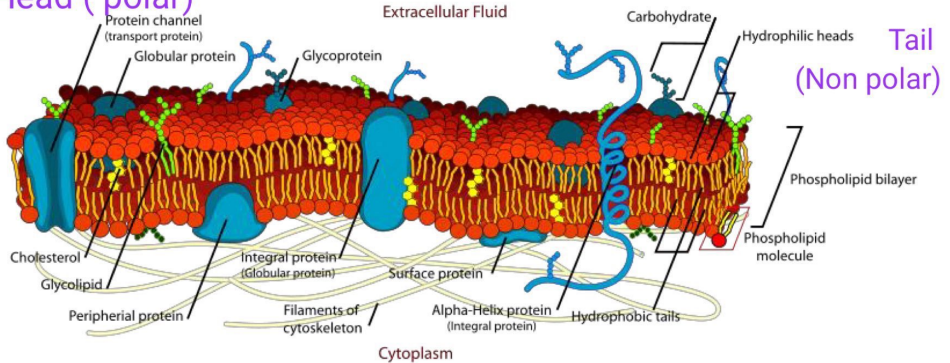
- The basic structural framework of the plasma membrane is the **lipid bilayer** (lipid molecules—phospholipids (75%), cholesterol (20%), and glycolipids (5%)).
((يحدد cholesterol الداعم للغشاء البلازمي وهو الذي يعطيه ال structur))
- The lipids are amphipathic molecules (polar and nonpolar parts).
- Glycolipids appear only in the membrane layer that faces the extracellular fluid, which is one reason the two sides of the bilayer are asymmetric.  مهم : بسبب وجود ال Glycolipids على أحد أطراف الغشاء يعتبر

THE PLASMA MEMBRANE

- Membrane proteins are classified as integral or peripheral according to whether they are firmly embedded in the membrane. تقوم البروتينات بنقل ال polar molecules كبيرة الحجم التي لا تستطيع الانتقال عبر ال gap junction الموجود في الغشاء .
- 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.

THE PLASMA MEMBRANE

Head (polar)



The membranes of different cells and various intracellular organelles have remarkably different assortments of proteins that determine many of the membrane's functions.

هلاً هون لو كان غي مادة polar بدھا تدخل الخلية

Integral proteins : حتدخل اولاً من head وبس توصل لل tail حتتوقف
فبدخلوا عن طريق ال gap junction إذا كان حجم الجزيئات بتناسب مع

حجم ومدى الفتحة إذا كانت حجمها كبير
هحتاج البروتينات الموجودة على الغشاء

1. Forming ion channels.

2. Acting as carriers or transporters.

3. Are called receptors.

4. Are enzymes.

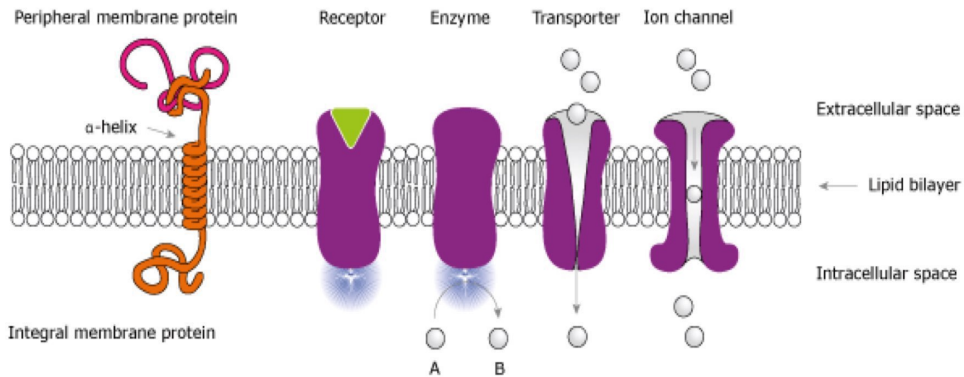
5. Serving as linkers.

6. Serving as cell identity markers.

في جهاز المناعة خلايا الدم البيضاء تميز الجسم
الغريب عن طريق ال markers

Peripheral proteins:

1. Serve as enzymes and linkers.
2. Support the plasma membrane.
3. Anchor integral proteins.
4. Participate in mechanical activities:
 - Moving materials and organelles within cells.
 - Attaching cells to one another.



Membrane fluidity:

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

Membrane permeability:

- 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.
- 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).

THE CYTOPLASM

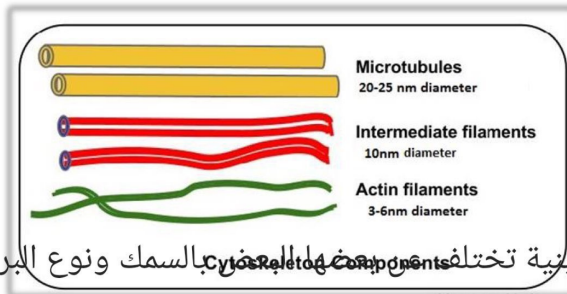
- Cytosol:

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).

وما عليك إلا حُسن السعي، ويسدّد الله لك ما يشاء. 💜

THE CYTOPLASM

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



Thickest

Thinnest

((خيوط بروتينية تختلف في السمك ونوع البروتين))

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).

تدعم الخلية عند تعرضها لأي حادث أو توتر خارجي

- 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.

- **Microtubules:**

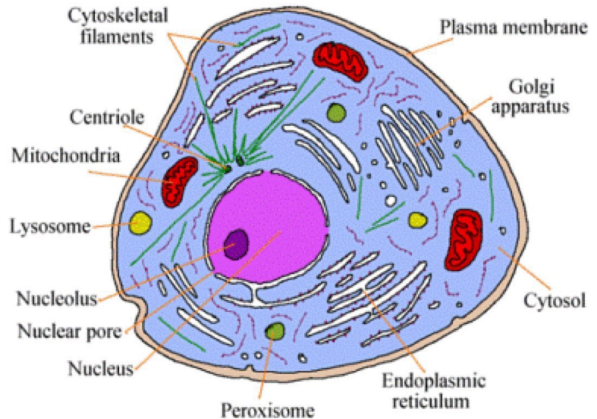
1. Are the largest of the cytoskeletal components.
2. They are composed mainly of the protein tubulin.
3. They help determine cell shape.
4. They also function in the movement of organelles.

كل من ال Microtubules و Microfolaments يساهم في انقسام الخلية .

THE ORGANELLES

Organelles are **specialized structures** within the cell that have characteristic shapes, and they perform specific functions in cellular growth, maintenance, and reproduction. They often cooperate to **maintain homeostasis**.

Organelles of the Cell

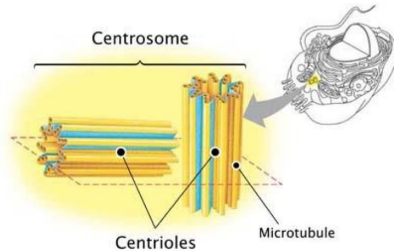


THE ORGANELLES

1. Centrosome.
2. Cilia and Flagella.
3. Ribosomes.
4. Endoplasmic Reticulum.
5. Golgi Complex.
6. Lysosomes.
7. Peroxisomes.
8. Proteasomes.
9. Mitochondria.
10. Nucleus.

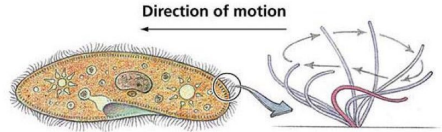
Centrosome

- Is located near the nucleus and it consists of two components: **a pair of centrioles and pericentriolar material**.
- **The centrioles** are cylindrical structures (microtubules). Surrounding the centrioles is pericentriolar material which contains the **tubulin complexes**.
- These complexes organize centers for growth of the mitotic spindle (cell division, and microtubule formation).



Cilia

- **Microtubules** are the dominant components of cilia and flagella.
- They are motile projections of the cell surface.
- **Basal body** is similar in structure to a centriole and functions in initiating the assembly of cilia and flagella.



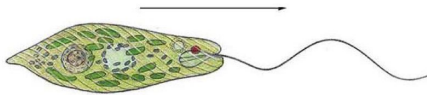
(b) Cilia

تتحرك بشكل دائري وبنفس الاتجاه



Flagella sperm موجوده فقط بال male في

تتحرك بطريقتين حسب نوع الخلية
الموجودة فيها



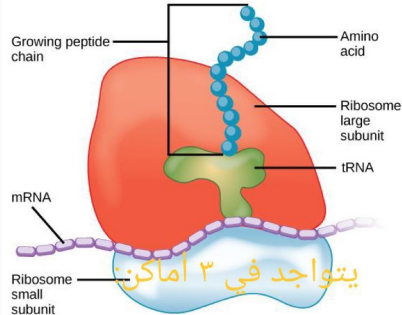
(a) Flagella

عدد cilia أكثر من عدد ال flagella
Direction of motion

- The coordinated movement of many cilia on the surface of a cell causes the steady movement of fluid along the cell's surface.
- Flagella are similar in structure to cilia but are typically much longer.
- Flagella usually move an entire cell.

النواة تصنع الرايبوسوم والرايبوسوم يصنع البروتينات . Ribosomes

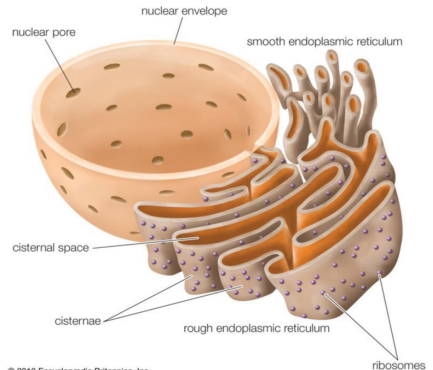
- Are the sites of protein synthesis.
- The name of these tiny structures reflects their high content of one type of ribonucleic acid (ribosomal RNA, or rRNA).
- Some ribosomes are attached to the outer surface of the nuclear membrane and to an endoplasmic reticulum. Ribosomes are also located within mitochondria. Other ribosomes are "free" or unattached to other cytoplasmic structures.



Endoplasmic Reticulum

- **The endoplasmic reticulum (ER)** is a network of membranes in the form of flattened sacs or tubules.
- The ER extends from the nuclear envelope (membrane around the nucleus), to which it is connected and projects throughout the cytoplasm.
- Cells contain two distinct forms of ER (**rough ER and smooth ER**), which differ in structure and function.

Endoplasmic reticulum



© 2010 Encyclopædia Britannica, Inc.

Endoplasmic Reticulum

- The outer surface of **rough ER** is studded with ribosomes. Proteins synthesized by ribosomes enter spaces within the ER for processing and sorting. Thus rough ER produces secretory proteins, membrane proteins, and many organellar proteins.
- Unlike rough ER, **smooth ER** does not have ribosomes on its membrane. However, smooth ER contains unique enzymes that make it functionally more diverse than rough ER (synthesizing fatty acids and steroids, such as estrogens and testosterone).
- In liver cells, enzymes of the **smooth ER** help release glucose into the bloodstream and inactivate or detoxify lipid-soluble drugs or potentially harmful substances, such as alcohol, pesticides, and carcinogens (cancer-causing agents). In addition, it stores and releases calcium ions that trigger contraction in muscle cells.

في عنا نوعين من الشبكة الاندوبلازمية rough + smooth
مهم جدا الفرق بينهم حيث يتم تصنيع البروتينات فقط بال rough
لأنها تحتوي على رايبوسوم اما smooth لا تحتوي .