

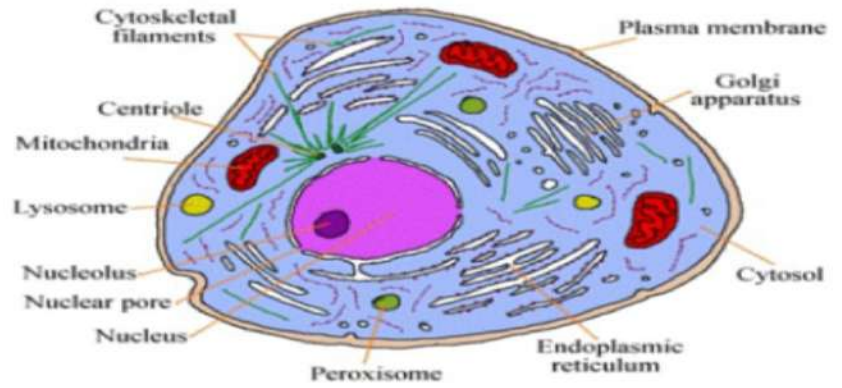
Physiology Revision:

- Upnormalities in Structures: Histology
- Upnormalities in Functions: Pathophysiology
- Components of the feedback system: سؤال أكيد بالامتحان
- Response comes as a comand
- Rash: Sign (can be seen)
- Bleeding: 1) External: sign (can be seen)
2) Internal: Symptom (can't be seen)
- ECF: contains plasma and interstitial fluid
- O₂ and nutrients exchange between the blood and the extracellular fluid throgh the interstitial fluid then by the plasma membrane to the intracellular fluid
- CO₂ goes through the plasma membrane to the extracellular fluid (interstitial fluid) from the other side if the cell, then goes back to the heart through the blood vessels.
- glucose catabolism: glycolysis of glucose and the main purpose of it is producing energy
- microtubules are found in the centrosome, they have a functioning during cell devision
- plasma membrane is lipid bilayer and it is amphipathic since it is consists of phospholipids that has polar heads and nonpolar tails.
- phosoholipids form 75% of the plasma membrane
- H₂O transportaion channels: aquaporins (it also acts as a glucose transporter)
- specific glucose transporters are called: glut1 / glut4
- Hyperpolar: gives a lot of ions
- what moves throgh each transportation type? (سؤال امتحان)
- Hypotonic / Hepertonic / Isotonic (سؤال امتحان)

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



١٩/١

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.

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حنشرح في هاد التفريغ عن ال organelles الموجودة في الخلية.

اول اشى بدنا نتذكر معلومة مهمة ..

حكينا كل cell تتكون من ٣ مكونات رئيسية :

1) plasma membrane

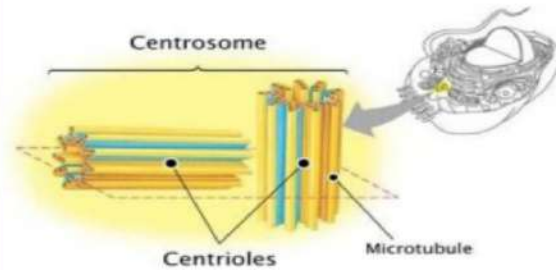
2) cytoplasm ويتكون cytosol + organelles

حكى الدكتوراه أهم اشى نعرف ال function

لكل organelles ...

Centrosome

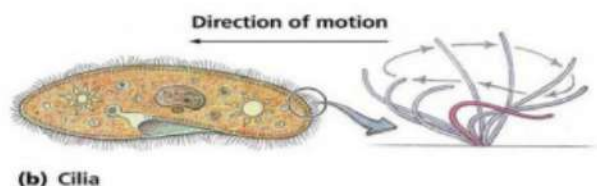
- Is located near the nucleus and it consists of two components: **a pair of centrioles and pericentriolar material**.
- The **centrioles** are cylindrical structures (microtubules). Surrounding the centrioles is pericentriolar material which contains the **tubulin complexes**.
- These complexes organize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



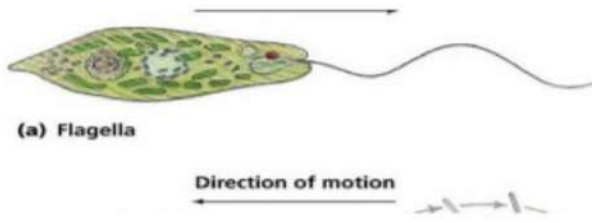
Centrosome : يقع بالقرب من النواة ويتكون من زوج من centrioles وهي هياكل أسطوانية محاطة بما يسمى بال pericentriolar material وهو يحتوي على (tubulin protein)
وظيفة هاد ال organelle هي تنظيم نمو الخيوط المغزلية الي بتعمل (cell division).

Cilia

- **Microtubules are the dominant components of cilia and flagella.** Both are motile projections. However, cilia is present throughout the surface of a cell, but flagella is present at both the ends or all over the surface.
- Hair-like structure.
- The main function of motile cilia is to keep the airways clear of mucus and dust.



Flagella



- Flagella are similar in structure to cilia but are typically much longer.
- Flagella usually move an entire cell (i.e. sperm).
- The motion of cilia is rotational, very fast moving. The motion of flagella is rotary movement in prokaryotes whereas it is bending movement in eukaryotes. Cilia beat in coordination or one after the other. Flagella beat independent of each other.

Cilia and flagella: هي أجزاء الحركة بالخلية
بكون موجود على سطح الخلية (Cilia)
موجود في نهايات الخلية او على كل (Flagella)
السطح

حكت الدكتور انه عنا نوعين من cilia حركية
وغير حركية ... Motile cilia وظيفتها تحافظ
على مخارج الهواء من الغبار والمخاط .

في بعض الفروق بينهم مهم نعرفها ...

عدد cilia أكثر من عدد ال flagella

تتحرك ال cilia بحركة دائرية

أما ال flagella تتحرك بطريقتين حسب نوع
الخلية

بشكل دائري -In prokaryotes : rotary

- In eukaryotes : bending أمواج

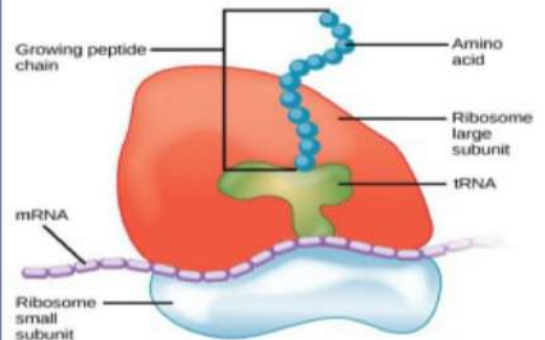
❌ flagella : لا تعتمد بحركتها على بعضها البعض (independent)

❌ cilia : وتتحرك بنفس الاتجاه dependent of each other

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).
- "Scattered throughout cytoplasm": 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.



Ribosomes: مصنع البروتينات

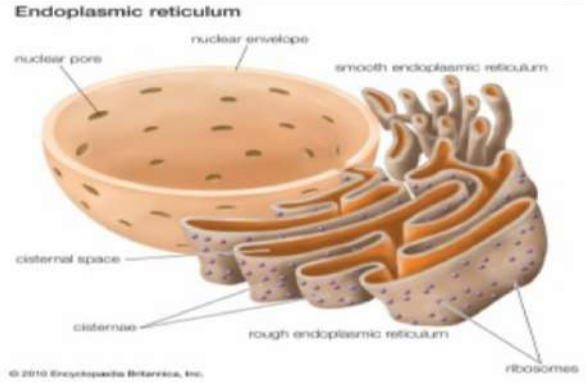
اولا يدل اسمها على وجود محتوى عالي من الحمض النووي (rRNA) ، تتواجد في ثلاثة أماكن في الخلية :

1 Rough endoplasmic reticulum

3 in mitochondria 2 Free in cytoplasm

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

- The outer surface of **rough ER** is studded with ribosomes (membrane-bound 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 contributes to lipids and carbohydrates synthesis, making phospholipids bilayer for cell membranes as well as it stores and releases calcium ions that trigger contraction in muscle cells.

Endoplasmic reticulum :

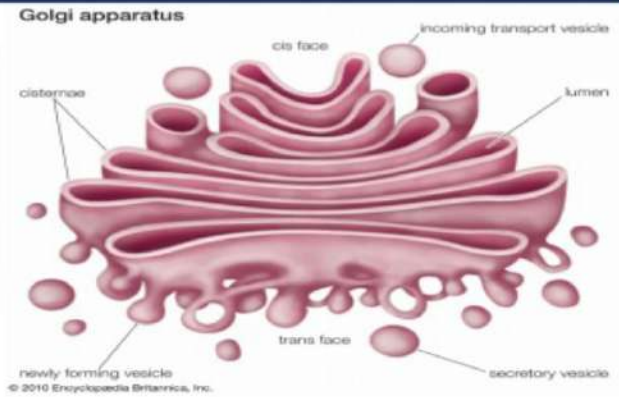
هي شبكة من الانابيب والاكياس المسطحة ، تمتد من الغشاء النووي المحيط بالنواة للسيتوبلازم ، في عنا نوعين:

1 rough: تحتوي رايبوسومات وتتم فيها صناعة البروتينات

2 smooth: لا تحتوي رايبوسومات فبتالي لا تصنع البروتينات بل تصنع الدهون والكربوهيدرات وتخزن ايونات Ca^{+2} .

Golgi Complex

- Most of the proteins synthesized by ribosomes attached to rough ER are ultimately transported to other regions of the cell (i.e. **Golgi complex**).



Golgi Complex

Functions of Golgi Complex:

- Modifies, sorts, packages, and transports proteins received from the rough ER (through cis face or trans face). Enzymes in the middle site of the Golgi complex modify the proteins to form glycoproteins, glycolipids, and lipoproteins.
- Forms secretory vesicles that discharge processed proteins via exocytosis (through cis or trans face) into extracellular fluid and forms transport vesicles that carry molecules to other organelles, such as lysosomes.

بعد تصنيع البروتينات تنتقل للجزيئات غولجي وتحدث لها تعديلات، تخزين ، تغليف ، ونقل .
الانزيمات الموجودة داخل غولجي تعدل البروتينات وتحولها إلى:

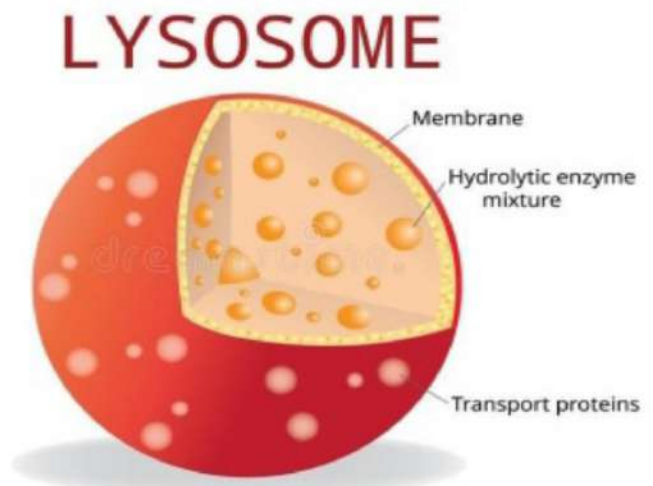
lipoprotein , glycoproteins ,Glycolipids,

-هلاً البروتينات لما تدخل جزيئات غولجي في الها
طريقين cis or trans face
إذا دخلت البروتينات من RER عن طريق cis تُغلف

وتخرج عن طريق trans والعكس صحيح .
_ بعد ما البروتين بصيره packaging داخل
غولجي ويصير vesicles بخرج
بعملية Exocytosis إلى أحد العضيات الثلاث الي
حنشرح عنهم .

Lysosomes

- **Lysosomes** are membrane-enclosed vesicles that form from the Golgi complex.
- They can contain as many as 60 kinds of **powerful digestive and hydrolytic enzymes** that can break down a wide variety of molecules.



Lysosomes

- **Functions of lysosomes:**
 1. **Digest substances (within the cell)** that enter a cell via endocytosis and transport final products of digestion into cytosol.
 2. Carry out **autophagy**, the digestion of worn-out organelles.
 3. Implement **autolysis**, the digestion of an entire cell.
 4. Accomplish **extracellular digestion**.

أحد العضيات المسؤولة عن تحليل الحويصلات
المغلقة الي خرجت من غولجي وتحليل اي مادة
فيها خلل اووغير ضرورية (**defective or**
unnneeded substances) نظرا لاحتوائها على
60 انزيم يحطم جزيئات او خلية او عضية ثم تنقلها بعد
ذلك إلى cytosol
مهم نميزرز بين

تحطيم عضية بعملية (**autophagy**)
تحطيم الخلية بعملية (**autlysis**)
وممكن تعمل كمان تحلل خارج
الخلية (**extracellular digestion**)

Peroxisomes

- **Peroxisomes** contain several **oxidases**, enzymes that can oxidize (remove hydrogen atoms from) various organic substances.
- They protect the cells from oxidative damage.
- They protect other parts of the cell from the toxic effects of potentially toxic compounds.
- Peroxisomes are very abundant in the liver, where **detoxification of alcohol** and other damaging substances occurs.
- Peroxisomes also contain the enzyme **catalase**, which decomposes by-product of the oxidation reactions which is hydrogen peroxide (H_2O_2); thus, it decomposes hydrogen peroxide to water and oxygen.

أهمية معلومة بدنا نعرفها عنه انه بحتوي نوعين من الانزيمات الاول : **oxidases** الثاني: **catalase** وهي انزيمات تعمل على إزالة السمية من المركبات

oxidases:

يقوم بحذف ذرة الهيدروجين من المركبات العضوية

Catalase :

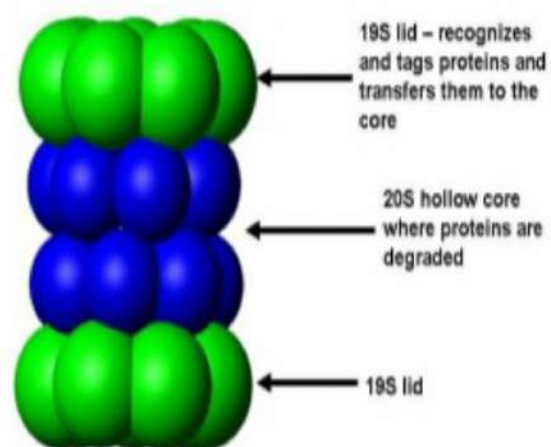
يحلل ال H_2O_2 إلى ماء وأكسجين

_ يتواجد أكثر اشي بالكبد ويعمل على إزالة السمية من المواد التي تحتوي كحولات

Proteasomes

- Cytosolic proteins require disposal at certain times in the life of a cell. **Continuous destruction of unneeded, damaged, or faulty proteins** is the function of tiny barrel-shaped structures consisting of four stacked rings of proteins around a central core called **proteasomes**.
- Proteasomes were so named because they contain **proteases, enzymes that cut proteins into small peptides**. Once the enzymes of a proteasome have chopped up a protein into smaller chunks, **other enzymes then break down the peptides into amino acids, which can be recycled into new proteins**.

26S proteasome

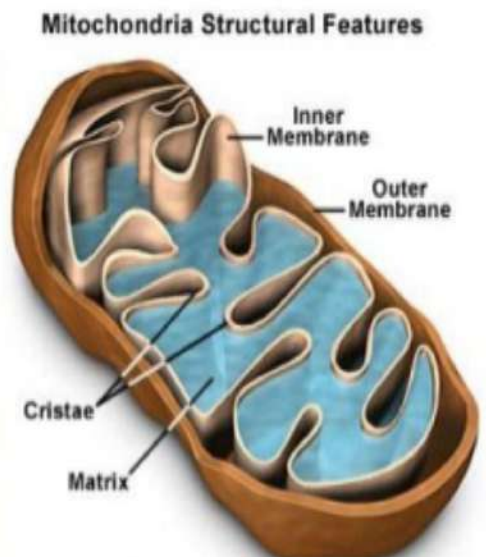


هاد بالذات من اسمه prot... مخصص لتحطيم اي بروتين unneeded or damaged -- يحتوي على انزيم (proteases) -- يحطم البروتينات إلى peptide وبعد ذلك انزيمات أخرى تحطم ال peptide إلى amino acids .

-- يتكون من 4 حلقات الحلقتين الخارجية تتعرف على البروتين وتتدخله إلى core (الحلقتين الداخلية) ويحدث فيها تحطيم للبروتين .

Mitochondria

- **Mitochondria** generate most of the ATP through aerobic (oxygen requiring) respiration, ("powerhouses" of the cell). The enzymes that catalyze the chemical reactions which are part of the aerobic phase of cellular respiration are located in the mitochondria.
- Active cells that use ATP at a high rate—such as those found in the muscles, liver, and kidneys—have a large number of mitochondria.
- A mitochondrion consists of an **outer mitochondrial membrane** and an **inner mitochondrial membrane** with a small fluid-filled space between them (**mitochondrial matrix**).



مصنع ال ATP

تسمى المايتركندريا (power house) حيث يتم إنتاج ال atp بعملية (cellular respiration)

-- كل ما كانت الخلية نشطة active وتحتاج كمية كبيرة من atp يكون عدد المايتركندريا عندها أكثر يعني مش كل الخلايا عندها نفس العدد من المايتركندريا مثل خلايا

, liver , kidneys , muscles

__ كل مايتركندريا تتكون من

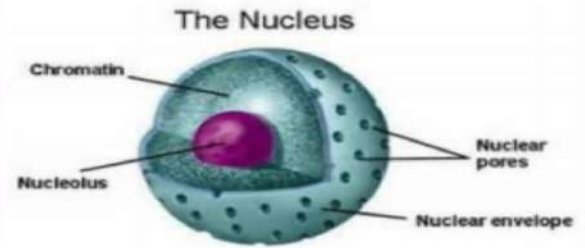
Outer membrane, inner membrane,
matrix



تووووت توووت شد حيلك يا كتكووت

Nucleus

- **The nucleus** is a spherical or oval-shaped structure that usually is the most prominent feature of a cell.
- Most cells have a single nucleus, although some, such as mature red blood cells, have none. Other types of cells have multiple nuclei.
- A double membrane called the **nuclear envelope** separates the nucleus from the cytoplasm. Many openings called **nuclear pores** extend through the nuclear envelope.
- The complex of DNA, proteins, and some RNA is called **chromatin**. The total genetic information carried in a cell, or an organism is its **genome**.



Nucleus

▪ Functions of nucleus:

1. Controls cellular structure.
2. Directs cellular activities.
3. Produces ribosomes in nucleoli.
4. Nuclear pores control the movement of substances between the nucleus and cytoplasm.

وصلنا لمركز الخلية (النواة)

هيكل كروي او بيضوي، اغلب الخلايا عندها single nucleus، وفي خلايا ما عندها نواة مثل خلايا الدم الحمراء، وبعضها عندها multiple nucleus.

-- تتكون النواة من الغشاء المحيط بها اسمه (nuclear envelopes) ، وفتحات تسمى (nuclear pores) تنظم دخول المواد بين النواة والسيتوبلازم

-- تحتوي النواة على المادة الوراثية المحمولة على شكل جينوم

وظائف النواة :

بتحدد شكل وهيكل الخلية وتتحكم بنشاطاتها
وأهم وظيفة الها صناعة الرايبوسوم المسؤول عن
صناعة البروتين