بسم الله الرحمن الرحيم

A

تلخيص لمادة

علوم الحياة Bio101

Campbell Biology

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Chapter 6 :- The cell (unit of structure and Function)

one cell (unicellular) — many cell (Multi cellular)

* Cells features :-

1] it's measured by $\mu m = 10^{-6} m$

2] small in size (Microscopic) (10 - 100) μm

* microscope
  - → light microscope (1000 X)
  - → electron microscope
    - → SEM (to study the surface)
    - → TEM (to study interial structure of cells)

* Parameters of microscope?

1] magnification (ratio of image size to real size)

2] resolution

3] contrast : (show difference in sample parts)

* cells have huge surface area to volume (to exchange material / contain many organells)

* common structures :-

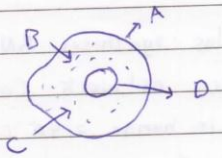
A] cell membrane

B] cytosol

C] organells

} cytoplasm

D] nuclear material



cells kinds

prokaryotic

1] no nucleus : it contains group of chromosomes without envolope called nucleoid

2] small cells eg : Bacteria

3] No membrane bound organizm

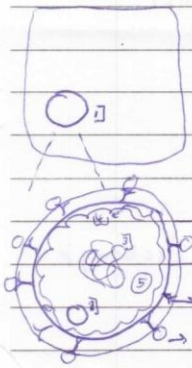
Eukaryotic

1] Nucleus

2] larg cells eg : plants

3] all organizms are surrounded by membrane

* Eukaryotic : most cells have nucleus but there are some exeptions eg : RBC



1] nucleus : control center of cells

→ outer membrane } nuclear envolope
→ inner membrane

→ pore (inter action between two membrance) } pore complex
→ protein (to open / close the pore

2] nucleolus : synthises RNA + Ribosom

3] cromatin network (after cell division → chromosoms)

* in human = 46 chromosomes

4] Network of protein Fibers (nuclear laminas)

1] support nucleus 2] tolarate tention

5] nucleoplasm

* Ribosomes : (tiny particular shape)

made of two subunits → large (L) = rRNA
→ small (s) = protein

* it's available in all cells because of it's function = protein synthises
* it is availabe as two subunits because it is easier to move
* when the two subunits aren't united, the ribosome is non-functional

eg: ribosome in nucleolus (it imports protein)

* Functional ribosome → free in cytosol
→ bound in Endoplasme reticulm

* protein used by the cell = Free ribosomes
* bound ribosomes are secretary ribosoms and their protein is export to faraway organizm such as : metocandria

* Endoplasmic reticulum [ER] : Network of [interconnected + membranous + sacs + tubules] = interconnected cisternae

* near to nucleus
* rough endoplasmic reticulum = full of ribosoms (RER)
* smooth " " = lack of " (SER)

* Functions of (er) :-

1] SER (smooth)

A) carbohydrate metabolism

eg: in liver cells there is Glycogen $\xrightarrow{\text{hydrolysis}}$ Glucose-(P) → Glucose

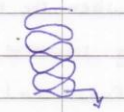
حتى يستطيع الخروج لباقي الخلايا نزال (P) عن طريق ser

B) lipid synthisis

eg: 1] phospholipids

2] oils

3] steroids



all activities happen in the cesterna

* عملية التصنيع تحدث في SER لأنها تحتاج مساحة كبيرة توفرها لها

C) Drugs → toxic $\xrightarrow{\text{ser}}$ detoxification

eg: phenobarbital / barbiturates

X $\xrightarrow{\text{enzyme}}$ X-OH } happens in ser

insolable solable

* when wastes are solable it's easier to get red of them

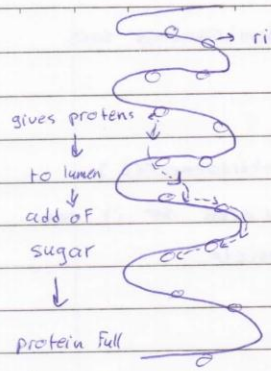
D] storage for calisum (ca)

2] RER (Rough):-

1) add sugers to protein (modification of protein)

2) move protein through transport vesicle

3) membrance Factory

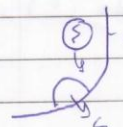


→ ribosoms (there is interaction between ribosoms and RER Function)

* ribosomes at RER gives secretary protein

of sugar = glycoproteins → move through the membrane → transport vesicle is produced → protein

* The RER synthesis it's membrane again ~~every year~~ when there is loss in it because of producing vesicles)



(the protein is export / the empty vescile becomes part of the cell membrane)

Endomembrance system

- ER
- nuclear envelope
- cell membrane
- golgi body ~~apparatus~~
- lysosome
- vacules

* Golgi ~~apparatus~~ body :- group of Flat cesternae = membranouse sacs

(it's function is releated to RER Function)

receiving Face = cis → from er

lumen } sac

seperated (non-interconnected)

flat = gives large area so it can receive many vesicle

shipping Face = trange

(where protein leaves)

* Functions:

1] Final protein modification

2] sorting of protein (depend on structure) also it gives function to protein by adding functional group

3] packaging (put it in transport vesicle)

4] shipment (moving to the cell which needs it)

5] pectins synthises

↓

polly saccharide (macromolecule)

* Lysosome :- one of the transport vesicle which came from golgi.

* توفر بيئة مناسبة لعمل enzyme (pH = acidic) -لأن pH معين

→ Full of protein

(work as enzyme)

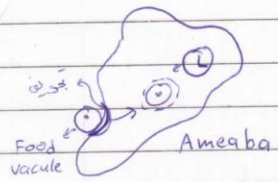
↓

(hydrolitic enzyme) = (digestive enzyme) = to digest

* only available in animal's cells.

Ⓛ = lysosomes Functions:-

1] phagocytosis (intracellular digestion)



* يحاط الغذاء بغشاء cellmembrane ثم تقوم lysosomes
بهضم الطعام المغشية بتحليله

* in humen the Macro phages do the same process to get red of bacteria

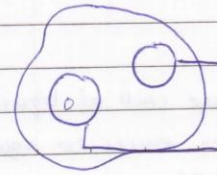
2] Autophage (young cell → mature → old)

* تقوم Ⓛ بإحاطتها بغلاف ثم تتخلص منها وتصنع
ميتوكندريا أحدث عمرًا.

3] lipids lysis : brain cells $\xrightarrow{\text{contain}}$ lipids (some should be lysis or it would cause Taysachs disease)

* if lipids weren't digested then there is a missing enzyme.

* Vacude (part of the Endomembrance system)



1] contractile vacude (to get red of extra water / salt in side the cell)

2] Food vacuole (Formed by phagocytosis)

3] Central vacuole (in plant cells)

→ surrounded by membrane = Tonoplast

occupise 70% of cell volume

* Function :-

1] storage site A) organic materials
B) minerals

2] pigments storage (if they were stored in cytosole they'll act badly with it)

3] poisonious material

4] waste disposal site

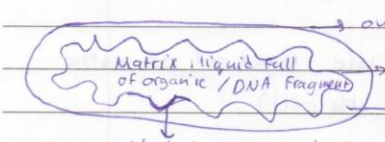
5] control expantion Growth (elongation)

* Energy transformation (cells only use (ATP) energy)

light $\xrightarrow[\text{transform}]{\text{chloroplast}}$ ATP (chemical energy)

sugar $\xrightarrow[\text{transform}]{\text{mitochandria}}$ ATP

* mitochandria (Function : cellular Resperation) (uses O_2 to generate ATP)



→ outer membrane

→ inner membrane

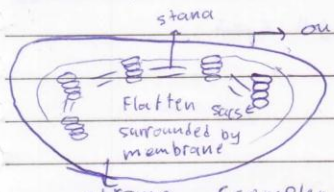
→ intermembrane space (full of liquid)

folded to give large surface area, so it's easier to synthsis ATP / every single fold is called <u>crstae</u>

DNA → nuclues (not only in nuclues)
→ mitochandria
→ chloroplast

mitochandria matrix contains → DNA
is semi autonomous (دائمة شبه) → ribosome (protein synthisis)
because of the DNA

* Chloroplast



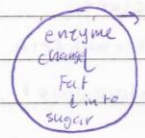
stroma (complex system of interconnected membrance) =
(Thylakoid system)

* Function of chloroplast (to carry out photosynthises)
- light reaction (Thylakoid membrance)
- Calvin cycle (stroma

* peroxisomes :- (plant / animal cells)
→ single membrane
Enzymes Deal with organic material → (oxidation reaction) (loss of H)
removes H_2 from organic material and move it to O_2 ⇒ H_2O_2 /eg of organic = fatty acid
hydrogenperoxide (Toxic) if this process happens in cytosol cell will die / $H_2O_2 \xrightarrow{enzyme} H_2O$ (water)

* Fatty acid oxidation takes place in peroxisomes
→ detoxification for toxic substances eg: Alcohol

* Glaxysomes (in plant cells only) → single membrane



* Cytoskeleton (Group of protein fibers = network)

Functions:

1] support cells 2] maintains cell shape

3] role in movment of cell or cell's organells

→ microtubules (protein tubulin α and β) radius = 25-15 nm

Hallow / couples / متكونة الطول من أجل الحركة

→ microfilaments / 7nm / solid

→ intermedial filaments / 8-12 solid / solid

* they may work togather or alone.

* microtubules: 1] maintain cell shape because they resist pressure

2] movement → all cell

cilia ← → Flagelum (9 + 2 arrangment)

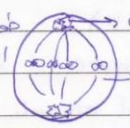
cilia and Flagelum is made of: double single

1] microtubles 2] basal body 3] protein dynein

* Chromosomes (in cell division)

1] → centrosome ⇒ ⇒ group of microtubules (a triplet)

استواء



→ asumbly → disasumbly

* centroiodes only in animal cells

→ organills

(work as tracks for organills using motor protein)

* microfilament (actin filament) :- made of actin (thin) + myosin (thick) (two interwind strand)

* Functions:-

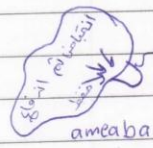
1] muscles contractions

2] cytoplasm streaming

3] mentaining of cell shape because it's tenssion bearing

4] cell metiloty

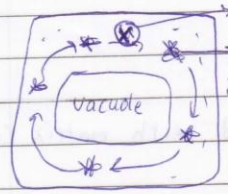
* cell metiloty



→ psendopodium (group of microfilament)

change in cell shape

* cytoplasm streaming (in plant cell's)

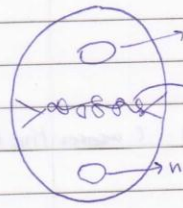


→ hard to move because of the dence cytoplasm

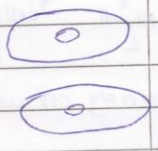
→ microfilament

تمنع تنقل المواد

* cell division



constriction →



constriction forues

which contain microfilament.

microfilament support microvelli in intestine

* intermediate filaments: (contain keratin protein) مادة بروتينية
(more permanent)

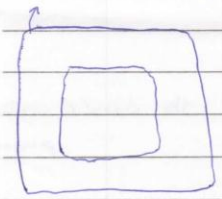
*Functions :-

1) Tention bearing (protect cell's shape)
2) ancourage (تثبيت) structures of nucleus and other organells.
(the permanent fixtion of cell)
3) nucleur laminas
4) support

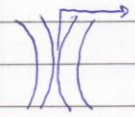
* Extra cellular structures → animal cells
→ plant cells

1] plant cells :-

cell wall = rigid and thick => 1] protection
2] control expantion (growth)
(maintaning shape)



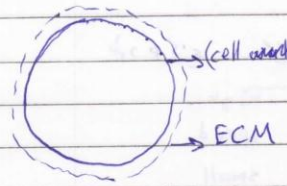
*made of cellulose and microFibrels embedded with matrix (group of pollysacchride and protein)



→ connected by pollysaccharide => pictin =
(middle lamella)

* primary cell wall —ترسيب مواد→ secondary cell wall (~~more~~ thicker)

2] animal cells :-



* الخلية تفرز Glycoprotein يتراكم ويكونه
طبقة لزجة = extra cellular matrix
[ECM]

* Function :-
1] support and protection 2] Adhesion 3] regulation

* Glycoprotein kind :-
1] collagen
2] proteoglucains
3] Fibronectins

* Intercellular junctions :-
* Function :-
1] joining cells 2] exchange materials

	Animals	Plants
* Joining	tight Junction	middle lamella
* exchanging	Gap Junction	plasmodesmata (water, small solute)

يلتحمان وينشأ pore لتبادل
المواد

* tight Junction (group of protein) + intermediate Filament ⇒
Desmosomes للربط بقوة

* Isolation of organils => cell fractionation (depend on size / density)

largest ↑ nucleus
mitochandria
ribosome

centerfuge

lower speed	high speed
(large organells)	small

cells → blender → → centerfuge
تكسير الخلايا

* for very small organells we use ultra centerfuge. (سرعة عالية جداً)