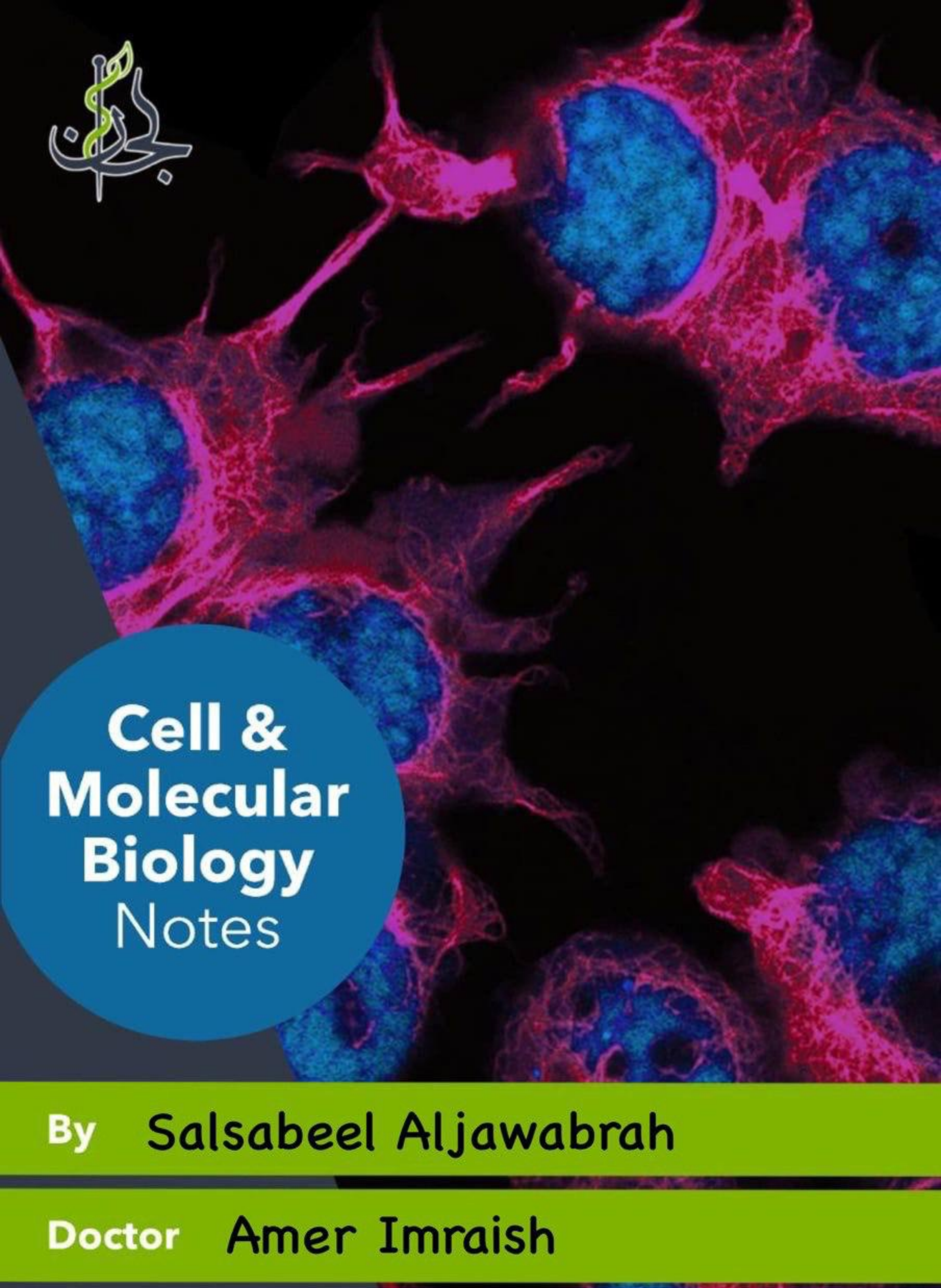

Cell & Molecular Biology Notes

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CELLS' BIOLOGY

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Lecture Three

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* lipid composition is different between the membranes.
* Cholesterol Lives → Animal cells.
* A cell membrane has distinct lipid composition
* lipids differ in :- * fatty acids * head group
* lipid types

NO. of carbon
Saturated level

The fatty acids change influence th membrane fluidity

* Lipid composition can determine the physical state :-
- fluid / solid (Head group نوع / fatty acid نوع الدهن) (يعتمد على نوع)

Also, it influence the membrane protein activity.

* The entire lipid bilayer is only about 60 Å (6 nm) thick

* The membrane is flexible (The change of its shape according to its state).

(invagination) division of plasma membrane (لكان الغشاء ثابت مايصير يصير انقسام بنطلب ((membrane invagination))

* Also, in movement : when the cell moves from a place it causes buffing of the plasma membrane
(lipid bilayer تتغير شكل)

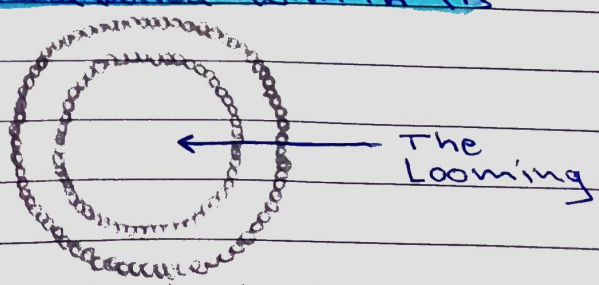
* Also, fusion changes the shape of lipid bilayer
(fusion of Sperm and egg)
يعني ما تتغير شكل الغشاء كل الاشياء اللي فوق ما بتصير

* **Membrane potential**: the difference in ion distribution or charge distribution across the membrane.
* Lipid bilayer helps to maintain internal composition in the proper situation and separates the electrical charges across the plasma membrane.
(⊖ inside the cells ⊕ out side the cells)
to create the membrane potential.

* Lipid bilayer self-assemble
head → water ← bilayer glass ↓ cells ppl is in
tail → to the inside

liposomes → spherical shape
phospholipids
with out protein → we can add

* liposomes is used to study the properties of the membranes
* To study a specific protein we can insert it in the liposomes, then we can study its function more easily than the natural membrane
* We can use liposomes as a vehicle to deliver drugs as DNA within the body (Gene therapy)
* Drugs or DNA links with the liposomes wall or contain high concentration within its looming



- After inserting the drugs in high concentration inside the lisosomes => The the drugs are sustained (released) in a specific rate to cure some diseases

- Targeting the liposomes by inserting specific proteins in the liposomes wall to bind with particulars target cells in the body.

- Lisosomes Are Foreign to the body. So immune system applies immune destruction

- We can avoid the attacking from the immune system to the lisosomes (By the Stealth Liposomes) which Contain outer polymar Outer polymas → polyethyleneglycol (PEG) The immune system can't recoghize the stealth liposomes so it protect the liposomes (Coating the liposomes with (PEG))

Drug

☐ Stealth liposomes (Caelyx) → to cure breast cancer it is put inside a liposomes, then coated with polymas to protect it from the immune system ✓

* ASYMMETRY

- The lipid bilayer isn't symmetric. (two distinct leaflets with two distinct (different) lipid compositions.

* Exoplasmic → ECM face.
* Cytoplasmic → Cytoplasm face.

* Cholesterol is almost equal in the two leaflets.

- Lipid Bilayer is composed of TWO

SEMI-STABLE INDEPENDENT

MONOLAYERS

having different chemical and physical properties

The asymmetry of membranes is determined in the endoplasmic reticulum (ER) الشبكة الإندوبلازمية
مع التفاصيل في الأغشية مصدر مكان تصنيع الأغشية في الشبكة الإندوبلازمية.

Glycolipids → outer leaflet → acts as receptors

phosphatidylethanolamin → inner → (promotes membrane curvature) fusion budding

phosphatidylserine أكثر → inner → has negative charge to bind with positive charge of adjacent proteins

membrane potential

أقل → outer → aging lymphocytes marks the cells

phosphatidylinositol → inner → signal Transduction pathways

Membrane Carbohydrate

↓

Eukaryotic cells have carbohydrates

↓

2-10% by weigh < 90% Glycoproteins
10% Glycolipids

↓

Out ward into the extracellular space

Internal cellular membranes faces away from the cytosol

Carbohydrates bind to proteins (glycoproteins) (oligosaccharides)

less than 15 sugars per chain (oligosaccharides are extensive variability)

oligosaccharides (may contain Glucose - Galactose ....)

Two ways of binding oligosaccharides to the proteins (amino acids) --- types of linkages

1. N-linkages (oligosaccharides attached to the amide nitrogen of an asparagine (Asn) residue of a protein)
2. O-linkages (two amino acids: serine (Ser), threonine (Thr) residues in a protein.

serine - threonine have an O atom in the R-group

function of Carbohydrates → mediating the interaction of cell with its environment. (cells' recognition)

→ Sorting of proteins to different cellular compartments it's important for protein trafficing or how does the protein know the final distination

Sorting → Golgi apparatus

Carbohydrates are produced in ribosomes then it is modified in (ER), Then, further modification in the Golgi apparatus. and Sorting based on the carbohydrate

Sorting → Some proteins go to mitochondria and other to Cytoplasm ... etc.

Or Secretory proteins.

Glycolipids of blood cells determine the blood type (A, B, AB, O)

Membrane Proteins

Protein determines the function of the membrane

Structure of protein is extensive variable it results in a high variation of membrane function.

Proteins are also asymmetric on the bilayer (exoplasmic - cytosol) endoplasmic

Proteins

A * Integral protein (penetrate the membrane)

Amphipathic molecule (hydrophopic, hydrophilic)

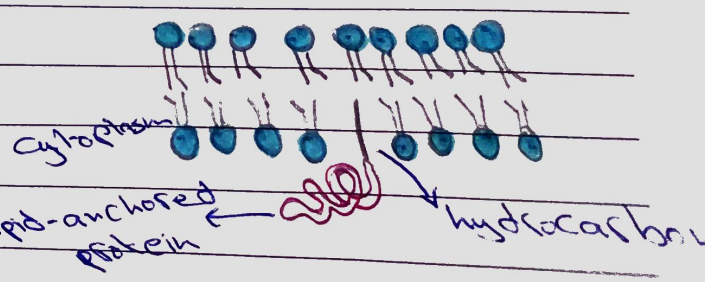
hydrophobic forms functional domain outside the bilayer (out - in)

* داخل هذا البروتين يوجد ذيول لمرور بعض المواد ال hydrophilic من ال out

B * peripheral proteins → weak bond (electrostatic bonds)
easily solubilized (easily separation and extraction by changing salt concentration) because it has weak bond (electrostatic bonds)
peripheral proteins located out side the bilayer, extracellular side and cytoplasmic side
no covalent bond → weak bond

C * Lipid-anchored membrane proteins
distinguished by (the types of lipid anchor and their orientation)
located in extracellular side and cytoplasmic side
peripheral protein binds with any lipid but the lipid-anchored bind with specific lipid
Glycophosphatidylinositol (GPI)-linked protein
a huge proteins (lipid-carbohydrate-protein)
It's found in the ater leaflet can be released by a specific enzyme called inositol-specific phospholipases

* Some inner-leaflet proteins are anchored to membrane lipids by long hydrocarbon chains.



Some details

- Integral proteins :-
  * receptors for some ligands
  * channels / transporters
  * Agents that transfer electron during photosynthesis and respiration. (electron transport chain)

Amphipathic :-
hydrophopic transmembrane domains form van der Waals interactions with the fatty acyl chains of the bilayer.

Transmembrane Domain (hydrophopic) is linked with lipids which are exchanged → a situation of flexibility.

بعض البروتينات عشان تفتح وتقفل بشكل كبير
Transmembrane Domain لازم تكون مرتبطة بال
specific lipid molecules عشان تعطيها مساحة
with special interaction
↳ hydrophopic region of the membrane

Integral proteins aren't fixed, they can move

* Peripheral proteins → ionic bond (electrostatic bond) → weak bond
من اسهل انواع بروتينات الغشية مناظرة للاستخلاص

peripheral protein is binded to the integral protein to support the skelton.

peripheral proteins aren't fixed, They has Dynamic relationship with the membrane.

* Lipid - anchored Membrane proteins
ممكن تعتبر peripheral لكن الله يعلم ظاهرة

Src and Ras are important for cellular Signaling. Ras ظاهرة ال

8.5 Concept isn't included.