

The topic of this lecture:

1. cell membrane, its structure and function.
2. transport of different material through the cell membrane.

Remember the cell membrane surrounds the cell which include different organelles such as:

1. Rough/smooth ER
2. Nucleus
3. Mitochondria
4. Golgi apparatus
5. Lysosomes

The structure of the cell membrane

1. phospholipid
 - ❖ head hydrophilic
 - ❖ tail hydrophobic
2. protein
 - ❖ integral protein (spanning protein)
 - ❖ peripheral protein ...it might be found on the inner or outer surface of the cell membrane
3. carbohydrate: mainly attached
 - ❖ lipid ...glycolipid
 - ❖ protein ...glycoprotein
4. in addition to some cholesterol which depends mainly on the temperature to give rigidity or flexibility to the cell membrane

Functions of the cell membrane proteins

1. Ion channel << entrance for the water-soluble substances that can't cross the cell membrane >> peripheral proteins can't act as an ion channel
2. function as an enzyme or catalyst
3. look and key receptors (in order for the cell to receive signals from a specific hormone (adrenaline, thyroxine) it has to synthesis a suitable receptor for that hormone.)

Functions of carbohydrates on the cell membrane

1. connect cells together (adhesion)
2. cell coding → each cell in the human body has a specific barcode
3. cell identification ...familiar to (cell coding) → thus the body is able to recognize its own cells

If an error occurs in cell coding ...the body is unable to identify it's cells → thus it's going to attack that cells causing autoimmune disease

Examples of autoimmune disease:

- * Rheumatoid arthritis
- * Autoimmune thyroiditis
- * Auto immune hepatitis

Transport the materials through the cell membrane

1. fat soluble substance ... cross the cell membrane directly without needing a channel or carrier
2. water soluble substance ...transport through integral proteins (ion channels)

transportation across the cell membrane:

1. passive transport
 - ❖ simple diffusion → fat soluble substances → cross the membrane directly

- **Example:** O₂ enters the cell membrane with the concentration gradient because it's found in high amounts outside the cell, whereas the opposite take place with CO₂ (both are through passive transport)
- ❖ facilitated diffusion → water soluble substances → requires channels
 - **Example:** Ion such as (Na⁺, K⁺) require an (Ion channel) to enter the cell membrane (facilitated diffusion)
 - Leak channels → Non – gated (opened all the time) such as
 - A. sodium leak channel
 - B. potassium leak channel
 - Gated channel and they include
 - A. voltage gated channel
 - B. chemical gated channel (ligand gated channel)

2. active transport

Passive transport	Active transport
*occurs with electrochemical gradient (downhill)	*occurs against electrochemical gradient
* from high concentration to low concentration	* from low concentration to high concentration
*doesn't require energy	*requires energy

Voltage channel

when a stimulus changes the electricity of the cell membrane (shift the +ve charge outside) voltage membrane channels are going to be opened

examples

1. Ca⁺² voltage gated channel
2. Na⁺¹ voltage gated channel

Chemical gated channel

found in the (synapse) and opens when a stimulus such as acetyl choline or adrenaline binds to it which result in an action potential → cause muscle contraction or nerve impulse movement.

Factors affecting of molecules to cell membrane

1. temperature
 - the higher the temperature, the higher the cell activity - simple diffusion is less affected in temp than facilitated diffusion
2. molecular Wight
 - the lower the molecular Wight, the easier it enters the cell (inversely proportional)
3. concentration gradient
 - the higher the concentration difference the easier it enters (directly proportional)
4. size of cell's pores
 - the larger the pores of any semi permeable membrane the easier the entrance (directly proportional)
5. thickness of the membrane
 - the less the thickness the easier the entrance (inversely proportional)
6. surface area
 - the higher the surface area the easier the entrance (directly proportional)

**FACILITATED DIFFUSION (الرجاء الرجوع الى الريكورد في حال لم تفهم المضمون)

*it needs a carrier (Integral protein) to enter the cell

* the cell produces carriers to the substances that carriers are specific for each substance that enters

* it has something called 'transport maximum'

a maximum number of molecules that can enter the cell, because the cell produces a specific number of carriers

* competitive inhibition

the carrier chose the substance with higher concentration to enter the cell

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