**Membrane Structure and Transport Notes Guide:**

**Concept: Passive transport is diffusion of a substance across a membrane with no energy**

Diffusion

 -2nd Law of Thermodynamics: Universe tends towards disorder

 -Movement of molecules try to reach equilibrium. Movement from high to \_\_\_\_\_\_\_\_\_\_ concentrations

-Each substance diffuses down its \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ concentration gradient, independent of concentration gradients of other substances

 -Passive transport: No energy needed

Cell (Plasma Membrane)

 -Cells need an inside and an outside

 -Separate the cell from its environment

 -Cell membrane is the boundary

-Cells need food, carbohydrate sugars, proteins, amino acids, lipids, salts, O2, H20 to enter into the cell

 -Cells need to get rid of waste, ammonia, salts, CO2, H20, proteins, products.

Lipids of Cell Membrane

 -Membrane is made of phospholipids with a phospholipid bilayer

 -Semi-permeable membrane which allows certain materials in and out.

 -Fats and other lipids can slip directly through the phospholipid cell membrane

 -“holes”, or channels, in cell membrane allow material in & out

Why Proteins in the membrane?

 -Proteins are mixed molecules

-hydrophobic amino acids

-stick in the lipid membrane

-anchors the protein in membrane

-hydrophilic amino acids

-stick out in the watery fluid in & around cell

-specialized “receptor” for specific molecules

Facilitated Diffusion

 -Globular proteins act as doors in membrane

-channels to move specific molecules through cell membrane

Active Transport:

-Globular proteins act as ferry for specific molecules

-shape change transports solute from one side of membrane to other  protein “pump”

-“costs” energy

Getting through the cell membrane

-Passive transport

diffusion of hydrophobic (lipids) molecules

high 🡪 low concentration gradient

-Facilitated transport

diffusion of hydrophilic molecules

through a protein channel

high 🡪 low concentration gradient

Some channel proteins open only in presence of stimulus (signal) stimulus usually different from transported molecule

-ex: ion-gated channels: when neurotransmitters bind to a specific gated channels on a neuron, these channels open = allows Na+ ions to enter nerve cell

-ex: voltage-gated channels: change in electrical charge across nerve cell membrane opens Na+ & K+ channels

**Concept: Active transport uses energy to move solutes against their gradients**

-Active transport

diffusion against concentration gradient

low --> high

uses a protein pump

requires ATP

Cells may need molecules to move against concentration situation need to pump \_\_\_\_\_\_\_\_\_\_\_ concentration

protein pump

requires energy: ATP

**Concept: Bulk transport across the plasma membrane occurs by exocytosis and endocytosis**

How about large molecules?

Moving large molecules into & out of cell

through vesicles & vacuoles

endocytosis

phagocytosis = “cellular eating”

pinocytosis = “cellular drinking”

receptor-mediated endocytosis

exocytosis

**Concept: Membrane structure results in selective permeability**

Osmosis:

Water is very important, so we talk about water separately

Diffusion of water from high concentration of water to low concentration of water

across a semi-permeable membrane

Direction of osmosis is determined by comparing total solute concentrations

Hypertonic - more solute, less water

Hypotonic - less solute, more water

Isotonic - equal solute, equal water

Aquaporins

 Water moves rapidly into & out of cells showed evidence that there were water channels

**Concept: Cellular membranes are fluid mosaics of lipids and proteins**

Fluid Mosaic Model (Cell Membrane)

A membrane is a collage of different proteins embedded in the fluid matrix of the lipid bilayer

Proteins determine most of membrane’s specific functions: Transport, Enzymatic activity, Signal transduction, intercellular joining, cell-cell recognition, attachment to cytoskeleton and extracellular matrix (ECM)

Membrane proteins:

-peripheral proteins = loosely
-bound to surface of membrane

-integral proteins = penetrate into
-lipid bilayer, often completely spanning the membrane = transmembrane protein

Membrane Carbohydrates

-Play a key role in cell-cell recognition

-ability of a cell to distinguish neighboring cells from another

-important in organ & tissue development

-basis for rejection of foreign cells by immune system