**المحاضرة ألسادسة المرحلة الأولى**

**كلية الطب**

**Control of Intracellular Function**

-cells control proper quantities of different cellular constituents, by feedback control systems (monitor the cell’s).

- the genes can be either activated or inhibited by operator gens(activator and repressor)genes.

Enzyme systems also can be either activated like, ATP depleted cause increase cyclic adenosine monophosphate (cAMP)(activator enzyme)for ATP synthesis.

or inhibited like ,controlling intracellular concentrations of multiple amino acids,

purines, pyrimidines, vitamins, and other substances. As well as hormones , (from without the cell) activating or inhibiting one or more of the intracellular control systems.

***Apoptosis—Programmed Cell Death***

-the total number of cells control by cell division and cell death.

-When cells are become a threat to the organism, they undergo a suicidal *programmed* *cell death,* or *apoptosis*.

-a specific proteolytic enzymes called caspases ,synthesized and stored in the cell as inactive procaspases. causes the cell to shrink and condense, alter its cell surface*( necrosis*).

-Neighboring phagocytic cell, a macrophage, digest the cell, before any leakage of its contents occurs, and neighboring cells usually remain healthy.

-apoptosis occurs in tissues that remodeled during development.

- billions of cells die each hour in tissues such as the intestine and bone marrow and are replaced by new cells.

- abnormalities of apoptosis may play a key role in neurodegenerative diseases such as Alzheimer’s disease, as well as in cancer and autoimmune disorders.

- Some drugs induce apoptosis like in cancer cells.

**Intercellular connections:-**

Two types of junctions form between the cells that make up tissues: - 1-Junctions that fasten the cells to one another and to surrounding tissue.

The junctions that tie cells together and endow tissues with strength and stability include tight junctions which are also known as the zonula occludens .

The desmosome and zonula adherens also help to hold cells together, and the hemidesmosome and focal adhesions attach cells to their basal laminas.



2- junctions that permit transfer of ions and other molecules from one cell to another,

at gap junctions , the intercellular space narrows from 3nm to 25nm , formed as a channels(connexons) , the diameter of each channel about 2nm which permits the passage of ions , sugars , amino acids and other solutes substances to pass between the cells without entering the ECF, thus permit the rapid propagation of electrical activity from cell to cell.

-The diameter of each channel is regulated by intracellular ( increase ( reducing the diameter of the channel )



**Endocytosis:-**

-One form of endocytosis , called phagocytosis ( cell eating ) is the process by which bacteria , dead tissues are engulfed by tissue macrophages and some of the white blood cells like monocytes.

- The second form , called pinocytosis ( cell drinking ) is essentially the same process , the only difference being that the substances ingested are in solution and hence not visible under the microscope.

-The engulfed materials makes contact with the cell membrane which then invaginates , the invagination is pinched off , leaving the engulfed material in the membrane – enclosed vacuole and the cell membrane intact .

-In the cell , the membrane around apinocytic or phagocytic vacuole generally fuses with that of a lysosome mixing the digestive enzymes in the lysosome with the contents of the vacuole

**Exocytosis:-**

- Exocytosis is the reverse of endocytosis

-Proteins that are secreted by cells move from the E.R to golgi apparatus and then extruded into secretary granules or vesicles .

-This secretory granules and vesicles move to the cell membrane .

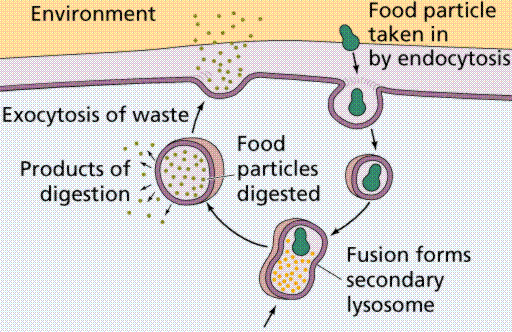
-Their membrane then fuses to the cell membrane and the area of fusion breaks down .

-This leaves the contents of granules or vesicles outside the cell and the cell membrane intact

-This extrusion process is called exocytosis .

-It requires energy , but the mechanism responsible for the break down of the membrane are unknown .





***( Body fluids ):-***

**-**In the average young adult male , 18% of the body weight is protein and related substances , 7% is mineral and 15% is fat .The remaining 60% is water .

-Total body water is comprised of extracellular and intracellular fluid.

-The extracellular fluid can be subdivided into two main subcompartments :-

-The plasma , Which makes up almost one – fourth of the extacellular fluid .

-And the interstitial fluid which lies between the tissue cells and amounts to more than

three – fourths of the extracellular fluid .

-The extracellular fluid , Which is about 20% of total body weight .

-Approximately 25% of the extracellular fluid is in the vascular system ( plasma = 5% of body weight ) and 75% outside the blood vessels ( interstitial fluid = 15% of body weight ) .

-Whereas , the intracellular fluid acounts for about 40% of body weight .

-The percentage of total body water is greater in newborns and lean persons , and is lower in adult females , elderly persons , or adults with a large amount of adipose tissue .

-Because the plasma and interstitial fluids are separated only by highly permeable capillary membranes , their ionic compositions are similar and they are often considered together as one large compartment of homogeneous fluid .

Summary of body fluid regulation, including the major body fluid

compartments and the membranes that separate these compartments.

The values shown are for an average 70-kilogram person.



-The most important difference between plasma and interstitial fluid is the higher concentration of protein in the plasma , which exists because the capillaries have a low permeability to the plasma proteins .

-Both extracellular and intracellular fluid contain nutrients that are needed by the cells , including glucose , amino acids , oxygen and other nutrients.

-Extracellular fluid contains large quantities of sodium and chloride ions ,but only small amounts of potassium ,magnesium and phosphate ions ( the major cation is and the major anions are and ) .

-In contrast, intracellular fluid contains large amounts of and phosphate ions , moderate amounts of ions and few ions ( The major cations are and and the major anions are protein and organic phosphates such as ATP, ADP and AMP.

-These differences in the ionic composition of the fluids cause a membrane potential to develop across the two sides of the cell membrane – negative on the inside and positive outside

-The maintenance of a relatively constant volume and a stable composition of the body fluids is essential for homeostasis. This table describe the daily intake and out put of water:-



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