IQRA NATIONAL UNIVERSITY

DEPARTMENT OF ALLIED HEALTH SCIENCES

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COURSE TITLE:

Human Physiology

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QUESTION NO. 1:

QUESTION:

Differentiate between;

1. Positive and Negative Feedback Mechanism.
2. Smooth and Rough Endoplasmic Reticulum.
3. Lysosomes and Peroxisomes.
4. Pepsin and Pepsinogen.
5. Peptic Ulcer and Duodenal Ulcer.

ANSWER:

1. POSITIVE AND NEGATIVE FEEDBACK MECHANISM:

THE NEGATIVE FEEDBACK MECHANISM:

DEFINITION:

"It's a kind of reaction that brings a decrease in the function and this is done due to the response to a stimulus, and then it causes the system to stabilize."

STEPS TO THE NEGATIVE FEEDBACK:

The following are the 4 steps to The Negative Feedback, they are as follows;

I. Stimulus
II. Sensor
III. Response (Control)
IV. Effector

EXPLANATION:

The negative feedback is the process that helps in maintaining the body's (temperature, Ph, Hormones, Blood Sugar level and other metabolic runs). Like the "Homeostatus" which is responsible for the body's normal internal body temperature which is controlled by the Brain (Hypothalamus).

EXAMPLES OF NEGATIVE FEEDBACK:

The following are the examples of the negative feedback;

- ***Regulation of Blood Sugar Level:***

When a person eats the food, the food is converted into glucose which is responsible for the body's sugar level because it is absorbed into the blood stream. So, when the glucose level in the blood stream rises so the Pancreas secrets a hormone (insulin), the insulin helps in the regulation of glucose which is up taken by the liver and the muscles calls and are stored in them. So, when the glucose level becomes normal the Pancreas stops secreting insulin. This is done by the negative feedback.

- ***Temperature Regulation:***

We know that, the body needs specific optimal temperature to perform normally which is **(97.6° F or 37° C).** And most of the temperature regulation is done by the Brain (Hypothalamus) this process is done by the negative feedback. As the body temperature rises it turns on the enzymes and controls the different behaviors like sweating, panting or seeking shade done by animals or humans, this decreases the body's temperature and it reaches a point that the body reaches its normal optimal temperature, thus this process is done by the negative feedback.

THE POSITIVE FEEDBACK MECHANISM:

DEFINITION:

"The positive feedback mechanism is exactly opposite to that of the negative feedback. This process enhances the original stimulus. The positive feedback in which the product of the actions occurs in a feedback which amplifies the original action."

STEPS TO THE POSITIVE FEEDBACK:

The following are the 4 steps to The Positive Feedback, they are as follows;

V. Stimulus
VI. Sensor
VII. Response (Control)
VIII. Effector

EXAMPLES OF POSITIVE FEEDBACK:

The following are the examples of the negative feedback;

- ***Blood Clotting:***

When a person gets hurt or cut and the blood starts pouring out this activates chemicals like blood platelets, which are responsible for forming clots. So, an activated platelet activates more platelets to clot the blood together which stops the blood coming out. It forms a protective layer on the injury, so all this process is done by the positive feedback.

- ***Digestion:***

The digestion is a process in which the food is broken down from large complex molecules to small simpler molecules. This is done in the stomach. The Stomach users an enzyme (Pepsin) which digests the proteins. The pepsin is formed from an inactive form of pepsinogen. This conversion activates the positive feedback

2. SMOOTH AND ROUGH ENDOPLASMIC RETICULUM:

SMOOTH ENDOPLASMIC RETICULUM:

DEFINITION:

"The Smooth Endoplasmic Reticulum (SER) it is an organelle, a continuous membrane system which forms a series of flattened sacs in the cytoplasm of the eukaryotic cell that plays an important role in the various functions like biosynthesis transportation etc."

FUNCTIONS OF SER:

Its main function is the production of (hormones & lipids) which are then spread throughout the cell & other parts of the organism. It also processes the toxic substances and produces the calcium ions. And the main difference that (SER) differs from the (Rough ER) is the absence of the ribosomes attached on the surface of (SER) which are used for the synthesis of Proteins. The (SER) is also responsible for the synthesis of lipids like cholesterol and phospholipoids which are used for the formation of the membranes of the organism. It also secrets the steroid hormones. The (SER) has a dynamic structure which is important for the liver which helps in the purification of many substances at the body and are removed from the body.

ROUGH ENDOPLASMIC RETICULUM:

DEFINITION:

"The Rough Endoplasmic Reticulum (RER) is also an organelle and it is responsible for the synthesis, modification and folding of proteins which are transported to every organelle of the cell."

FUNCTIONS OF RER:

Its main function is the synthesis of proteins with the help of ribosomes which are attached on the surface of the (RER). It helps in the modification of stress and quality control for protein folding. The (RER) contains enzymes which are involved in the (RNA) metabolism the binds and the modifies the (RNA). The process is very important since this organelle is involved in the translating (RNA) into protein.

3. LYSOSOMES AND PEROXISOMES:

LYSOSOMES:

DEFINITION:

"Lysosomes are numerous cells. It is one of the key and important organelles in digestion and is an organelle which helps in the removal of wastes from the body because they contain a digestive enzyme, they digest the waste materials, germs, toxic substance warm out organelles, viruses, bacteria etc."

FUNCTIONS OF LYSOSOMES:

When the wastes are produced by the cell the lysosomes 0act as the cell gets damaged, it is moved to the outer edge of the lysosomes. When that is done the membrane of the lysosomes opens and the molecules damaged cell goes into the lysosomes, then the digestive enzymes of lysosomes break down the molecule, and when its completely digested, then the lysosomes release the remains of the cell back to the cell as a vesicle that the cell can excrete it out through it's membranes.

PEROXISOMES:

DEFINITION:

"These are small simple cells but they are very important for the body, they perform different processes internally. They are present in the cytoplasm and contain oxidizing enzymes like fatty acids & amino acids. Those oxidation reactions produce hydrogen peroxide which gives them their name ***'peroxisomes'****"*

FUNCTIONS OF PEROXISOMES:

The first function is that they are involved in the oxidation reaction, and the decomposition of hydrogen peroxide and gives it their name the ‘peroxisomes’. They contain enzymes, catalase, D-Amino acid oxidase, uric acid oxidase. They oxidize substances as formic acids, formaldehyde, phenols etc.) They also digest lipids which are needed by the body done by the process called “Beta Oxidation”. They also are important for the cholesterol and bile acid synthesis. They peroxisomes are in plants and are required for the photorespiration.

4. PEPSIN AND PEPSINOGEN:

PEPSIN:

DEFINITION:

"It is a major digestive enzyme which helps in the digestion of Proteins and break them into polypeptides."

FUNCTIONS OF PEPSIN:

These are the major digestive enzymes, they are proteolytic enzymes that are produced by the chief cells, they are a part of the digestive gastric juices and helps in digestion of food. They are active in acidic environment only inside the stomach with the pH of 1.5 – 2.5. They break down large complex polypeptides into smaller simpler peptides.

PEPSINOGEN:

DEFINITION:

"They are an important and powerful protein digestive enzyme that are produced by the Gastric Chief cells, as a proenzyme. They are an inactive form of Pepsin."

FUNCTIONS OF PEPSINOGEN:

Pepsinogen is an inactive form of Pepsin, they are produced by the "Gastric Chief Cells", they help in the digestion of the food especially proteins. So when the food goes into the stomach the pepsinogen is activated into active pepsin in the presence of the stomach juices (HCl), it is a proteolytic enzyme which digest the proteins.

5. PEPTIC ULCER AND DUODENAL ULCER:

PEPTIC ULCER:

DEFINITION:

"Peptic Ulcer are the holes that develop on the inner lining of the stomach, lower esophagus or small intestine. It is the inflammation created by the H-Pylori Bacteria or increase in the level of acidity of stomach."

TYPES OF PEPTIC ULCER:

1) Gastric Ulcer (Stomach)
2) Esophageal (Esphagus)
3) Duodenal Ulcer (small intestine part "duodenum").

CAUSE:

- It is caused by the bacteria (H-Pylori)
- Increase in the level of acids in the stomach which causes major acidity.
- It can also be caused by smoking, radiation or cancer (stomach).

DUODENAL ULCER:

DEFINITION:

"Duodenal Ulcer is a type of Peptin Ulcer that is developed in the part of the small intestine (Duodenum)."

EXPLANATION:

This is formed or developed in the 1st part of the small intestine the (Duodenum), it appears like holes and it is caused by a bacteria (H-Pylori). It will take 4 to 8 weeks to heal the ulcer with medications.

END OF ANSWER

QUESTION NO. 2:

QUESTION:

What is Portal Triad? Give clinical significance of Portal Triad.

ANSWER:

PORTAL TRIADS:

The Portal Triads are the branches of Portal vein, Biliary ducts and Hepatic artery together bound in the perivascular capsule or may in the portal track. It is a component of liver lobe. It can also be referred to be the largest of these vessels (each) that goes from the hepatoduodenal ligament, and to the smaller branches of these vessels with in the liver.

COMPOSITION & FUNCTIONS:

It is composed of three main tubes which are;

1. **Hepatic Artery:**
   Carries the oxygenated blood to the hepatocytes.

2. **Portal Vein:**
   Carries the blood that have the nutrients from the small intestine

3. **Bile Duct:**
   Carried the products of the bile away from the hepatocytes, from there to the large duct then into the bladder.

IMPORTANCE OF PORTAL TRIAD:

They are composed of 3 major tubes, the hepatic artery which carried the oxygenated blood to the hepatocytes, the portal vein carries the blood nutrients from the small intestine. While the bile duct carried the products of the bile away from the hepatocytes the gallbladder and larger ducts. On the other hand the portal vein mostly carried the deoxygenated blood.

CLINICAL SIGNIFICANE OF PORTAL TRIAD:

A type of fibrosis, the Bridging Fibrosis is found in various types of Liver injury, describes fibrosis from the central vein to the portal triad.

END OF ANSWER

QUESTION NO. 3:

QUESTION:

Give properties of cell membrane structure.

ANSWER:

PROPERTIES OF CELL MEMBRANE STRUCTURE:

CELL MEMBRANE:

The Cell Membrane is also known as the “Plasma Membrane”. This is a type of a biological Membrane. It is a thin membrane that surrounds the cell and gives it shape and protection. Inside the cell membrane are water soluble molecules, charged molecules, proteins, nucleus etc. Which are involved in cellular metabolism. While outside the cell membrane are water-based ions, acids, alkalis and some nutrients that the cell needs.

CHEMICAL COMPOSITION:

The Cell or Plasma membrane is a thin membrane. The plasma membrane is composed of lips, proteins and carbs. The major class of lipids are;

- Phospholipids.
- Sphingolipids.
- Glycolipids.
- Sterols (like cholestrol).

PROTEINS:

The Protein are 50% in the cell membrane and the Myelin cells contain 25% of Proteins in the internal membrane of chloroplast, while the mitochondria contains 50% proteins. There are two types of cell membrane ectoproteins and the endoproteins. It also contains enzymes, structural & transport proteins, which some also act as receptors as ATPase, RNA-ase.

CARBOHYDRATES:

The carbs are present in the plasma membrane which are present in the exterior glycoproteins and the phospholipids (polar ends only) which are at the external surface of cell membrane.

STRUCTURE OF CELL MEMBRANE:

The cell membrane is a thin protective layer around the cell which is composed of Proteins & Lipids, the lipid can form 20% - 80% of the membrane. The remaining is done with the proteins. The lipid gives the membrane it's flexibility while the Proteins help in the maintenance of its chemical composition.

FUNCTIONS OF THE CELL MEMBRANE:

The following are the functions of the Cell Membrane;

1) It protects the cell from the outer environment.
2) Gives shape to the cell
3) Selectively permeable membrane helps in the transport of materials.
4) Can pass oxygen & carbs because they are lipid soluble, while water can pass freely.
5) The large molecules cannot pass through.
6) It is a binding site for enzymes.
7) Contains fluids in the cell (Cytoplasm).

MEMBRANE STRUCTURE:

It is composed of Phospholipid bilayer joined with many types of proteins as in the fluid mosic model. The surface of the membrane is hydrophilic which is water-loving while the inner is hydrophobic which is water-hating.

MODELS OF PLASMA MEMBRANE:

There are 3 types of models which are;

1) Danielli and Dawson Model.
2) Robertson's Model.
3) Fluid Mosic Model.

1) DANIELLI AND DAWSON MODEL:

- This was discovered in ***1935*** by Danielli and Dawson, by triglyceride lipid bilayer over a water surface.
- They studied and founded that they all arrange themselves with their polar ends facing outwards.
- The almost always formed droplets like oil in water and its surface tension was also higher than the cells.
- It is also known as the ***"Sandwich Model"***

2) ROBERTSON'S MODEL:

- This model was discovered by Robertson in ***1965*** by the help of electron microscope.
- There were no pores seen on the surface by him on the electron microscope.
- He then hypothesized it that it looked like a ***"Railway Track"*** in appearance.
- He proposed unit membrane hypothesis.

3) FLUID MOSIC MODEL:

- This model was discovered by S.J Singer and Garth Nicolson in ***1972***. The membranes can be considered as 2-Dimensional Liquid and where all the lipid & protein molecules are combines more or less freely.
- They studied that the phospholipid bilayer and they found that they can form a flattened surface on the water which has no requirements of a protein coat.
- It is formed as a globular protein.
- Among all the models presents for the Cell Membrane this model is widely acceped.

END OF ANSWER