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ANSWER 1:-

A) ATROPHY:-

DEFINITION:- Atrophy is defined as the partially or fully decrease in the size of the cell, certain tissues or organ.

Although the atrophic cell is not dead but some function may have diminished.

PHYSIOLOGICAL EXAMPLES:-

1)The atrophy of the thymus gland and other lymphoid tissue occur at adolescence. Because during birth, certain bacteria enters in the body as these bacteria are new for the individual so they form memory cell for these bacteria or pathogens. In adolescence the thymus functions decrease as more memory cell was formed in new born by B cell or CD8 T-cell, resulting in the decrease in the size of thymus.

2) Muscle atrophy occur when we don't work on it like exercise or any other stress. Because when we don't do any work on it, the protein synthesis stops thus decreasing the size of the muscle cell.

PATHOLOGICAL EXAMPLES:-

- 1) There are many diseases that cause muscle loss. It may be ***cachexia***, a syndrome consist of certain diseases such as cancer, AIDS, congestive heart failure etc.
- 2) The decrease in the brain cortex is another example which may due to atherosclerosis, resulting in the decrease flow to the brain.

B)HYPERTROPHY:-

DEFINITION:- It's the opposite of atrophy and it is defined as the increase in the volume or size of the cell, due to enlargement of it's cell content.

It should be noted that hypertrophy is just increasing in cell size and not the number of cells.

PHYSIOLOGICAL EXAMPLE:-

1) Muscle hypertrophy is characterized by increase in size of the skeletal muscle. It may be due to mitochondrial membrane hypertrophy, due to which muscle can store more glycogen or it may be myofibrillar hypertrophy.

2) Cardiac hypertrophy which occurs due to increased training exercise, due to which heart pumps the blood efficiently.

PATHOLOGICAL EXAMPLE:-

1) Cardiac hypertrophy may also be due to hypertension and heart valve stenosis which result in the decrease output of heart.

2) Myotonia congenita and myotonic muscular dystrophy are usually caused by a mutation or other abnormality in a gene known as *CLCN1*. Myotonia is a form of muscle dystrophy which is characterized by increased muscle size, strength and stiffness.

C)HYPERPLASIA:-

DEFINITION:- It may be define as the increase in the size of organ due to increase in the number of cell in it.

Note that hyperplasia term is limited to number and not the size of the cell.

PHYSIOLOGICAL EXAMPLE:-

- 1)** Hyperplasia in the glandular cells of the breast due to pregnancy, to prepare it for future feeding.
- 2)** Hyperplasia may occur in the muscle fiber due to weight training exersice.

PATHOLOGICAL EXAMPLE:-

- 1)** Hyperplasia of adrenal cortex due to increased circulating level of ACTH(adrenocorticotropic hormone), also known as cushing`s disease.

- 2) Intimal hyperplasia is the hyperplasia of tunica intima. It's the response to injury of the vessel. It may occur due to endarterectomy.

D) METAPLASIA:-

DEFINITION:- The word metaplasia is derived from Greek word which means *Change in form*. The change in one differentiated cell type to another differentiated cell type which is more suitable to the environment.

As the initial type can't cope with the environment, so it adapts to the new environment by changing itself.

PHYSIOLOGICAL EXAMPLES:-

- 1) Normal physiological metaplasia, such as that of the endocervix, is highly desirable. Squamous metaplasia occur in endocervix which is

a benign non-cancerous change of surfacing epithelial cells to a squamous structure.

- 2) cirrhosis of the liver, which is a common condition of chronic alcoholics, the normal functional hepatic cells are replaced by nonfunctional fibrous tissue.

PATHOLOGICAL EXAMPLES:-

- 1) Intestinal metaplasia occurs when cells in the tissues of the upper digestive tract, which may be in the stomach or esophagus, transform and become more like cells from the intestines. Some doctors consider intestinal metaplasia to be a precancerous condition.
- 2) Barrett's esophagus is another type of metaplasia in which the non-keratinized epithelial cells of the esophagus convert into the columnar (like column) cells. It's due to the

acid reflux. If that condition persists then the metaplasia can convert to cancer which may be adenocarcinoma.

ANSWER 2:-

Calcium ion influx effect:-

When hypoxia occurs, so mitochondria can't make ATP for the cell to do their job. The whole cellular factory can be damaged. Because without oxygen, the sodium-potassium pump, which prevents the cell from overload of the sodium and maintaining a constant concentration gradient, can't work. Resulting in the swelling up of cell which creates many complications. Blebs form which is the sign of the deframing of cytoskeleton, and many other complications occur.

- After an interval of time this damage becomes irreversible. **Calcium pump** also stops working

which activate certain enzymes like proteases that can slice up protein and damage the cell cytoskeleton which is the structural frame work that keep the cell together.

- Also endonucleases can be activated which can cut up DNA, the cell genetic material. And it`s the main mechanism for cell death.
- These factors contribute to break the lysosome, thus resulting in the leakage of hydrolytic enzyme. Which basically start digesting the cell from the inside.
- Finally the phospholipase enzyme, which breakdown phospholipids, activated. Since the cell membrane made up phospholipids, these can destroy cell membrane. Which is probably the most prominent sign of irreversible damage. And the cell content leak out.

- Calcium then enters in the mitochondria, resulting in the permeability of mitochondrial membrane. The small molecule that usually stays in the mitochondria which may be *cytochrome c* to leak out from the mitochondria to the cytosol. Which the biggest sign of cell death because it activates the process call apoptosis(programmed cell death). So it is like a cellular suicide. Thus cell death occur.

ANSWER 3:-

FREEC RADICAL:

DEFINITION:-

it may be define as the atom or molecule that are highly reactive with other cellular

component, because of the presence of the unpaired electron in its outer shell.

ROS or Reactive oxygen species is the term used for free radical.

EFFECT ON THE CELL:-

As free radical contain one electron in its outer shell. So it has to gain an electron from other molecules to complete its orbit and that's the reason that it cause damage to the cell.

- Free radical may formed in the body due to physiologically(normal body process such as metabolism) or pathologically(due to some disease). It can also be formed by ultra violet radiation.
- It may be superoxide, hydrogen peroxide or hydroxyl radical.

- There is some defense mechanism in the body to protect it from free radical. When free radical overwhelm these defense systems, cell damage starts to happen.
- Free radical can react with lipid in the cell membrane, causing lipid peroxidation. Which ends up damaging the cell membrane.
- Free radical can also cause oxidative modification of protein, affecting the enzymes and other structural protein such as oxidation of DNA can cause the breaking of DNA strands and also induce mutation which increase the risk of cancer.
- They do cell damage in various ways which leads to aging.

ANSWER 4:-

Difference between apoptosis and necrosis:-

- a) **Apoptosis** is a programmed cell death, which occur naturally. While **necrosis** is unnatural cell death which occur through trauma or sudden accident.

- b) **Apoptosis** after regular interval of time. While **Necrosis** have no regular time.

- c) **Apoptosis** is not harmful for the body while **Necrosis** harmful for the body.

- d) **Apoptosis** is controlled genetically. While **Necrosis** is not genetical, due to it`s pathological reason.
- e) in **Apoptosis** the shrinkage of cell occur. While **Necrosis** is characterized by swell up of the cell.
- f) **Apoptosis** is active process, which means that it needs ATP. While **Necrosis** is a passive process, and don`t need any ATP.
- g) **Apoptosis** usually have no symptoms. While **Necrosis** have noticeable symptoms(gangrene).

CONCLUSION:-

Apoptosis and necrosis are cell death processes. Apoptosis is a natural, programmed cell death, which occur at some interval of time and controlled by genetics. And Necrosis is a cell death process characterized by sudden trauma, unnatural and not genetically controlled process.

ANSWER 5:-

AIR EMBOLISM:-

DEFINITION:- An air embolism also called *Gas embolism*. Which is define as the blockage of the vessel, caused by a gas or air bubbles in the circulatory system.

Sources:-

The sources of air embolism may be:-

1) Exogenic source:-

It's usually always caused by exogenic factors.

Artificial pneumothorax which is the surgical treatment of the lungs to collapse it, by inserting nitrogen or air into the pleural cavity. It was a treatment for pulmonary tuberculosis.

Pneumoperitoneum is the abnormal presence of air in the peritoneum cavity.

2) ENDOGENIC SOURCES:-

It may be decompression sickness which is the commonly occur in deep-sea diver.

When the diver deep down in the sea. The gases in the blood stream such as helium and nitrogen, dissolved at higher amount. When the diver come to the surface, the gases become insoluble, thus resulting in the formation of the bubble. And this condition is called **Decompression sickness or Cassion disease.**

RESULT:-

When an air enters a vein, it's called a venous air embolism. And when the bubbles of air enters into the artery, arterial air embolism.

These air bubbles can travel to your brain, heart, or lungs and cause a heart attack, stroke, or respiratory failure and even death.

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