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**Subject : Pathology Program : BS-MLT**

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1. Define the following terms with 2 physiological and

pathological examples each.

1. Atrophy
2. Hypertrophy
3. Hyperplasia
4. Metaplasia

Ans : Atrophy :

As the shrinkage in size of cell by loss of cell substance. When a sufficient number of cells involved, the entire tissue/organ diminishes in size.

 Physiological:

1. Atrophy of notochord and thyroglossal ducts during fetal development.
2. Atrophy of uterus after parturition.

Pathological:

 Pathologic atrophy may be localized or generalized:

1. Generalized: e.g. inadequate nutrition.
2. Localized: e.g. loss of innervation, loss of endocrine stimulation or diminished blood supply.

Hypertrophy:

Hypertrophy refers to an increase in the size of cells, resulting in an increase in the size of the organ.

Physiological:

1. Increase muscle mass through sport.
2. Uterus enlargement due to hormonal changes.

Pathological:

1. Hypertrophic cardiomyopathy due to arterial hypertension.
2. It can often be the result of abnormal (non-physiological) levels of circulating hormones.

Hyperplasia:

An increase in the number of cells which result increase the size of an organ. It is the result of increased cell mitosis, or division.

 Physiological:

1. Estrogenic stimulation of the endometrium the menstrual cycle.
2. Reactive bone marrow hyperplasia in hemolytic anemias.

Pathological:

1. Endometrial hyperplasia due to excess estrogen stimulation can progress to dysplasia and cancer.
2. Parenchymal organs in acromegaly.

Metaplasia:

 A reversible change in cell structure from one fully differentiate form one to another in response to normal or abnormal stimuli.

Physiological:

1. Metaplasia of the endocervix (columnar epithelium into squamous epithelium).
2. Cervical ectopy

 Pathological:

1. Respiratory epithelium in smoker (ciliated columnar epithelium to squamous epithelium)
2. Occur as a response to chronic chemical or physical stimuli.

**Example:**

 . Intestinal metaplasia (Barret metaplasia)

 . Squamous metaplasia of the bronchi due to smoking-ciliated

 pseudostratified squamous epithelium.

2. How does the calcium ions influx affect the cell? Write in your own words.

Ans: Oxidative stress causes influx of calcium ions into the cell cytoplasm that

causes calcium enter into mitochondria and nucleus.

In mitochondria it accelerates and disrupt normal metabolism leading to cell death.

In nuclei calcium molecules gene transcription and nucleus that causes apoptosis of cells.

3. What is free radical? What is the effect of Reactive Oxygen Specie (ROS) on the cell?

Ans: Oxygen in the body splits into single atoms with unpaired electrons.

 electrons. Electron like to be in pairs, so these atoms called free radicals,

 scavenge the body to seek out other electrons so they can become a pair,

 this causes damage to cells, proteins and DNA.

 Free radicals are associated with human disease, including cancer,

 atherosclerosis, Alzheimer’s disease, Parkinson’s disease and many

 others.

 Molecules having unpaired electron in its valence shell, Reactive oxygen

 specie damages and DNA that cause death of the cell.

 Reactive oxygen specie causes oxidation by attracting electrons from

 other molecule causing their destruction.

4. Write down some differences between Apoptosis and

Necrosis.

Ans: Whereas Apoptosis is a form of cell death that is generally triggered by

 normal, healthy in the body,

 Necrosis is cell death that is triggered by external factors or disease, such

 as trauma or infection,

 Apoptosis which can also occur as a defense mechanism during healing

 processes, is almost always normal and beneficial to an organism,

 While Necrosis is always abnormal and harmful. Though necrosis is being

 researched as possible form of programmed cell death (that is a

 sometimes natural process), it is considered an “unprogrammed’’

 (Unnatural) cell death process at this time. As a usually healthy form of

 a cells life cycle, Apoptosis rarely demands any form of medical treatment

 but Necrosis can lead to serious injury or even death.

NECROSIS Difference APOPTOSIS

. Cellular swelling . Cellular condensation

. Membrane are broken . Membrane remain intact

. ATP is depleted . Requires ATP

. Cell lyses eliciting an inflammatory . Cell is phagocytosed, no

 Reaction tissue reaction

. DNA fragmentation is random, . Ladder-like DNA

 or smeared fragmentation

. In vivo whole areas of the . In vivo, individual cells

 tissue are affected appear affected

. Cell swelling and lysis . Cell shrinkage and fragmentation

. Loss of plasma membrane . Loss of asymmetry of

 Integrity phospholipids in plasma

 membrane bilayer

. Recruitment of inflammatory . Detachment and engulfment

 Cells by phagocytes

. Lysed cells ingested by . Apoptotic bodies ingested by

 Macrophages neighboring cells

. Affects groups of neighboring . Affect single cells

 cells.

5. Write a note on Air Embolism.

Ans: An Air Embolism also called a gas embolism, occurs when one or more

Air bubbles enter a vein or artery and block it. When an air bubble enters a vein, its called a venous air embolism. When an air bubble enters an artery its called an arterial air embolism. These air bubbles can travel to your brain, heart, or lungs and cause a heart attack, stroke, or respiratory failure. Air Embolism are rather rare.

 **(Causes of an Air Embolism)**

An air embolism can occur when your vein or arteries are exposed and pressure allows air to travel into them. This can happen in several way, such as

* Injection and Surgical Procedures:

A syringe or IV air can accidently inject air into your vein. Air can also enter your vein or arteries through a catheter that’s inserted into them. Air can enter your vein and arteries during surgical procedures. This is most common during surgeries.

* Lung Trauma:

An air embolism can sometimes occur if there is trauma to your lung. For example, if your lung is compromised after an accident you might be put on a breathing ventilator. This ventilator could force air into a damaged vein or artery.

* Scuba Diving:

You can also get an air embolism while scuba diving. This is possible if you hold your breath for too long when you are under water or if you surface from the water too quickly.

These actions can cause the air sacs in your lungs,

Called alveoli, to rupture. When the alveoli rupture air may move to your arteries, resulting in an air embolism. Etc.