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Q1 : Define the following terms with physiological and pathological examples each.

ANS: Atrophy:

Atrophy is the term used to describe the wasting away or reduction in size of a part of the body, ultimately decreasing the function of the affected area.

Example:

Physiological:

- Fetal organ-like notochord and thyroglossal duct
- Uterus after parturition

Pathological:

- Disuse atrophy after immobilization in fracture cast
- Denervation atrophy
- Senile atrophy-heart

Hypertrophy:

Hypertrophy is a term describing an increase in the size of cells.

Example:

Physiological:

- Growth of uterus during pregnancy.
- A normal response to physiological levels of circulating hormones. e.g Puberty & Lactation.

Pathological:

- Myocardium in hypertension
- skeletal muscle in response to exercise

Hyperplasia:

The definition of hyperplasia is an abnormal increase in the number of cells in an organ or tissue.

Example:

Physiological:

Hormonal Hyperplasia :

- Hyperplasia of the female breast epithelium at puberty or pregnancy
- Pregnant uterus

Pathological:

Compensatory Hyperplasia:

- Regeneration of the liver following partial hepatectomy
- Regeneration of epidermis after skin abrasion

Metaplasia:

The term metaplasia also refers to the abnormal replacement of cells of one type by those of another type.

Example:

Physiological:

- Metaplasia is the squamous metaplasia that occurs in the uterine cervix during the menstrual cycle as the squamocolumnar junction migrates across the transformation zone

Pathological:

- Respiratory epithelium of smokers.

Q 2 :How does the calcium ion influx affects the cells?

ANS:

Calcium is the body fluids (extracellular fluid, the blood and the cellular fluids).The movement of calcium ions also plays a important role in the gene expression and affects the flexibility of the structures,called synapses,that are located between neurons and transmit electrical and chemical signals of various strengths from one cell to a second cell.The ion channels that are a major source of calcium ions are referred to voltage dependent calcium channels.

The reasreachers also found that the calicum binding massenger protein calmodulin,which is the cells main sensor for calcium ions, induce internalization , or endocytosis to remove this channel from the cell surface, thus providing an important negative feedback mechanism for excessive calcium ion influx into a cells(neuron).

Calcium ion influx inside the cell and combine with calmodulin protein and produce smooth muscle contraction.

calcium stored large quantity of sarcoplasmic reticulum which are help to cause skeletal muscle contraction.

Q3:What is free radical?what is the effect of reactive oxygen specie (ROS) on the cell?

ANS: Free Radical:

Free Radicals are molecules with odd number of electrons and a high instability.In addition, a wide variety of environmental agents (drugs capable of redox cycling,and xenobiotics that can form free radical metabolites)including the aging process cause free radical damage to cells.

Effect of Reactive Oxygen Species on the cell:

Effects of ROS on cell metabolism are well documented in a variety of species. These include not only roles in apoptosis (programmed cell death) but also positive effects such as the induction of host defence genes and mobilization of ion transport systems. This implicates them in control of cellular function. In particular, platelets involved in wound repair and blood homeostasis release ROS to recruit additional platelets to sites of injury. These also provide a link to the adaptive immune system via the recruitment of leukocytes.

Reactive oxygen species are implicated in cellular activity to a variety of inflammatory responses including cardiovascular disease. They may also be involved in hearing impairment via cochlear damage induced by elevated sound levels, in ototoxicity of drugs such as cisplatin, and in congenital deafness in both animals and humans. ROS are also implicated in mediation of apoptosis or programmed cell death and ischaemic injury. Specific examples include stroke and heart attack.

In general, harmful effects of reactive oxygen species on the cell are most often:

- Damage of DNA or RNA.
- Oxidation of polyunsaturated fatty acids in lipids (lipid peroxidation).
- Oxidations of amino acids in proteins.
- Oxidative deactivation of specific enzymes by oxidation of co-factors.

Q4: Write down some differences between Apoptosis and Necrosis ?

ANS:

Apoptosis:

Introduction:

Apoptosis, or programmed cell death, is a form of cell death that is generally triggered by normal, healthy processes in the body.

Effects:

Usually beneficial. Only abnormal when cellular processes that keep the body in balance cause too many cell deaths or too few.

Process:

Membrane blebbing, shrinkage of cell, nuclear collapse (nuclear fragmentation, chromatin condensation, chromosomal DNA fragmentation), apoptotic body formation. Then, engulfed by white blood cells.

Symptoms:

Usually no noticeable symptoms related to the process.

Causes:

Self-generated signals in a cell. Generally a natural part of life, the continuation of the cellular cycle initiated by mitosis.

Medical Treatment:

Very rarely needs treatment.

Necrosis:

introduction:

Necrosis is the premature death of cells and living tissue. Though necrosis is being researched as a possible form of programmed cell death, it is considered an unprogrammed cell death process at this time.

Effects:

Always detrimental.

Process:

Membrane disruption , respiratory poisons and hypoxia which cause ATP depletion, metabolic collapse, cell swelling and rupture leading to inflammation.

Symptoms:

Inflammation ,decreasing blood flow at affected site, tissue death (gangrene).

Causes:

Bacterial or fungal infections,denatured proteins that impede circulation, fungal and mycobacterial infections,pancreatitis,deposits of antigens and antibodies combined with fibrin.

Medical Treatment:

Always requires medical treatment. Untreated necrosis is dangerous and can lead to death.

Q5:Write a note on Air Embolism?

ANS: An air emulsion also known as a gas embolism, is a blood vessel blockage caused by one or more bubbles of air or other gas in the circulatory system. Air embolisms may also occur in the xylem of vascular plants,especially when suffering from circulation during surgical procedures, lung over-expansion injury,decompression,and a few other causes.

Divers can suffer from arterial gas embolism as a consequence of lung over-expansion injury.Breathing gas introduced into the venous system of the lungs due to pulmonary barotrauma will not be trapped in the alveolar capillaries and will consequently be circulated to the rest of the body through the systemic arteries,with a high risk of emolism.Inert gas bubbles arising from decompression are generally formed in the venous side of the systemic circulation , where inert gas concentration are highest,these bubbles are generally trapped in the capillaries of the lungs where they will usually be eliminated without causing symptoms.If they are shunted to the systemic circulation throught a patent foramen ovale they can travel to and lodge in the brain where they can cause myocardial ischaemia or other tissues,where the consequence are usually less critical.The first aid treatment is a to administer oxygen at the highest practicable concentration,treat for shock and transport to a hospital where therapeutic recompression and hyperbaric oxygen therapy are the definitive treatment.

Symptoms:

In surgery

- hypotension
- shortness of breath

In divers

- symptoms of arterial gas embolism include:
- Loss of consciousness
- Vertigo

- Loss of coordination
- Loss of control of bodily functions
- Paralysis
- Nausea or Vomiting

Causes of an air embolism:

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

Injection and Surgical Procedures:

A syringe or IV can accidentally inject air into your veins. Air can also enter your veins or arteries through a catheter that's inserted into them.

Air can enter your veins and arteries during surgical procedures. This is most common during brain surgeries. According to an article in the Journal of Minimal Access Surgery, up to 80 embolism. However, medical professionals usually detect and correct the embolism during the surgery before it becomes a serious problem.

Treatment:

- Treatment for an air embolism has three goals;
- Stop the source of the air embolism
- prevent the air embolism from damaging your body
- resuscitate you, if necessary