

1. What is apoptosis and necrosis?

Ans- Apoptosis - Programmed cell death or apoptosis is a genetically controlled mechanism that is essential for the maintenance of cellular homeostasis within tissues involving the development and elimination of unwanted cells. It is a mechanism that allows cells to self-destruct when stimulated by the appropriate trigger. Apoptosis can be triggered by mild cellular injury and by various factors internal or external to the cell; the damaged cells are then disposed of in an orderly fashion.

Necrosis - Necrosis is a form of cell injury which results in the premature death of cells in living tissue by autolysis. Necrosis is caused by factors external to the cell or tissue, such as infection, toxins, or trauma which result in the unregulated digestion of cell components. After necrosis, the harmful chemical substances released from the dead cells cause damage and inflammation of neighboring tissues.

2. Describe the process of apoptosis.

Or, Write down the activation process of apoptosis.

Or, Write down the role of mitochondria in apoptosis.

Ans: ACTIVATION OF APOPTOSIS:

Apoptosis is activated by either withdrawal of positive signals (survival factors) or arrival of negative signals.

- (a) **Withdrawal of positive signals** : Positive signals are the signals which are necessary for the long-time survival of most of the cells. The positive signals are continuously produced by other cells or some chemical stimulants.

Best examples of chemical stimulants are:

- i. Nerve growth factors (for neurons) ii. Interleukin-2 (for cells like lymphocytes). The absence or withdrawal of the positive signals activates apoptosis.

- (b) **Arrival of negative signals** : Negative signals are the external or internal stimuli which initiate apoptosis. The negative signals are produced during various events like:

1. Normal developmental procedures
2. Cellular stress
3. Increase in the concentration of intracellular oxidants
4. Viral infection
5. Damage of DNA
6. Exposure to agents like chemotherapeutic drugs, X-rays, ultraviolet rays and the death-receptor ligands

1. Role of Death-receptor ligands and death receptors:

Death-receptor ligands are the substances which bind with specific cell membrane receptors and initiate the process of apoptosis. The common death-receptor ligands are tumor necrosis factors (TNF- α , TNF- β) and Fas ligand (which binds to the receptor called Fas).

Death-receptors are the cell membrane receptors which receive the death-receptor ligands. Well-characterized death receptors are TNF receptor-1 (TNFR1) and TNF-related apoptosis inducing ligand (TRAIL) receptors called DR4 and DR5.