

Cell injury, adaptation and cell death

* Normal cells have a fairly narrow range of function or steady state: Homeostasis.

* Excess physiologic or pathologic stress may force the cell to a new steady state: Adaptation. Adaptation= Change in cell morphology and function in response to a stimulus. It is reversible.

* Too much stress exceeds the cell's adaptive capacity: Injury.

Adaptation

It is modification of cell morphology and function in relation to stress, it is reversible and preserves the viability of cells. It includes

1- Hypertrophy : is an increase in the size of individual cells, in response to a stimulus or injury.

2 –Atrophy : It is decrease size and weight of an organ due to decreased size and number of its component cells.

3- Hyperplasia : Is an increase in the absolute number of cells, in response to a stimulus or persistent cell injury. It may be physiological or pathological.

4- Metaplasia : A reversible change in which one mature/adult cell type (epithelial or mesenchymal) is replaced by another mature cell type of the same category.

Cell injury

It is change in cell's morphology and function in response to stress. - Cell injury occurs when the limits to an adaptive response (adaptation) have been exceeded or if the cells are not able to adapt.

Factors that affect cell injury:-

A.Type,duration and severity of injury.

B. Type of injured tissue, its adaptability and genetic makeup
e.g. - brain tissue is very sensitive to hypoxia (2-5 min) -
skeletal muscles can adapt hypoxia for (2-6 hours).

Hydropic degeneration

- A severe form of cloudy swelling.
- Cytoplasm accumulates vacuoles of water.

Fatty change (Steatosis)

-It is abnormal accumulation of intracellular neutral fat that occurs in parenchymatous organs most commonly liver and heart.

Cell death includes necrosis and apoptosis.

Necrosis

Death of a group of cells within living organism.

Two factors characterize irreversibility of the cell damage

- 1- Irreversible mitochondrial damage.
- 2-Increased intracellular calcium (Ca).

Types of Necrosis

- Coagulative (most common)
- Liquefactive
- Caseous
- Fat necrosis (traumatic and enzymatic)
- Fibrinoid necrosis.

Apoptosis

A type of cell death referred to as single or (programmed) cell death.