SNS COLLEGE OF ALLIED HEALTH SCIENCES
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1st YEAR

SUBJECT:PATHOLOGY

TOPIC:CELLULAR INJURY

DEFINITION:

- Cell injury is defined as the effect of a variety of stresses due to etiologic agents of a cell encounters resulting in changes in its internal and external environment.

- Stress = Etilogical agents like bacteria.

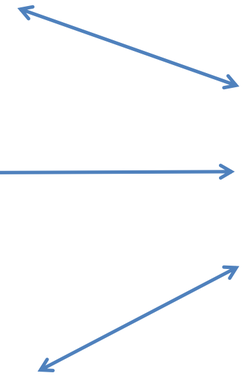
TYPES:

1. Reversible cell injury
2. Irreversible cell injury

STRESS

STRESS

STRESS



AFFECTED CELL
(Changes in internal and external environment)

STRESS

CELL

Altered functional demand

Adaptations

- Atrophy
- Hypertrophy
- Hyperplasia
- Dysplasia

Mild to moderate stress

Reversible cell injury

- Degenerations
- Subcellular
- Alterations
- Intracellular
- Accumulations

Severe stress and persistant stress

Irreversible cell injury

- Cell death

Etilogy:

- The cells may be broadly injured by two major ways:

1.Genetic Causes

2.Acquired Causes

Genetic Causes:

1.Features of reversible cell injury

- Cellular Swelling
- Hyaline Swelling
- Mucoid Change

2.Fatty change

Acquired Causes:

- Hypoxia and ischemia
- Physical agents
- Chemical agents and drugs
- Microbial agents
- Immunologic agents
- Nutritional dearrangements
- Ageing
- Psychogenic diseases
- Iatrogenic factors
- Idiopathic diseases

1.Hypoxia and Ischemia:

- Hypoxia is most common cause of cell injury

Reduced blood supply to cells due to interruption in blood flow leading to ischemia

Due to defects in oxygen carrying RBC’s or due toor heart disease,lung disease,due to increased demand from tissues

2.Physical Agents:

- Mechanical trauma
- Thermal trauma
- Electricity
- Radiation
- Rapid changes in atmospheric pressure

3.Chemicals and drugs:

- Chemical poisons such as cyanide,arsenic,mercury
- Strong acids and alkalosis
- Environmental pollutants
- Insecticides and pesticides
- Oxygen at high concentrations
- Hypertonic gulcose and salt

- Social agents such as alcohol and narcotic drugs
- Therapeutic administration of drugs

4.Microbial agents:

- Injuries by microbes include:
- Bacteria,virus,rickettsiae,fungi,protozoa,metazoa and other parasites.

5.Immunologic agents:

- Immunity is a double edged sword
- It protects the host against various injurious agents but it may also turn lethal and cause cell injury
- eg:hypersensitivity reactions,anaphylactic reactions & autoimmune disease.

6.Ageing:

- Cellular ageing or senscene leads to impairedd ability of the cells to undergo replication and repair,and ultimately lead to cell death culminating in death of the individual

Pathogenesis:

- Injury to the normal cell by one or more of the above listed etilogic agents may result in state of
- cell repair and heal - reversible cell injury
- Cell death - Irreversible cell injury

Based on type,duration,severity:

1.Small dose of chemical/physical agent

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Reversible cell injury

2.Short duration of ischemia

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REversible cell injury

1.Large dose of chemical/physical aget

↓

Irreversible cell injury

2.Long duration of ischemia

↓

Irreversible cell injury

Based on type,status,adaptability of target cell:

If a cell is highly sesceptablr to hypoxia

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Early cell injury

eg:1.Skeletal muscle can withstand hypoxic injury for long time
2.While cardiac muscle suffers irreversible cell injury if exposed to hypoxia for >20mins.

Pathogenesis of ischemia & hypoxic injury:

- Ischemia and hypoxia are the most common forms of cell injury
- It leads to
- Reversible cell injury
- Irreversible cell injury

Reversible cell injury:

- Reversible cell injury simply indicates that the affected cell has the potential to survive following a noxious insult.A reversibly injured cell may be morphologically recogonizable by a variety of changes dependin on its phenotype.

Reversible cell injury in hypoxia:

- If hypoxia is of short duration-the effects may be reversible on rapid restoration of circulation
- eg:In coronary artery occulsion,the myocardial contractility metabolism and ultra structure are reversed if the circulation is quickly restored.

Irreversible cell injury in hypoxia/ischemia:

Persistence of ischemia(ie,reduced blood flow to a tissue / organ)or hypoxia

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Continous decrease in ATP ,decrease in proteins,decrease intracellular ph and leakage of lysosomal enzymes into the plasma

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Irreversible damage to the structure and functions of cell even after reperfusion with oxygen(ie.cell death)

Morphology forms of reversible cell injury:

- Hydrophic change
- Hyaline change
- Muccoid change
- Fatty change

Morphology forms of irreversible cell injury:

- Cell death is a state of irreversible injury
- process involved in cell death

Locally:

1.Autolysis

2.Necrosis

3.Apotosis

Changes following local change:

1.Gangrene

2.Calcification

THANK YOU