

# Pathology

Sheet

Slide



## number

3

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## **Subcellular responses to injury:**

- 1) Lysosomal catabolism (heterophagy & Autophagy)
- 2) Hypertrophy in smooth ER
- 3) Mitochondrial alterations
- 4) Cytoskeleton abnormalities
- 5) Heat shock proteins

- Cytoskeleton can be affected by increasing or decreasing (hypertrophy or atrophy)

Microtubules are essential for leukocyte migration and phagocytosis; they could accumulate in joints which cause limited movement of the joint. The treatment is (colchicines)

- Heat shock proteins are called stress proteins (molecular chaperons)

(SLIDES 10-13)

\* Reversible cell shape

\* Irreversible cells can be injured not only reversible ones.

\* **Reversible cell injury:**

- Plasma membrane alteration (Na & water influx) causes swelling of all cell organelles (lysosomes – nucleus, etc.).

- Mitochondrial changes: earliest manifestation (because it will not be able to produce ATP anymore which cause functional injury then the structural one).

\* **Phospholipids found in the matrix of mitochondria:**

- Dilation of endoplasmic reticulum

- Nuclear alteration

(SEE SLIDES 7-10)

\* **General irreversible pathway:**

- Excessive damage to all membranes

- Cytosolic and organelles

**\* Leakage of digestive enzymes from lysosomes:**

Autolysis (digested by their own enzymes)

Heterolysis (digested by other cells enzymes)

- Removal of dead cells: combined process that the extracellular enzyme digests it with phagocytosis from other cells.

(SEE SLIDES 14-24)

Detergent function to break down membranes (ex: lysosome membrane, cell membrane, mitochondrial membrane, etc.) all types of membranes.

**\* Necrosis morphological changes:**

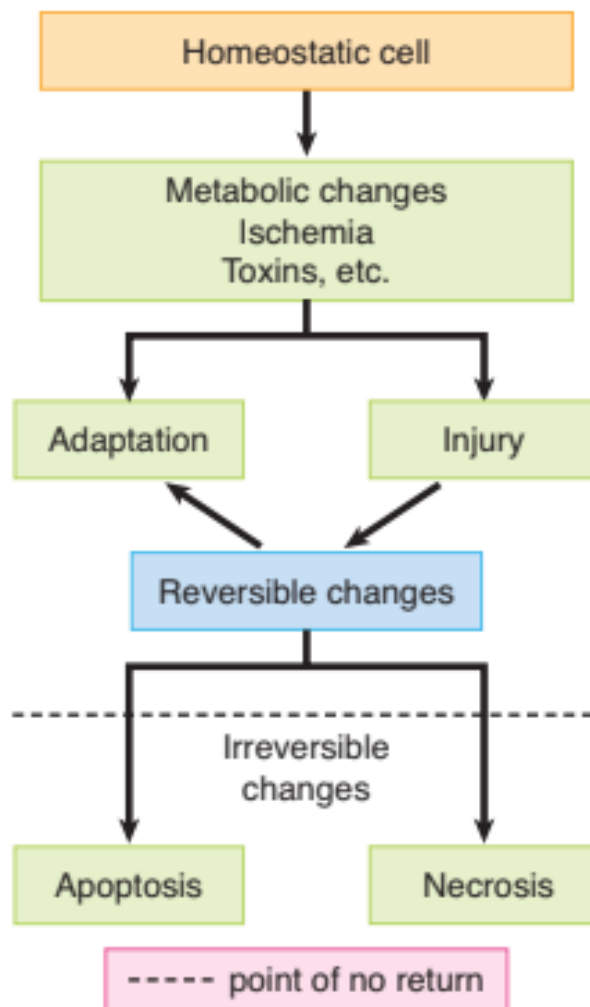
- Enzymatic digestion of the cell (autolysis-heterolysis)

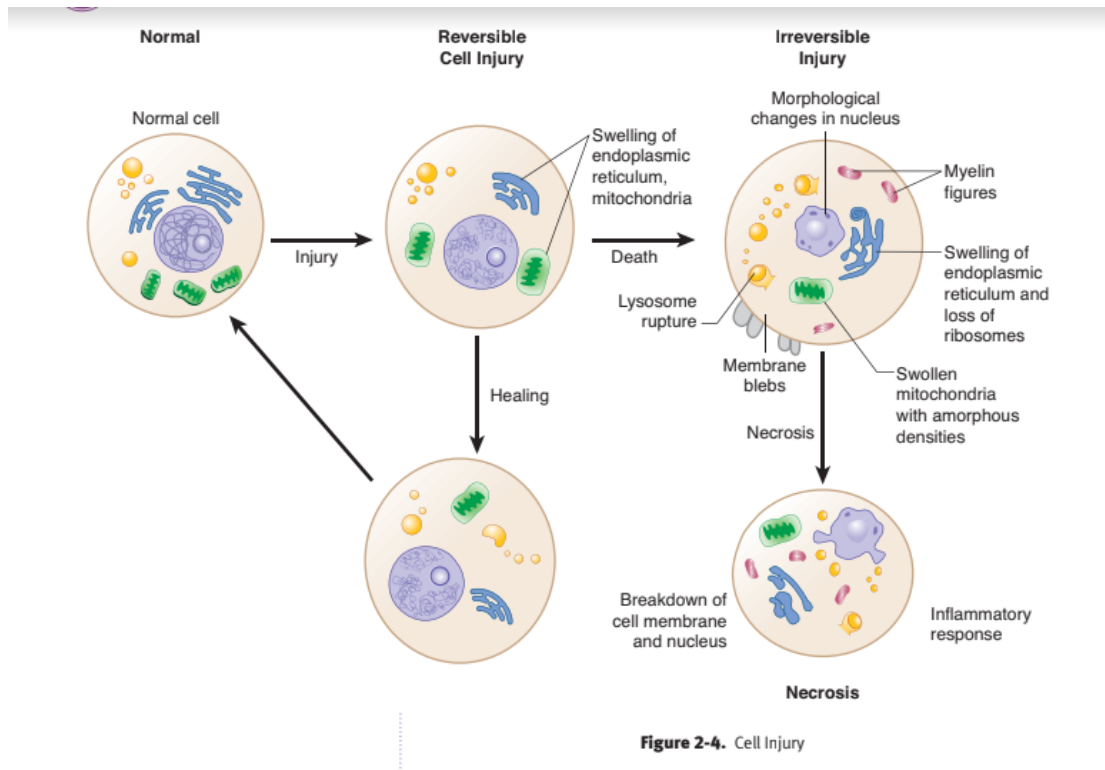
-Denaturation of proteins

Note: MI (injured cardiac muscle)

-ultrastructural changes (organelles)

## CELLULAR CHANGES DURING INJURY





## NECROSIS

Morphologic types of necrosis (cell death in living tissue, often with an inflammatory response) are:

Coagulative necrosis (most common type)-

Death of cells with preservation of the basic structural outlines of cells for days, with preservation of the general tissue architecture

- Liquefactive necrosis: Necrosis with complete digestion of cells and destruction of the normal

Caseous necrosis: Seen with tubercles infection-

- Fatty necrosis: Special type of necrosis with focal areas of fat destruction seen with acute pancreatitis
- Gangrenous necrosis: ischemic coagulative necrosis.



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**Figure 2-6.** Gangrenous Necrosis Affects the First and Third Toes of a Diabetic Foot

(SEE NECROSIS SLIDES)