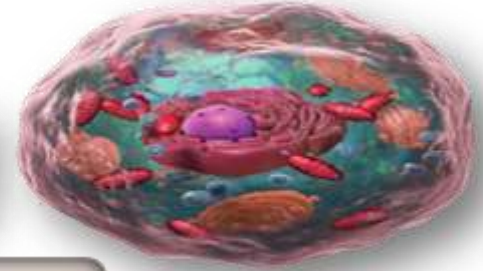


# Cell injury



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# ***At the end of this presentation you will be able to:***



1

-Define cell injury

2

-Discuss causes of cell injury

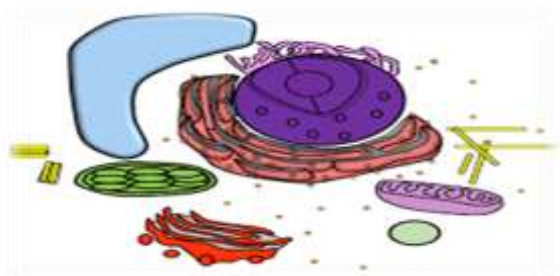
3

-Describe Mechanism of cell injury

4

-Describe type of cell injury

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## INTRODUCTION

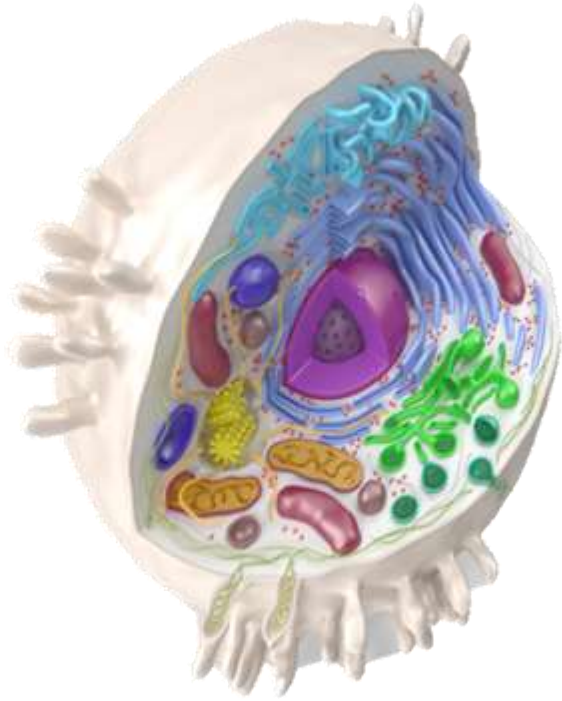
Normal cells have a fairly narrow range of function or steady state: Homeostasis

- Excess physiologic or pathologic stress may force the cell to a new steady state: Adaptation

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

# 1. Define of cell injury

- Cell damage (also known as cell injury) is a variety of changes of stress that a cell suffers due to external as well
  - as internal environmental changes.
  - Amongst other causes, this can be due to physical, chemical, infectious, biological, nutritional or immunological factors
-



Cause of  
cell injury

# 1. oxygen deprivation

- **Hypoxia** is a deficiency of oxygen, which causes cell injury by reducing aerobic oxidative respiration.
  - **Ischemia** is a loss of blood supply from impeded arterial flow or reduced venous drainage in a tissue resulting in oxygen deprivation and hypoxia
-

## 2. physical agents:

- Physical agents capable of causing cell injury include **mechanical trauma**, extremes of **temperature** (burns and deep cold).

## 3. chemical agent:

- The list of chemicals that may produce cell injury defies compilation. Simple chemicals such as **glucose** or **salt** in hypertonic concentrations.
-

## 4. infectious agents:



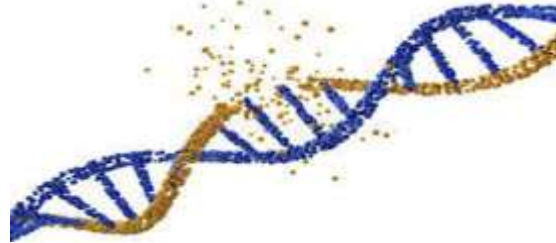
- Infectious agents range from the submicroscopic **viruses** to the large **tapeworms**. In between are **bacterias**, **fungi**, and higher forms of **parasites**.

## 5. Genetic diseases :

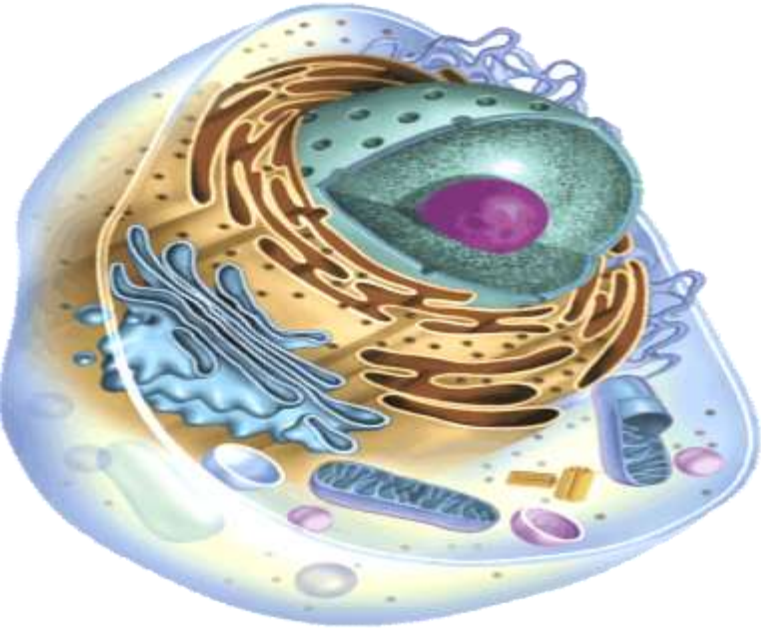
diseases due to anomalies of genes, as mutations.

### **Etiology :**

- radiations







# Mechanism of cell injury

# 1- Depletion of ATP

↳ Major causes :

- ↓ Reduced supply of oxygen and nutrients
  - Mitochondrial damage
  - The actions of some toxins (e.g., cyanide)
-

## 2- Mitochondrial damage & dysfunction

↳ Result in :

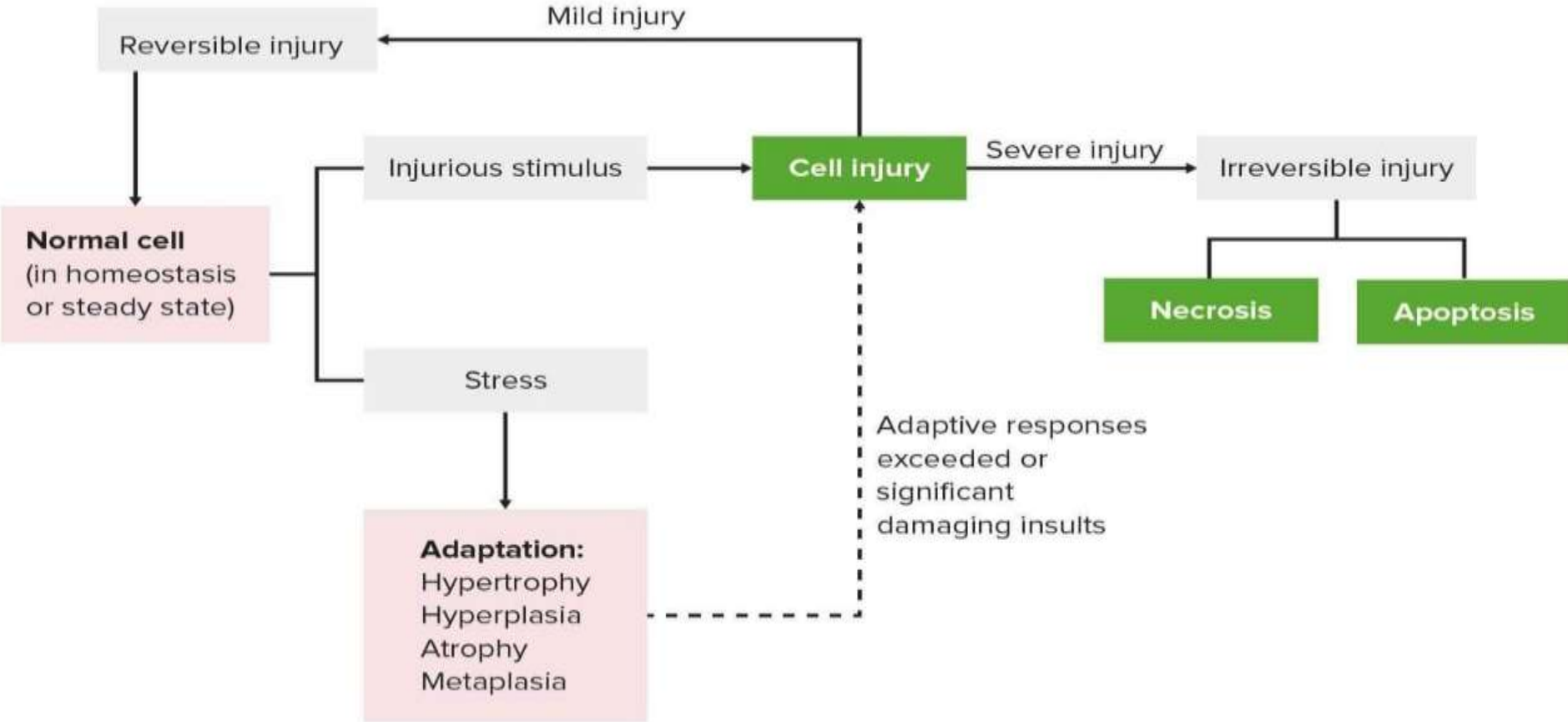
- Failure of oxidative phosphorylation leads to progressive **depletion** of ATP & formation of **reactive oxygen specie**
  - **loss** of mitochondrial membrane potential and **pH** changes
  - The mitochondria also contain several proteins that, when released into the cytoplasm, tell the cell there is internal injury and activate a pathway of **apoptosis**
-

# 3- Influx of Calcium

↳ *Increased cytosolic  $Ca^{+2}$  activates a number of enzymes:*

- **Phospholipases** (which cause membrane damage)
  - **Proteases** (which break down both membrane and cytoskeletal proteins)
-

# Type cell injury



1

## Necrosis

- is characterised by cytoplasmic swelling, **irreversible damage** to the plasma membrane, and organelle breakdown leading to cell death

2

## Apoptosis

- is the process of programmed cell death. It is used during early development to eliminate unwanted cells : **for example**, those between the fingers of a developing hand. **In adults**, apoptosis is used to rid the body of cells that have been damaged beyond repair.
-

# Summary

- Cell damage (also known as cell injury) is a variety of changes of stress that a cell suffers due to external as well as internal environmental changes
  - Cause: Hypoxia, physical agents, chemical agent, infectious agent
  - Mechanism: Depletion, Mitochondrial damage
  - Type cell injury: reversible, irreversible
  - Irreversible: Apoptosis, Necrosis
-

# Reference

- <https://www.slideshare.net/appyakshay/cell-injury-75140470>
  - [https://books.google.com.ly/books?id=WGNFAAAAYAAJ&q=MECHANISM+cell+injury:+BOOKS&dq=MECHANISM+cell+injury:+BOOKS&hl=en&sa=X&ved=2ahUKEwjN6cO6wvn6AhVsh\\_0HHY0HCjMQ6AF6BAgKEAI](https://books.google.com.ly/books?id=WGNFAAAAYAAJ&q=MECHANISM+cell+injury:+BOOKS&dq=MECHANISM+cell+injury:+BOOKS&hl=en&sa=X&ved=2ahUKEwjN6cO6wvn6AhVsh_0HHY0HCjMQ6AF6BAgKEAI)
  - <https://step1.medbullets.com/pathology/106028/cell-injury>
  - <https://www.humpath.com/spip.php?article8567>
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