



# NOVA

Charting New Horizons in Education

Introduction to pathology & cellular injury I

# 01

Pathology

# ~ Divisions of Pathology:



- Pathology is fundamentally divided into two main branches:
  1. **General Pathology:** basic concepts that are shared among various disease in multiple organs/systems (Ex: Inflammation, cell injury and neoplasia)
  2. **Systematic Pathology:** discuss pathology of diseases of a specific organs/systems



# ~ Core Aspects of Disease Process:

## A. Causation (Etiology) “Why?”

## B. Pathogenesis:

- The “HOW”, mechanisms of development and progression of disease, the cellular and molecular changes that give rise to the specific functional and structural abnormalities that characterize the disease.

## C. Morphology:

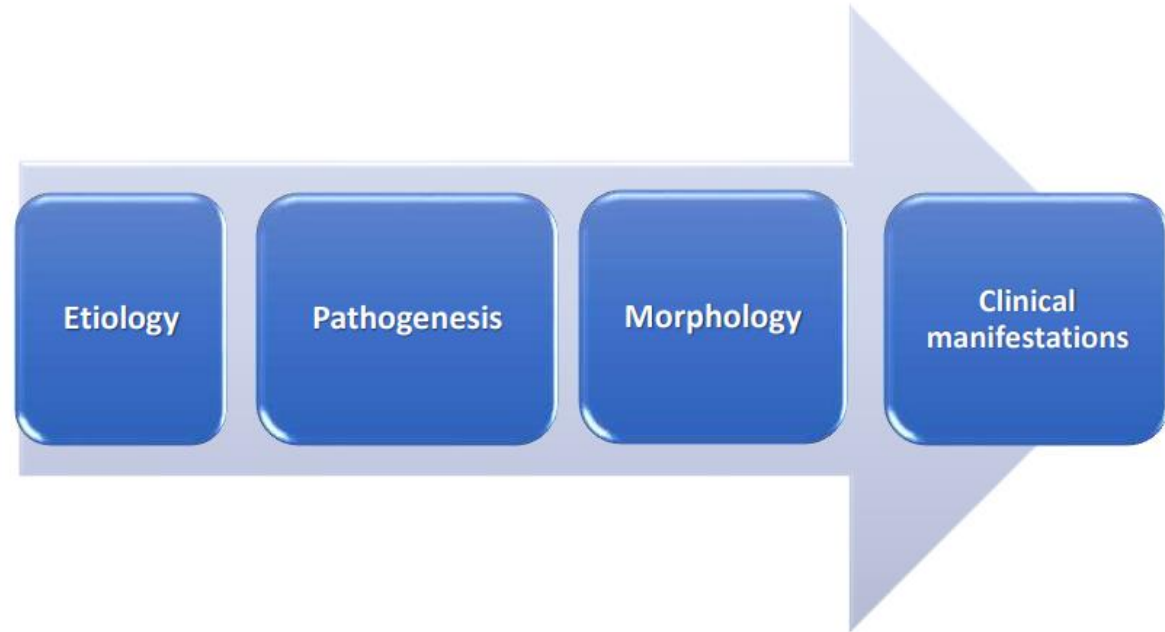
- Is structural alteration of cell and tissue as a result of the pathogenesis:
- ✓ Gross: naked eye
- ✓ Microscopic



# Core Aspects of Disease Process:

## D. Clinical Manifestations:

- The consequences of changes





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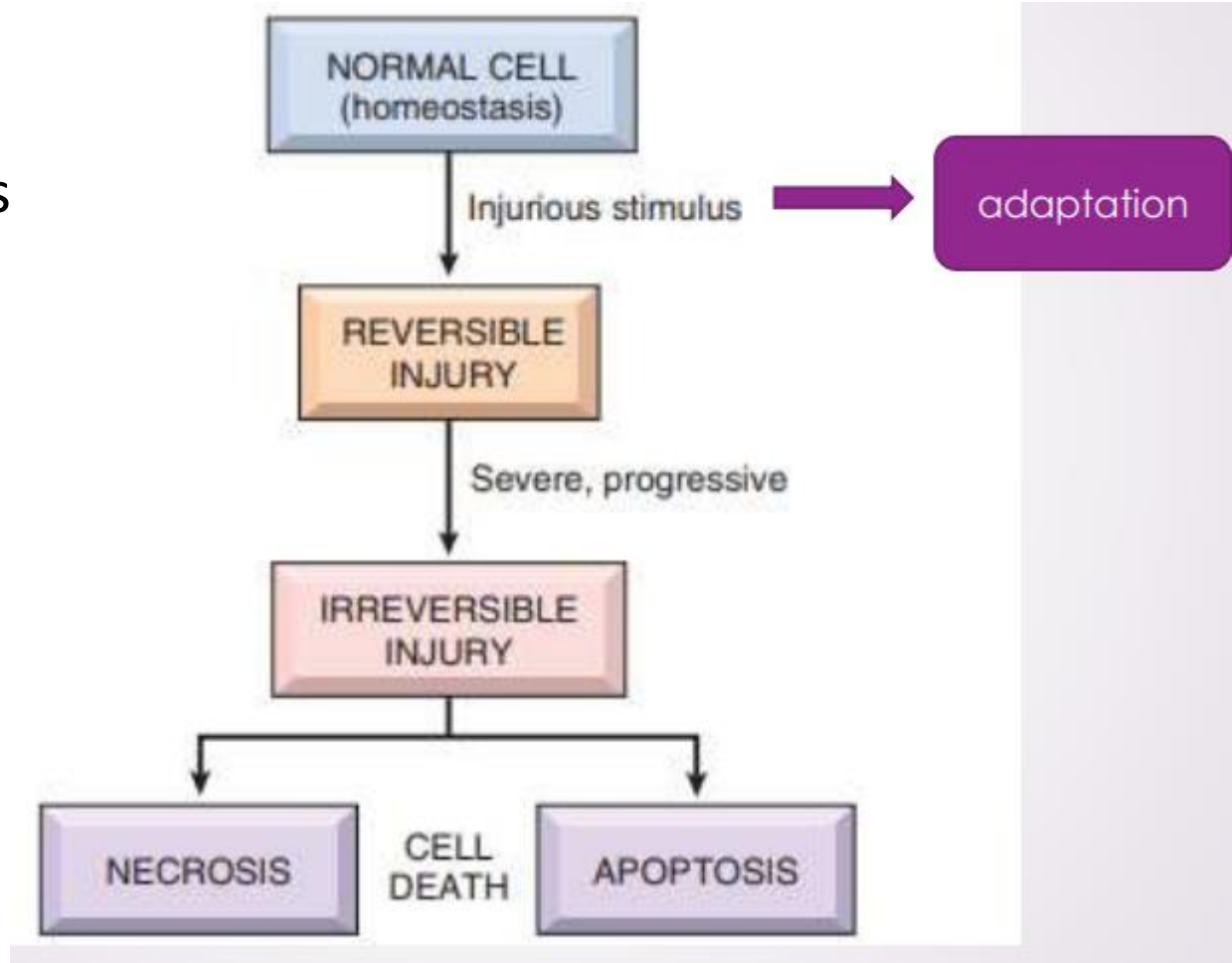
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Cell injury I

# Stress



- So in any:
- Physiologic stresses (such as increased workload in the heart) / Potentially injurious conditions (such as nutrient deprivation) → The cells undergo adaptation: new steady state with preserving viability and function.
- If the adaptive capability is exceeded or if the external stress is inherently harmful or excessive, cell injury develops



# ~ Causes of cell injury



1. Oxygen Deprivation (Hypoxia Vs ischemia) : most common causes of injury



## ~ Ischemia vs Hypoxia

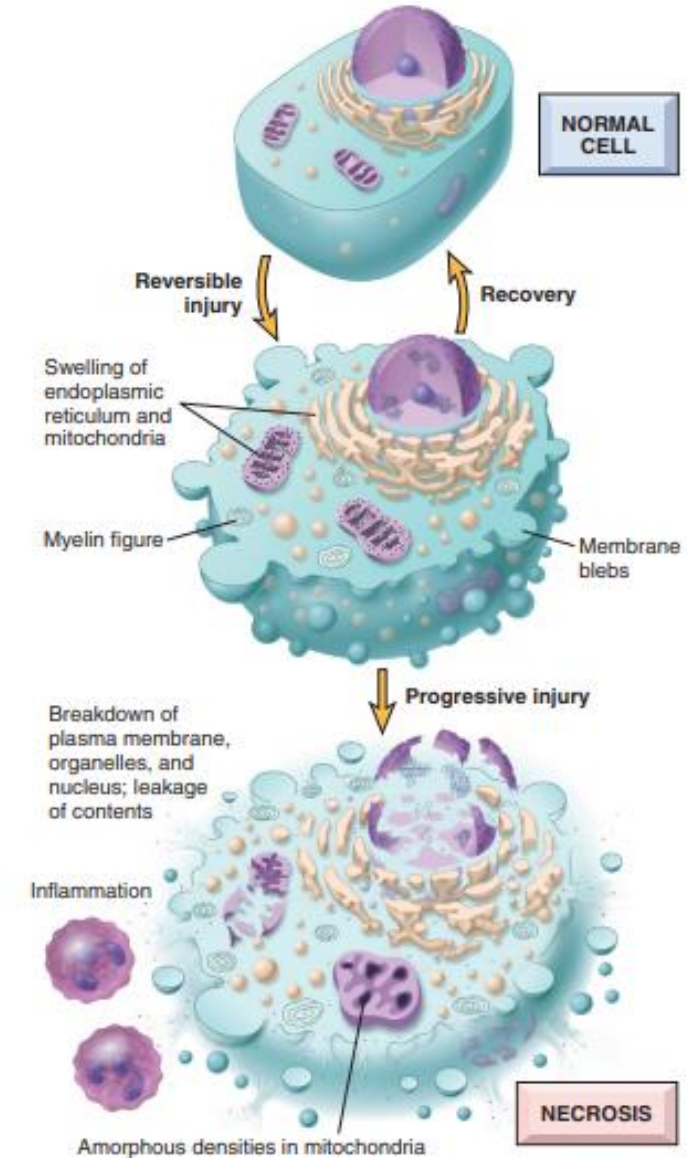
- Ischemia is insufficient blood flow to provide adequate oxygenation → Usually caused by arterial thrombus formation or vasospasm.
- Hypoxia: oxygen deficiency, can be caused by:
- Ischemia, anemia, lung disease, CO poisoning.
  
- Ischemia results in hypoxia; however, hypoxia can occur with normal (or elevated) blood flow if, for example, the oxygen content of the arterial blood is decreased by anemia.





# SEQUENCE OF EVENTS IN CELL INJURY AND CELL DEATH

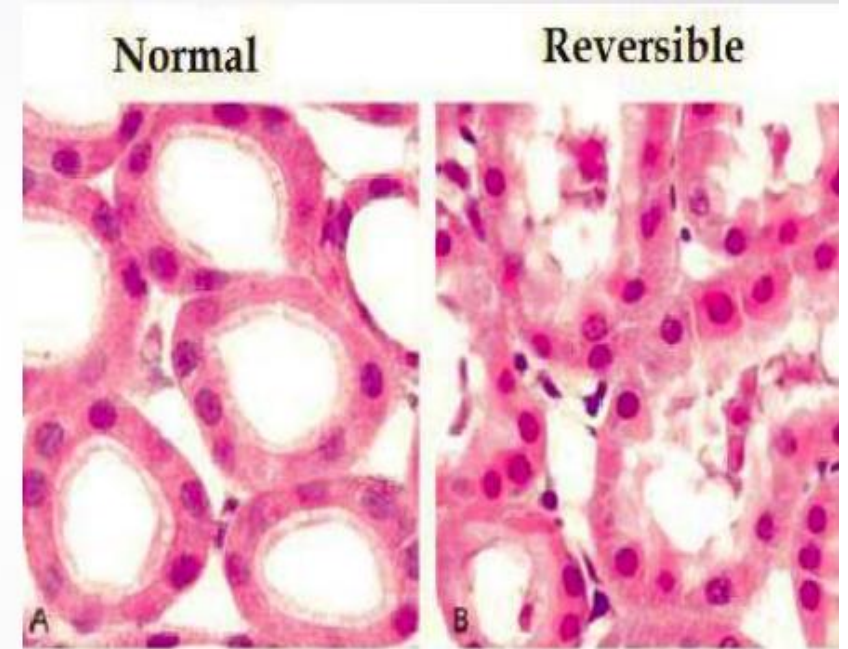
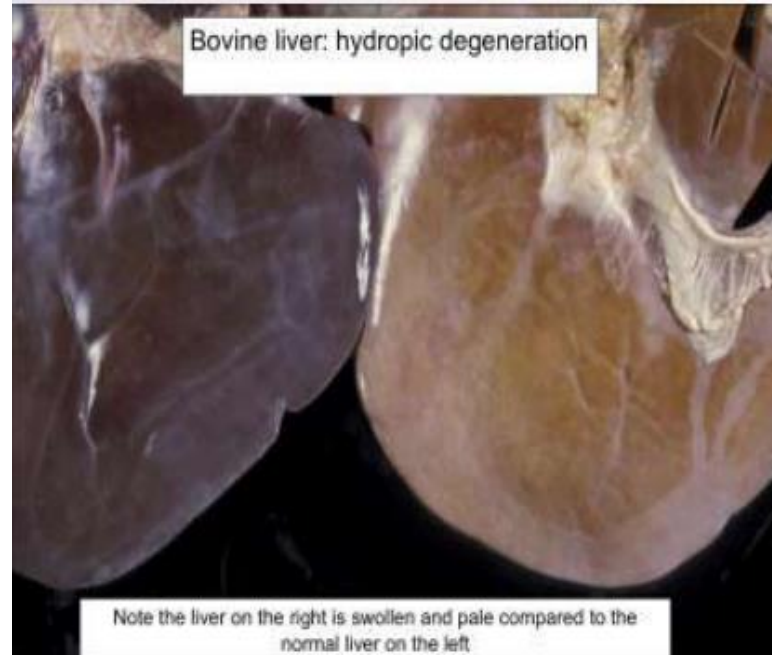
- Reversible Cell injury: the stage of cell injury at which the deranged function and morphology of the injured cells can return to normal if the damaging stimulus is removed
- Irreversible Cell injury: the stage of cell injury at which the injured cells pass a nebulous “point of no return” and undergo cell death.
- Occur if the stress is severe, persistent, or rapid in onset





- Morphology of reversible cell injury;
1. Cellular Swelling:
    - Reversible process results from failure of the sodium potassium pump (energy-dependent ion pumps) due to ATP depletion.

- Gross: pallor, turgor.
- Microscopy:
- ✓ Cellular swelling.
- ✓ Hydropic change





- Morphology of reversible cell injury;

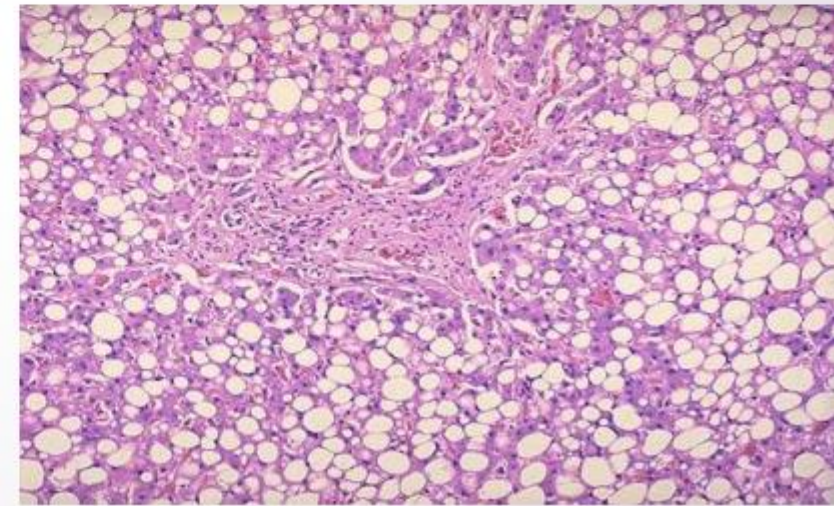
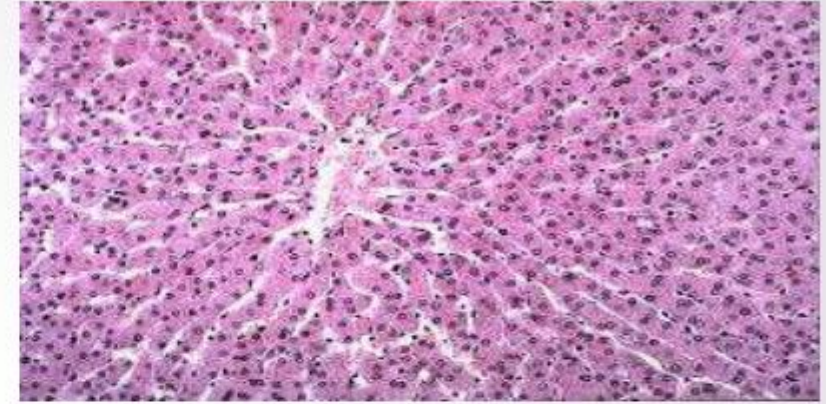
- 2. Fatty change

- It is reversible process, seen mainly in organs that involved in fat metabolism like Hepatocytes and myocardial cells .

- Occurs mainly in hypoxic injury, toxic and metabolic injury.

- Microscopy:

- ✓ Lipid (triglyceride) vacuoles in the cytoplasm





- Irreversible cell injury
- Consistently characterized by three phenomena:
  1. The inability to restore mitochondrial function even after resolution of the original injury
  2. Loss of structure and functions of the plasma membrane and intracellular membranes
  3. Loss of DNA and chromatin structural integrity.



«Education is the passport to the future, for tomorrow  
belongs to those who prepare for it today»

- Maclom X-