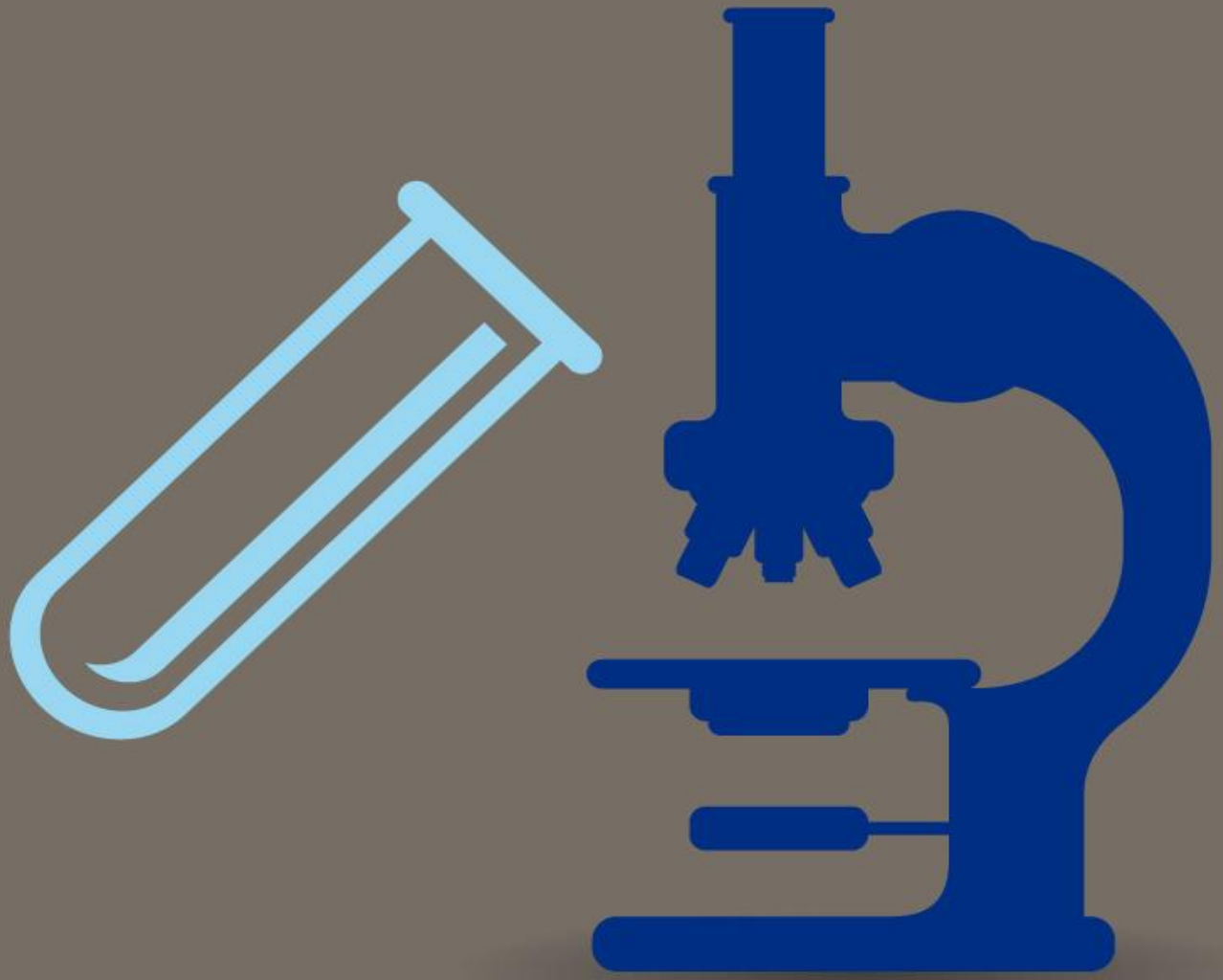
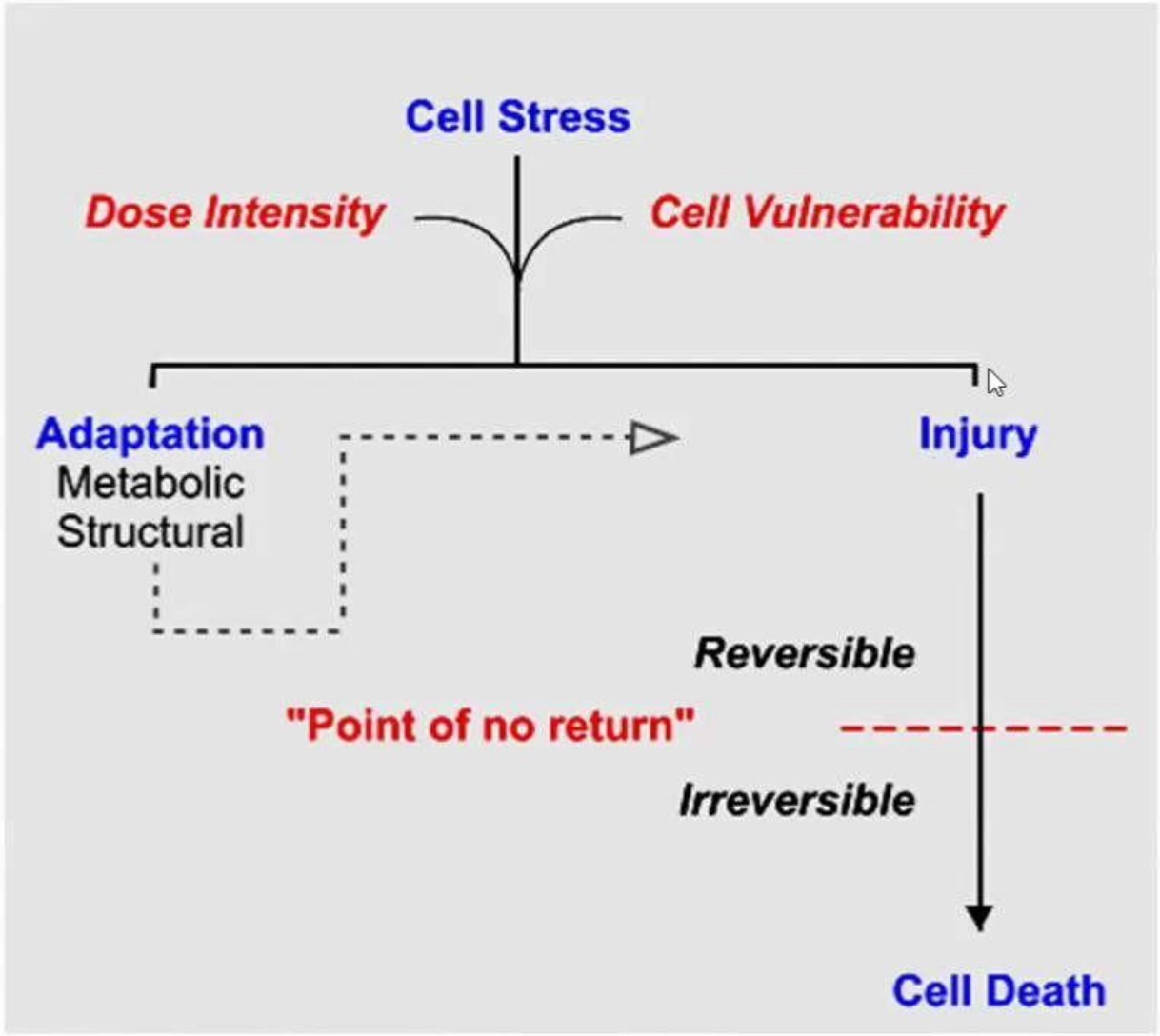


Cell Injury

Cell Injury

Injury

- It is an alteration in cell structure or function resulting from some STRESS that exceeds its ability to compensate through normal physiologic adaptive mechanisms.


Cell Stress
Dose Intensity
Cell Vulnerability
Adaptation
Metabolic
Structural
Injury
Reversible
"Point of no return"
Irreversible
Cell Death

Cell Injury

- **Causes**:

1. Hypoxia: reduced oxygen availability
2. Chemical agents
3. Physical agents
4. Infection
5. Immune reactions
6. Nutritional imbalance
7. Genetic derangements

Targets of Cellular Injury

1. The cell membrane integrity
2. Aerobic Respiration and ATP Production
3. Protein synthesis
4. Genes

Types of cell injury

Reversible

changes are reversible if the damaging stimulus is removed

Irreversible

With continuing damage, cell can't recover and it dies

Reversible Cell Injury

1. **Cell swelling**

It is associated with the abnormal influx of sodium and water into the cell.

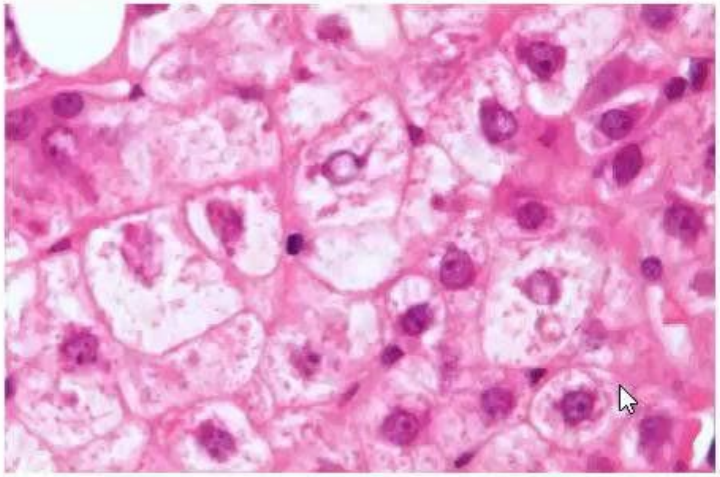
2. **Fatty change**

this results from accumulation of lipids inside parenchymal cells.

It can affect the liver, heart, kidney and other organs.

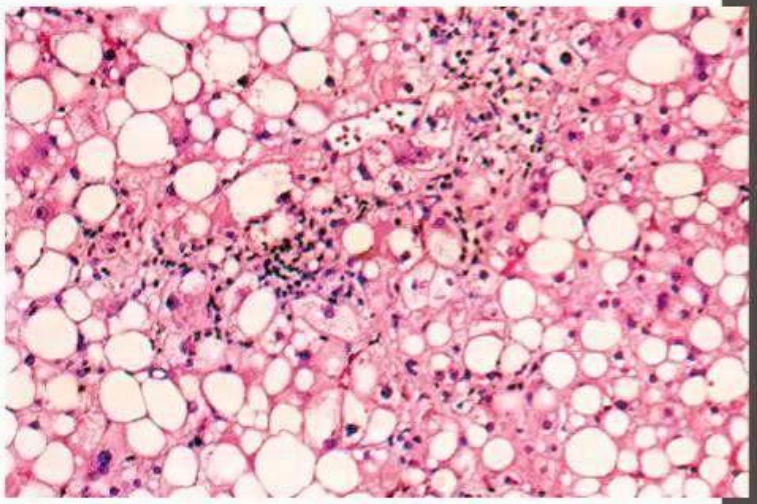
Reversible Cell Injury

Cell swelling



small clear vacuoles may be seen within the cytoplasm

Fatty liver



Irreversible Cell Injury

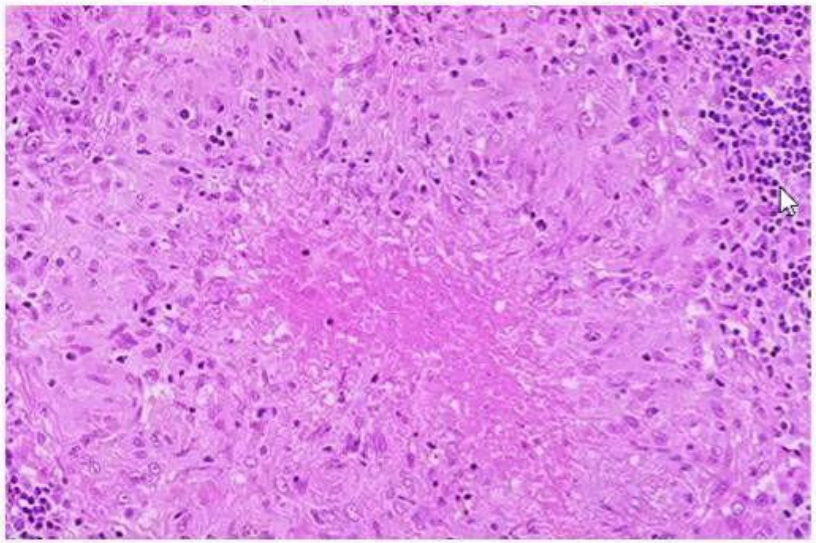
- The ultimate consequence of irreversible injury is cell death.
- Types of cell death:
  1. **Necrosis**
  2. **Apoptosis**

Irreversible cell injury

1- Necrosis

Definition:

- Death of a group of cells within a living body.
- It occurs as a result of denaturation of intracellular proteins and enzymatic digestion of the lethally injured cell

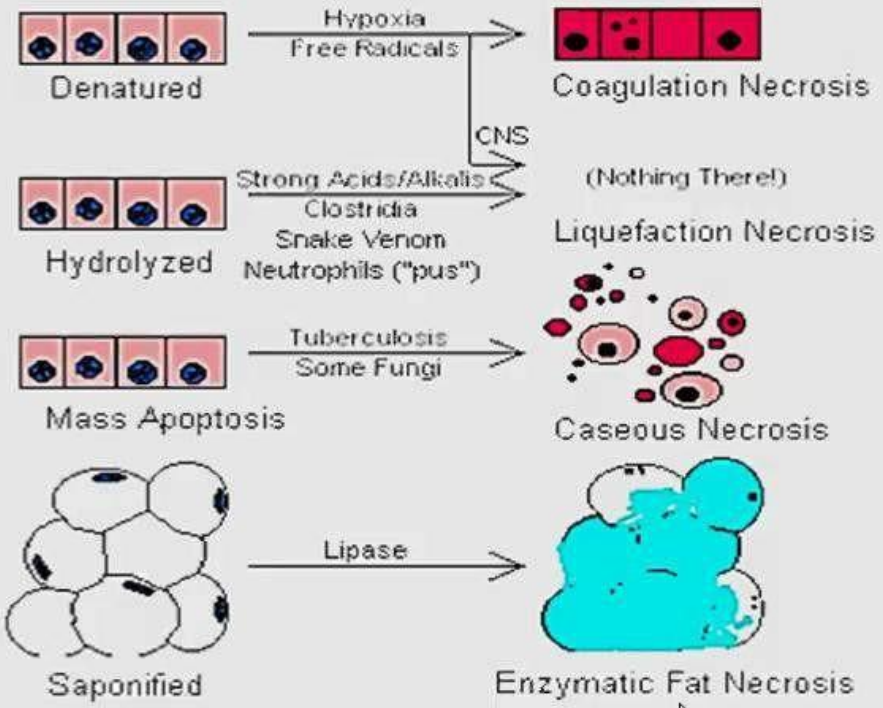


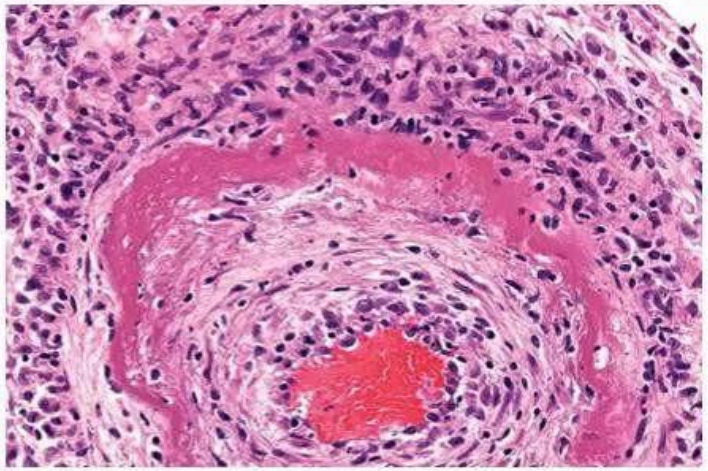
Types of cell necrosis

1. **Coagulation necrosis:**
in cases of hypoxia
2. **Liquefactive necrosis:**
proteolysis as in abscess and brain infarction
3. **Caseous necrosis:**
Combination of the above 2 types as in cases of tubeculosis
4. **Fat necrosis**
Occur in adipose tissue due to trauma or enzymes
5. **Gangrenous necrosis**
Gangrene as in diabetic foot

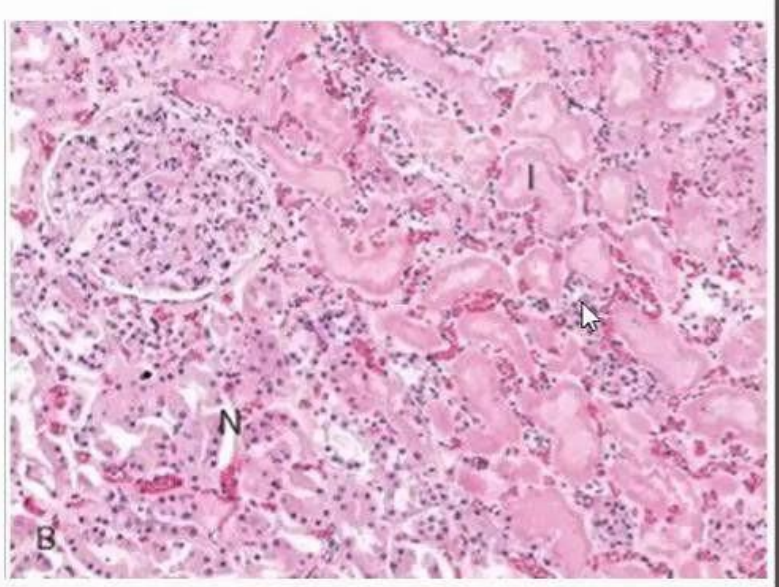
TYPES OF NECROSIS

The cytoplasm tell you HOW cells have died.





Fibrinoid necrosis in an artery



necrotic cells in the infarct (I) showing preserved cellular outlines

Irreversible cell injury

2- Apoptosis

- Apoptosis is genetically programmed cell death.

Causes:

- **In physiologic situations**: during embryogenesis, and throughout adulthood, to eliminate unwanted, aged or potentially harmful cells.
- **In pathologic events:** Apoptosis eliminates cells that are injured beyond repair without eliciting a host reaction.

Irreversible cell injury

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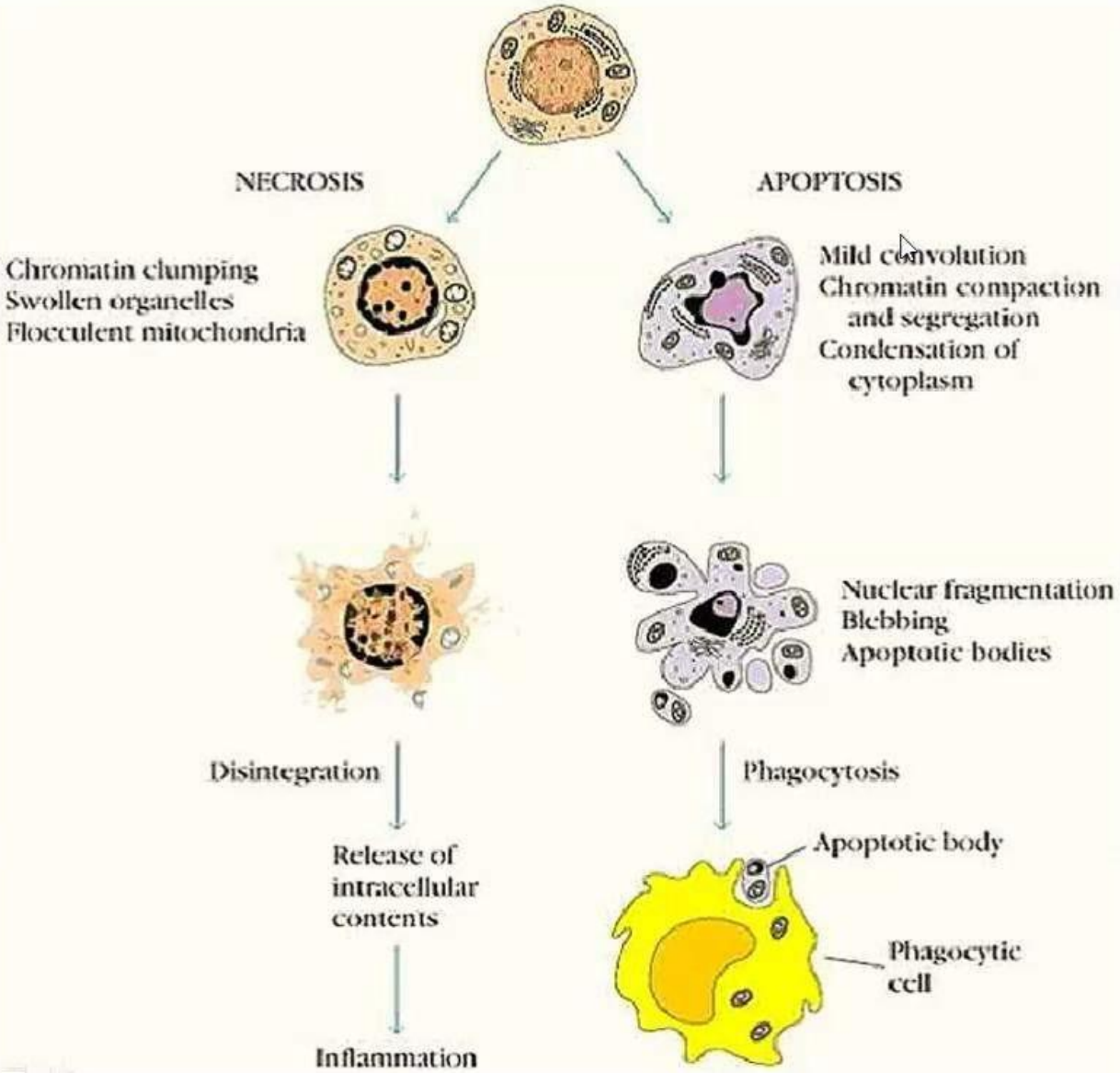
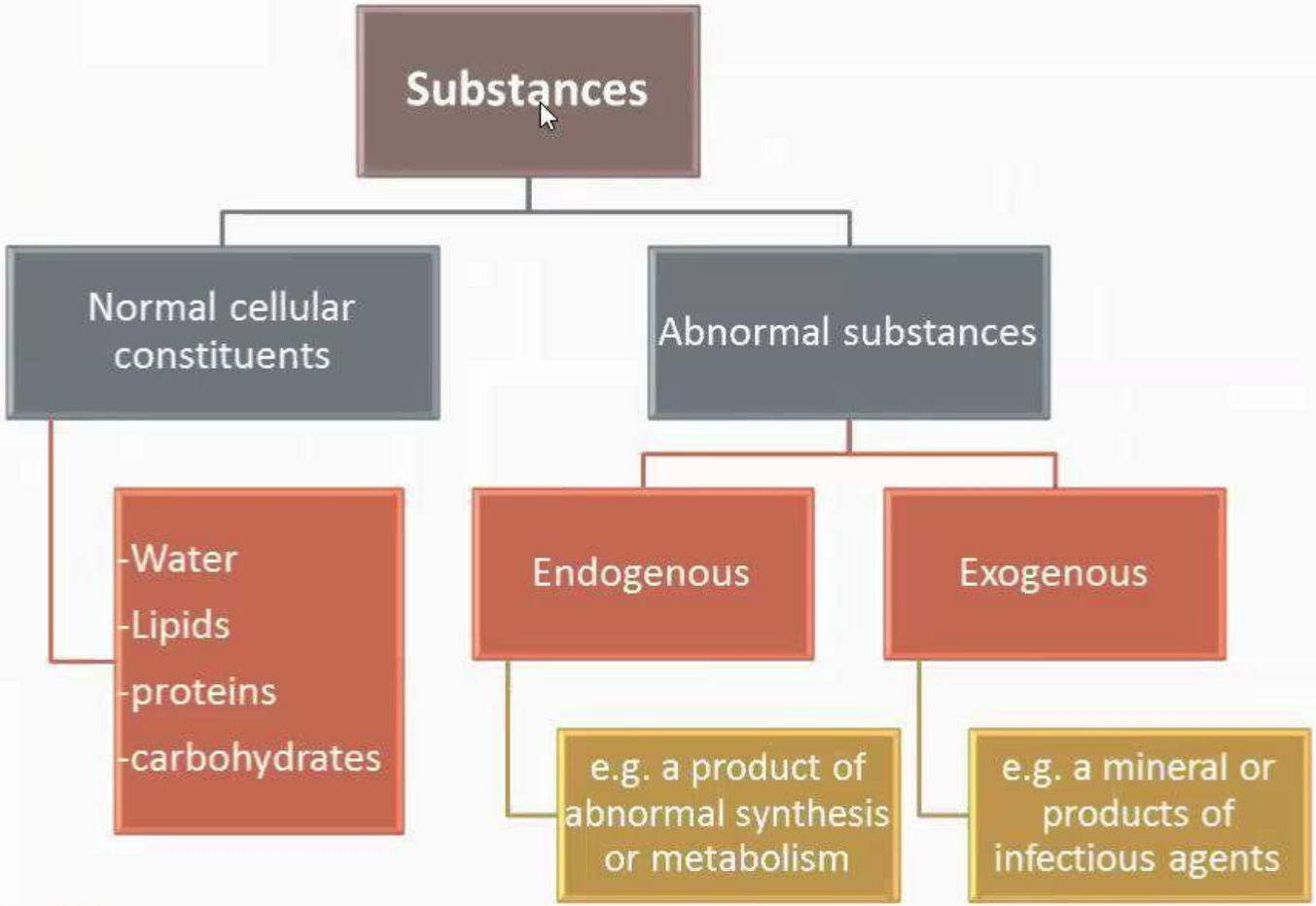

NECROSIS
APOPTOSIS
Chromatin clumping
Swollen organelles
Flocculent mitochondria
Mild convolution
Chromatin compaction
and segregation
Condensation of
cytoplasm
Nuclear fragmentation
Blebbing
Apoptotic bodies
Disintegration
Phagocytosis
Release of
intracellular
contents
Apoptotic body
Phagocytic
cell
Inflammation

Intracellular Accumulations

- The cell can accumulate and store various substances in the cytoplasm to adapt to injury that disrupts metabolic pathways.
- Intracellular accumulations are not usually harmful to the cell.

In some instances, however, intracellular accumulations can impair cell function and contribute to a disease process.

Intracellular Accumulation Of Abnormal Amounts Of Substances



Intracellular accumulations include the following:

1. Water (hydropic change)
2. Fats may accumulate in the liver as fatty change.
3. Mucin---mucoid change
4. Proteins: e.g. hyaline change (hyalinosis).
5. Cholesterol accumulation in macrophages (foam cells) as in atherosclerosis
6. Glycogen: in case of glycogen storage diseases.
7. Complex carbohydrates: mucopolysaccharidoses
8. Minerals: iron, as hemosiderin, or carbon.
9. Pigments: exogenous and endogenous
10. Calcium
11. Amyloid


Thank You!
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