NOVA

Charting New Horizons in Education

Necrosis

02

Pathology

Created by: Dr. Suhaib Al-Ma’aitah

Normal cells in H&E stain

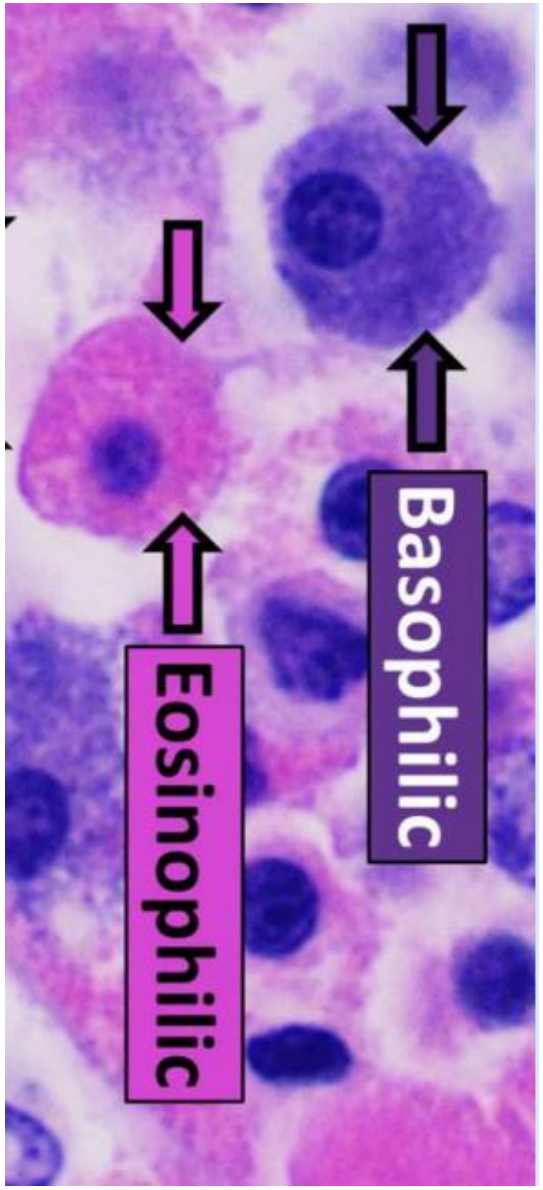
- H&E is the combination of two histological stains: hematoxylin and eosin.

1. **Hematoxylin (Blue/Purple Staining) – Basic - Basophilia:**

- **Nuclei:** The nuclei of normal cells stain dark blue or purple due to the binding of hematoxylin to nucleic acids (DNA and RNA).

Eosin (Pink Staining) – Acidic - Eosinphilia:

- **Cytoplasm**

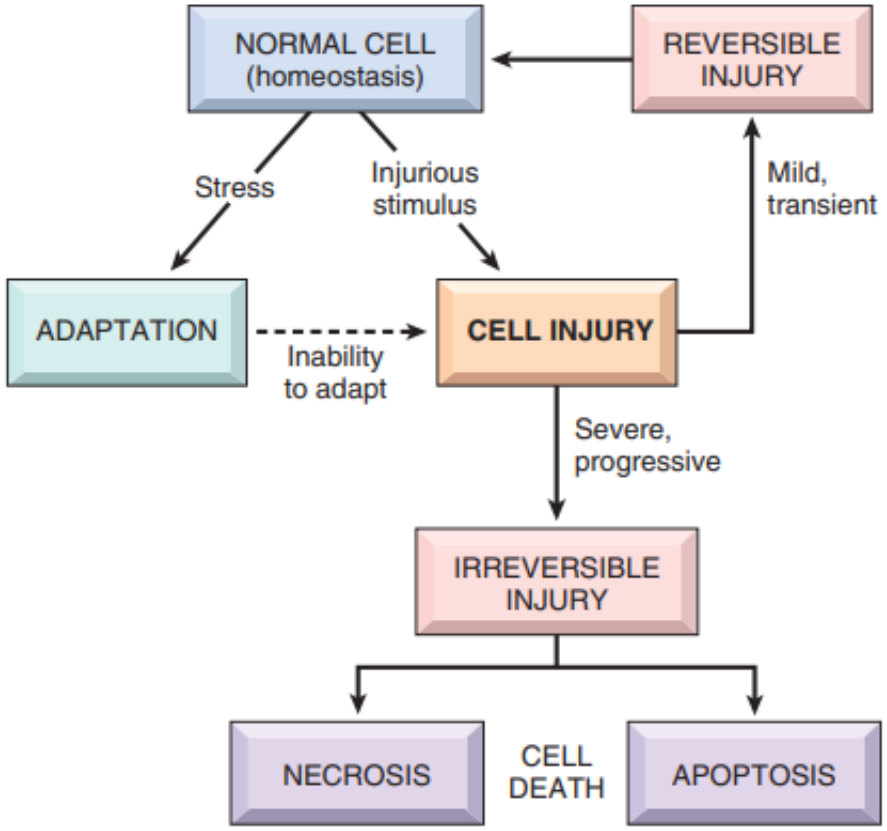


Apoptosis vs Necrosis

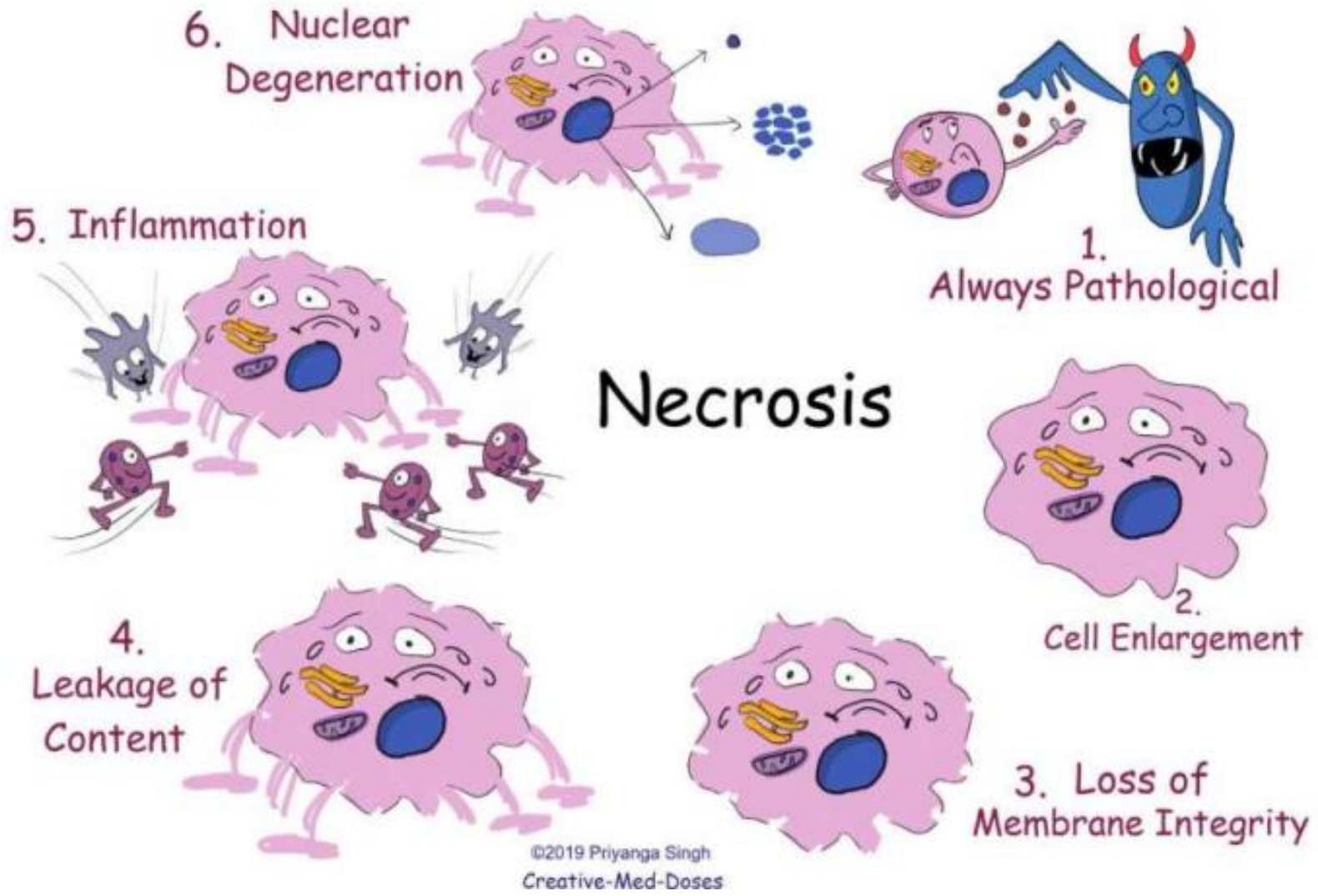
- **AP**optosis: Programmed cell death that occurs in a controlled and regulated manner.
- Causes: Can be triggered by normal physiological processes (e.g., develo**p**ment, **a**ging).

- **Necrosis:** Uncontrolled cell death resulting from severe injury or damage (Rapid) (Irreversible injury).

- Causes: Typically caused by factors such as ischemia (most common), toxins, infections, or physical trauma.



Necrosis


6. Nuclear Degeneration
1. Always Pathological
5. Inflammation
Necrosis
2. Cell Enlargement
4. Leakage of Content
3. Loss of Membrane Integrity
©2019 Priyanga Singh
Creative-Med-Doses

Necrosis

- Usually elicits a local host reaction, inflammation (due to the release of heat shock proteins, uric acid, ATP, DNA, and nuclear proteins).

Morphological features of necrosis - Microscopic

- Cytoplasmic changes:

1. Increased binding of eosin to denatured cytoplasmic proteins, loss of basophilic ribonucleic acid (RNA) in the cytoplasm (Increased eosinophilia).

2. A glassy, homogeneous appearance, mostly because of the loss of lighter staining glycogen particles. – Normally glycogen gives granular appearance.
3. After organelle digestion by enzymes, the cytoplasm becomes vacuolated and appears moth-eaten..

Morphological features of necrosis - Microscopic

- **Result from break down of DNA;** appear as three patterns:

1. Pyknosis: shrinkage and increased basophilia.

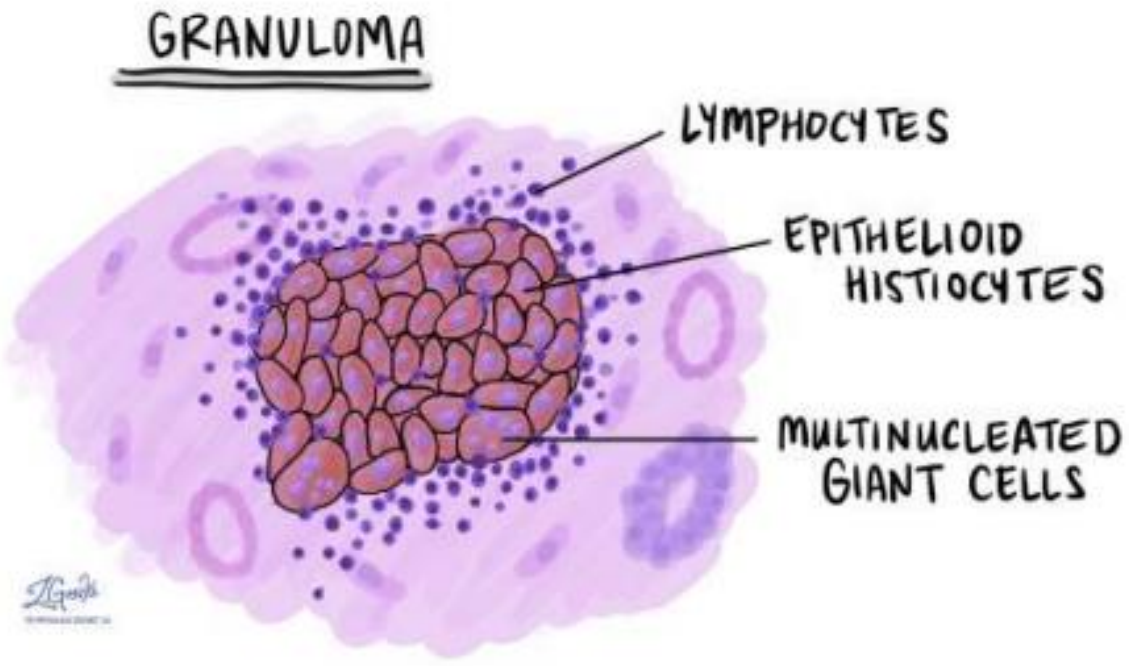
2. Karyorrhexis: fragmentation of pyknotic nucleus (K-a-r-y-o-r-r-h-e-x—i-s).

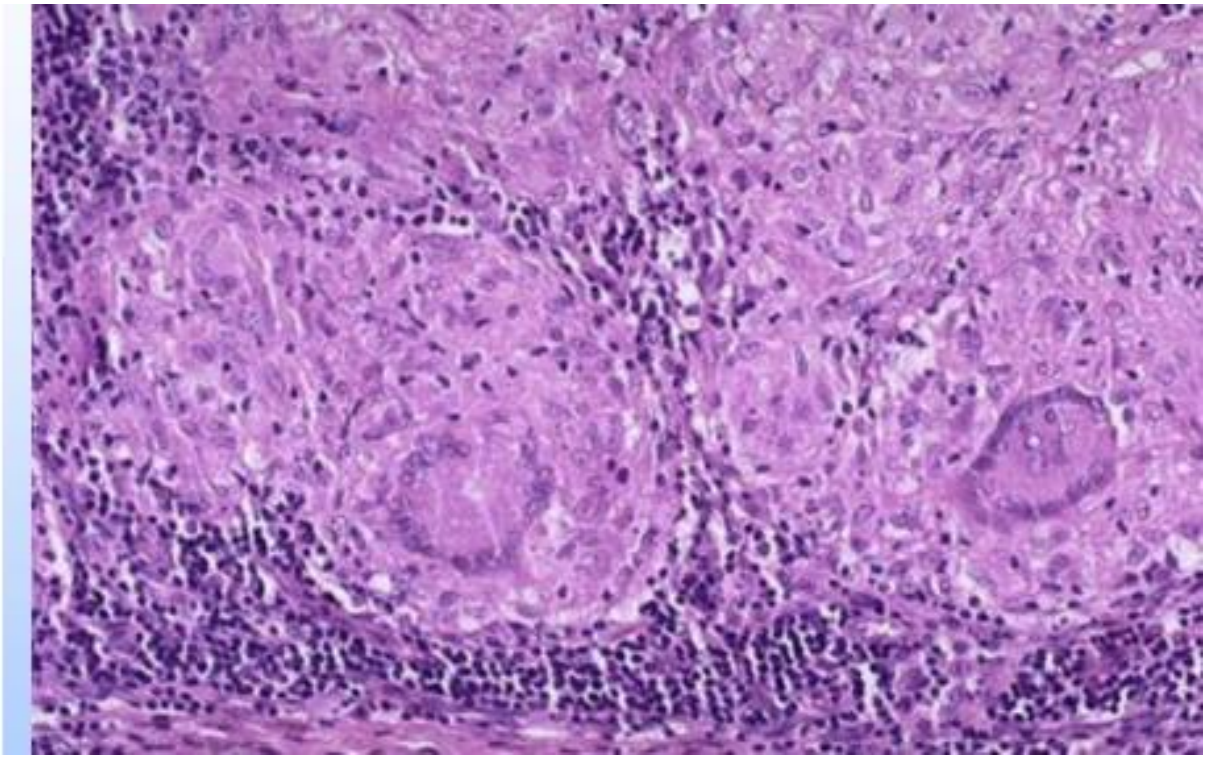
3. Karyolysis: decrease basophilia of chromatin, DNAase: (deoxyribonuclease, DNA digestion).

- In 1-2 days the nucleus in a dead cell may completely disappear.

Type	Mechanism	Sites	• Special terms
Coagulative necrosis	• Protein denaturation → ghost cells	• Particularly in myocardium, liver, kidney	• Characteristic of hypoxic cell death in all tissues except in the brain • Most common type • Preserved tissue structure
Liquefactive necrosis	• Neutrophils digest cells proteins	• Lipid rich tissues → ex: brain	• Cerebral infarction
Caseous necrosis	• Center of granulomas		• Cheese-like on gross morphology. • Tuberculosis infection (Mycobacterium)
Fat necrosis	• Degradation of fatty tissue by lipases (released from dead cells)	• Pancreas	• Chalky appearance (deposits) • Acute pancreatitis • Trauma to fatty tissues
Fibrinoid necrosis	antigen antibody complexes are deposited in the walls of blood vessels along with fibrin.	• Walls of blood vessels	• Severe hypertension

Granuloma





- Granulomas with Langhans giant cells

- Does all type of granuloma contain necrosis? No, not all types of granulomas contain necrosis.

Fate of necrosis

- Most of necrotic tissue is removed by leukocyte (Phagocytosis) combined with extracellular enzyme digestion
- If necrotic tissue is not eliminated it attracts → Ca^{+2} salts → dystrophic calcification

- **Dystrophic calcifications** refer to the abnormal deposition of calcium salts in damaged or necrotic tissues.

Fate of necrosis

- Leakage of intracellular proteins through the damaged cell membrane and ultimately into the circulation provides a means of detecting tissue-specific necrosis using blood or serum samples:

- Creatine kinase → Cardiac muscle
- Aspartate transaminase (SGOT) → Hepatocytes

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

- Maclom X-

Charting New Horizons in Education