



Lecture:

Necrosis and apoptosis. Infarction.

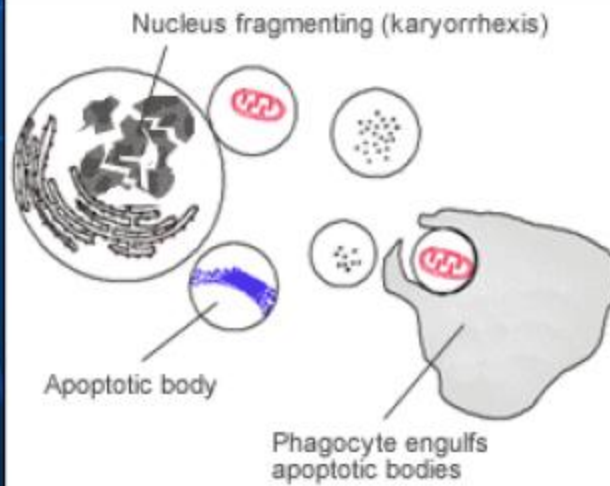
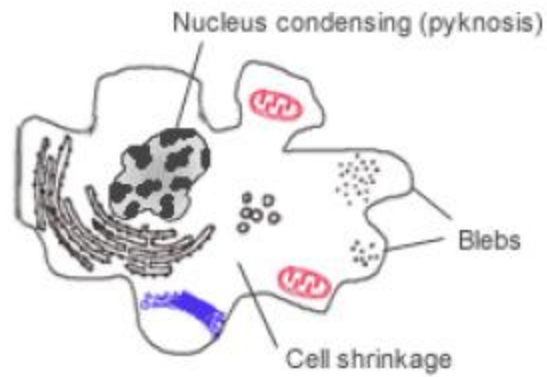
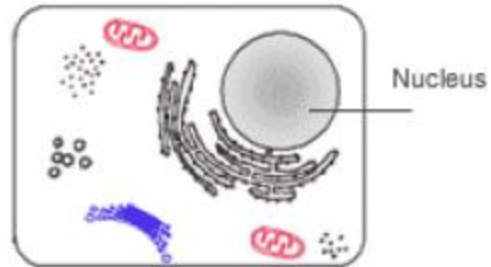
Injuries of cells and tissues

- Reversible and
- irreversible.

Apoptosis

- **Definition:** In this genetically mediated programmed cell destruction, cells die, shrink, and disintegrate in the absence of any reactive inflammation.

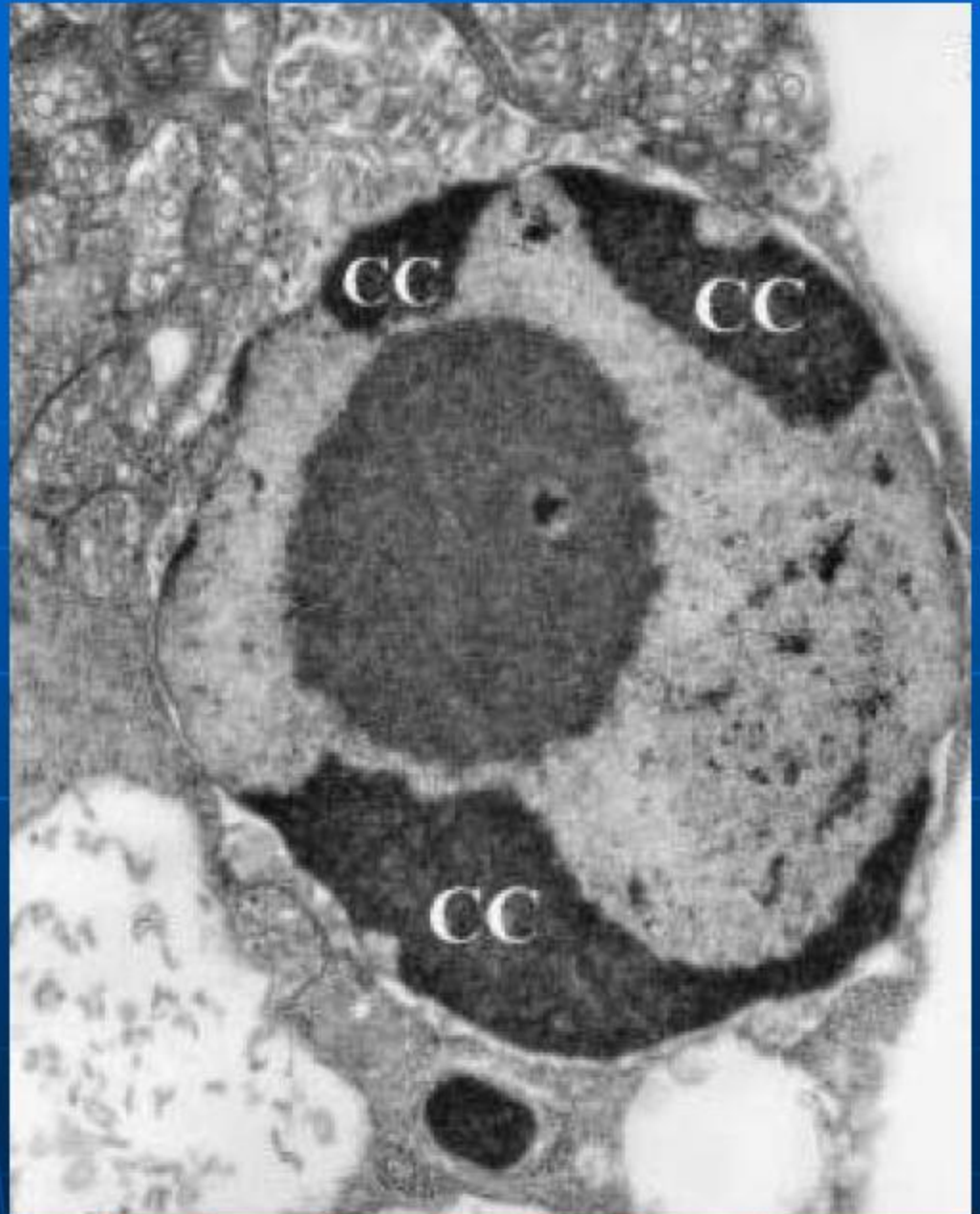


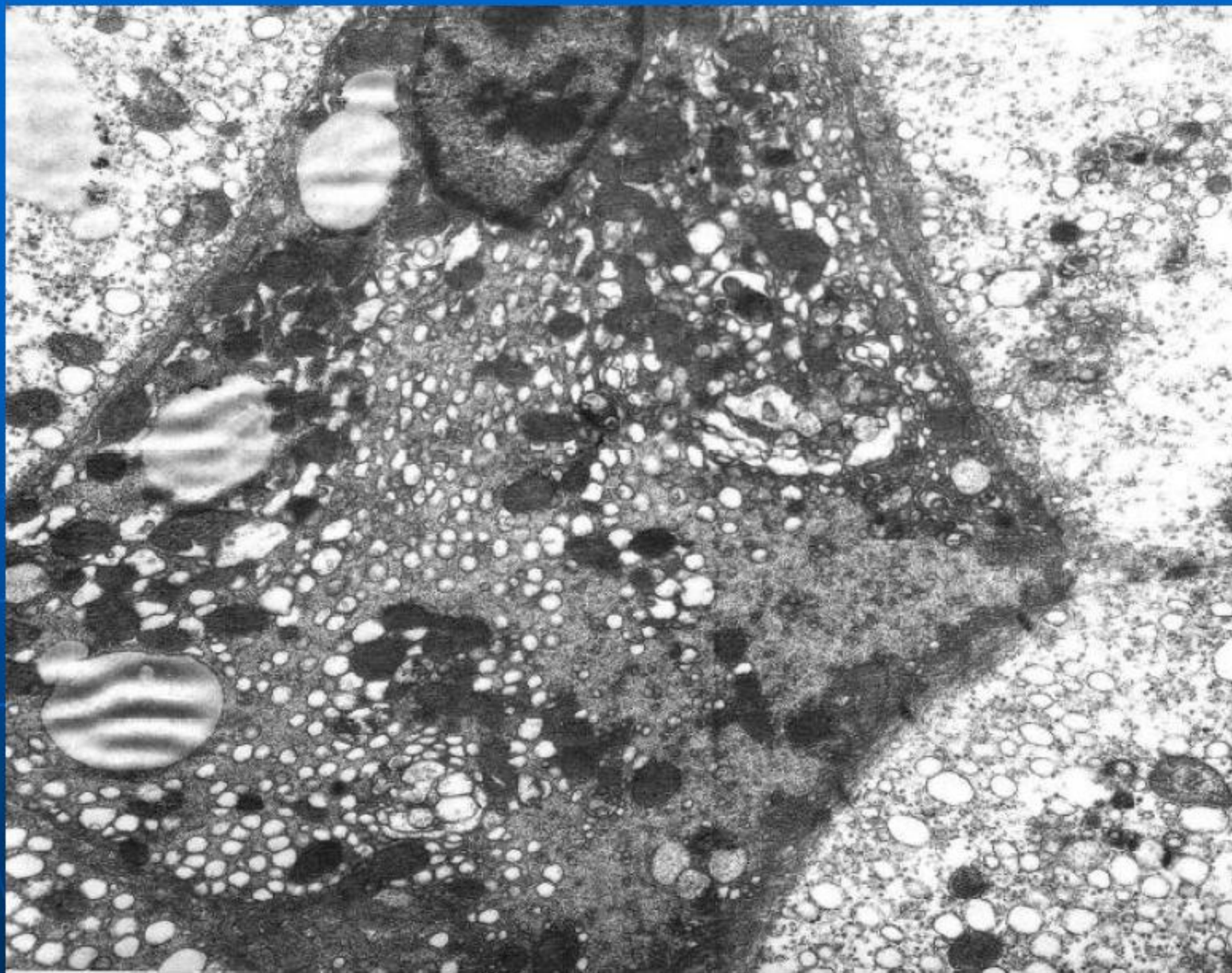


Morphologic features of apoptosis

- 1. Cell shrinkage. The cell is smaller in size; the cytoplasm is dense; and the organelles, although relatively normal, are most tightly packed.
- 2. Chromatin condensation. This is the most characteristic feature of apoptosis. The chromatin aggregates peripherally, under the nuclear membrane, into well-delimited dense masses of various shapes and sizes. The nucleus itself may break up, producing two or more fragments.
- 3. Formation of cytoplasmic blebs and apoptotic bodies. The apoptotic cell first shows extensive surface blebbing, then undergoes fragmentation into a number of membrane-bound apoptotic bodies composed of cytoplasm and tightly packed organelles, with or without a nuclear fragment.
- 4. Phagocytosis of apoptotic cells or bodies by adjacent healthy cells, either parenchymal cells or macrophages. The apoptotic bodies are rapidly degraded within lysosomes, and the adjacent cells migrate or proliferate to replace the space occupied by the now deleted apoptotic cells.

Apoptosis WNF (chromatin condensation)



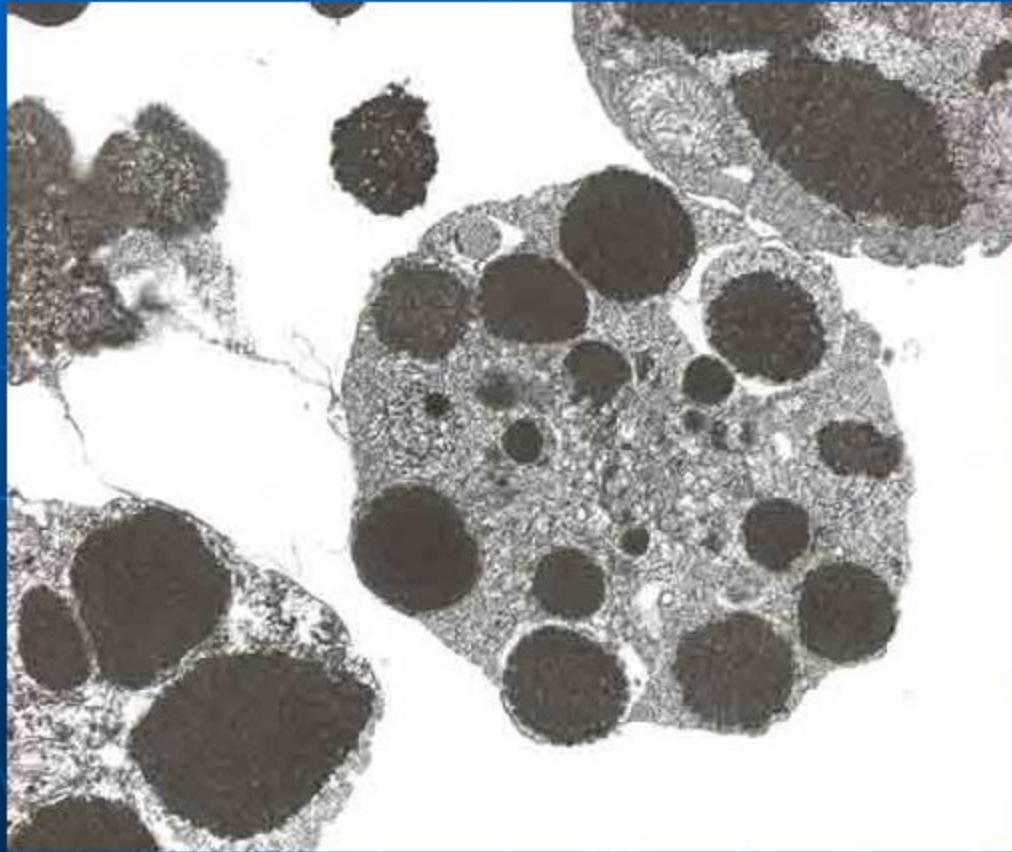


1.8. Апоптоз гепатоцита.

При электронной микроскопии апоптотическое тельце содержит мембранные структуры с заключенными внутри них органеллами и частицами ядра (препарат С.М. Секамовой).

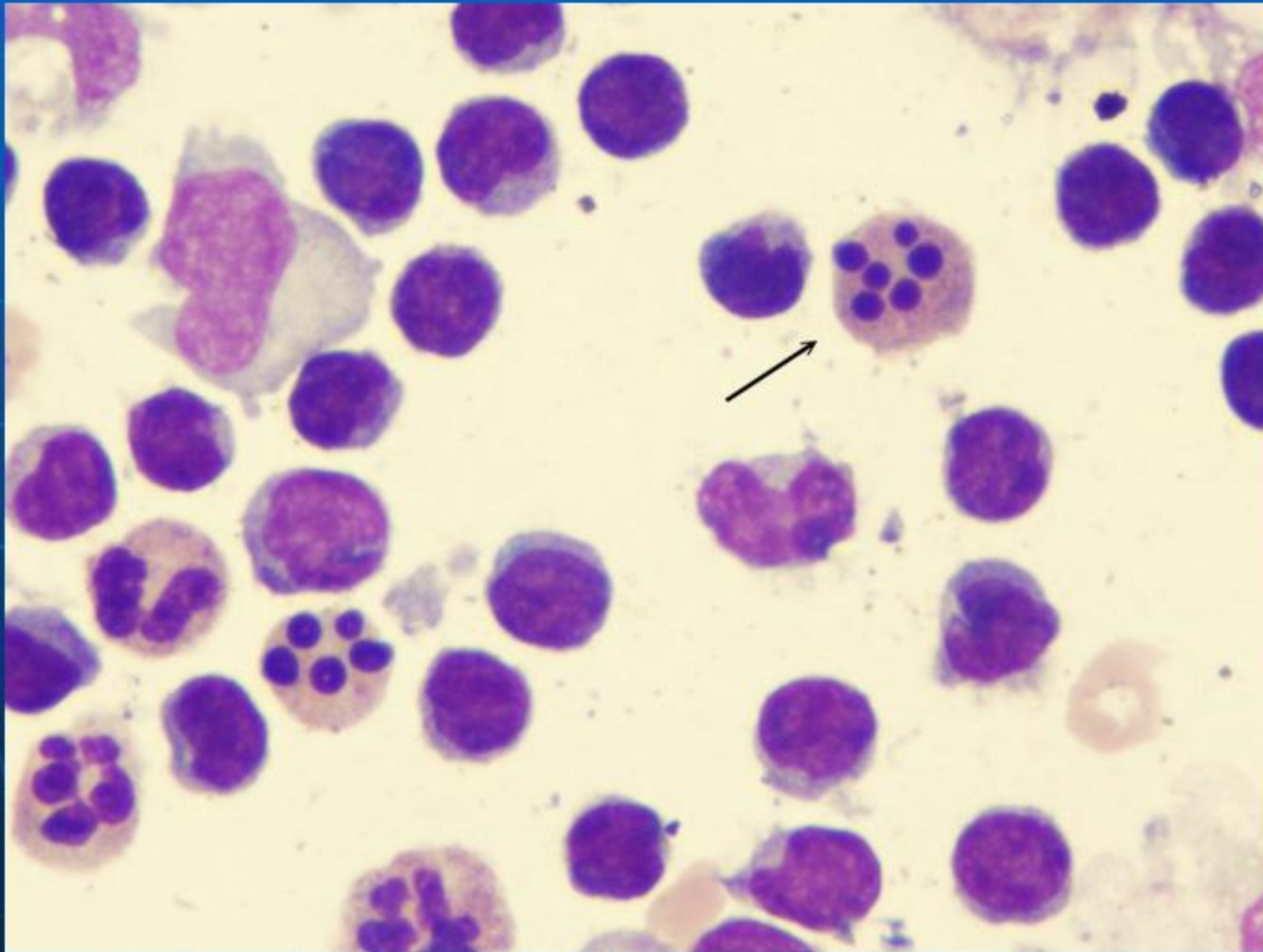
Apoptosis

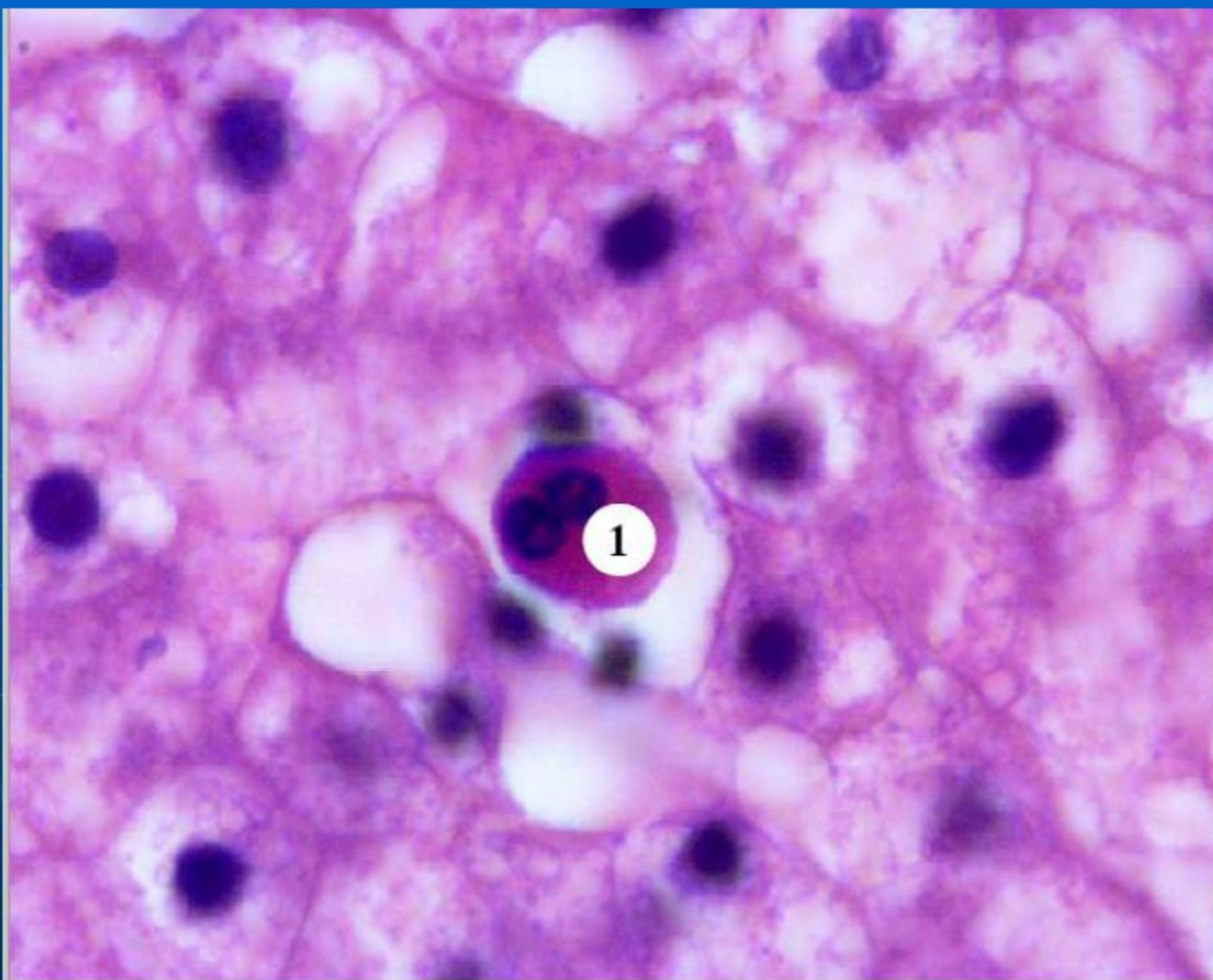
- karyorrhexis



Apoptosis

- karyorrhexis

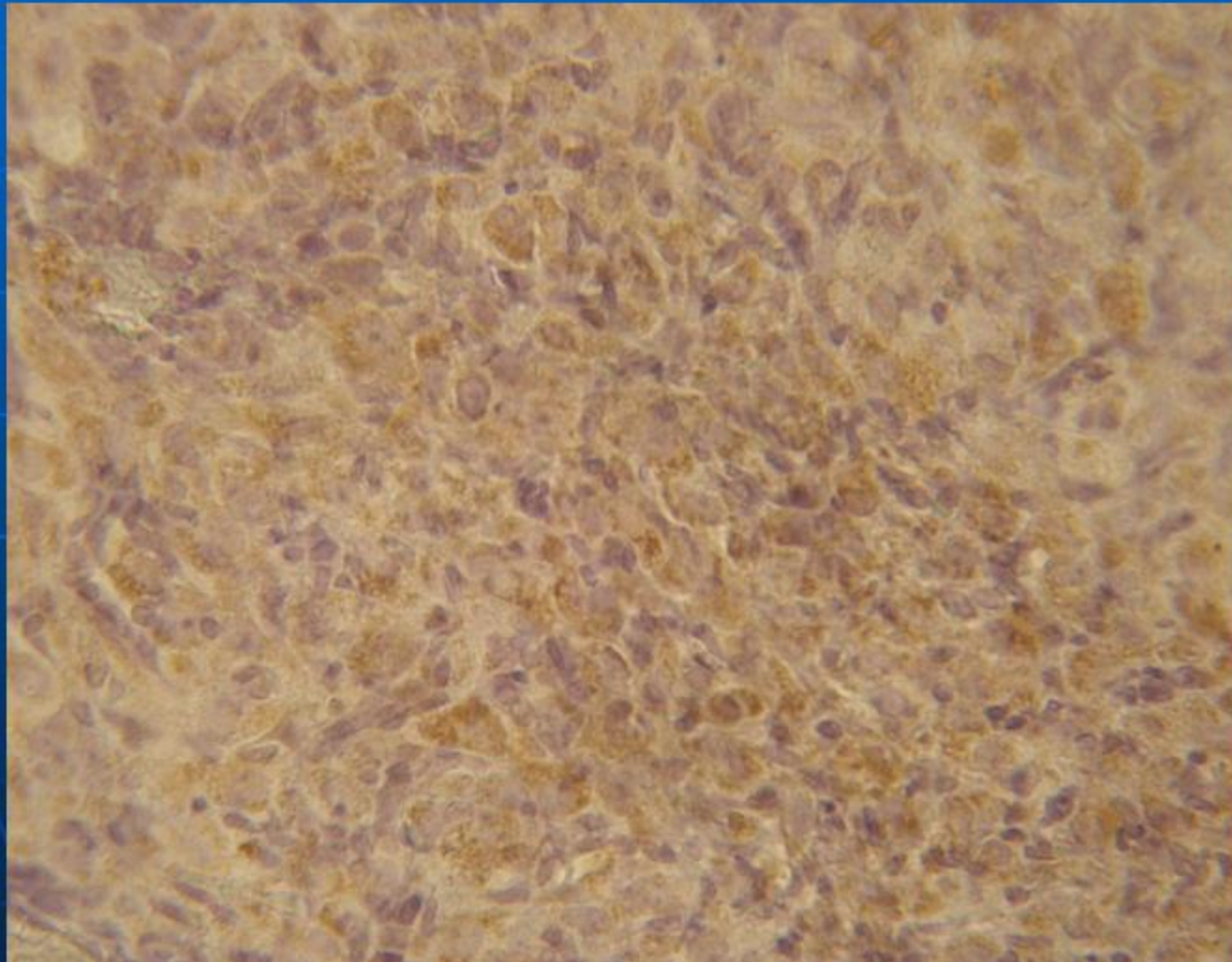




1.7. Апоптозные тельца (тельца Каунсильмена) при гепатите.
Апоптозное тельце расположено между гепатоцитами, имеет округлую форму, гомогенное строение и окрашивается в розовый цвет (1) (препарат Т.П. Некрасовой).

Apoptosis.

IHC – Caspasa 3.



Necrosis

- Necrosis is cell death, which is a complex of pathomorphologic changes that follow cell death in living tissue, largely resulting from the progressive degradative action of enzymes on the lethally injured cell.

CAUSES OF CELL INJURY

- Hypoxia
- Physical agents include mechanical trauma
- Chemical agents and drugs
- Infectious agents
- Immunologic reactions
- Genetic derangements
- Nutritional imbalances

Classification of necrosis according to the cause:

- - traumatic necrosis;
- - toxic necrosis;
- - trophoneurotic necrosis;
- - allergic necrosis;
- - vascular or ischemic necrosis.

Classification of necrosis

- Coagulative necrosis
- Liquefactive necrosis
- Caseous necrosis
- Gangrene
- Fat necrosis

Some additional types of necrosis:
fibrinous necrosis, sequestration.

Coagulative necrosis. White infarction.



Myocardial infarction.

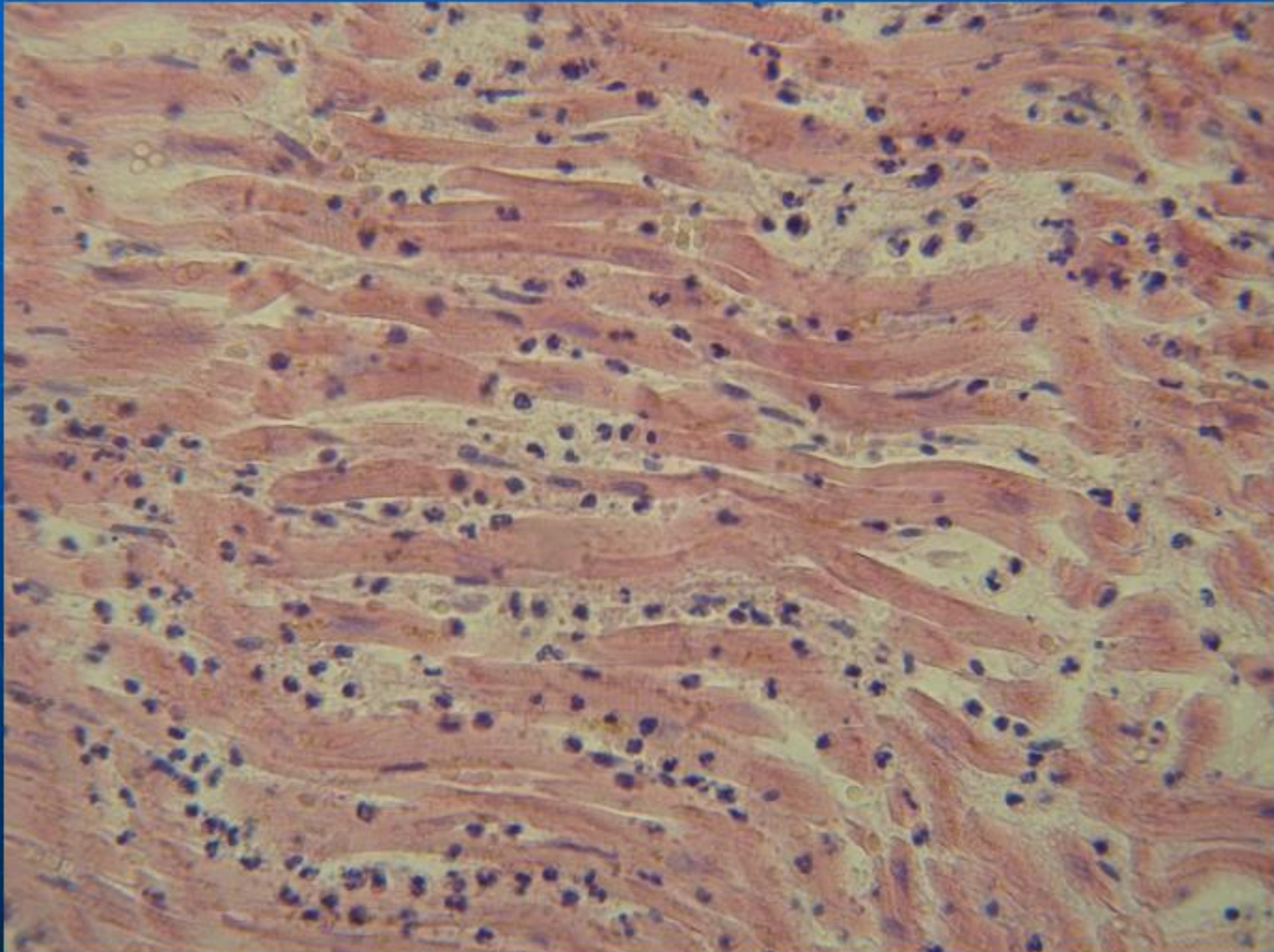


Coagulative necrosis. Red infarction.

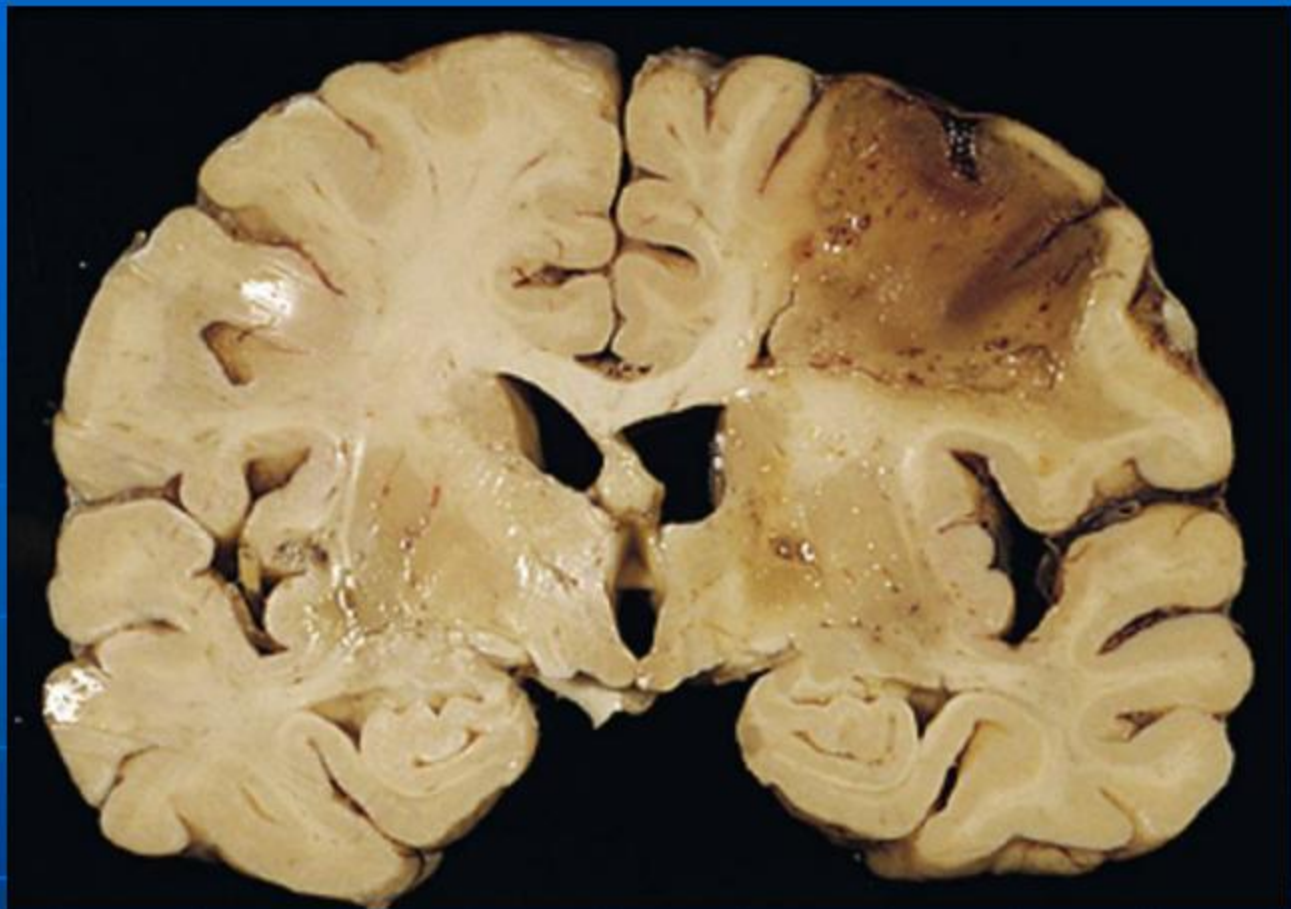


- Microscopic appearance: The microscopic changes of necrosis vary with the type of necrosis. Some general changes of necrosis in the cytoplasm are:
- Eosinophilia: The cytoplasm stains darker red in colour.
- Swelling and vacuolation: The cells are swollen and contain different types of vacuoles.
- Changes in the nucleus: The nucleus may show condensation (Pyknosis), fragmentation (karyorrhexis) and may disappear (karyolysis).

Coagulative necrosis. Myocardial infarction.

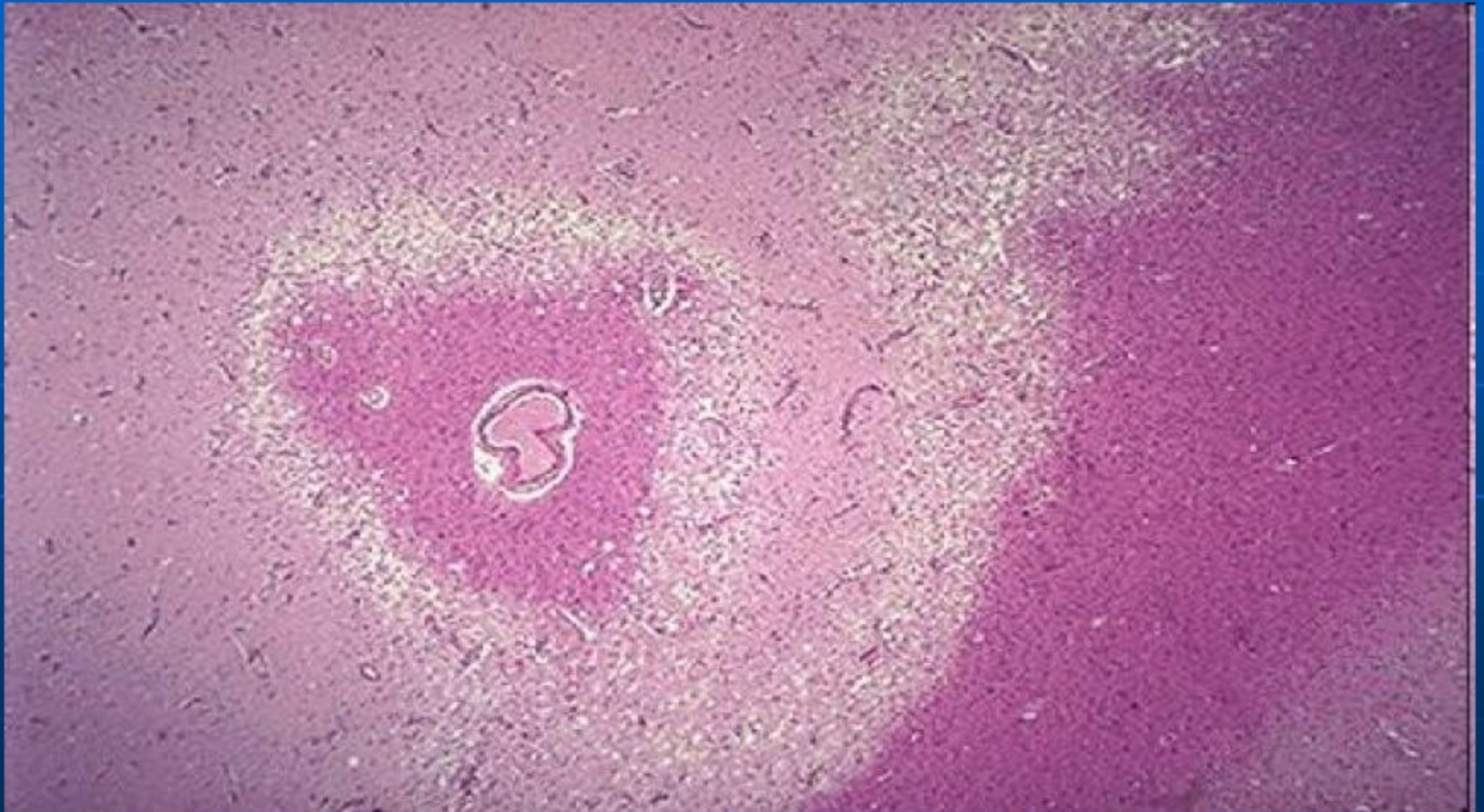


- Liquefactive necrosis: There is digestion and liquefaction of necrotic tissue.
- Causes:
 - 1. Pyogenic bacterial infections attract neutrophils. Bacterial and leukocytic enzymes liquefy dead cells and tissues.
 - 2. Some chemicals like turpentine oil also attract neutrophils and cause pus formation and liquefactive necrosis.
 - 3. The necrosis in the nervous tissue is mostly liquefactive due to high content of lipids and water.



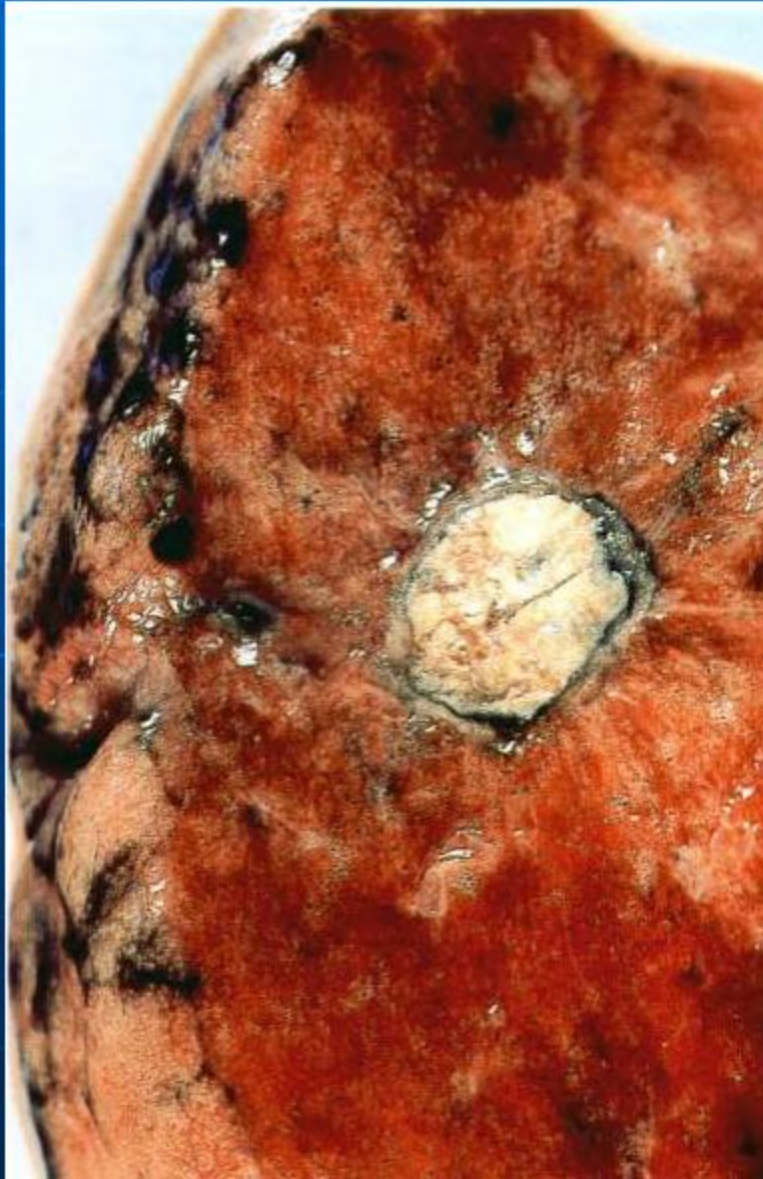
- Watershed infarction showing a wedge-shaped hemorrhagic infarction at the junction of the anterior and middle cerebral arteries

Liquefactive necrosis. Cerebral infarction.



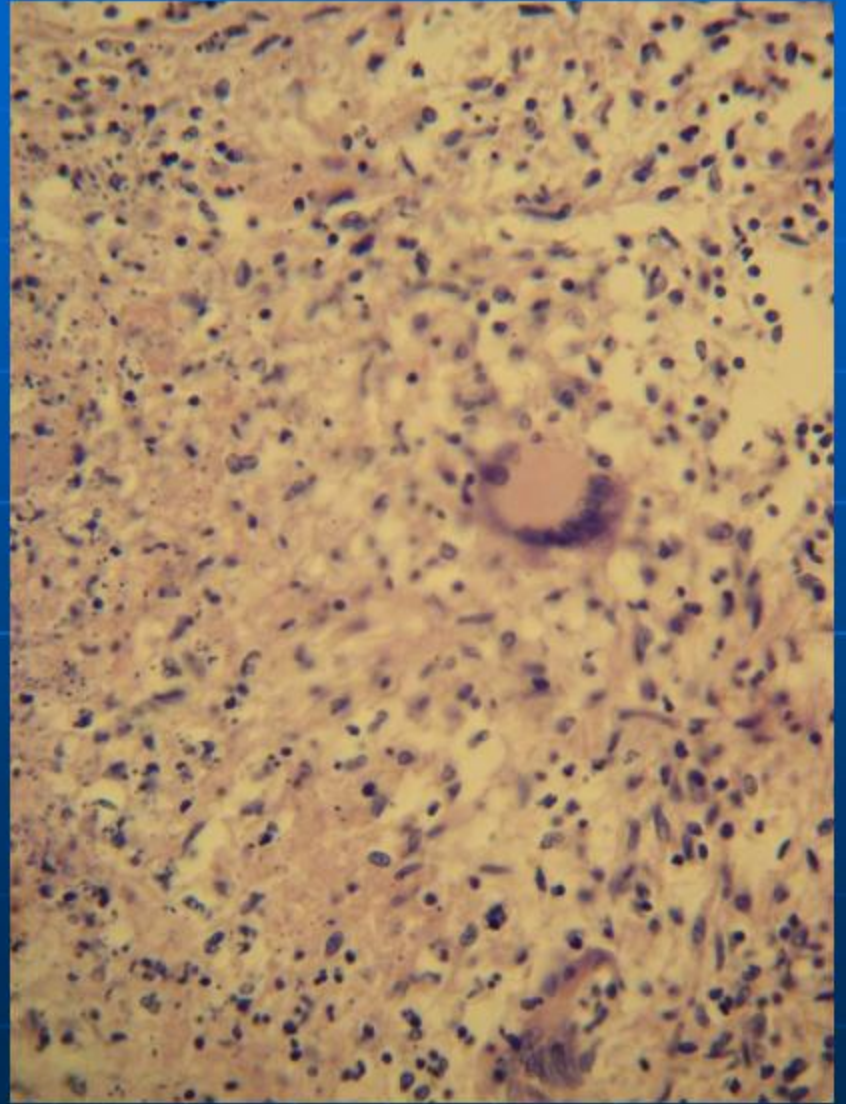
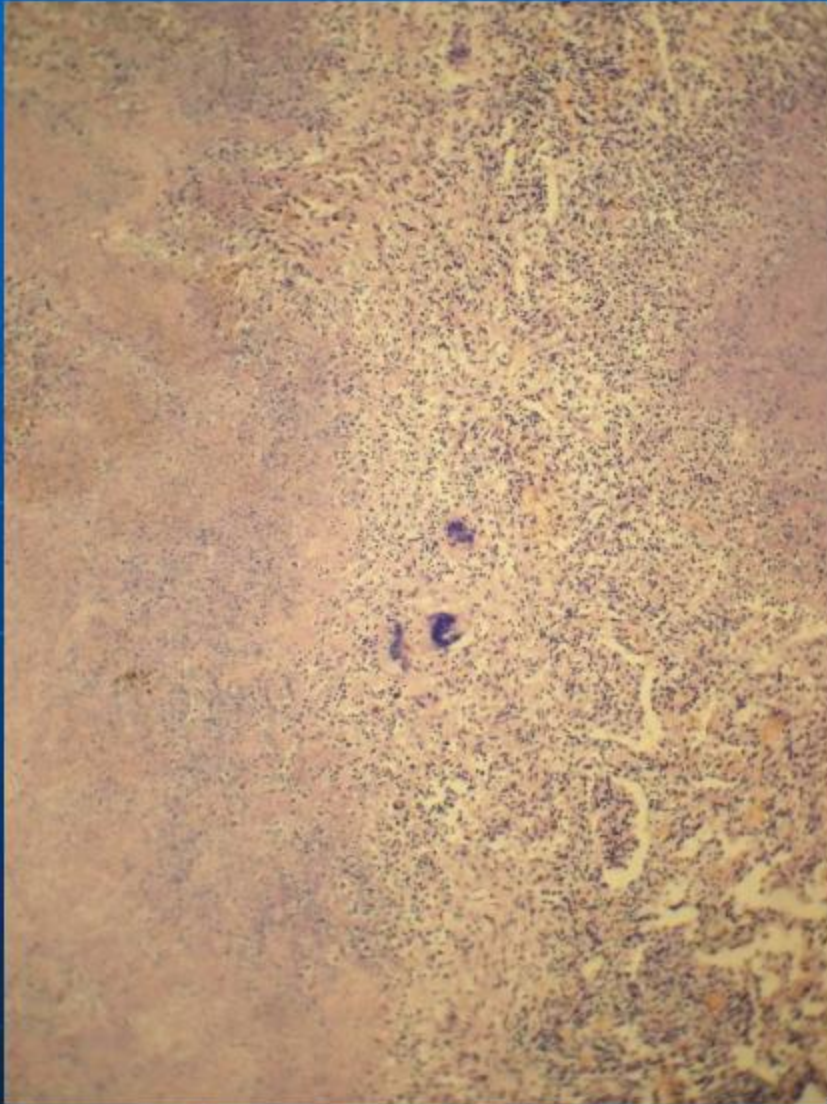
- **Caseous necrosis:** Dead tissue is converted into a homogenous, granular mass resembling cottage cheese.
- Cause: Associated with lesions of *Mycobacterium tuberculosis*, fungal infections etc.

Caseous necrosis.



Old, healed, calcified tuberculous lesion in the lung. F/70. This patient had been followed for many years with serial chest X-rays. The lesion had not changed in size, and repeated sputum examinations were negative for acid-fast bacilli.

Caseous necrosis.



Gangrene

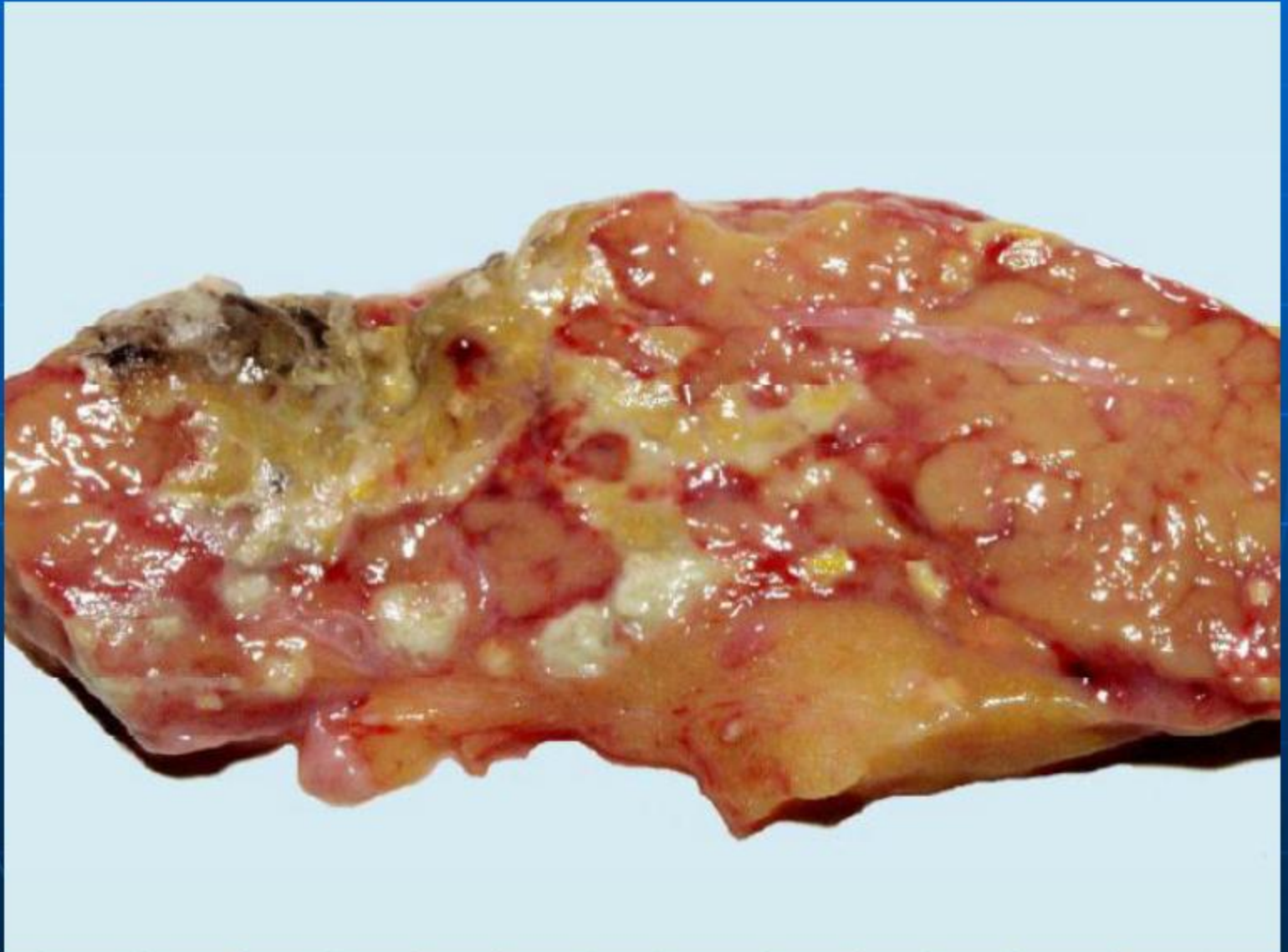


Gangrene: dry, wet, gas; decubitus (pressure sores).

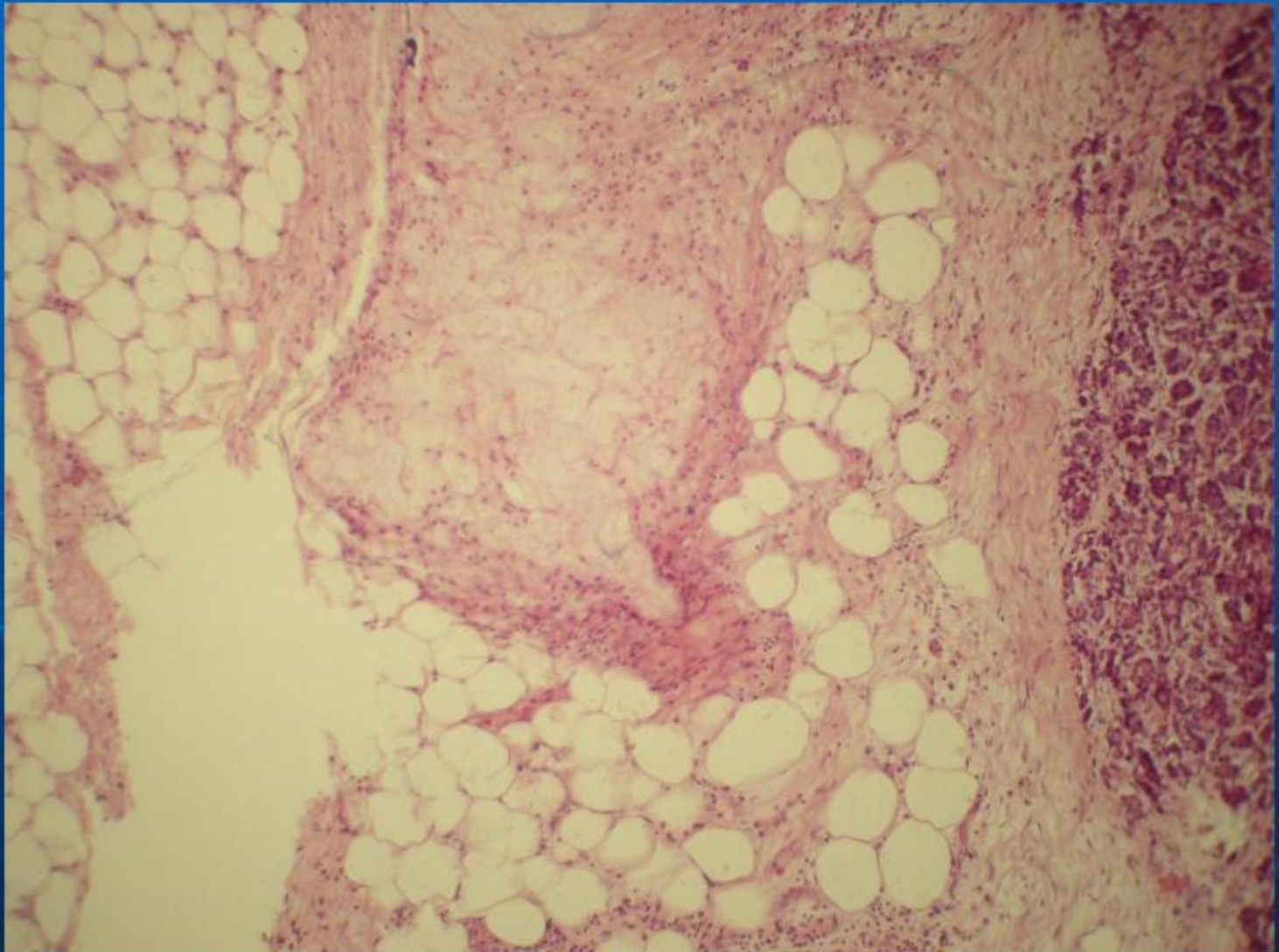
Wet gangrene



Fat necrosis in pancreas.



Fat necrosis.



Thank you!