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The Differences between Necrosis and Apoptosis

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Necrosis

Necrosis is the type of cell death that is associated with loss of membrane integrity and leakage of cellular contents culminating in dissolution of cells, it is largely resulting from the degradative action of enzymes on lethally injured cells. The leaked cellular contents often elicit

a local host reaction, called inflammation, that attempts to eliminate the dead cells and start the subsequent repair process. The enzymes responsible for digestion of the cells may be derived from the lysosomes of the dying cells themselves and from the lysosomes of leukocytes that are recruited as part of the inflammatory reaction to the dead cells.

Apoptosis

Apoptosis is a pathway of cell death in which cells activate enzymes that degrade the cells' own nuclear DNA and nuclear and cytoplasmic proteins. Fragments of the apoptotic cell then break off, giving the appearance that is responsible for the name (apoptosis, "falling off"). The plasma membrane of the apoptotic cell remains intact, but the membrane is altered in such a way that the cell and its fragments become avid targets for phagocytes. The dead cell and its fragments are rapidly cleared before cellular contents have leaked out, so apoptotic cell death does not elicit an inflammatory reaction in the host. Apoptosis differs in this respect from necrosis, which is characterized by loss of membrane integrity, enzymatic digestion of cells, leakage of cellular contents, and frequently a host reaction. However, apoptosis and necrosis sometimes coexist, and apoptosis induced by some pathologic stimuli may progress to necrosis.

Table 1: Comparison between Apoptosis and Necrosis.

Feature	Necrosis	Apoptosis
Cell size	Enlarged (swelling)	Reduced (shrinkage)
Nucleus	Pyknosis → karyorrhexis → karyolysis	Fragmentation into nucleosome size fragments
Plasma membrane	Disrupted	Intact; altered structure, especially orientation of lipids
Cellular contents	Enzymatic digestion; may leak out of cell	Intact; may be released in apoptotic bodies
Adjacent inflammation	Frequent	No
Physiologic or pathologic role	Invariably pathologic (culmination of irreversible cell injury)	Often physiologic; means of eliminating unwanted cells; may be pathologic after some forms of cell injury, especially DNA and protein damage

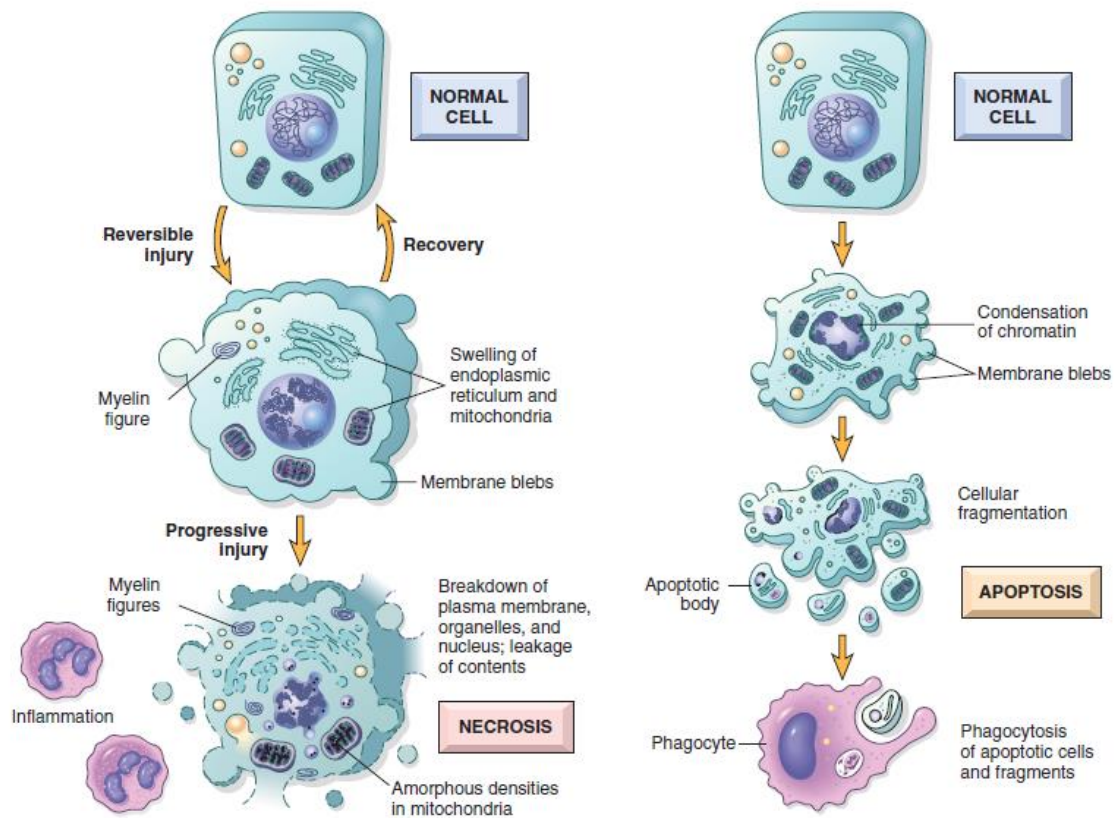


Figure 1-6 Cellular features of necrosis (left) and apoptosis (right).

Figure 1: Comparison between Apoptosis and Necrosis.

Reference:

Abbas, Robbins. *Basic Pathology*. Canada: Elsevier, The Ninth edition, 2013, page 9.