Apoptosis

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Apoptosis

- Programmed cell death
  - Especially during fetal development
  - In response to hormonal cycles (e.g. endometrium)
  - Normal turnover in proliferating tissues (e.g. intestinal epithelium)
- Cells shrink, not swell
- Nuclei condense and DNA fragments
- Cells fragment into membrane-bound bits
- Bits are phagocytosed by macrophages

Apoptosis—mitochondrial activation

- Initiated by cellular damage or viral infection
- Mitochondrial membrane permeability regulated by Bcl-2, Bcl-x, Mcl-1
- Activated by BH3-only proteins which create Bax/Bak channels
- Cytochrome C released to cytosol
- CytC binds Apaf-1and activates caspase-9
- Caspases (cysteine proteases that cleave after aspartate residues) activate a cascade of lytic enzymes
- Cellular and nucleosomal fragmentation occurs
- Dead cell fragments removed by phagocytes

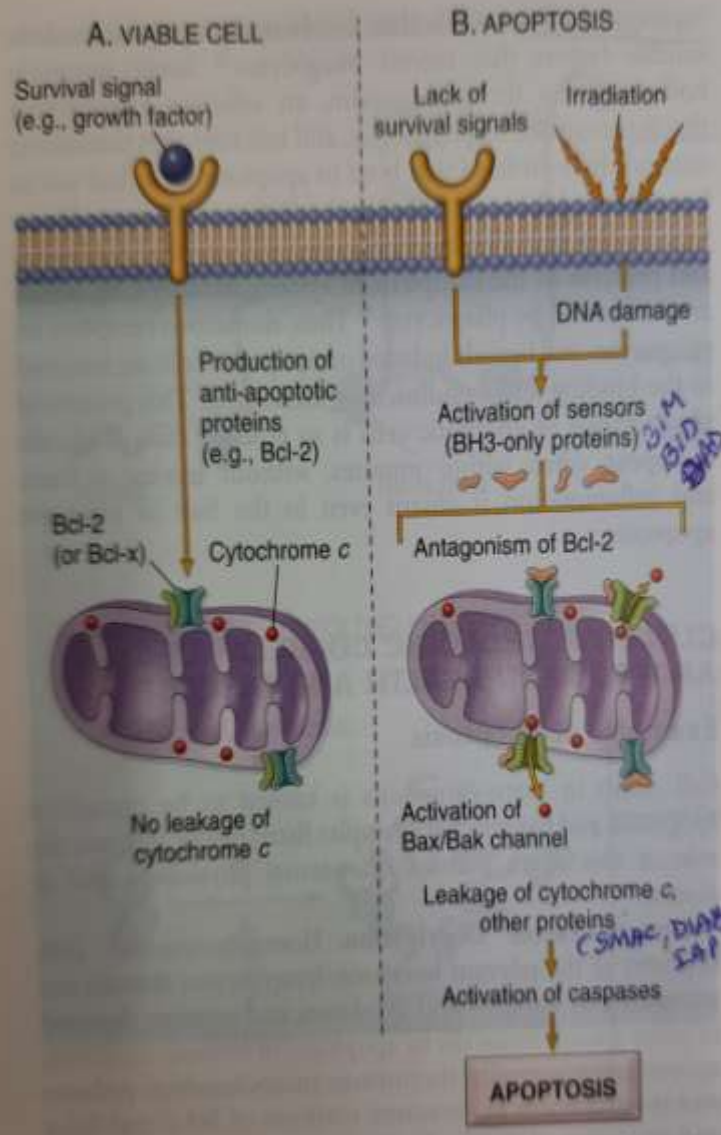


FIGURE 1-25 The intrinsic (mitochondrial) pathway of apoptosis. **A**, Cell viability is maintained by the induction of anti-apoptotic proteins such as Bcl-2 by survival signals. These proteins maintain the integrity of mitochondrial membranes and prevent leakage of mitochondrial proteins. **B**, Loss of survival signals, DNA damage, and other insults activate sensors that antagonize the anti-apoptotic proteins and activate the pro-apoptotic proteins

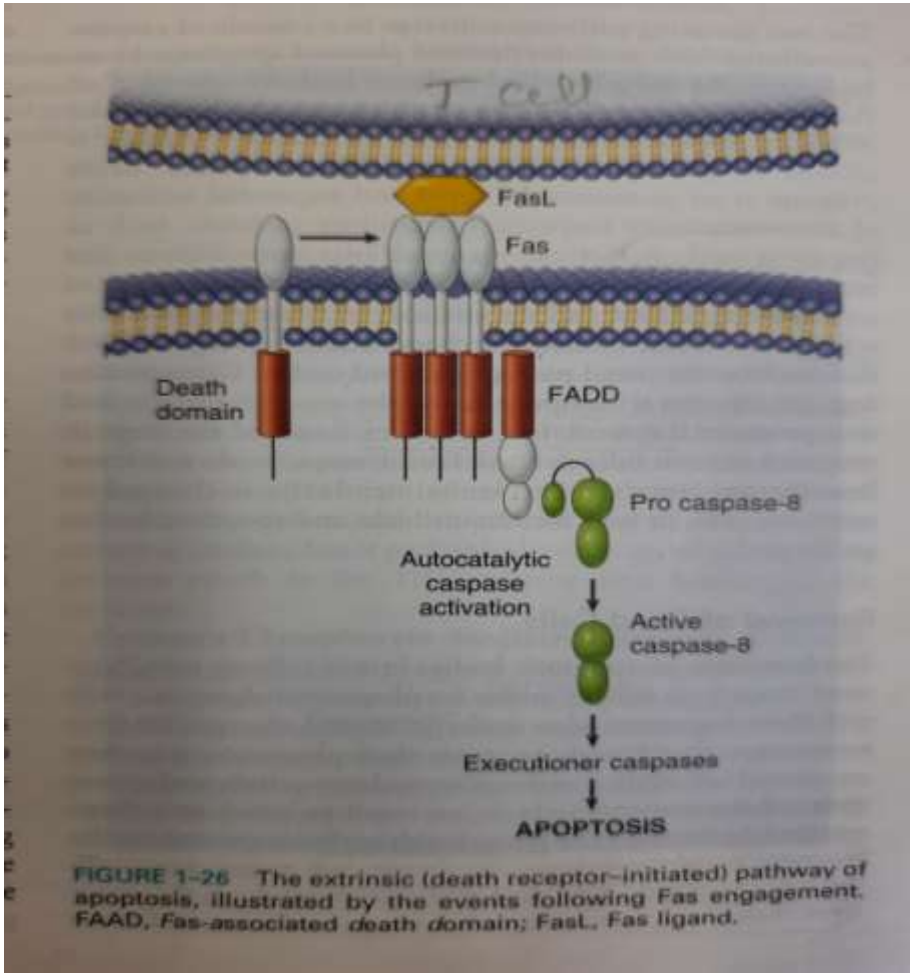
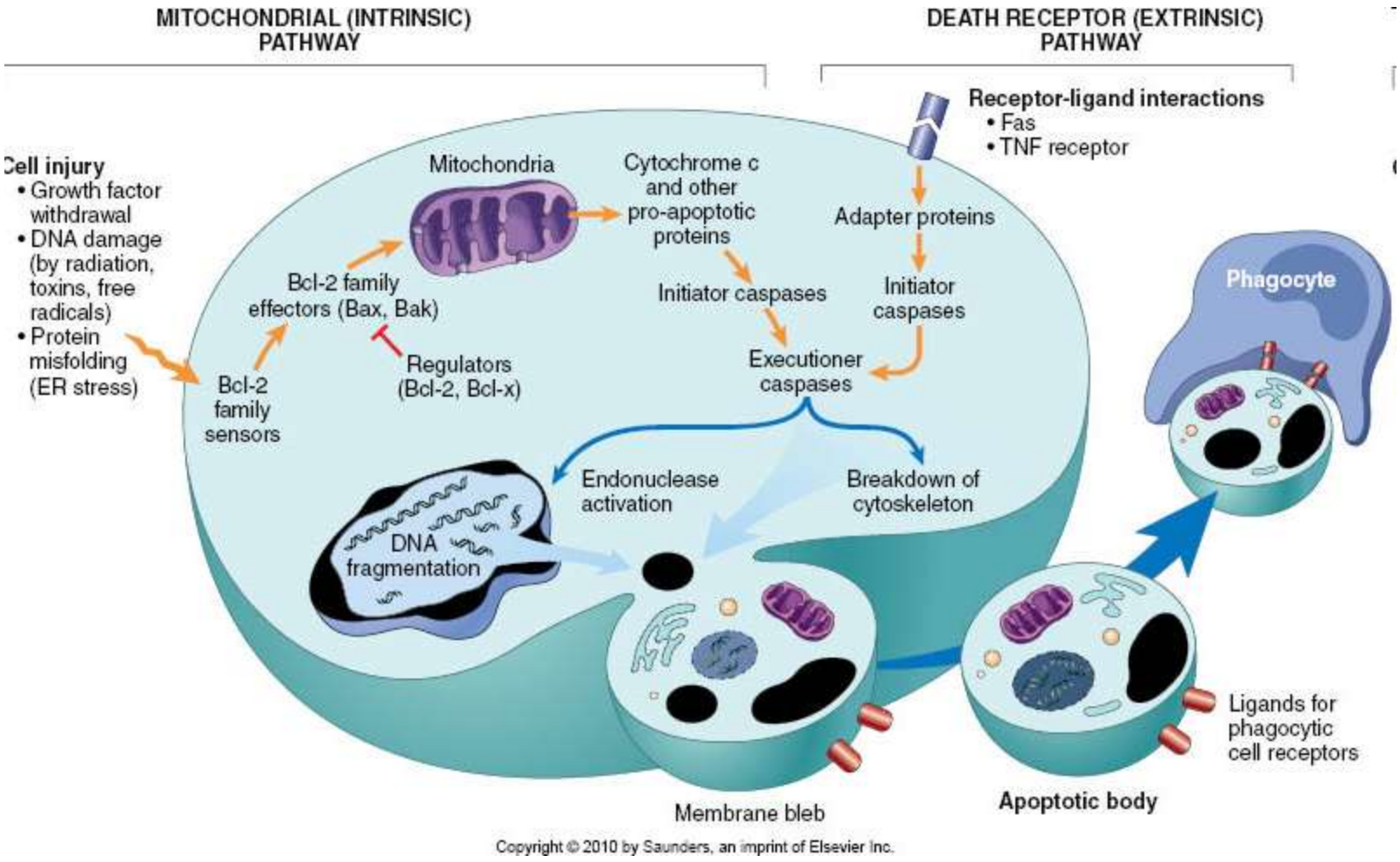
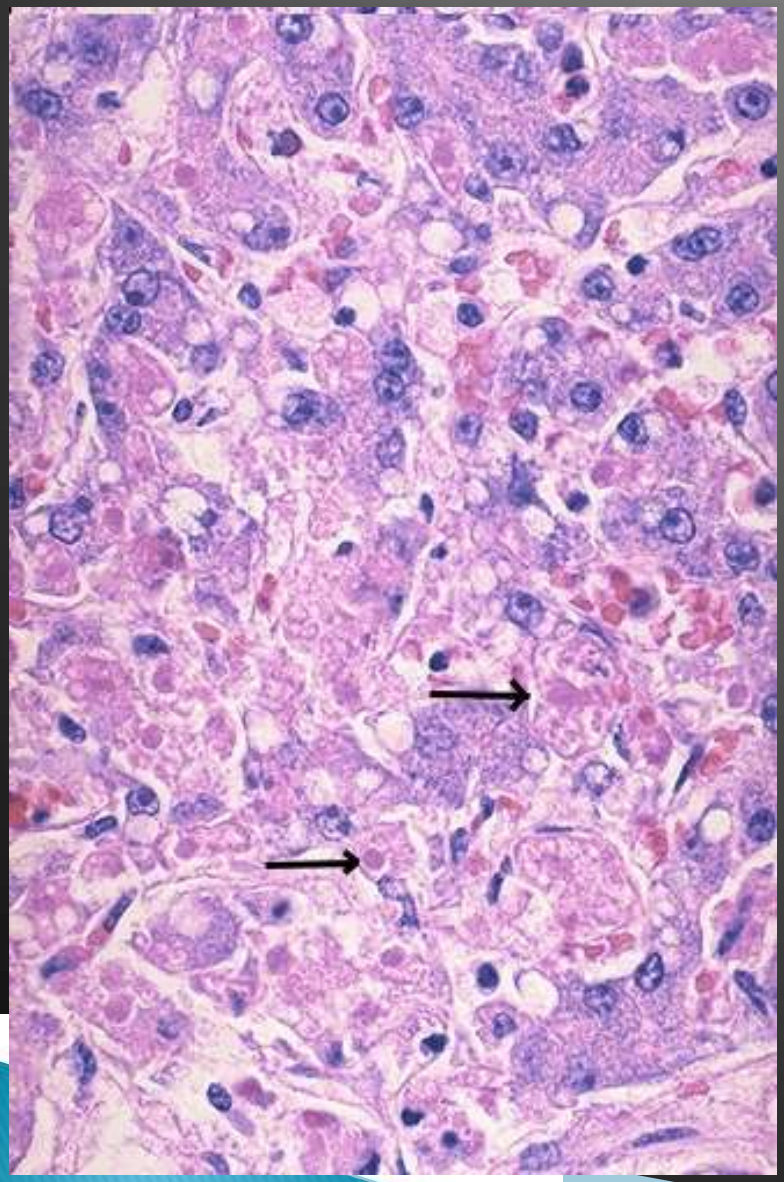


FIGURE 1-26 The extrinsic (death receptor–initiated) pathway of apoptosis, illustrated by the events following Fas engagement. FAAD, *Fas*-associated *death domain*; FasL, Fas ligand.

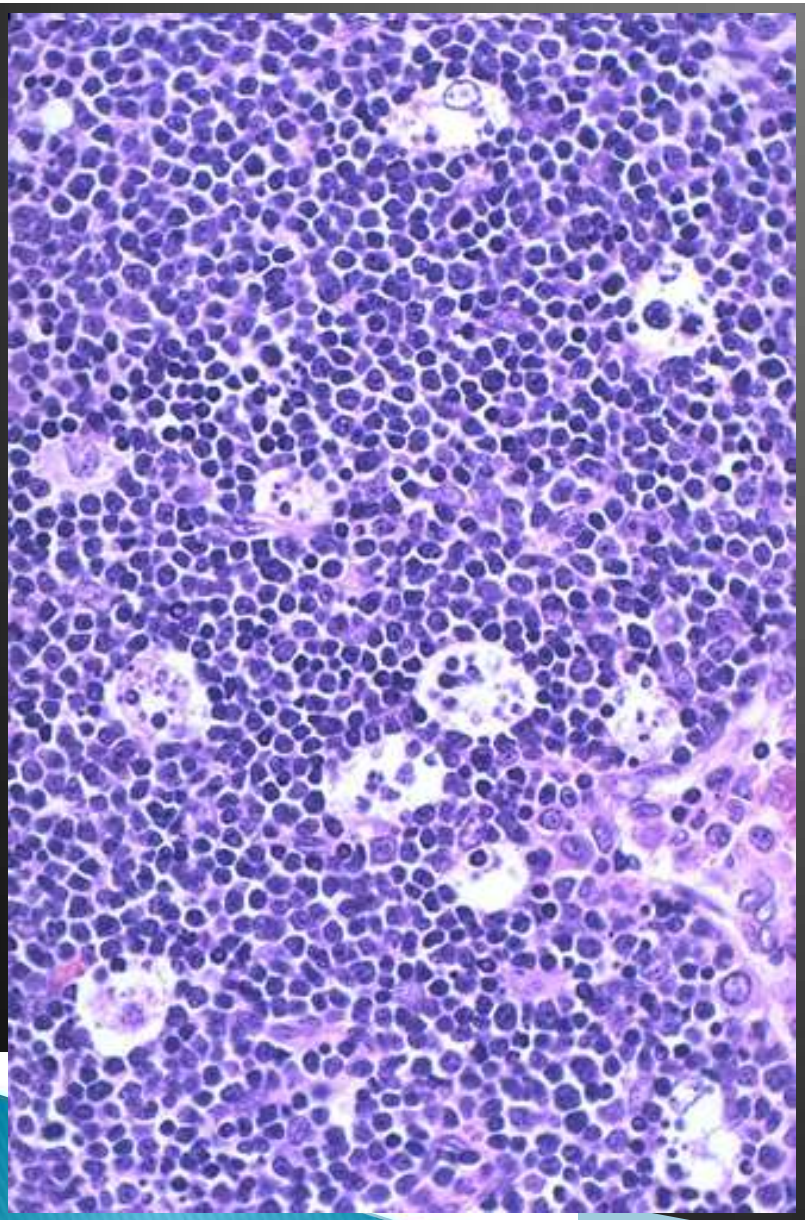


Apoptotic liver



Apoptosis is a more orderly process of cell death. Apoptosis is individual cell necrosis, not simultaneous localized necrosis of large numbers of cells. In this example, hepatocytes are dying individually (arrows) from injury through infection by viral hepatitis. The apoptotic cells are enlarged, pink from loss of cytoplasmic detail, and without nuclei. The cell nucleus and cytoplasm become fragmented as enzymes such as caspases destroy cellular components.

Apoptotic fetal thymus



In this fetal thymus there is involution of thymic lymphocytes by the mechanism of apoptosis. In this case, it is an orderly process and part of normal immune system maturation. Individual cells fragment and are consumed by phagocytes to give the appearance of clear spaces filled with cellular debris. Apoptosis is controlled by many mechanisms. Genes such as BCL-2 are turned off and Bax genes turned on. Intracellular proteolytic enzymes called caspases produce much cellular breakdown.

Regional and Systemic Cytokine Responses to Acute Inflammation of the Vermiform Appendix
Rivera-Chavez, Fernando A. MD*; Wheeler, Herbert BSc*; Lindberg, Guy MD§; Munford, Robert S. MD†‡; O'Keefe, Grant E. MD*

NAME OF AUTHOR	TITLE OF STUDY & DESIGN	AIM	RESULT	CONCLUSION
Rivera-Chavez, Fernando A. MD*; Wheeler, Herbert BSc*; Lindberg, Guy MD§; Munford, Robert S. MD†‡; O'Keefe, Grant E. MD*	Regional and Systemic Cytokine Responses to Acute Inflammation of the Vermiform Appendix LEVEL 2	To measure local (peritoneal fluid) and systemic (plasma) cytokine profiles in patients with infection-inflammation of the vermiform appendix, a relatively mild, localized inflammatory process	Of the proinflammatory cytokines tumor necrosis factor-alpha was present in PF but not in plasma, interleukin (IL)-1β and interferon-γ were found in low concentrations in both PF and plasma, and IL-12 (p70) was detectable in plasma but not PF. In contrast, IL-6 and IL-1 receptor antagonist (IL-1ra) were the most abundant cytokines in the PF and plasma, and the concentrations of IL-4 and IL-10 were also elevated in both compartments. Patients with more severe	As judged from the pattern of soluble cytokines in plasma and the effect of the plasma on monocyte activation by LPS, mild, localized infection can induce a systemic response that is predominantly anti-inflammatory.

1.True about Apoptosis are all except :

a) Inflammation is present

b) Chromosomal breakage

c) Clumping of chromatin

d) Cell shrinkage

2. Apoptosis refers to cell death and

- A) is always biologically detrimental to an organism.
- B) is merely the accumulation of genetic errors.
- C) can be programmed and is essential to normal development.
- D) is a failure in the translation or transcription mechanism.

3. Apoptosis

- A) is programmed cell death.
- B) is a process that acts to decrease the number of somatic cells.
- C) works to oppose the effects of mitosis.
- D) All of the above

4. What is the starting point of apoptosis for programme cell death is?

a)Activation of endonuclease
b)Release of enzyme
c)Accumulation of calcium
d)Destruction by macrophages

5. All of the following are features of Apoptosis,Except

[A]. Cellular swelling

[B]. Nuclear compaction

[C]. Intact cell membrane

[D]. Cytoplasmic eosiophilia

1.True about Apoptosis are all except :

- Answer: A

- 2. Apoptosis refers to cell death and
- Answer: C

- 3. Apoptosis
- Answer:D

- 4. What is the starting point of apoptosis for programme cell death is?
- Answer: A

- 5. All of the following are features of Apoptosis,Except
- Answer: A