Chapter 1: Cell Injury, Cell Death, and Adaptations

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Outline

Introduction

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- Understanding cell injury, death, and adaptations is crucial for diagnosing and treating diseases.
- This chapter explores the mechanisms and implications of these cellular processes.

Necrosis

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- Necrosis is a form of cell death characterized by cell membrane breakdown, organelle swelling, and rupture.
- It leads to inflammation in surrounding tissue.

Causes of Necrosis

- Caused by external factors like toxins, infections, or trauma.

Types of Necrosis

- Types include coagulative, liquefactive, caseous, and fat necrosis.

Example of Necrosis

- **Example:** Coagulative necrosis often occurs in the heart after a myocardial infarction, where lack of oxygen leads to cell death.

Apoptosis

Apoptosis

- Apoptosis is programmed cell death, crucial for removing damaged or unnecessary cells.
- Characterized by cell shrinkage, chromatin condensation, and apoptotic bodies formation.

Characteristics of Apoptosis

- Does not initiate inflammation.

Example of Apoptosis

- **Example:** The elimination of webbing between fetal fingers and toes is a natural occurrence of apoptosis.

Cellular Adaptations

Cellular Adaptations

- Adaptations include changes in size (atrophy, hypertrophy), number (hyperplasia), form (metaplasia), and function.

Types of Adaptations

- Atrophy: Decrease in cell size or number, e.g., in unused muscles.
- Hypertrophy: Increase in cell size, e.g., in heart muscle due to hypertension.

More on Adaptations

- Metaplasia: Change of one cell type to another, e.g., in the respiratory tract of smokers.

Example of Adaptation

- **Example:** Hyperplasia occurs in the endometrium during the menstrual cycle, preparing for potential pregnancy.

Intracellular Accumulations

Intracellular Accumulations

- Buildup of substances cells can't use or dispose of.
- Examples include lipids in liver cells, proteins in kidney tubule cells, and pigments like lipofuscin.

Example of Intracellular Accumulations

- **Example:** Fatty liver disease results from the accumulation of lipids in liver cells, often due to alcohol abuse or obesity.

Summary

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- This chapter covered the fundamental concepts of cell injury, death, and adaptations.
- Understanding these processes is essential for diagnosing and managing diseases.
- We explored necrosis, apoptosis, cellular adaptations, and intracellular accumulations.

Thank You

Thank you for your attention!
Questions?