

# GENERAL PATHOLOGY

## L-8 REVERSIBLE INJURY:

### CELL SWELLING

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# CELL INJURY

Continue ...

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## Cellular Patterns and Response to Stress

### □ Reversible Cell Injury

1. Cell swelling
2. Fatty Change

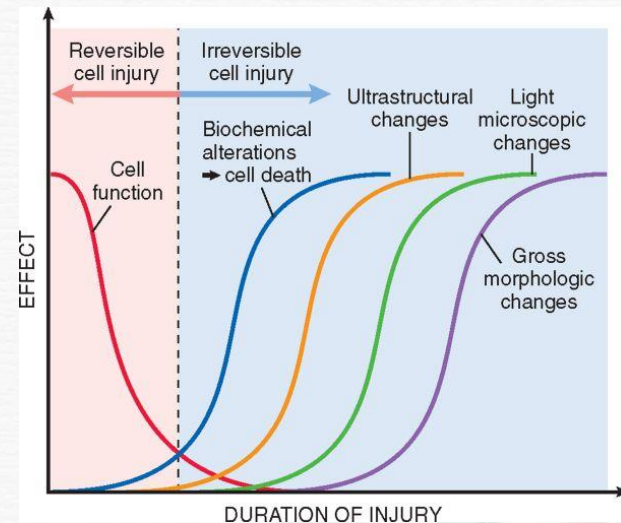
### □ Irreversible Injury

#### 1. Necrosis

- Coagulative
- Liquefactive
- Caseative
- Fat necrosis
- Zenker's Necrosis

#### 2. Apoptosis

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# REVERSIBLE INJURY

Degeneration = Reversible injury  
Necrosis = Irreversible injury

## Degeneration

- Cloudy swelling
- Hydropic degeneration
- Fatty Infiltration
- Fatty Degeneration

Degeneration -OSIS (hepatosis, nephrosis)

## Degeneration

- ✓ Cell Swelling
- ✓ Fatty Change

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# CELL SWELLING

(cellular oedema)

- Early and almost universal manifestation of injury.
- Failure in maintaining ionic and fluid homeostasis (Na ATPase).
- Difficult to appreciate under the light microscope.

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## CELL SWELLING

### □ Microscopically,

- Cells appear enlarged and compresses adjacent structures,
  - e.g., swelling of hepatocytes -- obliteration of sinusoid
  - and swelling of renal tubular cells -- obliteration of tubular lumen.
- In mildly swollen cells -- cloudy appearance of cytoplasm "cloudy swelling" (Rudolph Virchow, in 1860)

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## CELL SWELLING

### □ Microscopically,

- Extensive water logging
  - distension of organelles, "vacuolar degeneration".
  - distension of the cell, central areas cleared of proteins, shrunken nuclei pushed to the periphery -- "hydropic degeneration".
- The vacuoles need to be differentiated from fat droplets or non-membrane-bound areas as in glycogen storage disease.
- If majority of cells appear swollen and many are actually dead (devoid of nucleus), the injury is more serious

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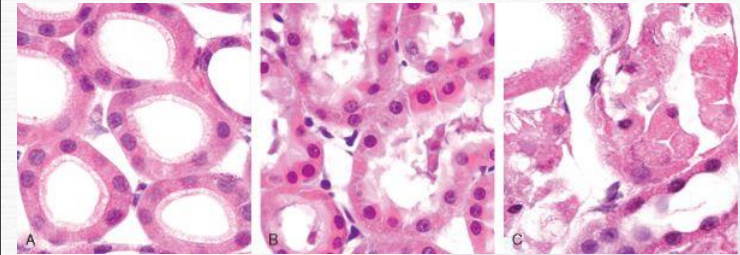
#### CELL SWELLING

#### □ The ultrastructural changes of reversible injury:

- Plasma membrane alterations, such as blebbing, blunting, and loss of microvilli
- Mitochondrial changes, including swelling and the appearance of small amorphous densities
- Dilation of the ER, with detachment of ribosomes; intra-cytoplasmic myelin figures may be present
- Nuclear alterations, with disaggregation of granular and fibrillar elements

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#### CELL SWELLING



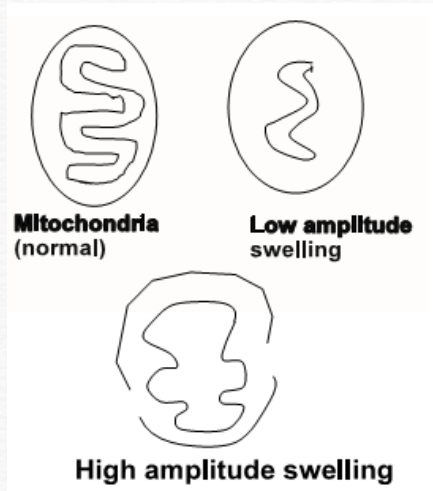
A Normal kidney tubules

B Early (reversible) injury

C Necrosis (irreversible injury)

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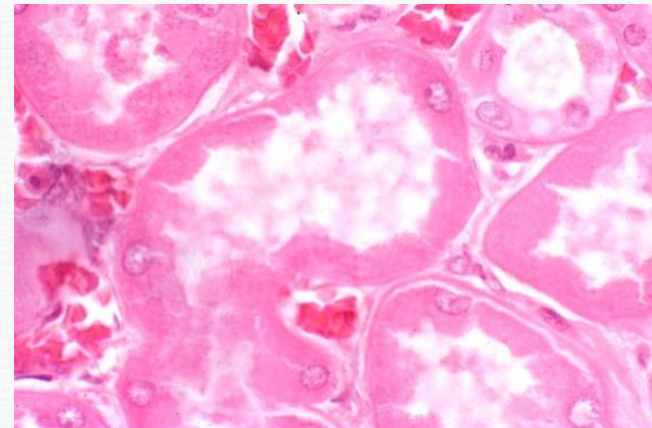
#### CELL SWELLING



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#### CELL SWELLING

#### HYDROPIc DEGENERATION

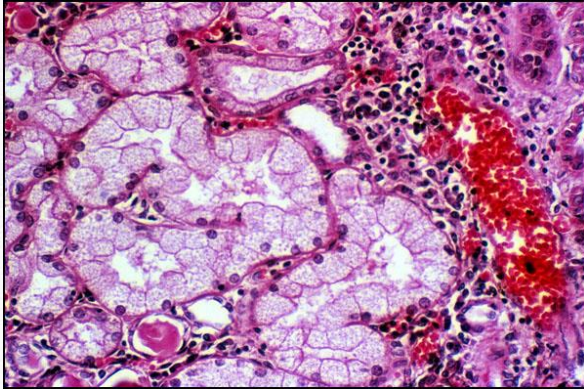


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CELL SWELLING

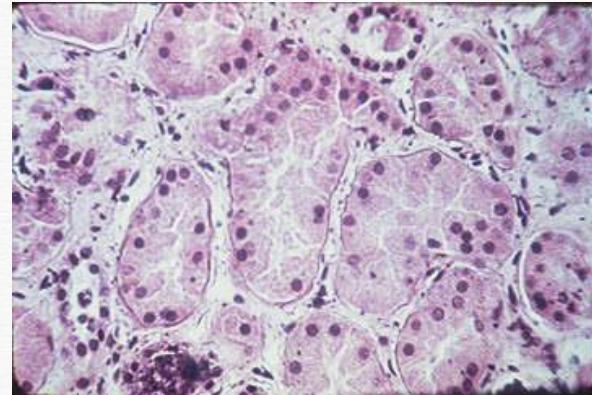
HYDROPIC DEGENERATION



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CELL SWELLING

Cloudy swelling Kidney



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CELL SWELLING

□ **Grossly**

- pallor colouration,
- increased turgor,
- increase in weight
- rounding of edges
- water oozes out of cut surface
- the cut surface bulges out.
- they sink in water
- In capsulated organs, the capsule appears stretched.

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CELL SWELLING

Cell Swelling Kidney



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