



## Lecture title: Water Overload

**Lecturer Affiliation: Department of Pathology and Poultry Diseases, College of Veterinary Medicine, University of Mosul, Mosul, Iraq.**

### Summary:

#### 1- Cell swelling (cloudy swelling , parenchymatous degeneration)

Cell swelling is the first manifestation of almost all forms of injury to cells due to the inability of cells to maintain homeostasis. It is the mildest, reversible degenerative change of parenchymatous organs particularly those of highly specialized cells (e.g. hepatic cell & renal tubular cell). It is characterized by water accumulation inside the cytoplasm which causes the cell to swell.

**Cause:** The most important causes are:

1. **Hypoxia:** It occurs associated with respiratory diseases, anemia, cardiac disease and in case of inability of the hemoglobin to carry oxygen as in carbon monoxide and hydrocyanic acid poisoning.
2. **Toxins:** The toxin may be exogenous (bacterial toxins, poisonous plants, chemicals and snake venom) or endogenous toxins (acetone, urea and uric acid).
3. **Free radicals.**

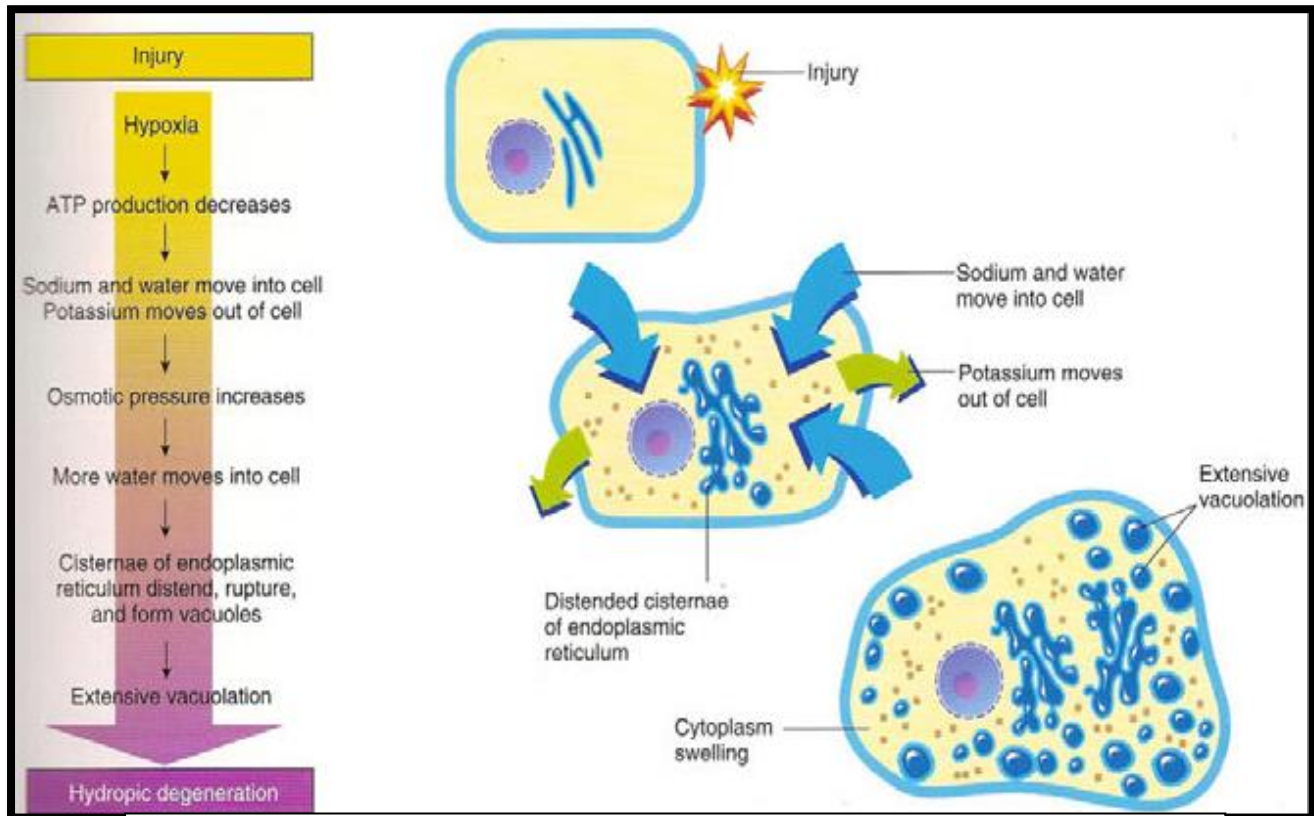
**Pathogenesis:** To cause cell swelling the injurious substances must cause damage to the plasma membrane barrier that controls water and electrolyte transports through cell surface. Normally the intracellular water is regulated by energy-dependent ionic pumps. Any damage in the sodium-potassium pump results in a leaky plasma membrane, which permits entrance of sodium, calcium and loss of potassium. Accumulation of sodium ions raises the osmotic pressure and is followed by entry of water into the cell. The cells become markedly swollen.

**Macroscopic appearance:** The affected organ is increased in size and weight if generalized swelling of cells occurs. The organ color is pale, its consistency is soft and the border is rounded. The cut section is bulged and appears convex.

**Microscopic appearance:** Firstly, the cells are swollen and the cytoplasm appears granular. The granules are eosinophilic. The nucleus is normal.



**Sequelae:** If the causes are removed recovery occurs but if the causes continue, the degenerative processes may end up in necrosis.



**Table 3: The process of acute cell swelling (hydropic degeneration).**

## 2- Hydropic degeneration (Vacuolar or ballooning degeneration)

**Def.:** It is reversible degenerative changes of **various** epithelial cells particularly those of skin and glands, which characterized by accumulation of fluid inside cellular cytoplasm to form the vacuoles.

**Causes:** the causes are similar to those of cell swelling.

**Microscopically:** there is clear vacuole in the cytoplasm of the cell, perhaps beside or around the nucleus and the cell is swollen.

**Hydropic degeneration:** the good example of it, is blister on the skin (burn) or mucous membrane (due to chemical irritants) and the vesicles that form in pox disease and foot and mouth disease. Liver cells manifest hydropic degeneration after administration of ether and in poisoning by CCL4.