INTRODUCTION TO PATHOLOGY

Lect.1

adaptation

Learning Objectives

- **Upon completing this chapter students should be able to:**

1. **Define pathology**
2. **Know the diagnostic techniques used in pathology**
3. **Discuss the pathological bases of diseases.**
4. **The core aspects of diseases in pathology.**

Core aspects of pathology

1. **Etiology,**
2. **Pathogenesis,**
3. **Morphologic changes,**
4. **Functional disturbances and clinical significance**

Etiology

- **Etiology of a disease means the cause of the disease.**
- **If the cause of a disease is known it is called primary etiology. If the cause of the disease is unknown it is called idiopathic.**
- **Knowledge or discovery of the primary cause remains the backbone on which a diagnosis can be made, a disease understood, & a treatment developed. There are two major classes of etiologic factors: genetic and acquired (infectious, nutritional, chemical, physical, etc).**

Pathogenesis

Pathogenesis means the mechanism through which the cause operates to produce the pathological and clinical manifestations. Pathogenesis leads to morphologic changes.

Morphologic changes

The morphologic changes refer to the structural alterations in cells or tissues that occur following the pathogenetic mechanisms. The structural changes in the organ can be seen with the naked eye or they may only be seen under the microscope. Those changes that can be seen with the naked eye are called gross morphologic changes & those that are seen under the microscope are called microscopic changes. Both the gross & the microscopic morphologic changes may only be seen in that disease, i.e. they may be specific to that disease. Therefore, such morphologic changes can be used by the pathologist to identify (i.e. to diagnose) the disease. In addition, the morphologic changes will lead to functional alteration & to the clinical signs & symptoms of the disease

Functional disturbances and clinical significance

The morphologic changes in the organ influence the normal function of the organ.

By doing so, they determine the clinical features (symptoms and signs), course, and prognosis of the disease.

In summary pathology studies:-

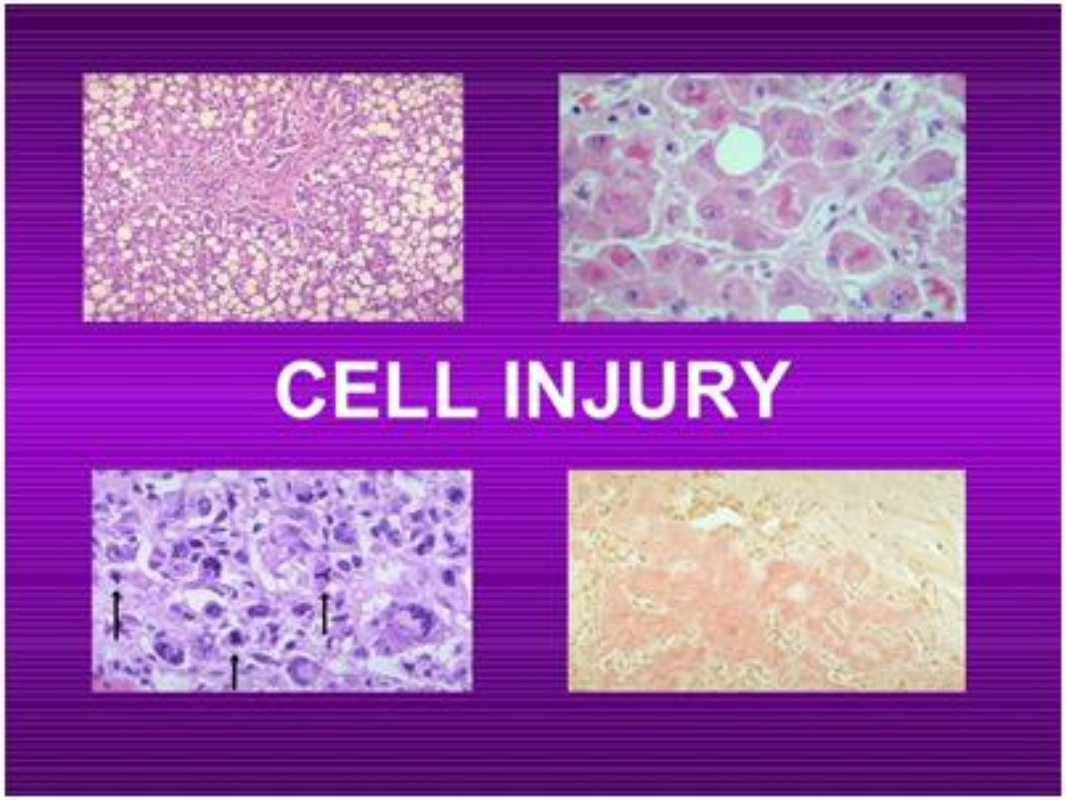
- Etiology
- Pathogenesis
- Morphologic changes
- Clinical features & Prognosis of all diseases.

Pathology course includes:

- Cell injury (reversible & non-reversible)
- Disturbances in circulation
- Inflammation
- Repair
- Immunopathology
- Cancer
- Liver, kidney and heart pathology

Cell injury

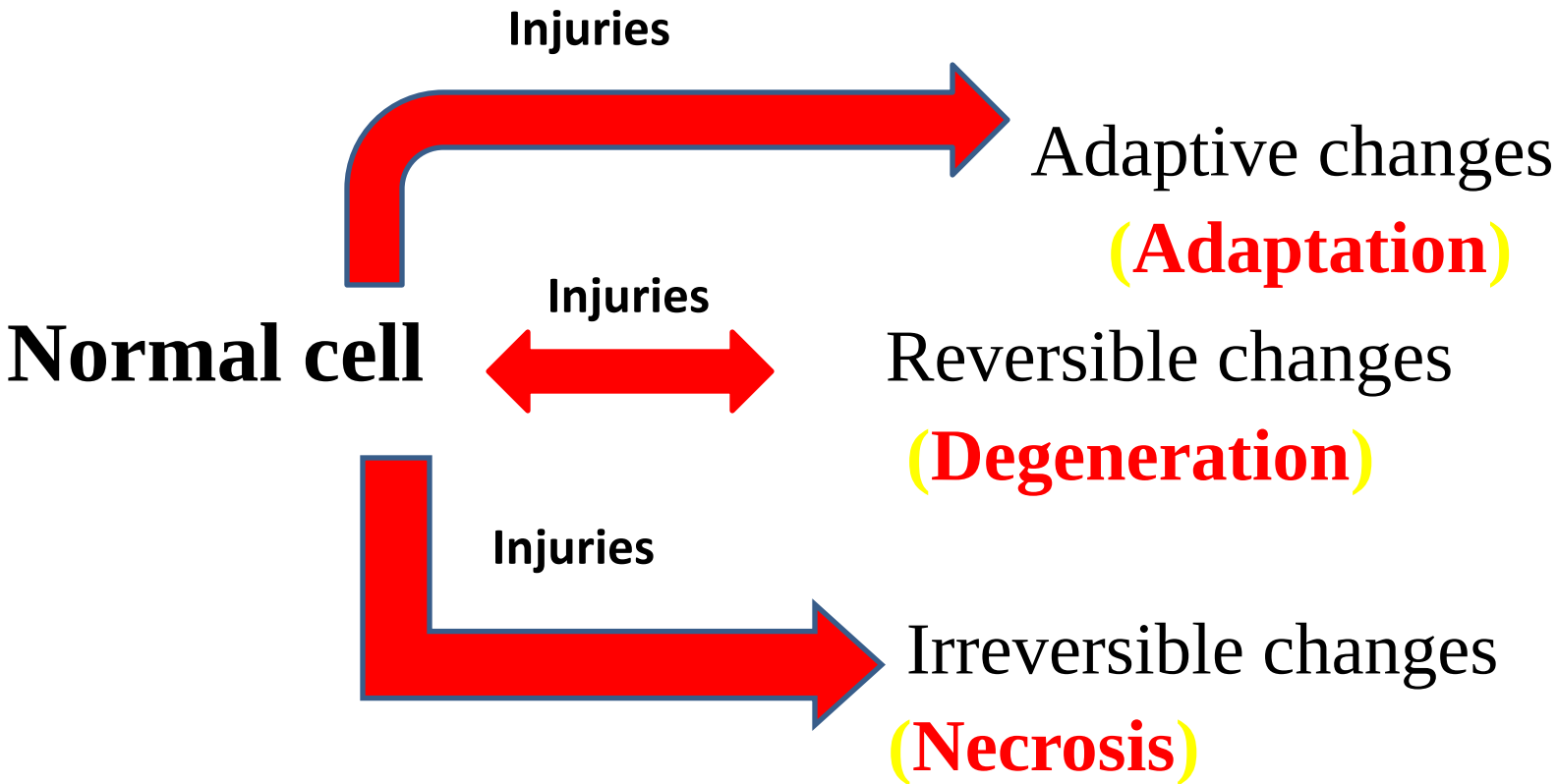
CELLULAR REACTIONS TO INJURY



Learning objectives

- **At the end of this topic, the student should be able to:**

1. **Define hyperplasia, hypertrophy, atrophy, & Metaplasia.**
2. **Know the differences between reversible & irreversible forms of cell injury.**
3. **Describe the mechanisms and types of cell death.**


Injuries
Adaptive changes
(Adaptation)
Injuries
Normal cell
Reversible changes
(Degeneration)
Injuries
Irreversible changes
(Necrosis)

Adaptation

- **The cells make adjustments (i.e. adapt) with the changes in their environment to the physiologic needs (physiologic adaptation) and to non-lethal pathologic injury (pathologic adaptation).**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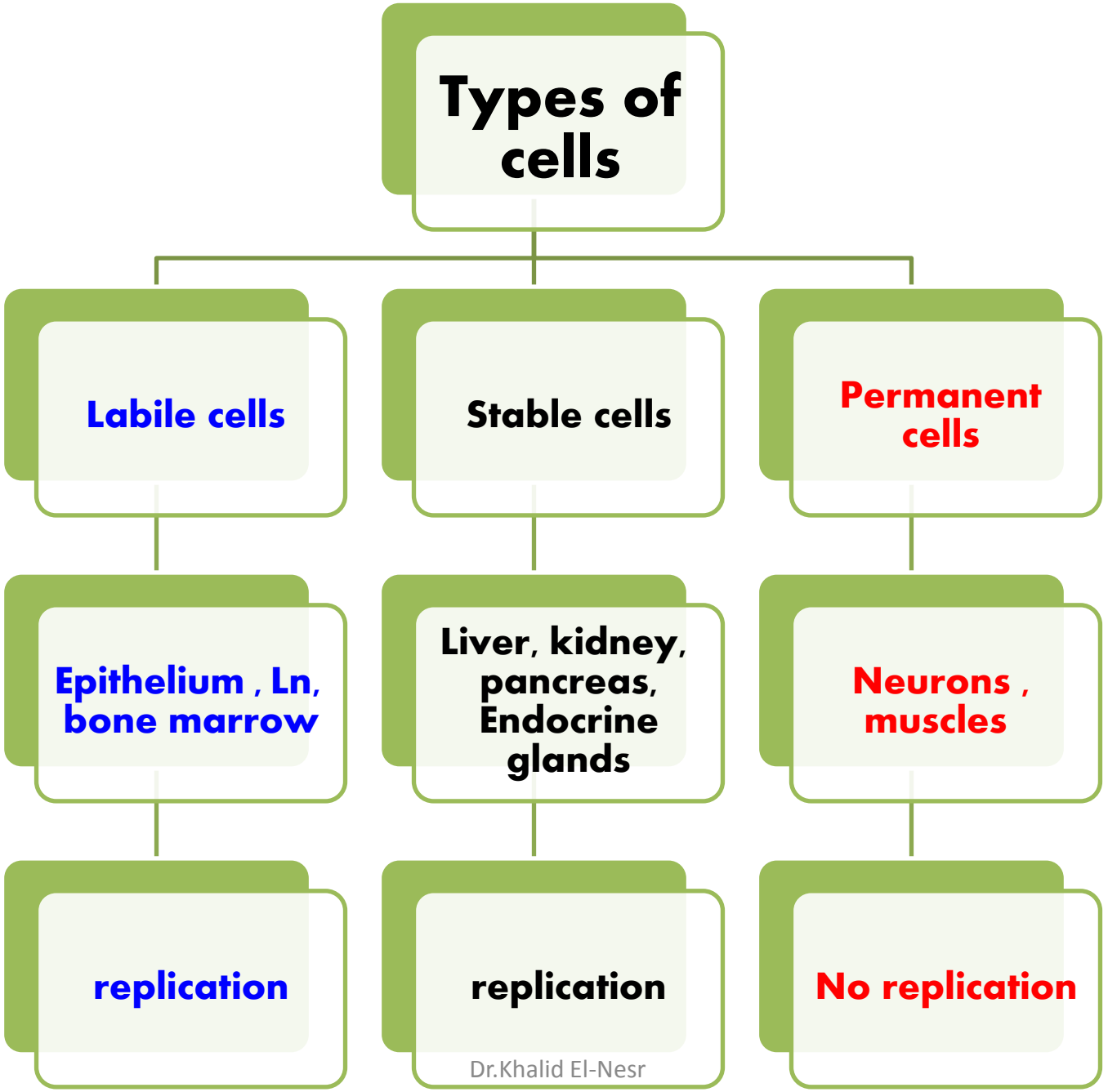

Types of cells
Labile cells
Stable cells
Permanent cells
Epithelium , Ln, bone marrow
Liver, kidney, pancreas, Endocrine glands
Neurons , muscles
replication
replication
No replication

Types of cellular adaptation

- **The types of cellular adaptation include hypertrophy, atrophy, hyperplasia, & metaplasia.**
  - **A. Hypertrophy**

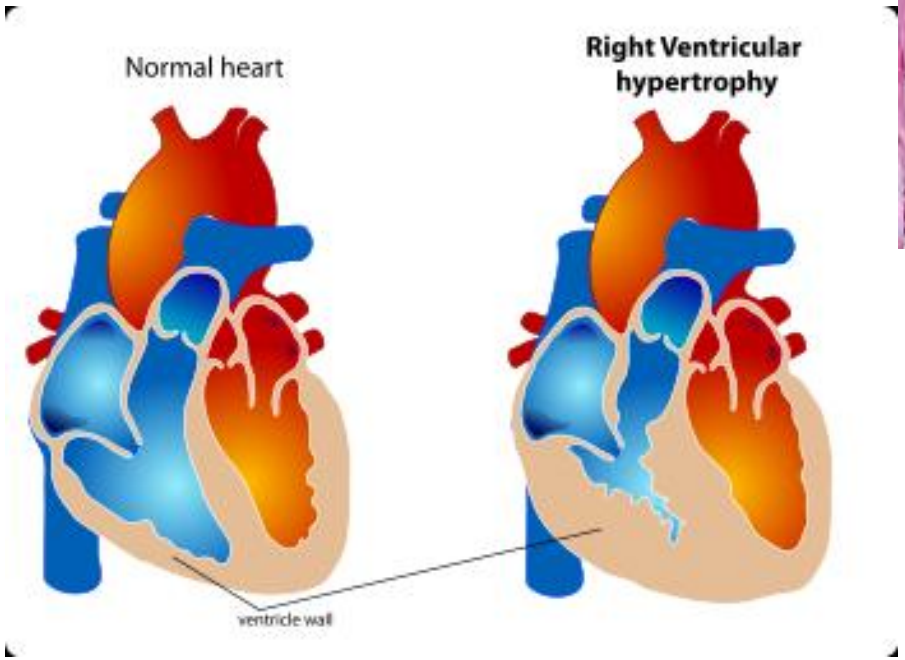
Hypertrophy is increase in the size of cells.

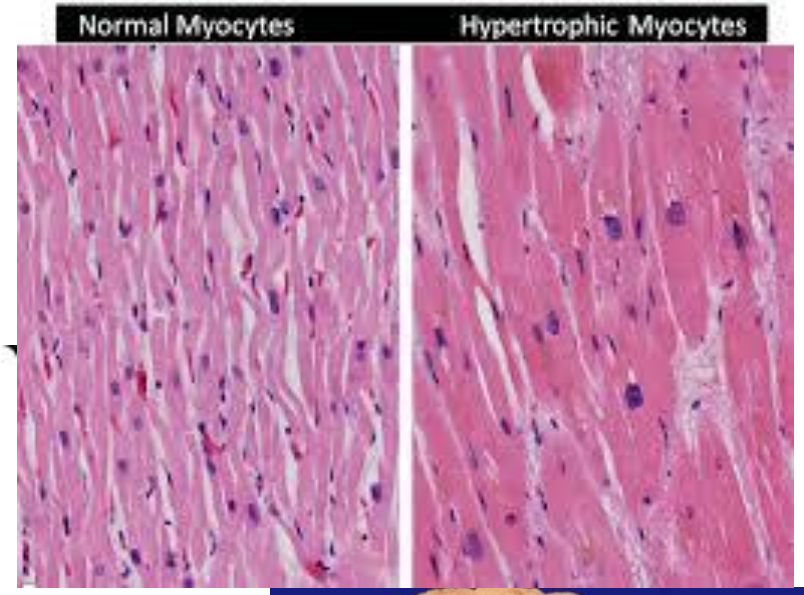
Increased workload leads to increased protein synthesis & increased size & number of intracellular organelles which, in turn, leads to increased cell size. The increased cell size **leads to increased size of the organ.**

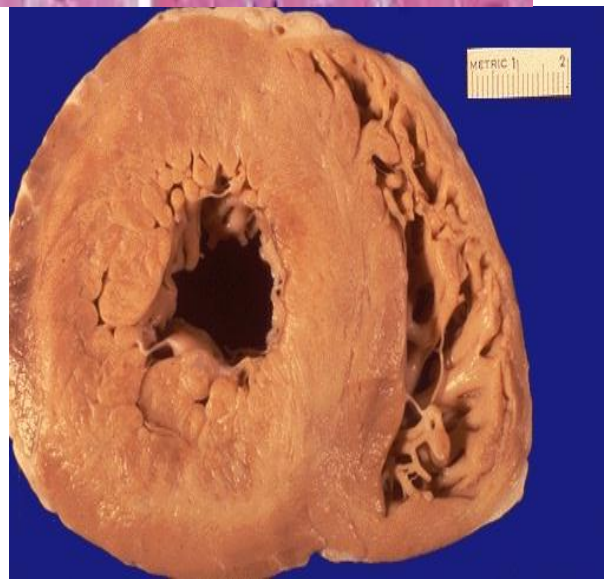
Examples: the **enlargement of the left ventricle** in **hypertensive** heart disease & the

increase in **skeletal muscle** during **exercise**.

Hypertrophy







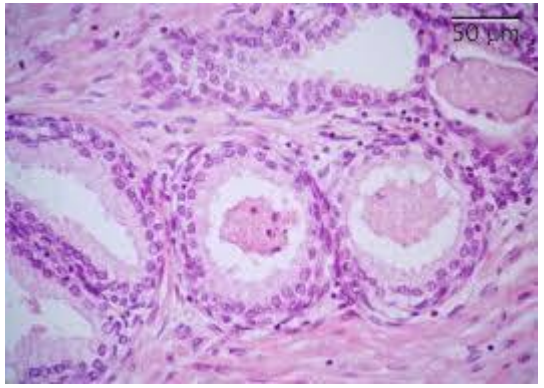
Types of cellular adaptation

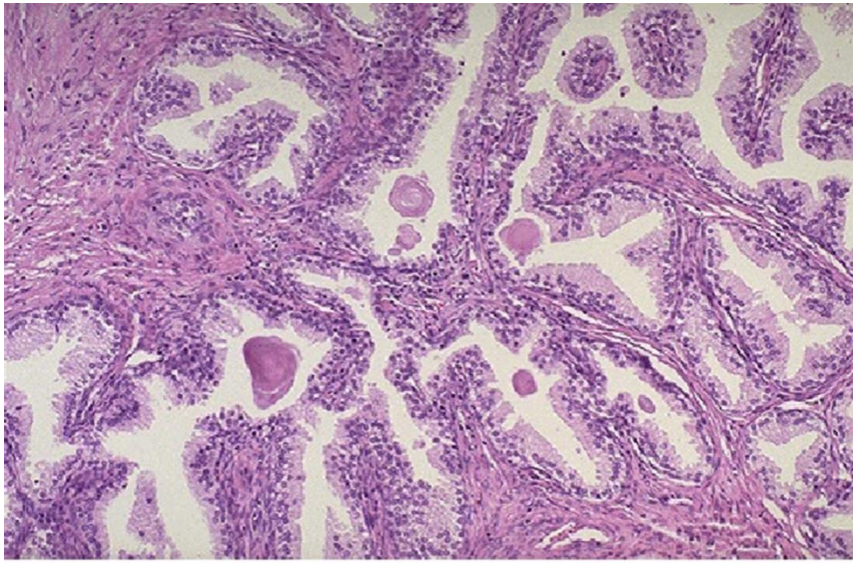
- **B. Hyperplasia**

Hyperplasia is an increase in the number of cells.

It can lead to an increase in the size of the organ. It is usually caused by hormonal stimulation. It can be physiological as in enlargement of the breast during pregnancy or it can pathological as in endometrial hyperplasia.

Hyperplasia





Prostate (man): hyperplasia

Types of cellular adaptation

• C. Atrophy

Atrophy is a decrease in the size and / or number of cells.

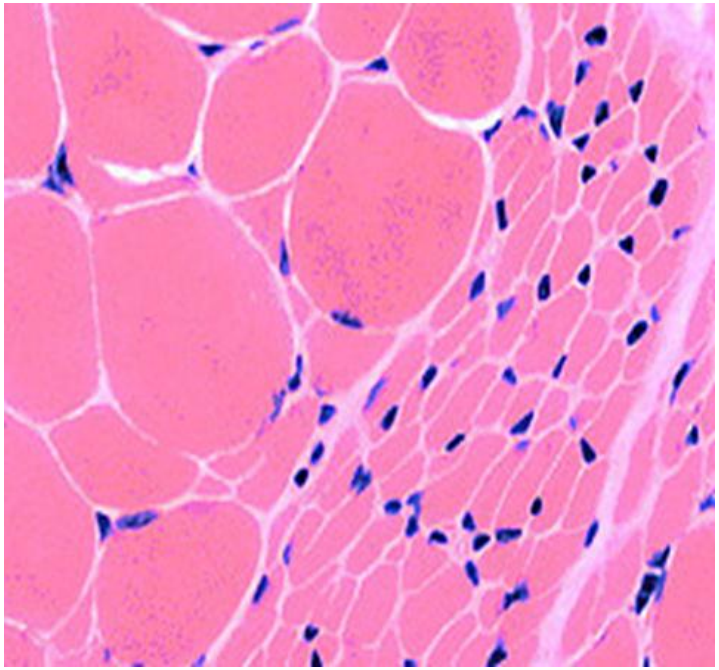
This can lead to decreased size of the organ.

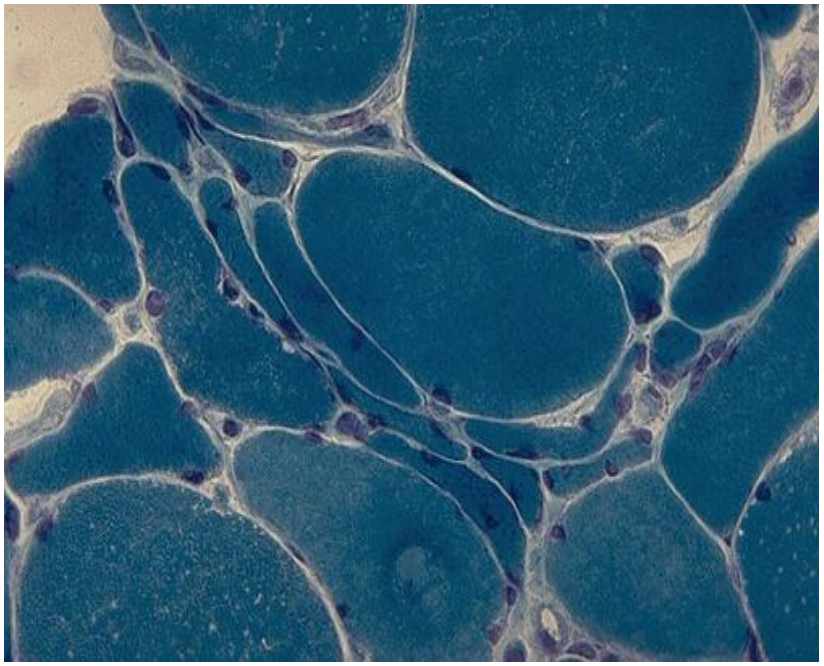
The atrophic cell shows autophagic vacuoles which contain cellular debris from degraded organelles.

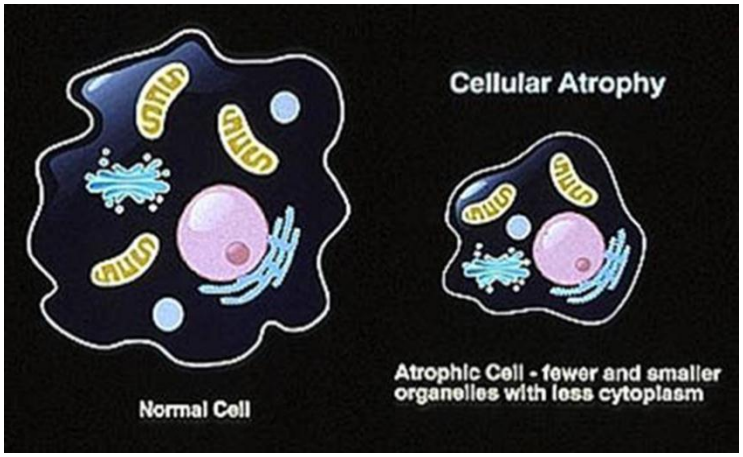
Atrophy can be :

1. **Physiological atrophy**
2. **Disuse atrophy**
3. **Senile atrophy**
4. **Starvation atrophy**
5. **Neurogenic atrophy (Denervation)**
6. **Pressure atrophy**
7. **Endocrine atrophy**

Atrophy






Cellular Atrophy
Normal Cell
Atrophic Cell - fewer and smaller organelles with less cytoplasm

Types of cellular adaptation

• D. Metaplasia

- **Metaplasia is the replacement of one differentiated tissue by another more specialized differentiated tissue**.
- There are different types of metaplasia. Examples include:

1. Squamous metaplasia:

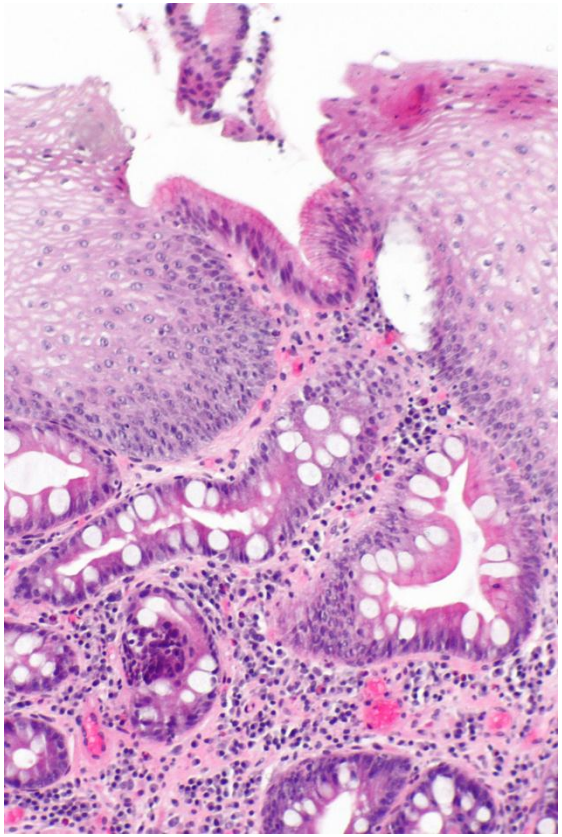
This is replacement of another type of epithelium by squamous epithelium. For example, the columnar epithelium of the bronchus can be replaced by squamous epithelium in inflammation.

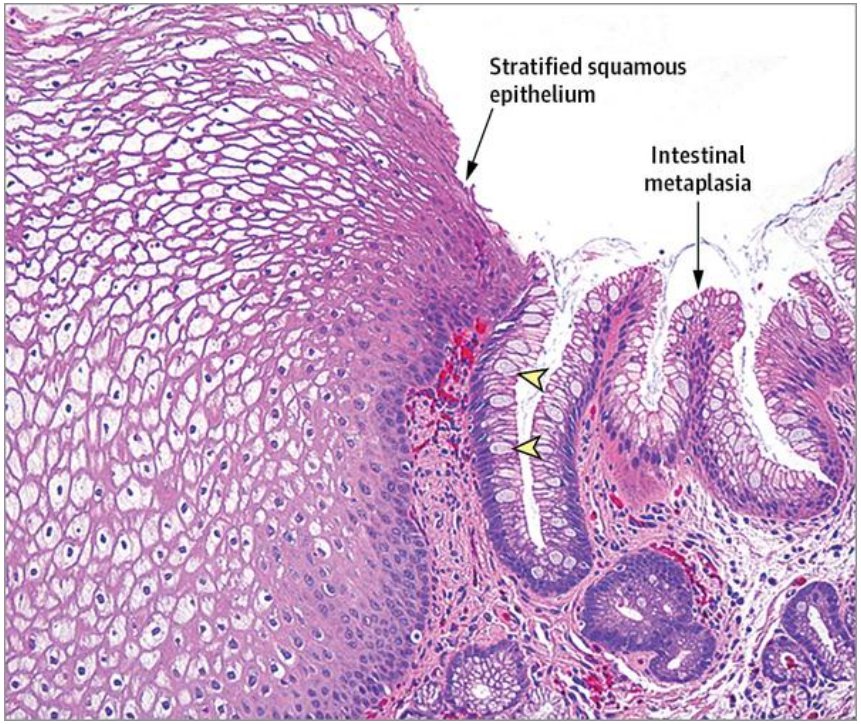
2. Osseous metaplasia:

This replacement of a connective tissue by bone, for example at sites of injury

Metaplasia

Intestine





- **Thanks**