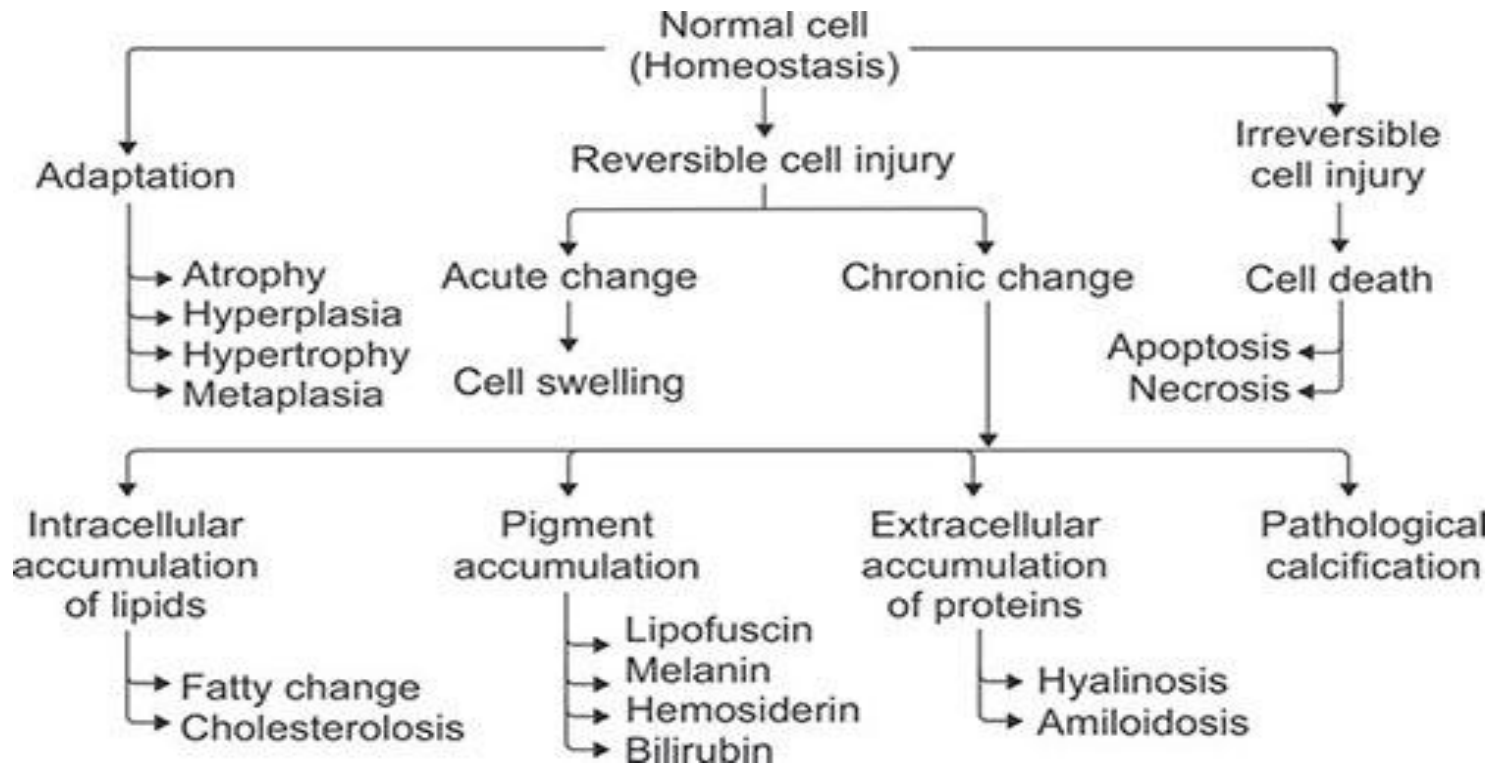


CELL INJURY AND ADAPTATIONS

CELL INJURY AND ADAPTATIONS: AN OVERVIEW



<https://www.google.com/search?q=cell+injury+and+its+types&tbm=isch&ved>



Morphology of Irreversible Cell Injury

- ✓ **Autolysis** (i.e. self-digestion) is disintegration of cell by its own hydrolytic enzymes liberated from lysosomes. Autolysis is rapid in some tissues rich in hydrolytic enzymes such as in the pancreas, and gastric mucosa; intermediate in tissues like the heart, liver and kidney; and slow in fibrous tissue.
- ✓ **Heterolysis** is disintegration of cell by the hydrolytic enzymes liberated from inflammatory mediators like Neutrophils etc.,
- ✓ **Necrosis** is a series of morphological changes which occurs in a lethally injured cell.
- ✓ **Apoptosis** is also known as Programmed Cell death.

<https://www.google.com/search?q=cell+and+its+injury&tbm=isch&ved=2ahUKEwi8lb>

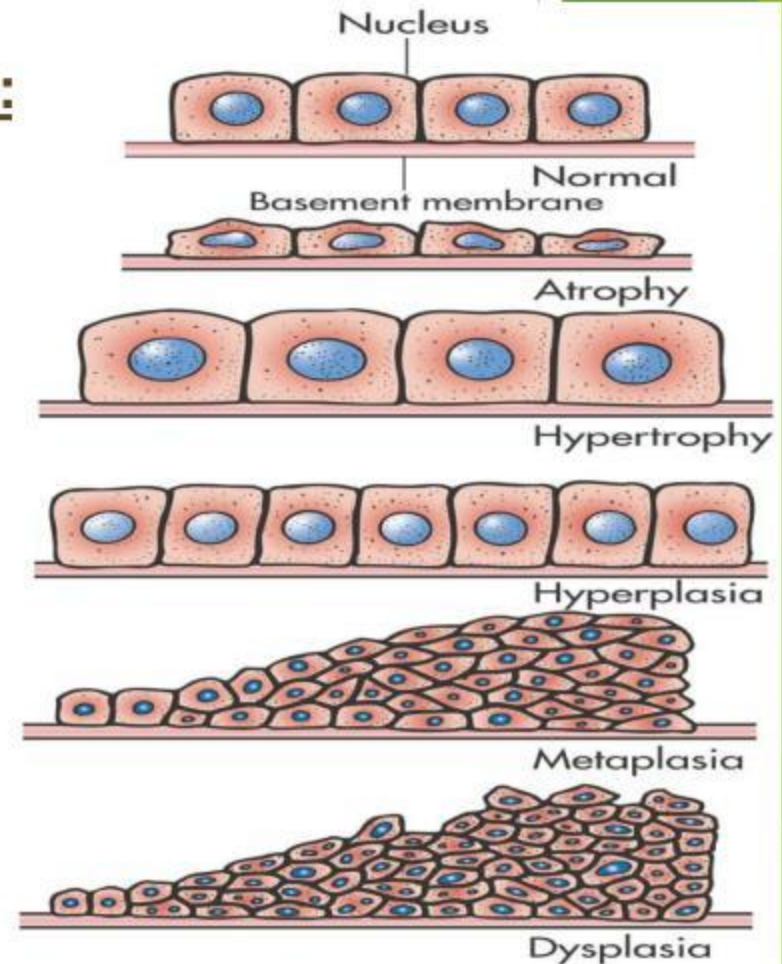
CAUSES OF CELL INJURY

1. **Hypoxia** (oxygen deficiency) and ischemia (blood flow deficiency)
2. **Physical injury**
 - Mechanical trauma
 - Temperature extremes (burn injury, frostbite)
 - Electrical current
3. **Chemical injury**
 - Chemicals, toxins, heavy metals, solvents, smoke,
 - pollutants, drugs, gases
4. **Radiation injury**
 - Ionizing radiation — gamma rays, X rays
 - Non-ionizing radiation — microwaves, infrared, laser
5. **Biologic agents**
 - Bacteria, viruses, parasites
6. **Nutritional injury**
 - Malnutrition: Protein deficiency
 - Over nutrition: Obesity

Cell Adaptation to Injury

Five Cellular Adaptations to Injury:

1. Atrophy
2. Hypertrophy
3. Hyperplasia
4. Metaplasia
5. Dysplasia



From Lewis SM, Collier IC, Heltkemper MM: *Medical-surgical nursing: assessment and management of clinical problems*, ed 5, St Louis, 2000, Mosby. Mosby items and derived items copyright © 2004, 2000 by Mosby, Inc.

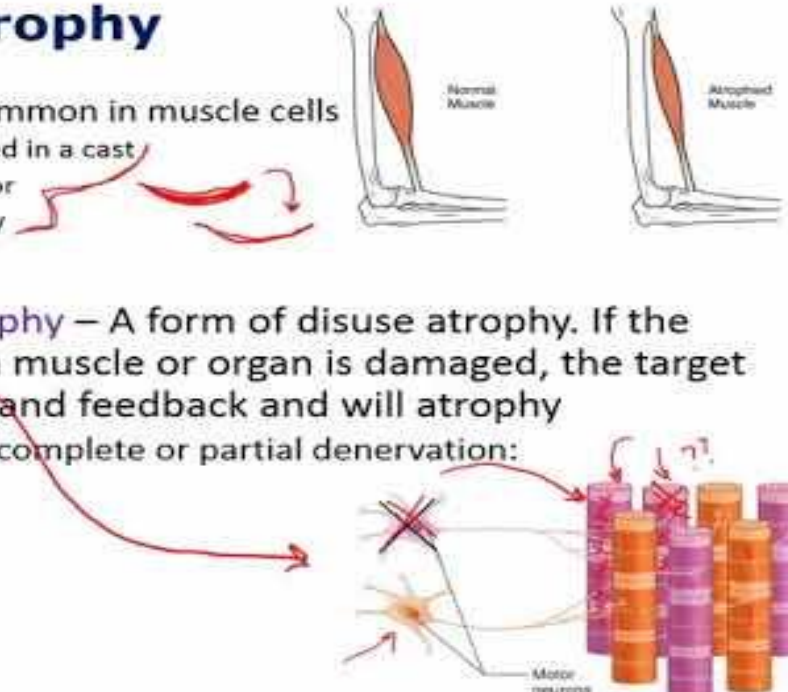
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ADAPTATIONS

○ Atrophy:

Types of Atrophy

- **Disuse Atrophy** – Common in muscle cells
 - Example: arm encased in a cast
 - Patient on a ventilator
 - Prolonged immobility
- **Denervation Atrophy** – A form of disuse atrophy. If the nerve supplying a muscle or organ is damaged, the target lacks stimulation and feedback and will atrophy
 - This can apply to complete or partial denervation:



The diagram illustrates the process of atrophy. On the left, a red arrow points from a normal muscle to an atrophied muscle, with a red squiggly line indicating the transition. On the right, two anatomical drawings show a normal muscle and an atrophied muscle. Below, a diagram shows a motor neuron with its axon terminal connecting to several muscle fibers. A red 'X' is drawn over the axon terminal, indicating denervation. A red arrow points from the text 'Denervation Atrophy' to this diagram.

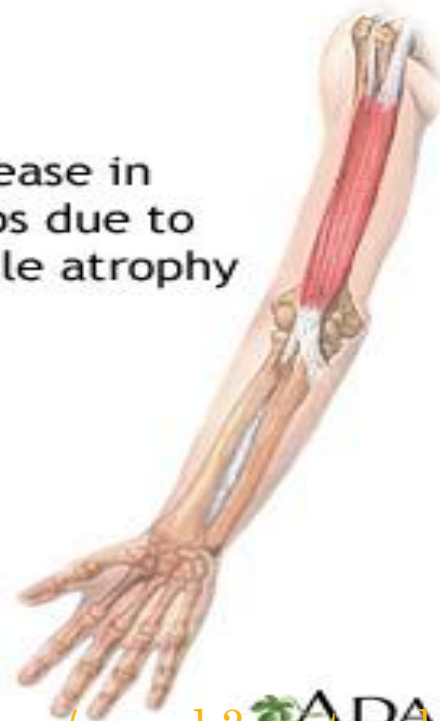
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Normal biceps
brachii muscle



Decrease in
biceps due to
muscle atrophy



<https://www.google.com/search?q=atrophy&tbm=isch&ved=2ahU>

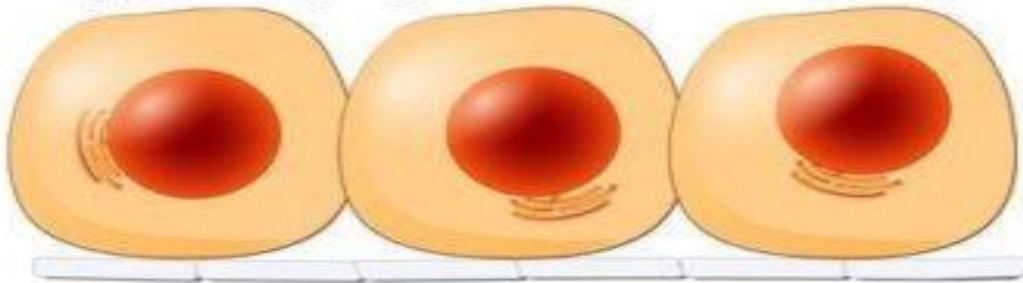
ADAM.



Muscle cell



Hypertrophy



Increase in
cell size

Hyperplasia



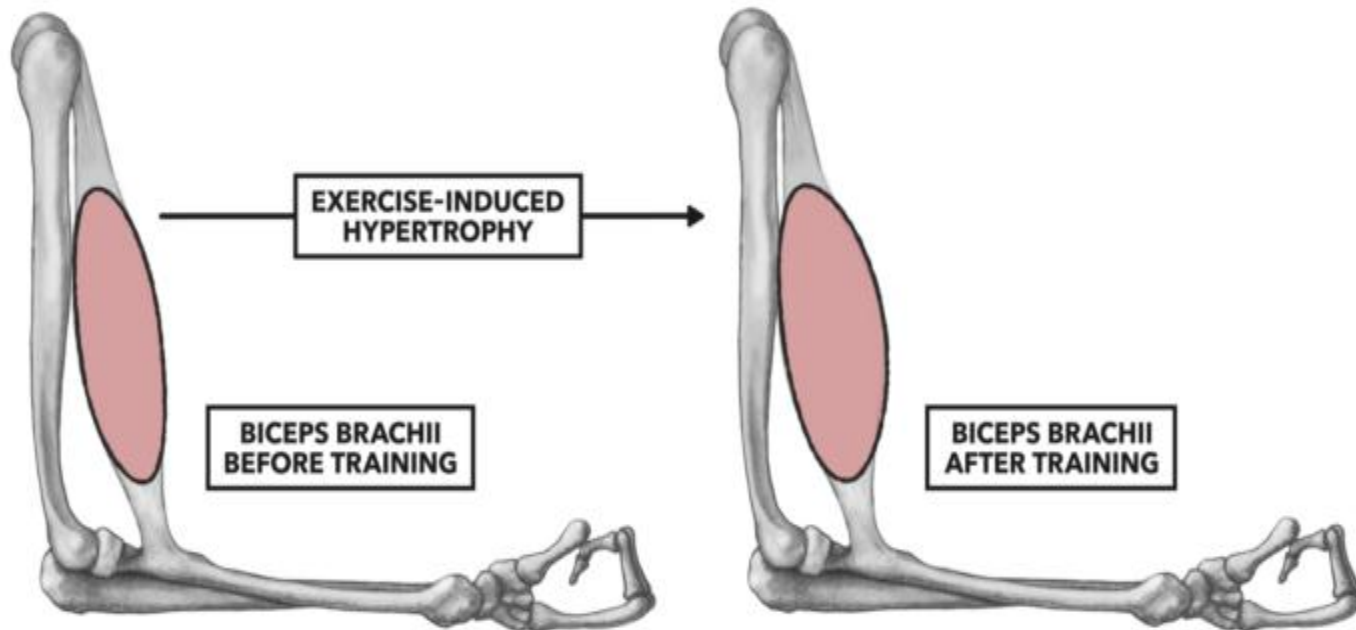
Increase in
cell
number

<https://www.google.com/search?q=hypertrophy&tbm=isch&ved=2ahUKEw>

Types of Hyperplasia : Pathological

- Excessive stimulation of hormones or growth factors
 - Endometrial hyperplasia
 - wound healing - of granulation tissue due to proliferation of fibroblasts and endothelial cells.
 - skin warts from hyperplasia of epidermis due to human papilloma virus.
 - Pseudocarcinomatous hyperplasia of the skin

- Hypertrophy:



<https://www.google.com/search?q=hypertrophy+types&tbm=isch&ved>



Differences between Metaplasia and Dysplasia.

ature	Metaplasia	Dysplasia
<i>Definition</i>	Change of one type of epithelial or mesenchymal cell to another type of adult epithelial or mesenchymal cell	Disordered cellular development, may be accompanied with hyperplasia or metaplasia
<i>Types</i>	Epithelial (squamous, columnar) and mesenchymal (osseous, cartilaginous)	Epithelial only
<i>Tissues affected</i>	Most commonly affects bronchial mucosa, uterine endocervix; others mesenchymal tissues (cartilage, arteries)	Uterine cervix, bronchial mucosa
<i>Cellular changes</i>	Mature cellular development	Disordered cellular development (pleomorphism, nuclear hyperchromasia, mitosis, loss of polarity)
<i>Natural history</i>	Reversible on withdrawal of stimulus	May regress on removal of inciting stimulus, or may progress to higher grades of dysplasia or carcinoma <i>in situ</i>