

Atrophy

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Atrophy is an decrease in the size of an organ or tissue resulting from a decrease in the mass of pre-existing cells. They have diminished function but are not dead.

Causes of atrophy include: Decreased workload for e.g immobilization of a limb to permit healing of a fracture, Loss of innervation, Diminished blood supply , Inadequate nutrition , Loss of endocrine stimulation , Aging (Senile Atrophy)

- All of these represent a retreat by the cell to a smaller size at which survival is still possible , therefore a new equilibrium is reached between cell size and nutrition etc.

- Mechanism of Atrophy consists of combination of decreased protein synthesis (https://en.wikipedia.org/wiki/Protein_biosynthesis) and increased protein degradation in cells.

- Protein synthesis decreases because of reduced metabolic activity.

- Degradation of proteins mainly occurs by the ubiquitin-proteasome pathway. A deficiency in nutrition activates ubiquitin ligases which attach the small peptide ubiquitin to cellular proteins and target them for degradation in proteasomes.

- This pathway is also thought to be responsible for the accelerated proteolysis seen in cachexia (<https://en.wikipedia.org/wiki/Cachexia>) (wasting syndrome) .

- Atrophy is accompanied by autophagy which results in increase of autophagic vacuoles.

- Autophagy is the process in which the starved cell eats its own components in an attempt to survive.

- Examples of atrophy as part of normal development include shrinking and the involution of the thymus in early childhood, and the tonsils in adolescence. In old age, effects include, but are not limited to, loss of teeth, hair, thinning of skin that creates wrinkles, weakening of muscles, loss of weight in organs and sluggish mental activity.

- Accumulation of Lipofuscin leads to a condition called Brown Atrophy.