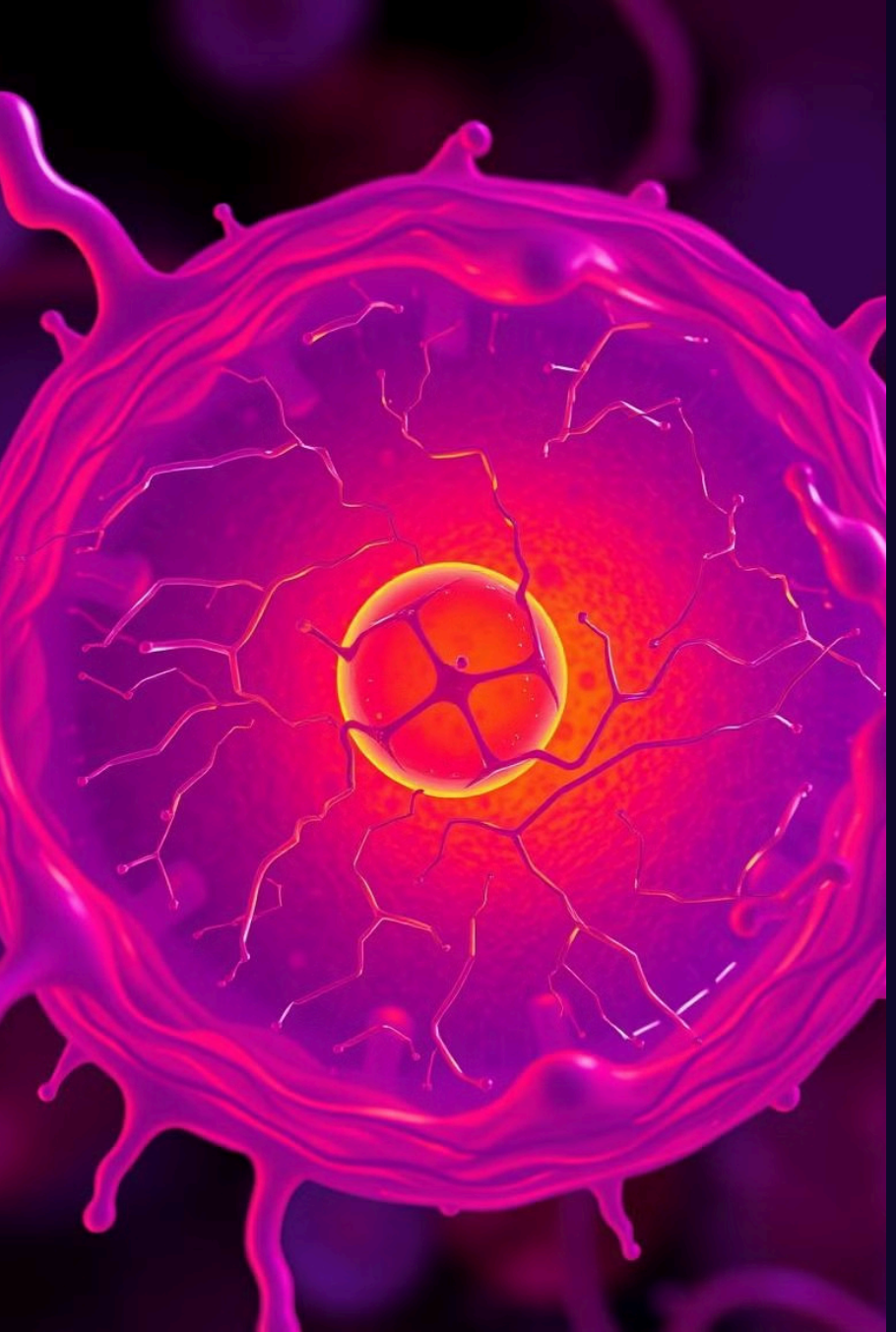

Lysosomes: The Cellular Recycling Centers

Lysosomes are tiny organelles within cells that play a vital role in cellular health, recycling waste and breaking down cellular components.

Presentation created by muzamilla,Nandini,Anusha and Abhilash.

What are Lysosomes?

Cellular Compartments

Lysosomes are membrane-bound organelles found in almost all animal cells.

Recycling Centers

They contain a variety of enzymes capable of breaking down cellular waste, worn-out organelles, and invading pathogens.

Structure and Composition of Lysosomes

Membrane-Bound

Lysosomes are surrounded by a single membrane that separates their acidic environment from the rest of the cell.

Enzymes

They contain about 60 different types of hydrolytic enzymes, each specializing in breaking down a specific type of molecule.

Functions of Lysosomes

Waste Removal

Lysosomes break down cellular debris, worn-out organelles, and other waste products.

Defense

Lysosomes destroy invading pathogens, such as bacteria and viruses, protecting the cell from infection.

Recycling

They break down cellular components into reusable building blocks, contributing to cellular renewal and growth.

Lysosomal Storage Disorders

Genetic Basis

Enzyme Deficiencies

These disorders arise from mutations in genes that code for lysosomal enzymes.

Undigested Waste

Without functional enzymes, waste accumulates within lysosomes, leading to cell damage and dysfunction.

Disease Symptoms

Symptoms vary widely, depending on the affected enzyme, and can include neurological problems, skeletal deformities, and organ failure.

Autophagy and Lysosomes

1. Damaged organelles are tagged for destruction.
2. A double-membrane structure called an autophagosome encapsulates the target organelle.
3. The autophagosome fuses with a lysosome, delivering the organelle to the lysosome's acidic environment.
4. Lysosomal enzymes break down the organelle, recycling its components.

Lysosomes and Aging

1

Reduced Activity

Lysosomal activity declines with age, leading to reduced cellular recycling.

2

Waste Accumulation

Undigested waste products accumulate within lysosomes, contributing to cellular dysfunction.

3

Cellular Stress

The buildup of waste products stresses cells and accelerates the aging process.

Therapeutic Potential of Lysosomes

1

Enzyme Replacement

Replacing missing enzymes with engineered versions can treat certain lysosomal storage disorders.

2

Drug Delivery

Lysosomes can be used as drug delivery vehicles, targeting specific cells and tissues.

3

Anti-Aging Therapies

Boosting lysosomal function may hold promise for slowing down the aging process.