

Peroxisomes – Notes

1. Introduction

Peroxisomes are small, single membrane-bound cell organelles present in all eukaryotic cells (both plant and animal). They play a vital role in oxidation–reduction reactions, especially in the breakdown of fatty acids and detoxification of hydrogen peroxide (H_2O_2). They contain several oxidative enzymes like catalase, urate oxidase, and D-amino acid oxidase.

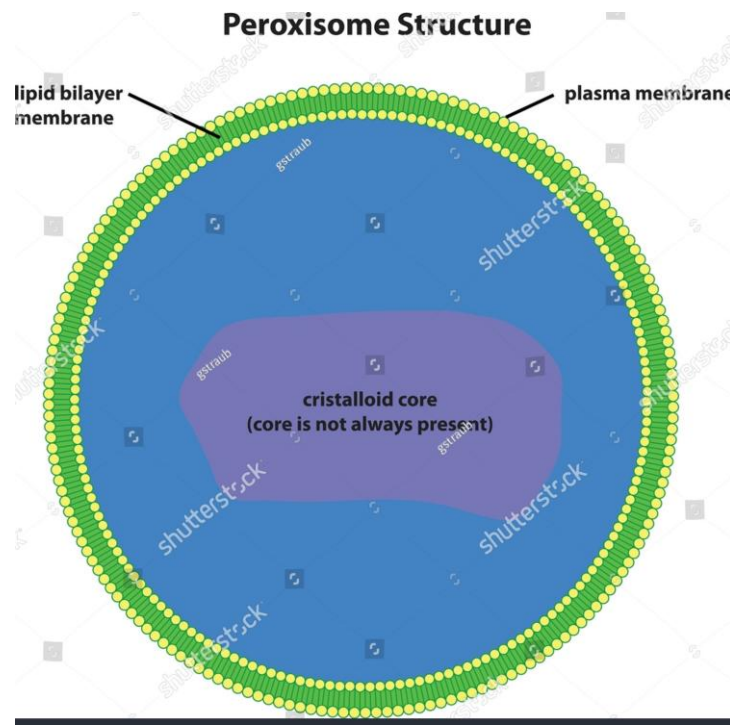
In plants, peroxisomes are involved in photorespiration and seed germination (glyoxysomes). In animals, they help in lipid metabolism and detoxification of harmful compounds.

2. History

Scientist	Year	Discovery / Contribution
Christian de Duve	1965	Discovered peroxisomes while studying liver cell fractions; named them due to their role in hydrogen peroxide metabolism.
Later Studies	—	Showed peroxisomes arise by growth and division or by budding from the endoplasmic reticulum (ER).

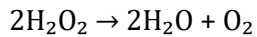
3. Structure

- Shape: Spherical or ovoid
- Size: 0.1 – 1.0 μm in diameter
- Membrane: Single lipid bilayer
- Matrix: Contains crystalline or amorphous core rich in oxidative enzymes
- Major enzymes: Catalase, urate oxidase, D-amino acid oxidase, acyl-CoA oxidase



4. Functions

A. Detoxification – Breakdown of H_2O_2 using catalase:



B. Fatty Acid β -Oxidation – Converts very long-chain fatty acids to acetyl-CoA.

C. Metabolism of Reactive Oxygen Species (ROS) – Protects the cell from oxidative damage.

D. In Animals – Cholesterol synthesis and plasmalogen formation.

E. In Plants – Photorespiration and conversion of fats to sugars during seed germination (glyoxysomes).

F. Role in Cellular Signaling and Aging.

5. Difference Between Peroxisomes and Lysosomes

Feature	Peroxisomes	Lysosomes
Membrane	Single	Single
Enzymes	Oxidative (catalase, oxidases)	Hydrolytic enzymes
Function	Oxidation, detoxification	Digestion of biomolecules
Byproduct	H_2O_2 formed and decomposed	No H_2O_2

Present in

All eukaryotic cells

Mainly animal cells