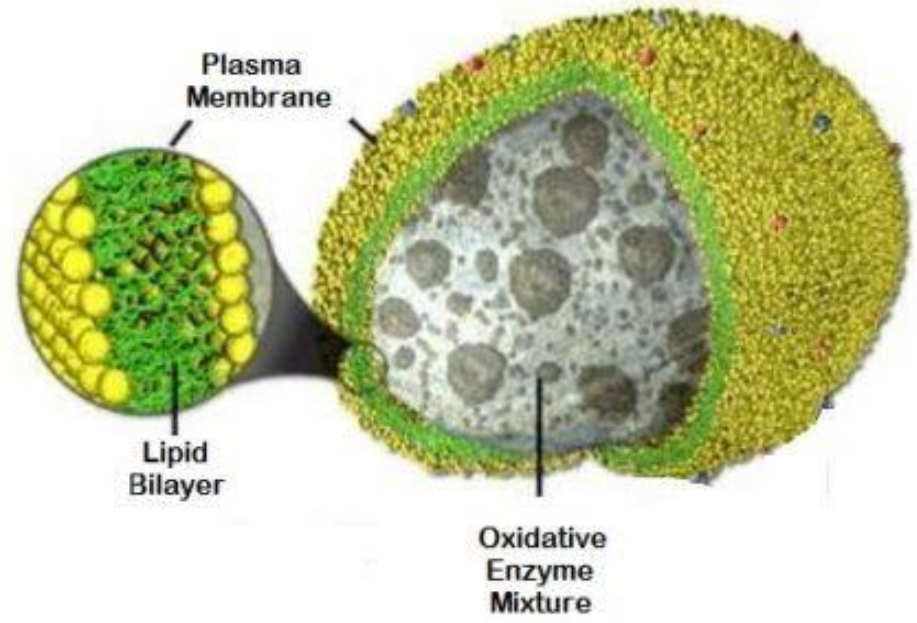
Peroxisomes



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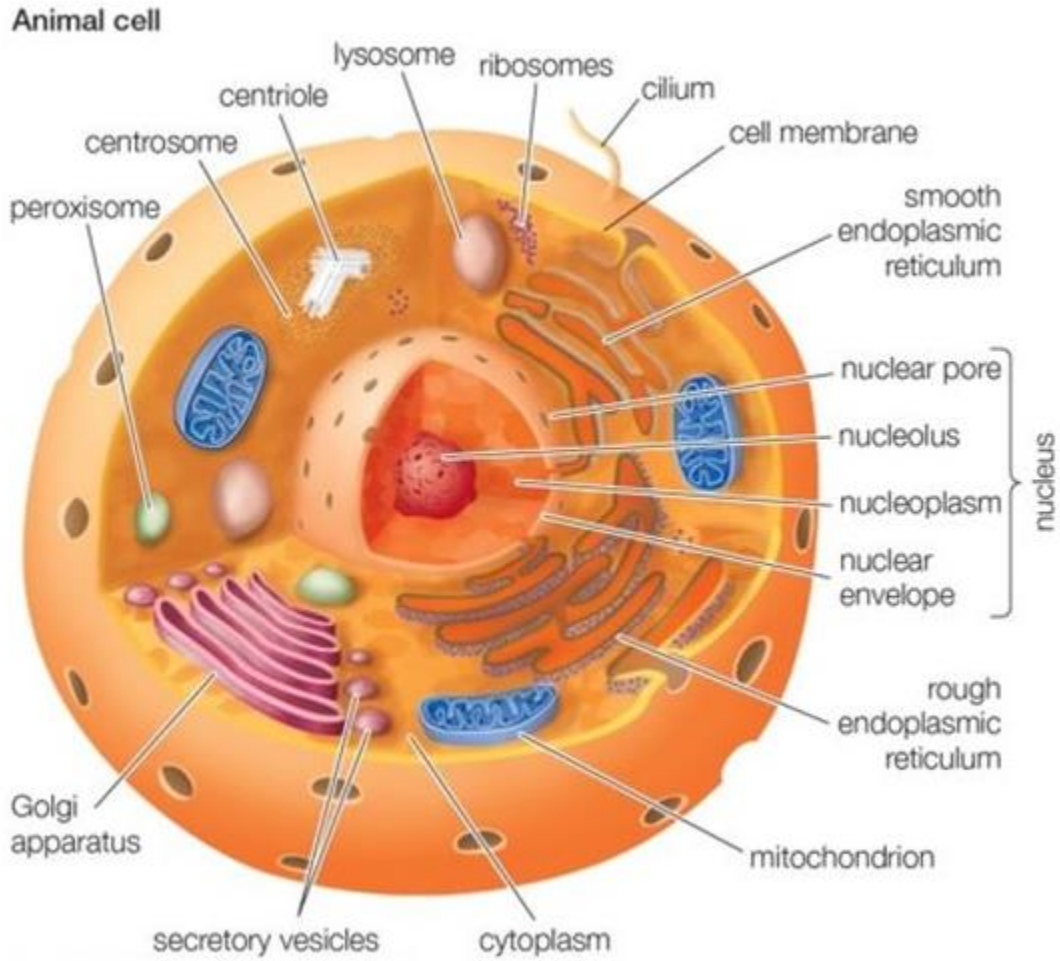
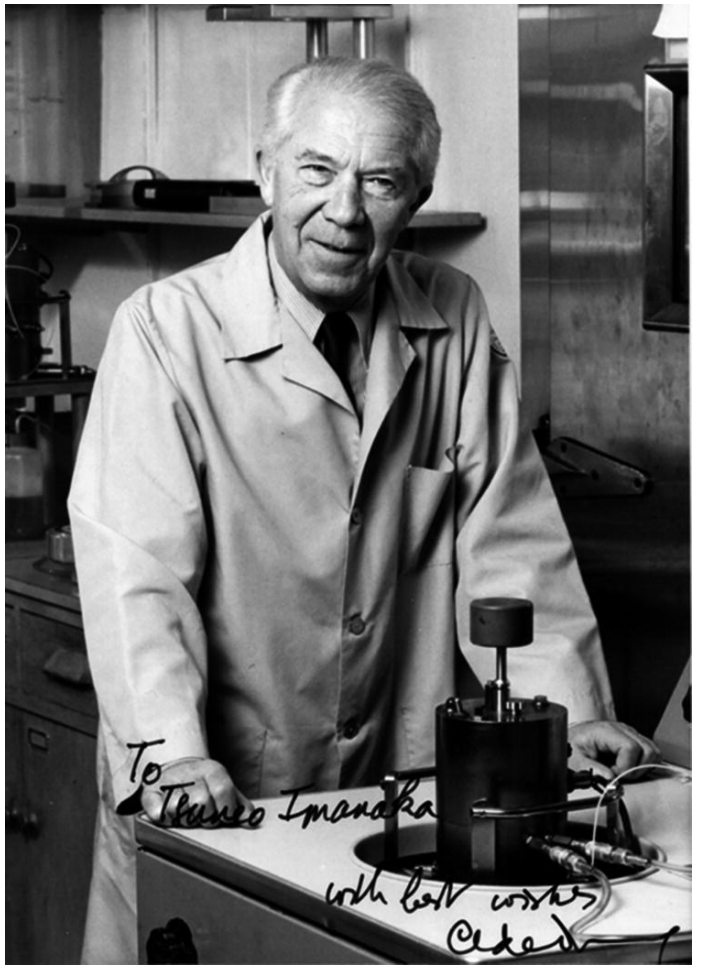


Peroxisomes

Discovery

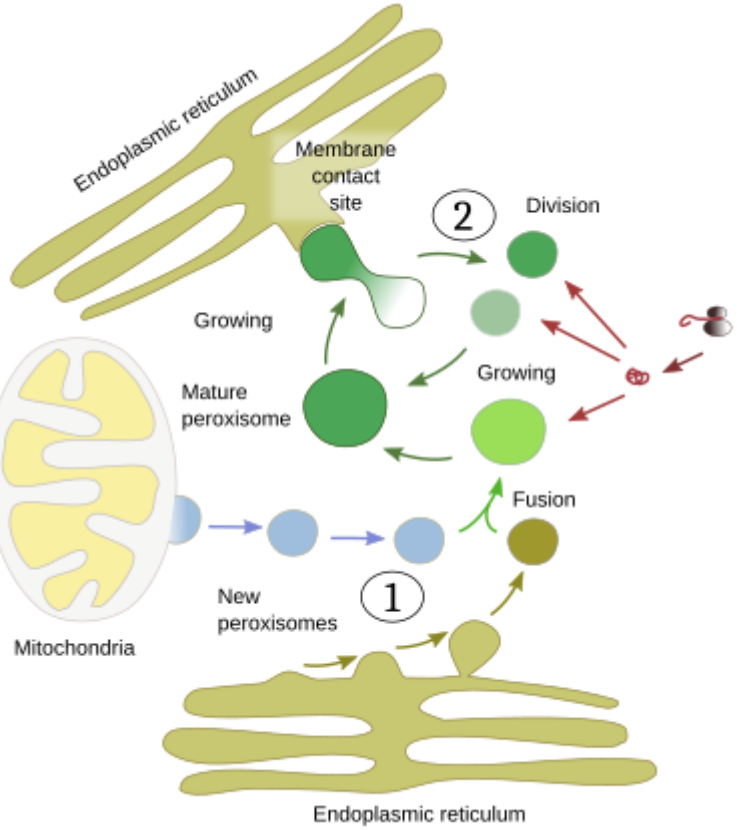
- Their existence was first discovered by J. Rhodin in 1954 by using mouse kidney on electron microscopy.



Peroxisomes

Origin

- The origin of peroxisomes as having developed from the endoplasmic reticulum (ER) was proposed on the basis of the similarity between some peroxisomal proteins and ER proteins



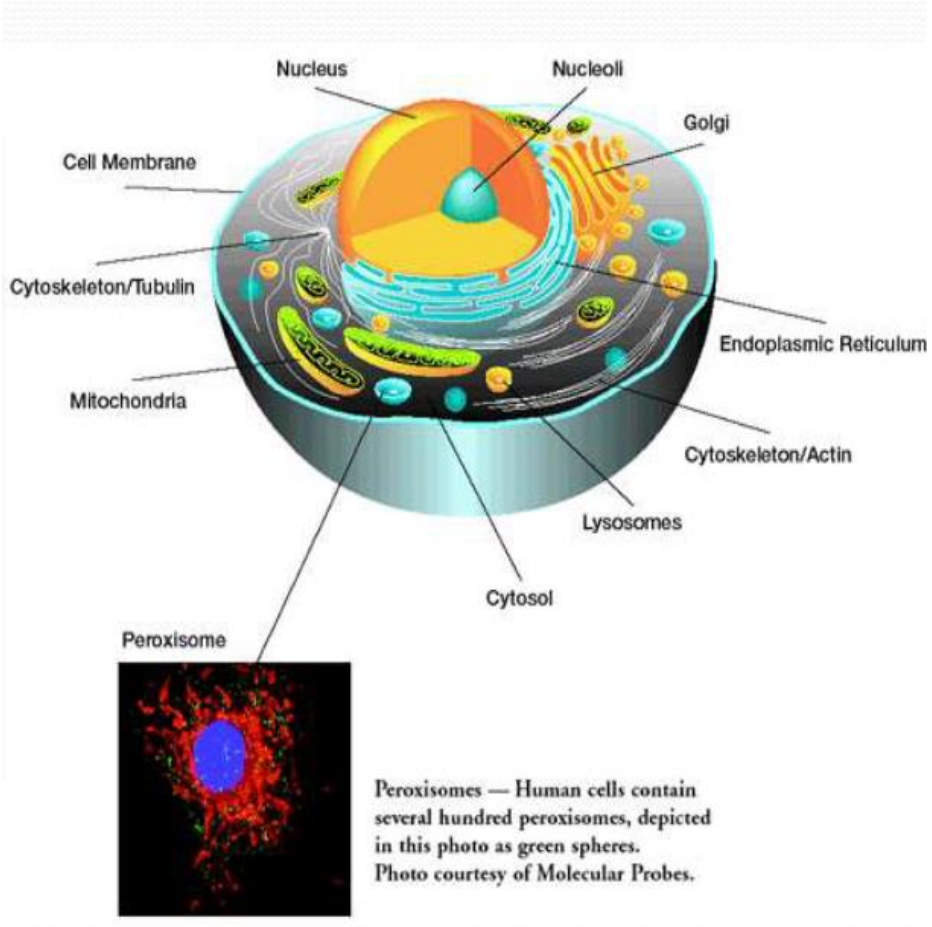
Peroxisomes

What is Peroxisomes

Examples of ROS

superoxide, hydroxyl radical, singlet oxygen, and alpha-oxygen.

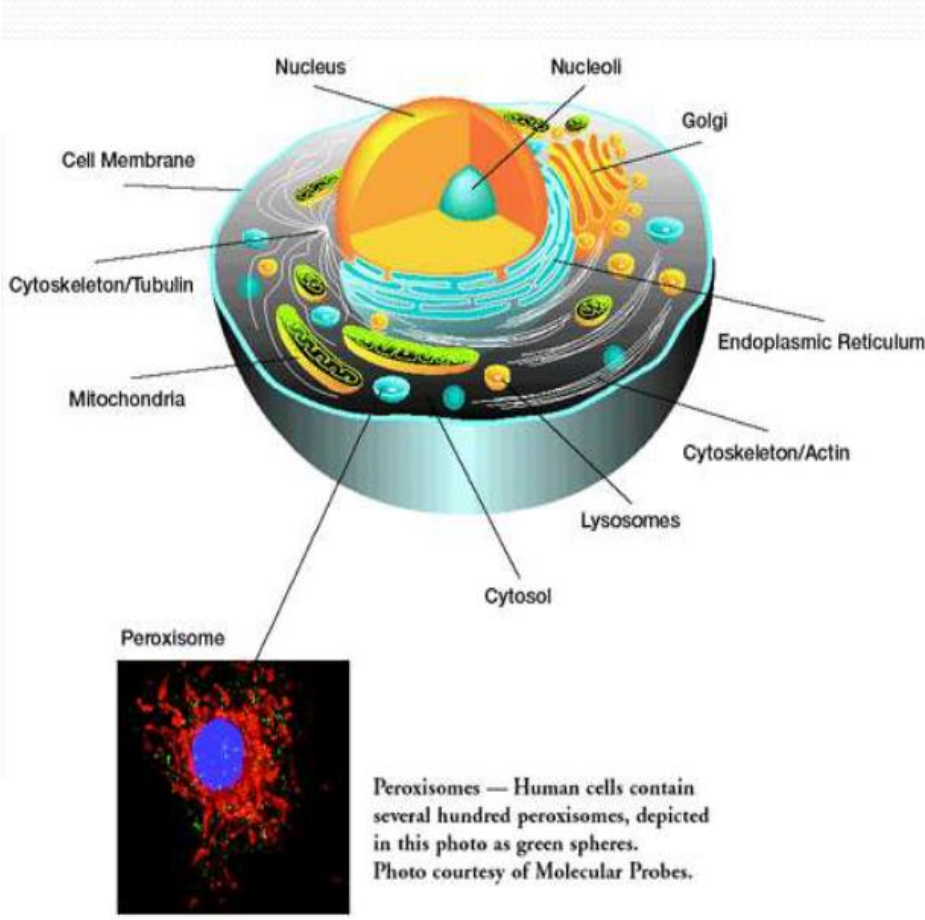
- Peroxisomes are small vesicles, single membrane-bound organelles found in the eukaryotic cells. They contain digestive enzymes for breaking down toxic materials in the cell and oxidative enzymes for metabolic activity.
- Peroxisomes play an important role in lipid production and are also involved in the conversion of reactive oxygen species such as hydrogen peroxide into safer molecules like water and oxygen by the enzyme catalase.



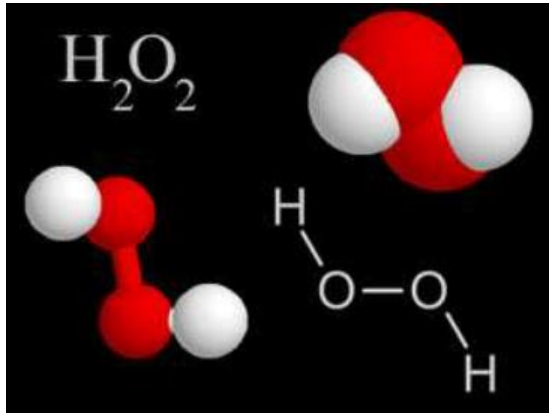
Peroxisomes — Human cells contain several hundred peroxisomes, depicted in this photo as green spheres. Photo courtesy of Molecular Probes.

Introduction

- They are found in nearly all eukaryotic cells
- Human cells may contain up to hundred peroxisomes depending on type of cell.
- They are called “Peroxisomes” because they are the site of synthesis and degradation of Hydrogen Peroxide [H2O2], a highly reactive and toxic oxidizing agent



Peroxisomes — Human cells contain several hundred peroxisomes, depicted in this photo as green spheres. Photo courtesy of Molecular Probes.



Similarity with lysosomes

They are similar to Lysosomes, being filled with enzymes.

Difference with lysosomes

Sr. no.	Peroxisomes	Lysosomes
1	Peroxisomes contain Oxidase enzymes	Lysosomes contain hydrolase enzymes
2	They originate from Endoplasmic reticulum	Lysosomes come from Golgi apparatus.

Structure of Peroxisome

- Peroxisomes vary in shape, size and number depending upon the energy requirements of the cell.
- These are made of a phospholipid bilayer with many membrane-bound proteins.
- There are at least 32 known peroxisomal proteins, called peroxins, which carry out peroxisomal function inside the organelle.
- Peroxisomes have the thickest membrane of all organelles.

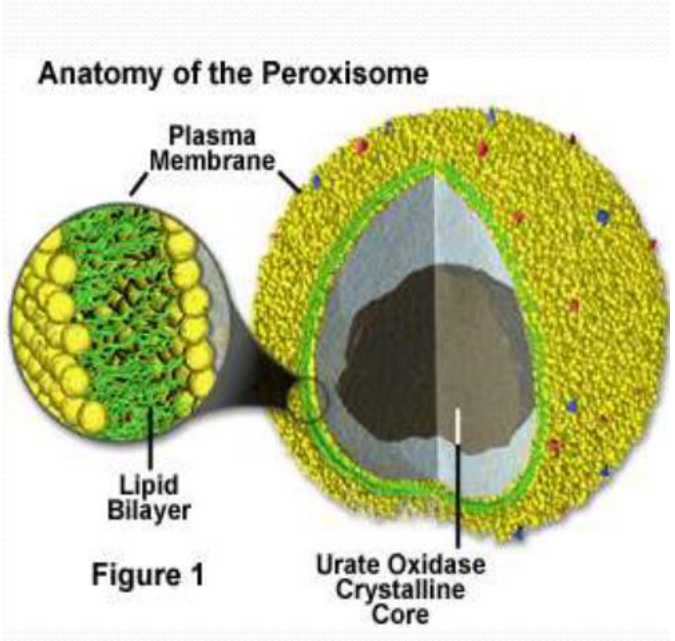
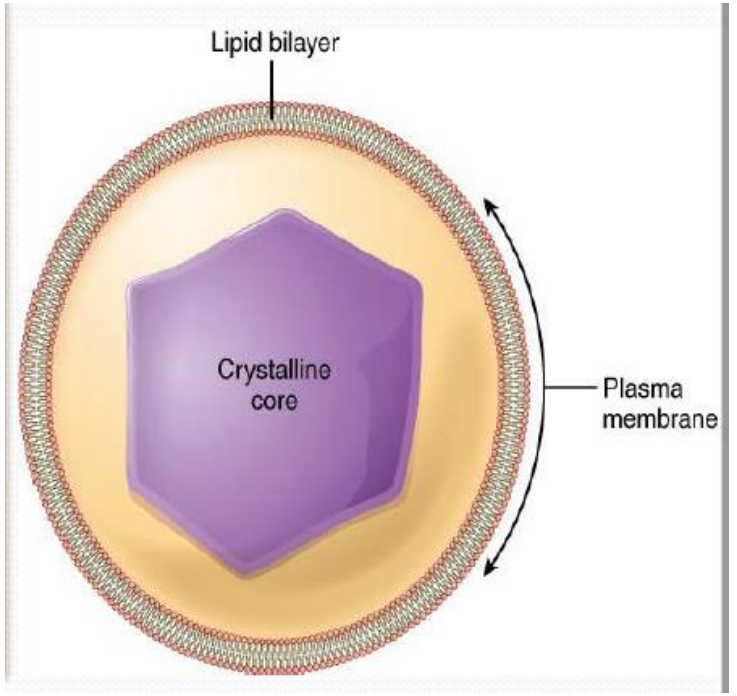


Figure 1

Structure of Peroxisome

- It has a dense matrix that contain enzymes.
- More than 30 different enzymes are present in peroxisomes.
- It has a crystalloid core in the center, which is present in some species e.g. liver cells of rat.
- It contains urate oxidase enzyme which oxidizes uric acid.
- The phospholipids of peroxisomes are usually synthesized in smooth Endoplasmic reticulum.

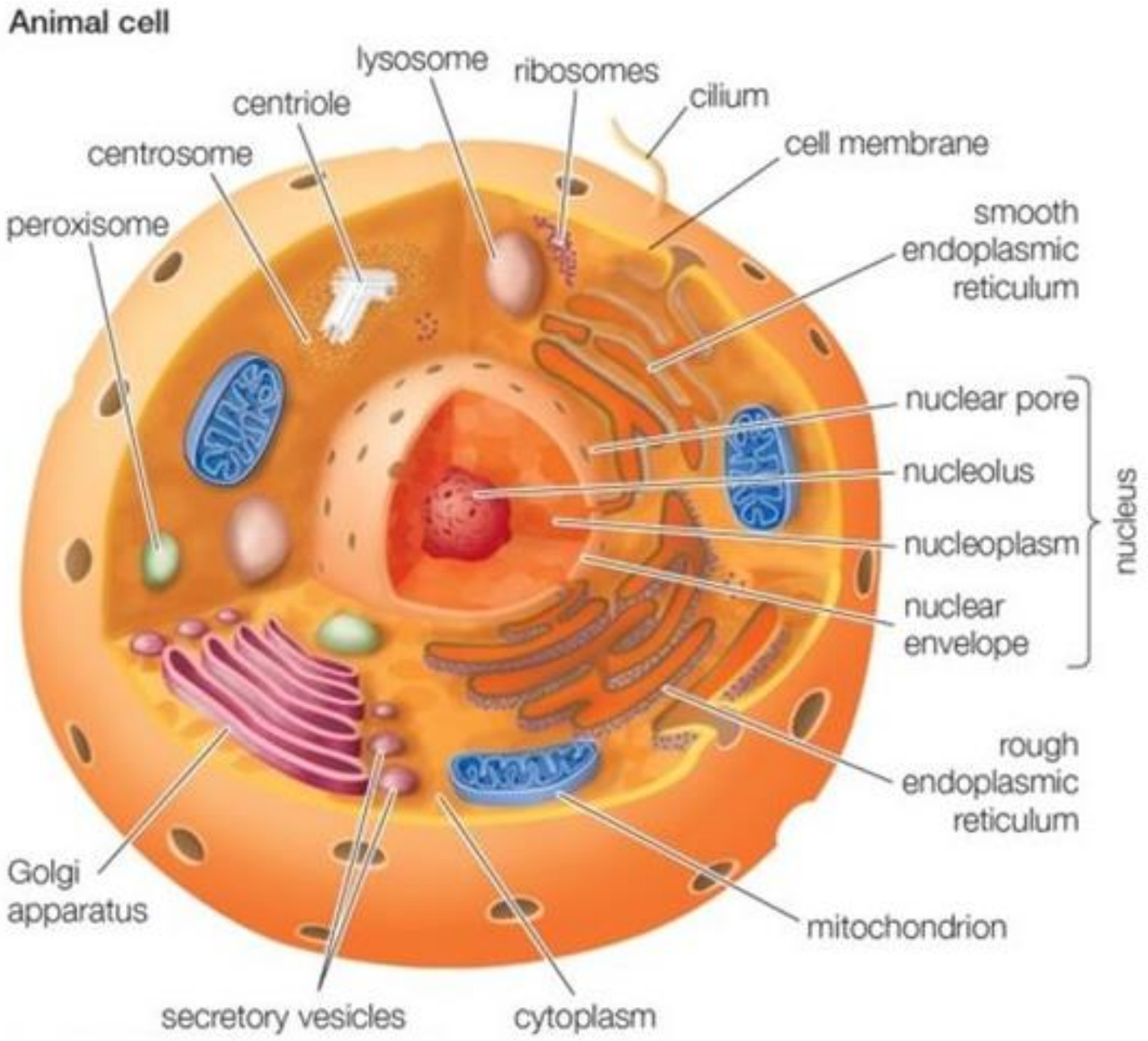


Function of Peroxisome

- **The main function of peroxisome is the lipid metabolism and the processing of reactive oxygen species (ROS).**
- **They take part in various oxidative processes. (**Oxidative processes are those **chemical/biochemical reactions** that involve the transfer of 1 or more electrons from an electron donor (reductant) to an electron acceptor (oxidant) leading to the transformation of both the oxidant and the reductant.**)**
- **They take part in lipid metabolism and catabolism of D-amino acids, polyamines and bile acids.**
- **Detoxification of alcohol and other toxic compounds.**
- **Peroxisomes detoxify about half of the alcohol a person drinks daily.**

Function of Peroxisome

- Biosynthesis of plasmogens, ether phospholipids, which are necessary for normal function of brain and lungs.
- Synthesis of unsaturated fatty acids.
- Participates in the synthesis of bile acids ion liver cells.
- Participates in the synthesis of cholesterol
- Participates in the synthesis of the lipids used to make myelin.
- Peroxisomes are important for normal brain and lungs functioning.
- Absence of peroxisomes can lead to abnormalities, specially brain disorders.



Thank You