PEROXISOMES

Q.What is peroxisome?

Peroxisomes are small, single membrane-enclosed organelles that contain enzymes involved in a variety of metabolic reactions including several aspects of energy metabolism. Most human cells contain about 500 peroxisomes.

Q.What is peroxin? How peroxin follows transportation?

i)Peroxisomes do not home their own genomes and all their proteins, peroxins (Pexl, PeXZ, etc.), are synthesized from the nuclear genome.

ii)Most peroxins are synthesized on free ribosomes and then imported into peroxisomes as completed polypeptide chains. Like mitochondria andchloroplasts, peroxisomes can replicate by division.

iii)However, unlike those organelles, peroxisomes can also be rapidly regenerated even if entirely lost to the cell.

While many mitochondrial and plastid proteins resemble those of prokaryotes, reflecting their endosymbiotic origin, the peroxins resemble typical eukaryotic proteins.

Q.Write a short note on function of peroxisome. Q.What is the functional significance of peroxisome in relation to energy rich molecule. Q.How hydrogenperoxide is related to peroxisome? Q.What is catalase? Q.How peroxisome helps to avoid harmful effect of hydrogen peroxide?

i)Peroxisomes contain at least 50 different enzymes, which are involved in a variety of biochemical pathways in different types of cells.

ii)Peroxisomes originally were defined as organelles that **carry out oxidation** reactions leading to the production of **hydrogen peroxide**. Because hydrogen peroxide is harmful to the cell, peroxisomes also contain the **enzyme catalase**, which decomposes hydrogen peroxide either by converting it to water or by using it to oxidize another organic compound.

iii)A variety of substrates are broken down by such oxidative reactions in peroxisomes, including uric acid, amino acids, purines, methanol, and fatty acids. T

iv)he oxidation of fatty acids (**Figure 1**) is a particularly important example, since it provides a major source of metabolic energy. In animal cells, fatty acids are oxidized in both peroxisomes and mitochondria, but in yeasts and plants, fatty acid oxidation is restricted to peroxisomes.

Q.How glycosylation in ER is related with peroxisomal activity?

v)In addition to providing a compartment for oxidation reactions, peroxisomes are involved in biosynthesis of lipids and the amino acid, lysine. In animal cells, **cholesterol and dolichol** are synthesized in peroxisomes as well as in the ER. In the liver, peroxisomes are also involved in the synthesis of bile acids, which are derived from cholesterol.

vi)In addition, peroxisomes contain enzymes required for the synthesis of **plasmalogens** -a family of phospholipids in which one of the hydrocarbon chains is joined to glycerol by an ether bond rather than an ester bond (**Figure 2**).

Q.What is plasmalogen?

vii)Plasmalogens are important membrane components in some tissues, particularly heart and brain, although they are absent in others, Peroxisomes carry out different biochemical reactions in different tissues.

viii)However, it is currently unknown whether there are subpopulations of peroxisomes that specialize in one or a limited number of processes within a cell.

Specify functional activities of peroxisome in plants.

ix)Peroxisomes play two particularly important roles in plants.

First: Peroxisomes in seeds are responsible for the conversion of stored fatty acids to carbohydrates, which is critical to providing energy and raw materials for growth of the germinating plant. This occurs via a series of reactions termed the **glyoxylate cycle**, which is a variant of the citric acid cycle (**Figure 3**). The peroxisomes in which this takes place are sometimes called **glyoxysome**s.