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Dr. Pritam Kumar
Deptt of Zoology,
V.K.S.U. Ara

B.Sc-I (Zool. Sub), LYSOSOMES

Q! Describe the structure and functions of lysosomes.

Ans!— C. De. Duve was the first to report about lysosomes in 1955.-

Lysosomes can be defined as globular, spherical, rounded or even irregular polymorphic or heterogenous cytoplasmic organelles surrounded by a single limiting membrane composed of lipoprotein. These contain many enzymes like acid deoxyribonuclease, acid ribonuclease, acid phosphatase, Cathepsins, glucuronidase etc. which is useful in digestion of interacellular and extracellular substrates like protein, carbo-hydrates nucleic acid etc.

Occurrence :— Lysosomes are found in all types of animal cells except mature mammalian erythro-cytes.

Shape & Size :—

Lysosomes may be

(i) Raunded, globular, spherical or irregular.
(ii) Variable in size ranging from 0·2 to 0·8 micron.
(iii) Exceptionally large in the cells of mammalian kidney i.e up to 5 micron.

Structure:— (i) Lysosomes are bounded by a single lipoprotein membrane. The membrane is imper-meable to substrates of enzymes contained in the lysosomes.

(ii) The limited permeability of the lysosomal membrane explains why lysosomal hydrolases cannot have a direct action to cellular components.

(iii) This prevents uncontrolled digestion of the cell cont-ents by lysosomal enzymes.

(iv) molecular weight and molecular structure deter-mine the permeability through lysosomal membrane

(v) Compaunds having a molecular weight higher than 200 do not diffuse through the membrane.

(vi) Internal organisation of lysosomes varies in different cells depending upon the physiological condition of these ~~cells where lysosomes have many~~ ~~forms~~

(vii) In some cells the lysosomes have very dense core whereas in other cells these may contain a dense outer region with a less dense inner region. Granu-lar material of some lysosomes contain ❑❑ vacuoles.

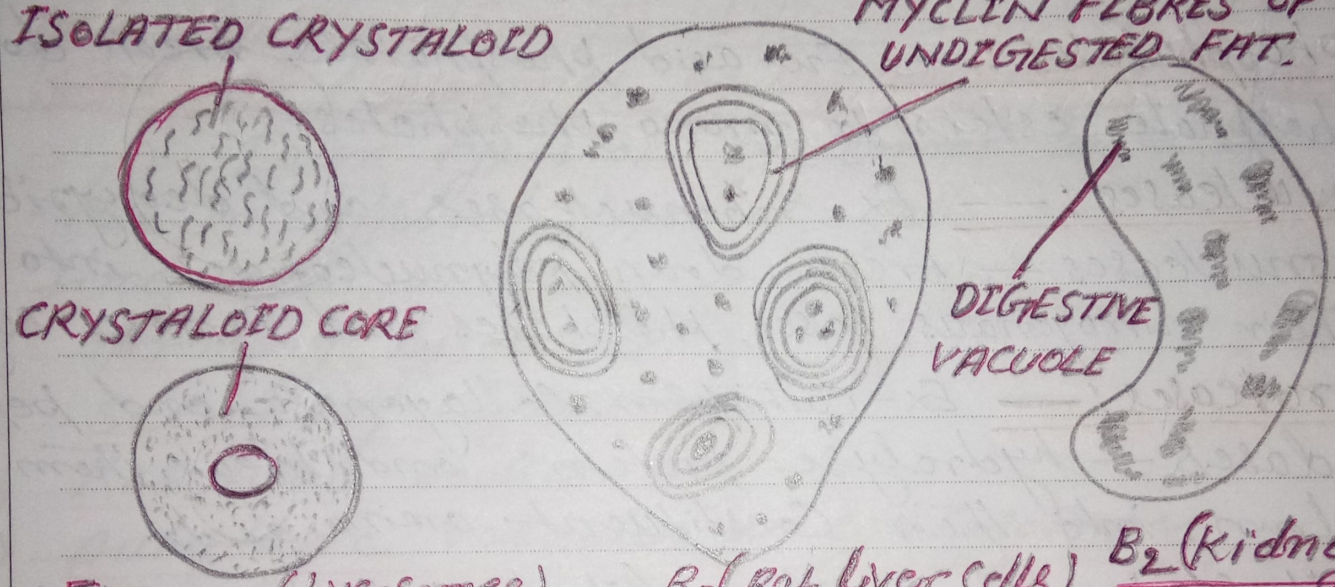

Fig:— A (Lysosomes) B_1 (Rat liver cells) B_2 (Kidney cells)

(viii) Certain Chemical substances such as cholesterol, Cortisone, Cortisol and chloroquine provide stability to the membrane of lysosomes. These are called stabilizers.

(ix) There is also a group of substances (such as vitamin K and A, detergents, ultraviolet radiations, freezing and Thawing) causes instability of the lysosomal membrane leading to release of enzymes from the lysosomes. These are called labilizers.

Chemical Composition :—

A lysosome is composed of

(i) a lipoprotein membrane.
(ii) a densely granulated stroma.
(iii) a large vacuole.

The Stroma Contains various hydrolytic and digestive enzymes such as

(a) **phosphatases :—** Ex- acid phosphatase break down phosphate esters to mono phosphates.

(b) **Nucleases :—** Ex- ribonucleases and deoxyribonucleases — break down polynucleotides into their nitrogenous bases, phosphates and pentose sugars.

(c) **proteases :—** Ex- cathepsin, Collagenase and peptidases — hydrolyse proteins and break them down into their constituent amino acids.

(d) **Lipases :—** Break down lipids into fragments.

(e) **Sulphatases :—** These act on sulphate esters breaking them down into fragments.

Atleast forty lysosomal digestive enzymes have been located in a verity of cells. it is not necessary that a single lysosomes Contains all enzymes.

Kinds of lysosomes or polymorphism in lysosomes :

Four types of lysosomes have been observed in different types of cells and at different times even within a single cell.