

JANUARY 2019
D.T.

MITOCHONDRIA

Paper III

Zoology (H)

15.04.2019

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Thursday

INTRODUCTION:- Mitochondria are small granular or filamentous bodies are called the powerhouses of the cell. They are associated with cellular respiration and are the sources of energy.

Historical:-

1. 1850 - Kolliker first observed mitochondria as granular structure in striated muscle.
2. 1892 - Altman referred to the mitochondria as bioplast.
3. 1898 - Benda developed the crystal violet staining technique and called the structures mitochondria.
4. 1940s and 1950s - Palade and Sjostrom worked out the fine structure of the mitochondria under the electron microscope.

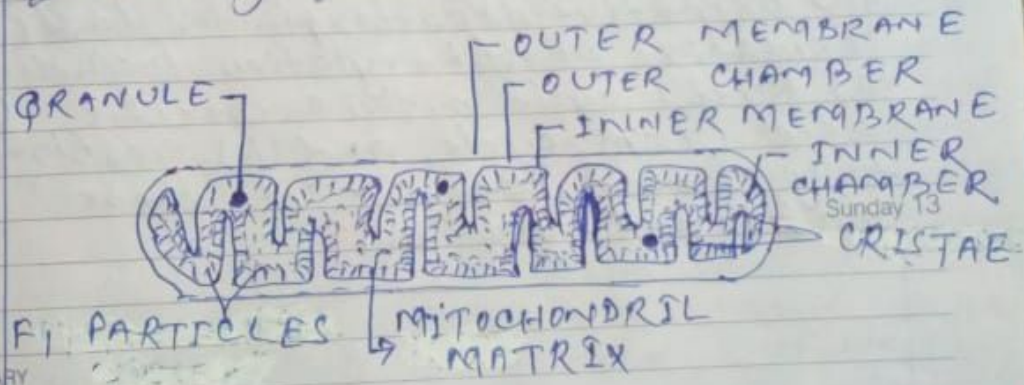
Number:- The number of mitochondria varies in different cell types. e.g. In a normal liver cell there are 1000-1600 mitochondria. Large sea urchin eggs have 140000-150000. In the sperm there are as few as 20-24 mitochondria while in some oocytes

there are about 300,000.

Distribution:- Ordinarily mitochondria are evenly distributed in the cytoplasm.

Su	Mo	Tu	We	Th	Fr	Sa
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29				

and the inner compartment. The inner compartment is called the matrix. The outer membrane forms the continuous limiting boundary of the organelle. The inner membrane forms a number of infoldings called cristae towards the matrix. The cristae increase the surface area. The two membranes have their own specific enzymes associated with the mitochondrion. They produce cellular energy in the form of ATP, hence they are called power houses of the cell. The matrix also possesses single circular DNA molecule, a few RNA molecules, ribosomes (70S) and the components required for the synthesis of proteins. The mitochondria divide by fission.



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6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

Fig:- Ultrastructure of Mitochondria

Friday They may, however, be localized in certain regions. Generally they are found in the basal region of the cell. In leucocytes they are radially arranged.

MOVEMENT:- Mitochondria may move freely in some cells, carrying ATP whenever required. Movement is less in animals than in plants. Often the movements are rhythmical.

STRUCTURE

15.01.2020

Mitochondria unless specifically stained, are not easily visible under the microscope. The number of mitochondria per cell is variable depending on the physiological activity of the cells. In terms of shape and size also, considerable degree of variability is observed. Typically it is sausage-shaped or cylindrical having a diameter of $0.2-1.0 \mu\text{m}$ (average $0.5 \mu\text{m}$) and length $1.0-4.1 \mu\text{m}$. Each mitochondrion is a double membrane-bound structure with the outer membrane and the inner membrane dividing its lumen distinctly into two aqueous compartments, the outer compartment

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CHEMICAL COMPOSITION

Monday Chemically, mitochondria consist of proteins (65-70%) and lipids (25-30%). These two classes of compounds will constitute about 90-99% of the organelle.

FUNCTION

Mitochondria are often referred to as "powerhouse" of the cell, since they produce 95% of ATP molecules in animal cells (5% ATP is produced during anaerobic respiration outside the mitochondria), although in plants cells ATP is also produced by the chloroplasts. This energy is produced the breakdown of food molecules including carbohydrates, fats and proteins (catabolic activity) which involves (i) Embden Meyerhof pathway (EMP or glycolysis), (ii) Oxidative decarboxylation, and (iii) Oxidative phosphorylation including (a) Krebs's cycle or tri-carboxylic acid (TCA) cycle, and (b) respiratory chain.