

Faculty Science

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B.Sc II Paper-II(Cytology, Genetics, Evolution& Ecology)

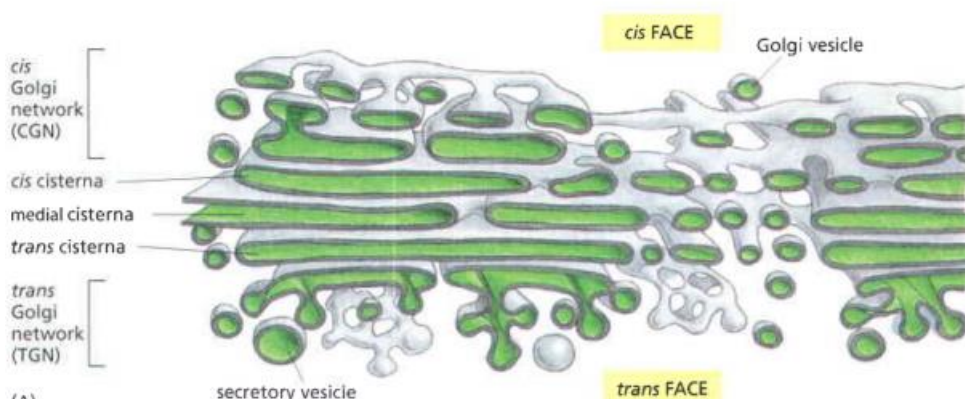
Unit-I Topic- Cell Organelles

Golgi Complex: Structure and Functions

Golgi Complex was described for first time by Camillo Golgi in 1873 in nerve cells. The structure was discovered in 1898. The Golgi bodies are also known as Dictyosomes or Golgi apparatus. In the cell Golgi complex along with other organelles like E. R. and lysosomes makes an extensive membrane system. This membrane system has a continuous lumen which forms a distinct channel separated from the cytoplasm and nucleoplasm of the cell. In this channel the material can be synthesized, modified and transported. G. C. provides connection between E R and peri nuclear space on one hand and between vesicles and plasma membrane on the other hand.

Structure of Golgi Complex: The electron microscopic studies have revealed that this organelle consists of series of compactly arrange smooth membrane limited vesicles of different shapes and sizes. Golgi bodies occur in both plant and animal cells but absent in prokaryotic cells. The vesicles of Golgi bodies are of two types:

1. Small and spherical vesicles. 2. Broad flattened vesicles in parallel or often in semi-circular array, the cisternae. They are compactly arranged



Electron microscopic structure of Golgi Complex

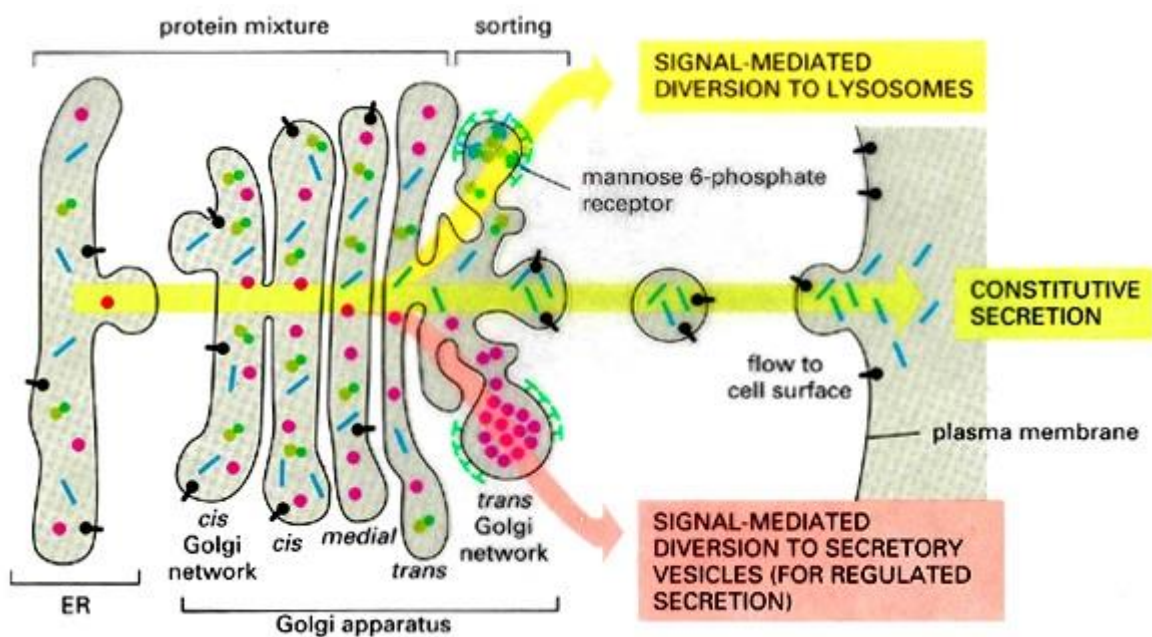
in parallel fashion. The Golgi body has polarity. It consists of one or more stacks of disc-shaped cisternae. Each stack is organised as a series of at least

three functionally distinct compartments known as cis or entry face, medial and trans or exit face. Both cis and trans faces are closely associated with special compartments, called as the cis Golgi Network and the trans Golgi network respectively. Proteins and lipids move through the Golgi stack in the cis-to-trans direction. Palade (1956-58) has shown that the Golgi bodies originate from smooth surfaced endoplasmic reticulum

Chemical Composition: Golgi bodies mainly consist of lipoproteins. It also has very low level of polysaccharides.

Functions of Golgi Complex:

1. Secretion - Secretion is the major function of Golgi apparatus, which help in collection, storage condensation, modification and packaging of various materials into secretory vesicles. These release the contents to the exterior through exocytosis, e.g., secretion of mucilage by root cap cells, secretion of hormones, gum, wax, cell wall material, ground matrix of connective tissue etc. Secretory proteins are seen emerging from the maturing face contained in a membranous dilation termed a prosecretory granule.



The Pathways of Protein Sorting in the trans Golgi network

The prosecretory granule buds off to become a condensing vacuole, which, after apparatus and chloroplast protein precursors. the removal of fluid, is termed a secretory granule or secretory vesicle. Secretory granules containing digestive enzymes are specifically referred to as zymogen granules. Under the appropriate conditions, the secretory granule moves to the

cell surface and fuses with the membrane, thereby releasing its contents to the outside. This Ca^{++} - dependent process is called exocytosis or secretion. There are two kinds of secretion: Constitutive secretion: Secretory products are produced and released continuously. Regulated secretion: Secretory products are released in response to specific stimuli.

2. Formation of cell plate- It helps in formation of cell plate, cell wall and new plasma membrane during cell division.

3. Formation of cell components- It also helps in the formation of primary lysosomes, sperm acrosome, nematocysts in coelenterates and root hairs. In oocytes of animals, yolk is deposited around Golgi apparatus by the process called vitellogenesis.

4. Formation of membranes- Golgi apparatus brings about transformation of membrane (e.g. ER) into another such as plasma membrane and lysosomal membrane. It also involves in recycling of membranes.

5. Glycosylation other functions- It facilitates glycosylation (addition of carbohydrates to proteins), liposylation (formation of lipoprotein) sulphation (addition of sulphates) and phosphorylation (addition of phosphates).

6. Proteolysis- Cleavage of some precursor proteins, e.g., prohormones.

7. Sorting and packaging of modified proteins- Most proteins processed by the Golgi are either secretory proteins for export or hydrolytic enzymes for cell use. These two kinds of proteins are segregated and packaged separately by the Golgi complex.

References

1. Alberts B et al. (2015) in “The Molecular biology of the cell”, sixth edition. Garland Science, New York.
2. <https://www.biologydiscussion.com>