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Topic: Microtubules

Microtubules

“Microtubules are microscopic, hollow tubes made of alpha and beta tubulin that are a part of the cell’s cytoskeleton.”

Microtubules extend throughout the cell providing it with proper shape and keeping the organelles in place.

They are the largest structures in the cytoskeleton and are about 24nm thick.

They facilitate cell movement, cell division, and transportation of materials within the cells.

They are also involved in the division of chromosomes during the process of mitosis and in locomotion.

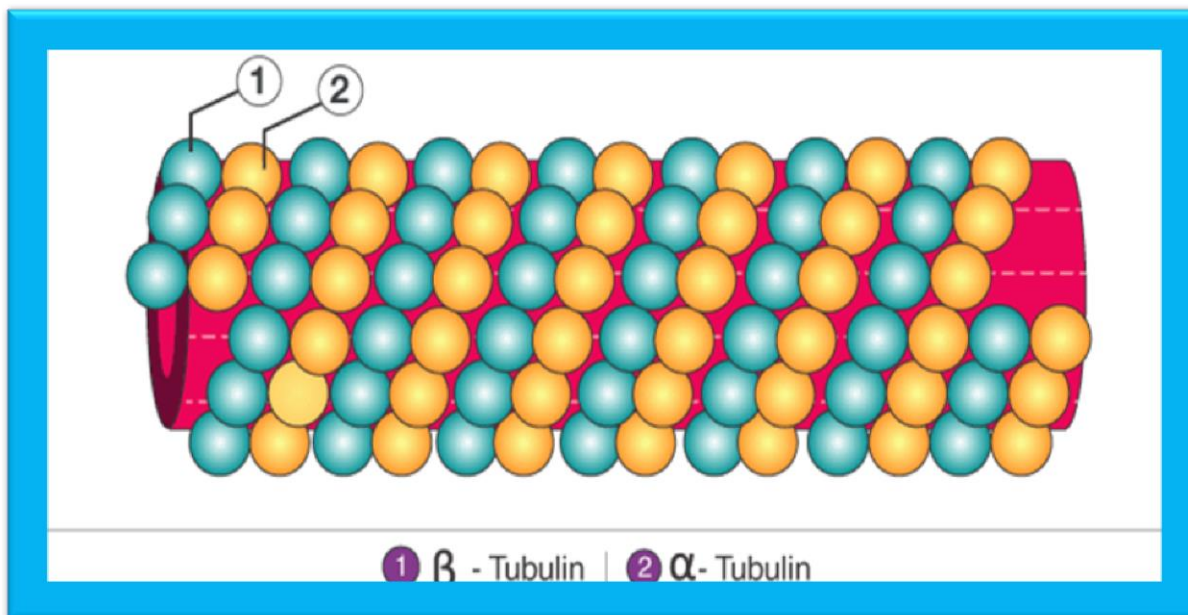


Fig. Microtubules structure

Microtubules Structure:

Microtubules are arranged in the form of microtubule-organizing centres. They are structures found in eukaryotic cells. During the interphase, most of the animal cells consist of microtubule-organizing centres. Several proteins are bound to microtubules namely dynein and kinesin.

All eukaryotic cells produce the protein tubulin, in the usual way. The usual way, of course, is by transcription of genes coding for tubulin to produce messenger RNA, followed by the translation of mRNA by the ribosomes in order to produce protein.

Cells maintain at least two types of tubulin, which we call alpha tubulin and beta tubulin.

Alpha and beta tubulin spontaneously bind one another to form a functional subunit that we call a *heterodimer*. A heterodimer is a protein that consists of two

different gene products.

The term is entirely descriptive - the prefix *hetero-* means "different," the prefix *di-* means "two," and the suffix *-mer* refers to a unit, in this case a single polypeptide.

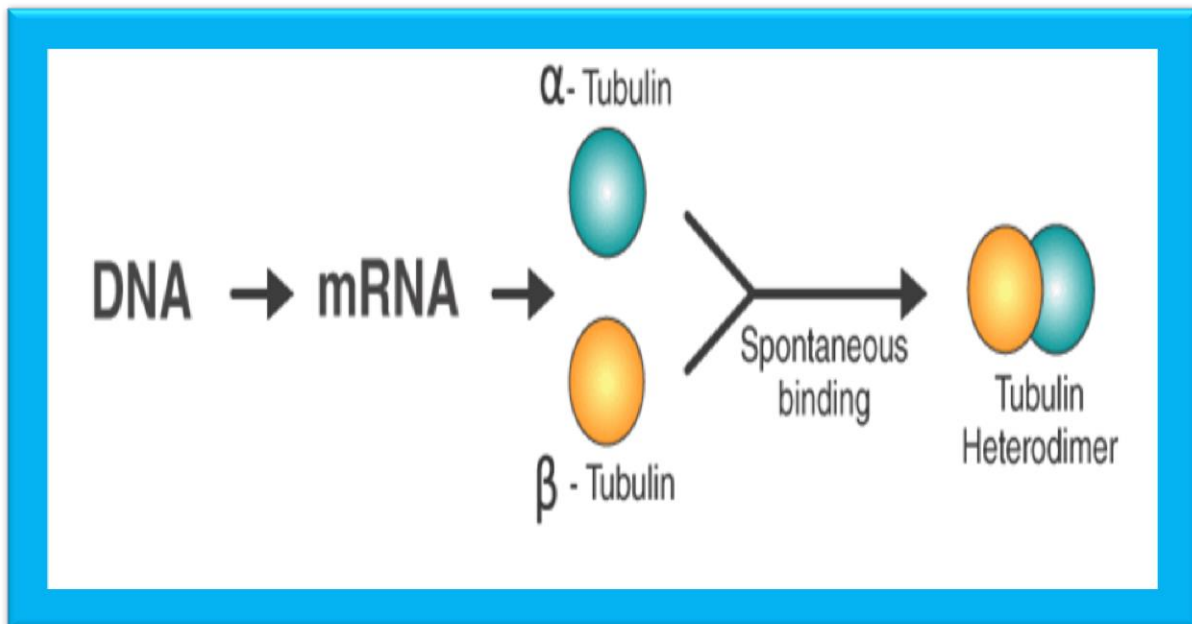


Fig. Structure of Microtubules

Microtubule Function:

Cell Movement:

Microtubules give structures to cilia and flagella. They also facilitate the contraction and expansion of the cell helping them to move from one place to another.

Cell Division:

Microtubules play a major role in forming the mitotic spindles. These mitotic

spindles organize and separate the chromosomes during cell division.

Cell Transport:

Microtubules aid the movement of organelles inside the cytoplasm of the cells. They also help various areas of cell to communicate with each other.

Intracellular Organization of Microtubules:

In the cytoplasm, microtubules form a structural network. The function of the cytoskeleton in microtubule includes chromosomes segregation, transport, mobility and mechanical support.

It can either shrink or grow to generate energy which is due to the presence of motor proteins that allow cellular components and others to be carried along with microtubules.

The arrangements in microtubules are specific to cell -type. So that it would be easy to facilitate the transportation of organelles, vesicles, and proteins along the apical-basal axis of the cell. They play a vital role in cell migration as well.