MEDICAL BIOLOGY

Cytoskeleton

- It is a dynamic structure that:

1. maintain cell shape.
2. has been known to protect the cell.
3. enables cellular motion.
4. play an important role in the movement of organelles and intracytoplasmic vesicles.
5. play role in cellular division.

Components of cytoskeleton:

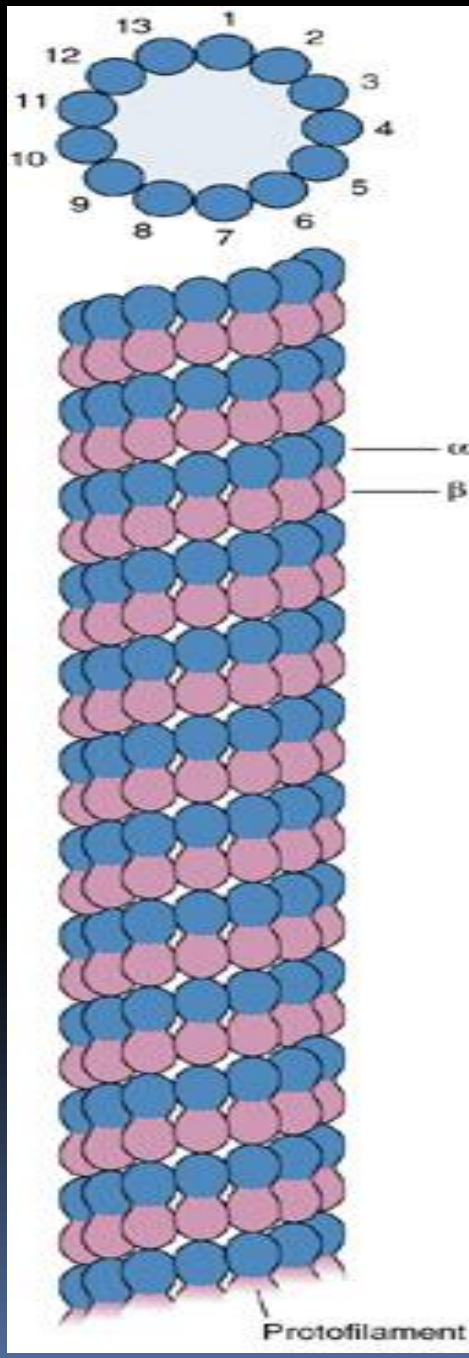
- 1. microtubules.
- 2. microfilamets.
- 3. intermediate filaments.

1. microtubules:

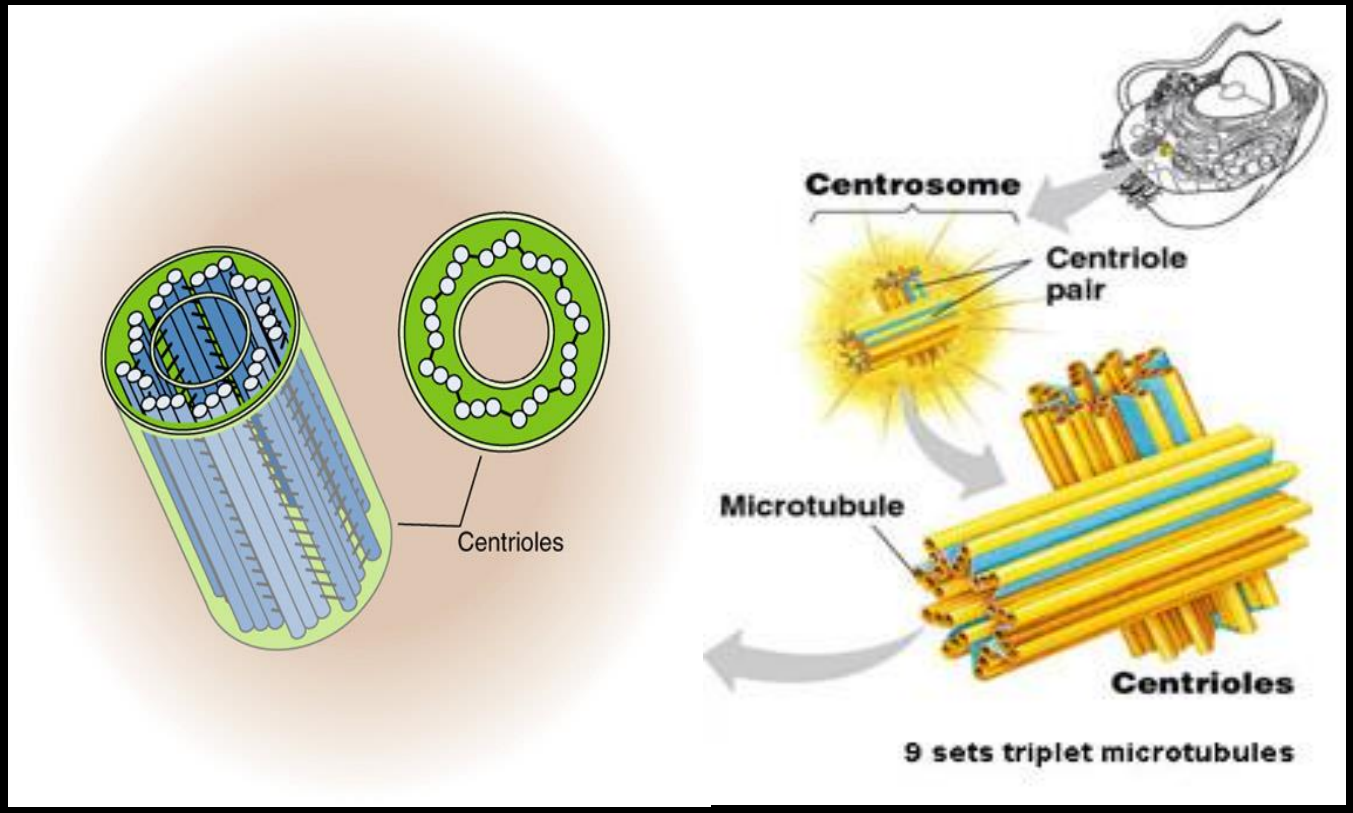
Microtubules provide the basis for several complex cytoplasmic components, including centrioles, basal bodies, cilia and flagella.

They play key role in:

1. intracellular transport (they transport organelles like mitochondria or vesicles).
2. The axoneme of cilia and flagella.
3. The mitotic spindle.
4. Synthesis of cell wall in plants.
5. They maintain the shape of the cell because they are rigid.



Centrosome:



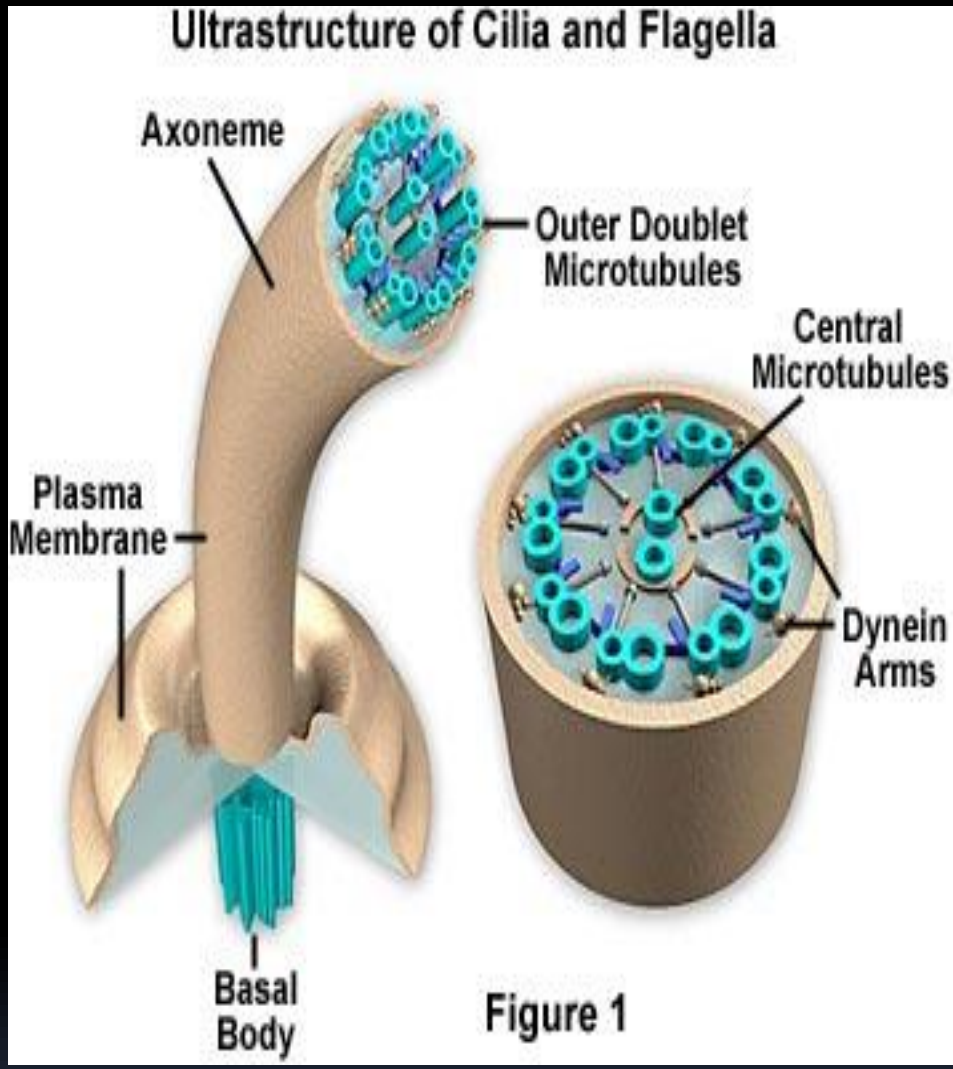
- They are not found in plant cell, many unicellular eukaryotes, and some animal cells.
- The centrioles play important role in cell division, one of the pair moves around to the opposite side of the nucleus from the other centriole, fiber spread out from each centriole towards the center of the cell and in some way act to move the chromosomes in cell division (mitosis and meiosis).

Cilia and flagella:

Cilia and flagella are motile projection of the plasma membrane

Cilia function
1. to move a cell
2. or to help transport fluid or materials past them.
3. The respiratory tract in humans is lined with cilia that keep inhaled dust, and harmful micro organisms from entering the lungs.

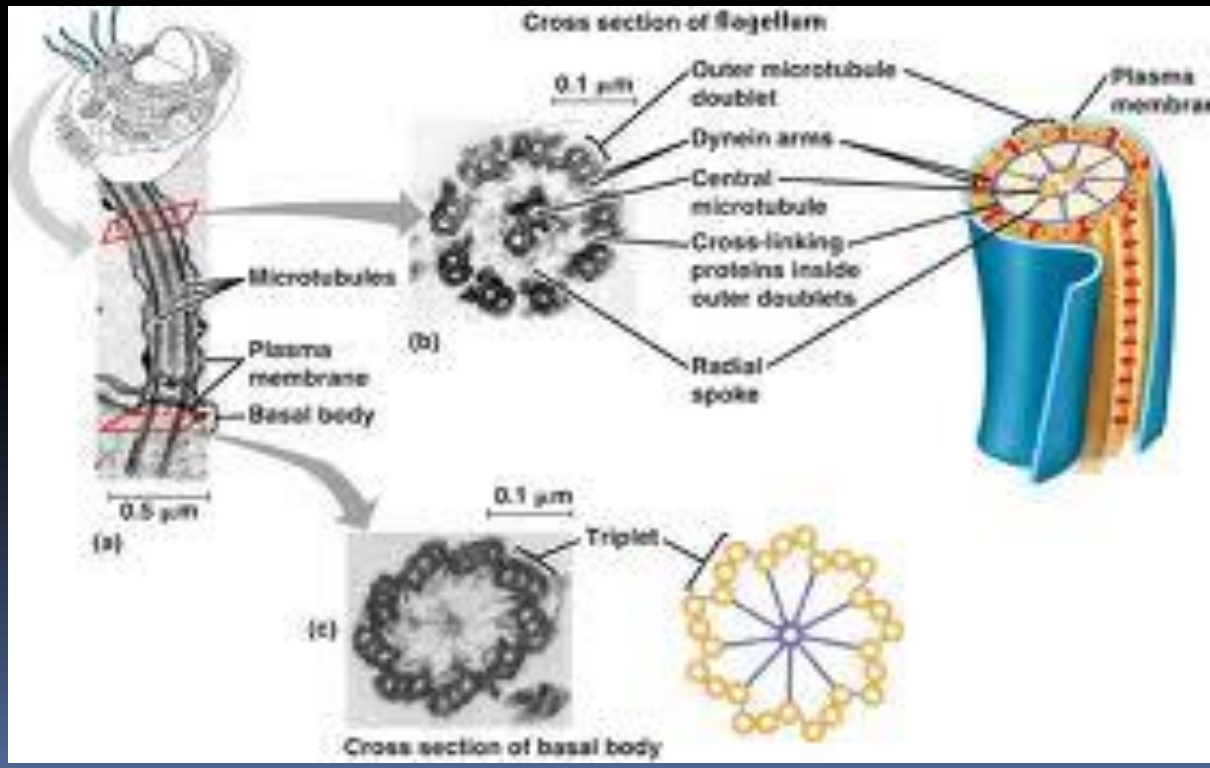
Cilia are usually shorter and occur together in much greater numbers than flagella.



- Cilia and flagella move when the microtubule doublets slide past one another.

Basal body:

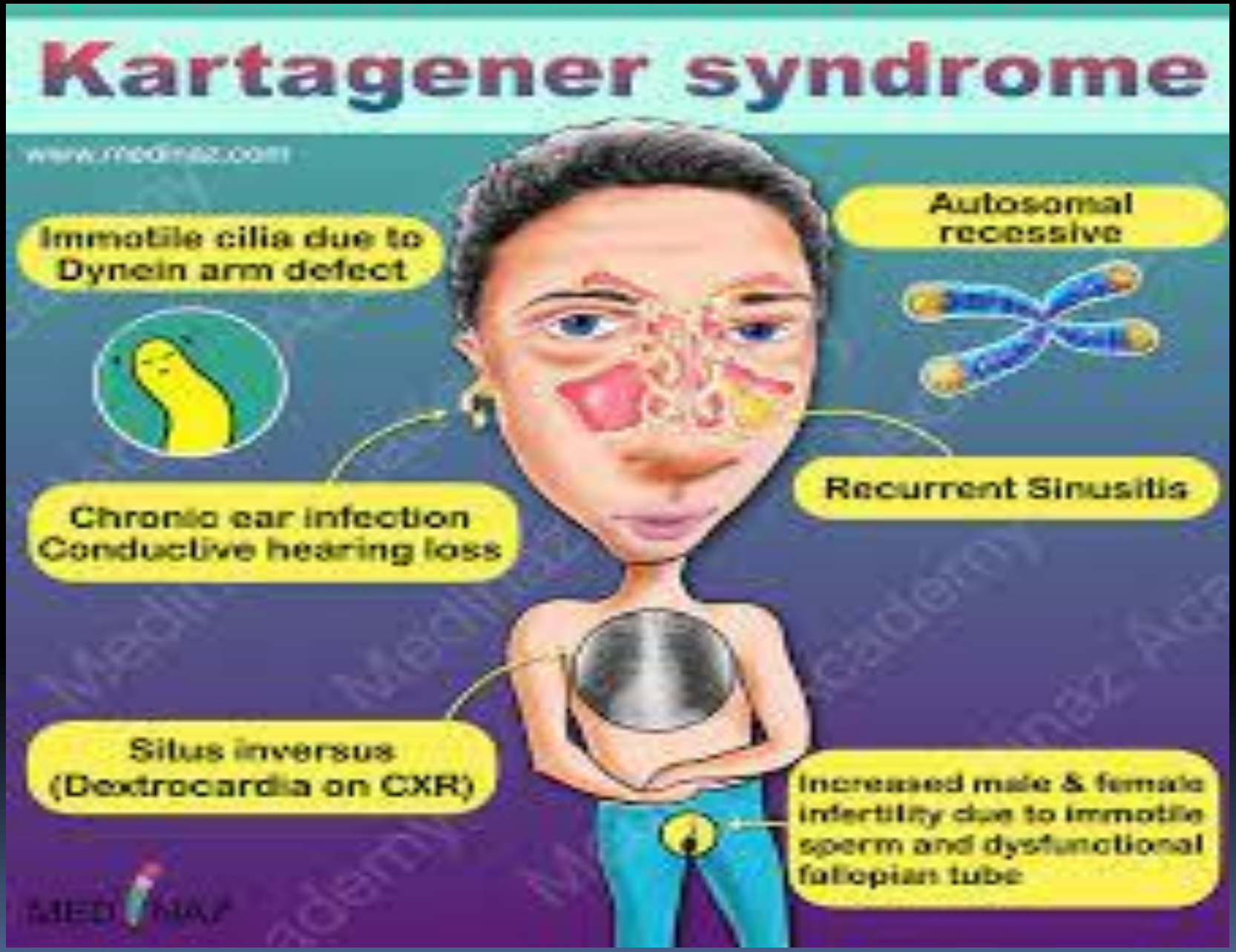
- The intracellular end of the microtubules of cilia and flagella are fixed in a basal body which is similar in structure to a centriole and contains nine triplets of microtubules.

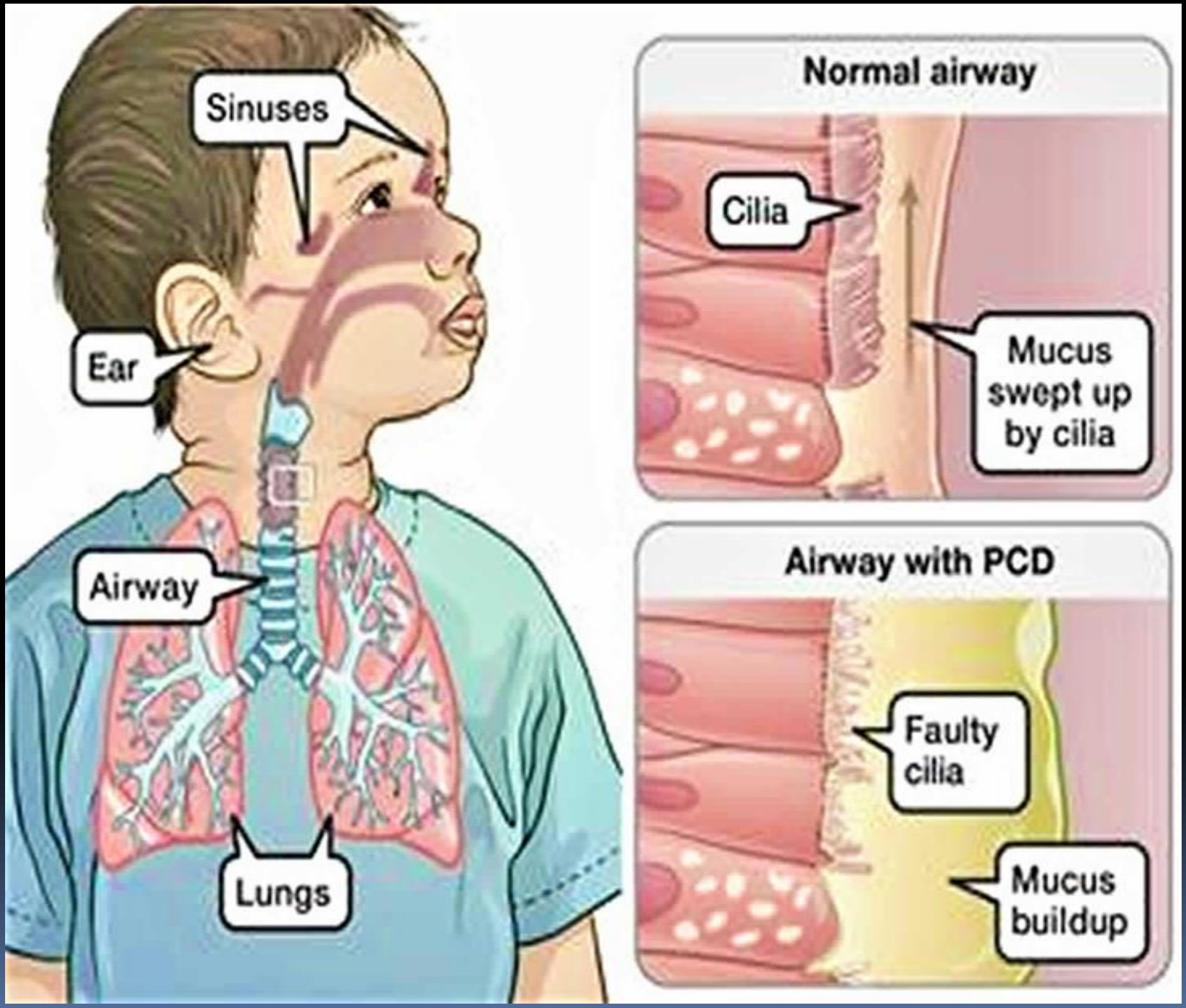


Clinical notes:

- Several mutations have been described in the proteins of the cilia and flagella. They are responsible for the immotile cilia syndrome, the symptoms of which are immotile spermatozoa, male infertility, and chronic respiratory infections caused by the lack of the cleansing action of cilia in the respiratory tract.

Kartagener syndrome



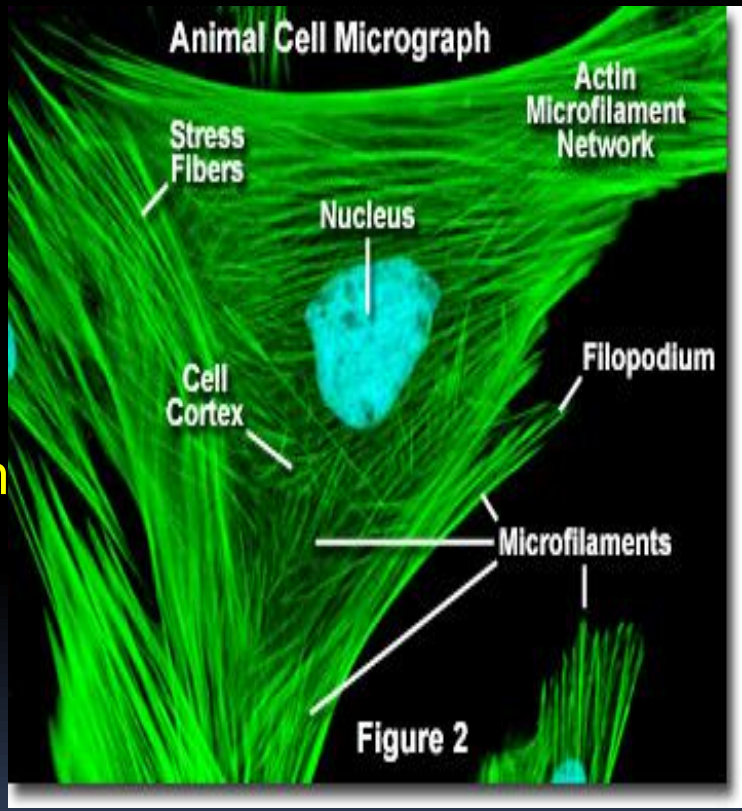

Sinuses
Ear
Airway
Lungs
Normal airway
Cilia
Mucus swept up by cilia
Airway with PCD
Faulty cilia
Mucus buildup

2. microfilaments:

microfilaments are solid rods made of a protein known as actin.

Functions of microfilaments:

- bearing tension.
- In skeletal muscle they are present as filament protein called actin associated with the filament called myosin which are responsible for contractile activity in muscle cells.
- **the cell cortex**.



3. **intermediate filaments:**

present in almost all eukaryotic cells, the diameter range between 10- 12 nm. They are of different types:

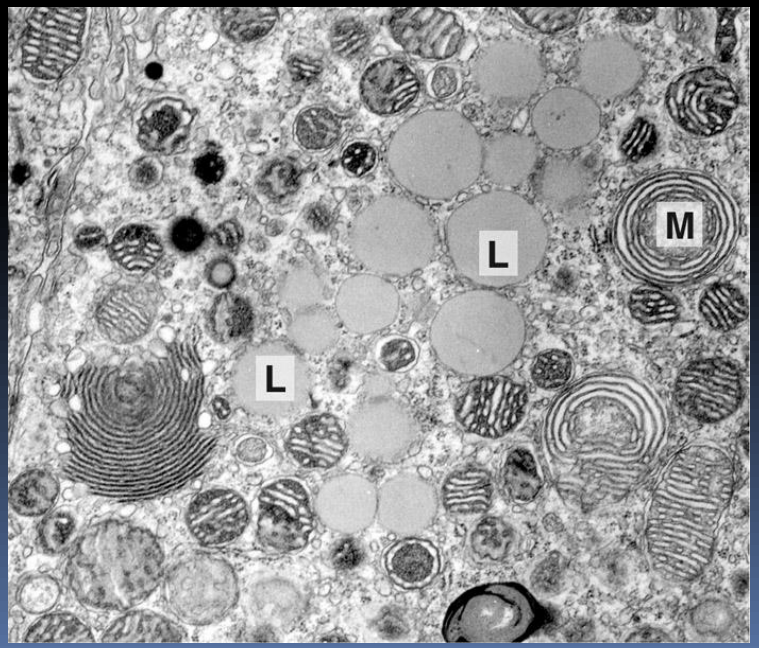
- keratin:
- Vimetin:
- Desmin (skeletin):
- Glial filament:
- Neurofilaments:

Medical Application

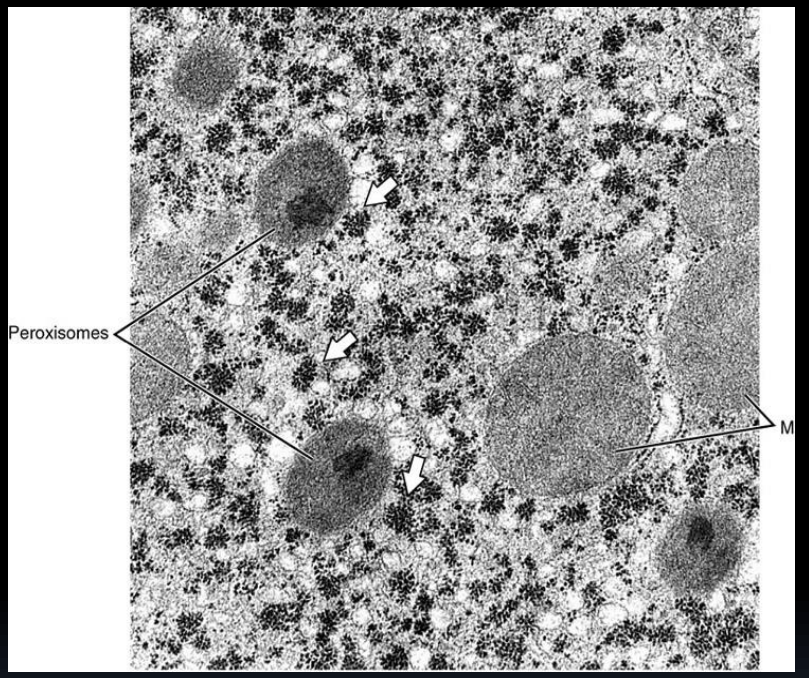
- The presence of a specific type of intermediate filament in tumors can reveal which cell originated the tumor, information important for diagnosis and treatment of the cancer. Identification of intermediate filament proteins by means of immunocytochemical methods is a routine procedure.

Non- living inclusion bodies:

- They are temporary components of the cytoplasm composed of one of the following metabolites:
- **Lipids:** fat droplets, they are present mainly in adipose tissue, adrenal cortex and liver cells. They serve as a source of energy.



- **Glycogen:** present in liver and skeletal muscle cell, they can be break down into glucose and used by the cell.



- **Proteins:** they are present either as granule e.g. in glandular cells or as crystals e.g. in adrenal cells.

- **Pigments:** these are deposits of colored substances. e.g.:

- Melanin: dark- brown pigment present in the skin, hair, retina and some parts of the central nervous system (CNS).
- Lipofuscin: yellow- brown pigments represent undigested substances of secondary lysosomes, they are present in long- lived cell and usually increase with age.
- Hemosiderin: gold- yellow in color, they are the end product of Hb degradation of old red blood cells. They are present in the liver, spleen and bone marrow.
- Crystals: are structures of crystalline forms of certain proteins. They are not commonly found in cells, with the exception of steroid cells, and interstitial cells of testes, and occasionally in macrophages.


THANK YOU