

NEET Biology

Short Notes

Cell Structure: Cytoskeleton

Powered by :



Cytoskeleton refers to the intracellular network of protein filaments. They are involved in adopting a variety of shapes and to carry out directed movements within the cell. There are three types of protein filaments: **microfilaments** (Subunit- **actin like protein**, are capable of contraction), **microtubules** (Subunit- **alpha and beta tubulin**, they do not contract but they can assemble and disassemble; play important role in the movement of the chromosomes) and **intermediate filaments** (forms a basket around the nucleus and are present in cell-cell junctions).

Microfilaments

- Non-living, contractile, solid rods made of **actin**, a protein. They are long polymerized chains of the initially globular actin molecules that are intertwined which thus create a filamentous protein known as **F-actin**. Make up 10-15% of total cell protein.

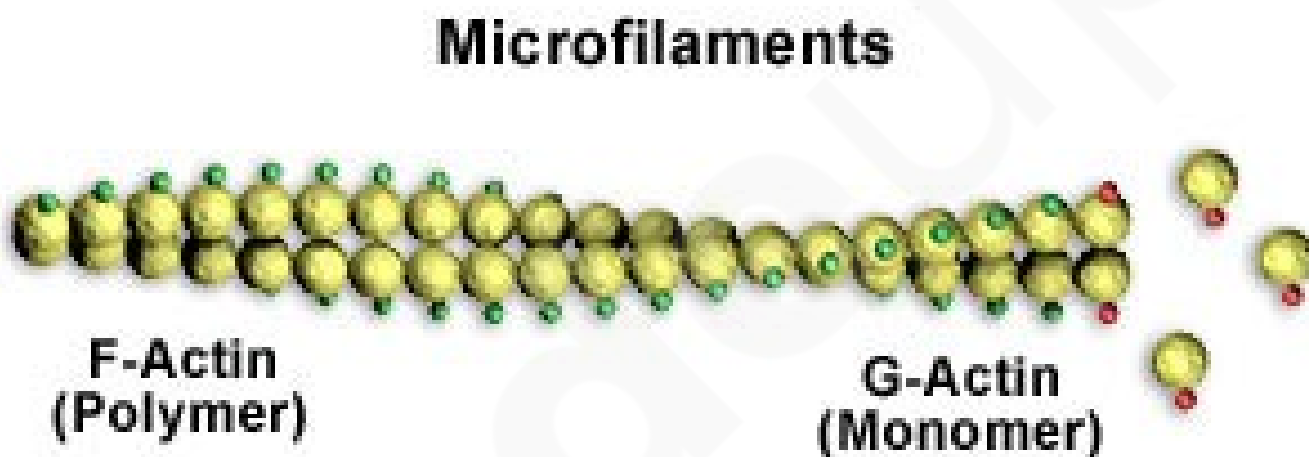


Figure 1

- Also known as actin filaments.
- Common to all eukaryotic cells.
- Not found in prokaryotes.
- Narrowest when compared to other elements of cytoskeleton i.e., IF and microtubules.
- Tough and flexible framework
- Also found connected with ER, spindle fibers, chloroplast etc.
- The highest concentration is found at the edges of the cell since they are nucleated at the plasma membrane.

Discovery: discovered by Paleviz.

Polarity in nature: same orientation of all the subunits that make up a microfilament.

Size: Diameter ranges from 5 to 9 nanometer.

Muscle contraction:

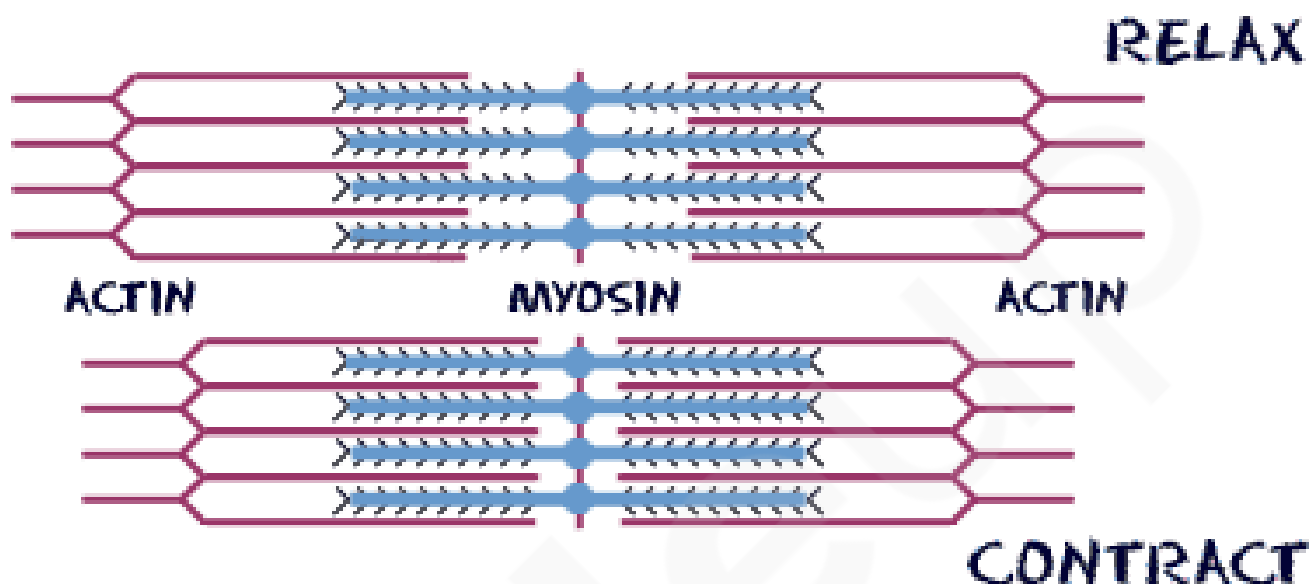


No.1 site & app

for JEE, BITSAT, NEET, SSC, Banking
& other competitive exams preparation

ATTEMPT NOW

Microfilaments (called as myofibrils) are present in muscle tissues. The two proteins **myosin** (Thick filament) and **actin** (thin filament) work together to help the muscle cells relax and contract. When both these filaments, actin and myosin slide over each other, the muscles contract. The two proteins need each other and together they are called actomyosin.



Functions

- Help a dividing cell to separate into 2 cells.
- They along with myosin generate forces that are used for basic cell movements and also in cell-contraction.
- Developing cell surface projections. For eg- lamellipodia, filopodia, and stereocilia.
- Provide mechanical support to cell and help a cell in shaping.

Microfilaments disassemble and again assemble quickly. For this reason, a cell changes its shape and moves.

Intermediate filaments

- Un branched structural and functional elements of the cytoskeleton.
- 8 to 12 nanometers in diameter.
- Made up of structural proteins like vimentin, keratin, and desmin.
- Larger than microfilaments.
- Form a basket around the nucleus.
- Found in cell-cell junctions.
- Found in glial cells and neurons. For eg, peripherin, neurofilaments

Types

- **Keratin filaments**—form keratin of skin & tonofibrils.



No.1 site & app

for JEE, BITSAT, NEET, SSC, Banking
& other competitive exams preparation

ATTEMPT NOW

- **Glial filaments**- intermediate filaments occurring in astrocytes.
- **Neuro filament**- lattice formation with bundles of microtubules in axons and dendrons of neurons.
- **Heterogeneous filaments**-found in muscles these are intermediate filaments connected to centriole, nuclear envelope.

Functions

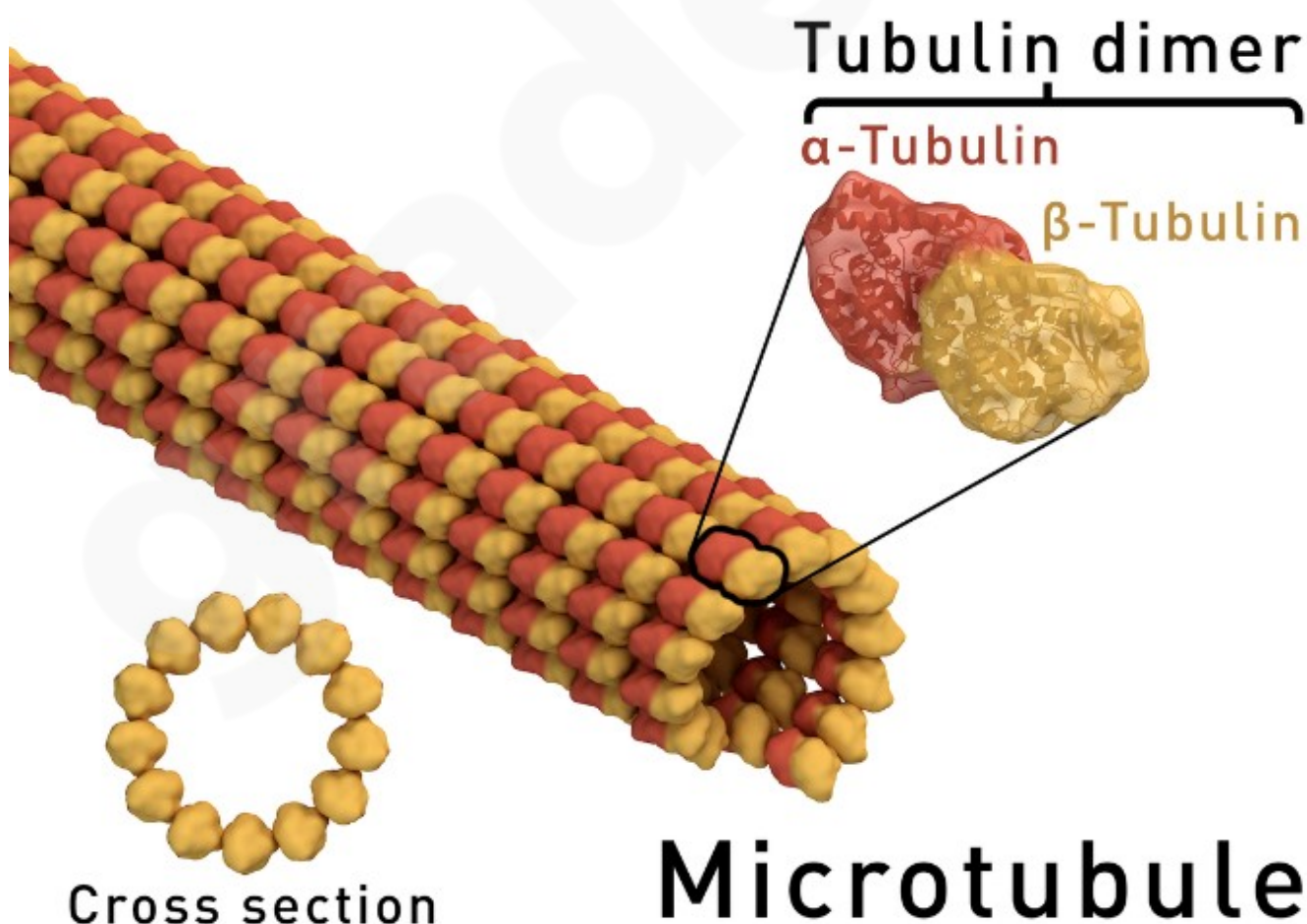
- Maintain rigidity and the shape of the cell as these elements bear the tension.
- Put the desmosomes and nucleus in place inside the cell.
- Shape of nucleus is maintained by nuclear lamina that is formed by the intermediate filaments. The nuclear lamina is a fibrous protein network and is found along the lining of the inner nuclear membrane.

Microtubules

- Hollow unbranched proteinaceous cylinders, found in all eukaryotic cells and absent in prokaryotes.
- In plants, they are associated with cell wall.

Size: 200-700 Å in diameter. Length ranges b/w 200nm and 25micrometre.

Discovery: by Franchi and De Robertis in 1953.



No.1 site & app

for JEE, BITSAT, NEET, SSC, Banking
& other competitive exams preparation

ATTEMPT NOW

Structure: Tubulin, a glycoprotein is the main constituent of microtubule which occurs in two forms, α -Tubulin and β -Tubulin.

Found in association with cilia, flagella, centriole, astral fibres, spindle fibres and other whips like organs that aid in locomotion. etc.

No movement of chromosome occurs where microtubules are disrupted with colchicine or other chemicals like colchicine.

Take part in the formation of spindle fibre at the time of cell division in mitosis.

Function

- Since they are a part of the cytoskeleton, they provide support and maintain cell shape.
- Provide guidance to the chromosome movement at the time of cell division.
- Help in transporting cell wall material from Golgi apparatus to exterior of cell in plants.

Comparison

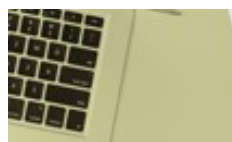
microtubules



actin filaments



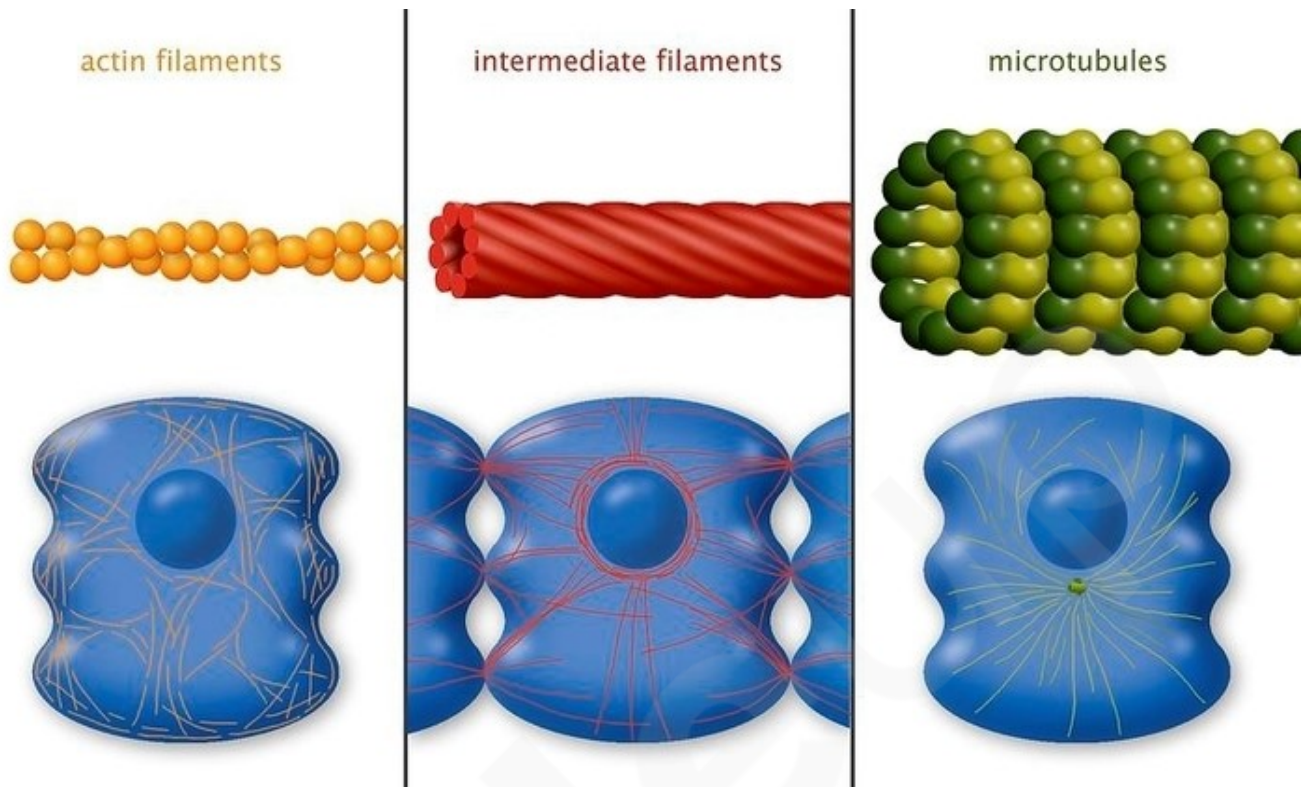
intermediate filaments



No.1 site & app

for JEE, BITSAT, NEET, SSC, Banking
& other competitive exams preparation

ATTEMPT NOW



Download Gradeup, the best [NEET Preparation App](#)

All the best!!

Team Gradeup



No.1 site & app
for JEE, BITSAT, NEET, SSC, Banking
& other competitive exams preparation

ATTEMPT NOW



NEET, JEE, GATE, SSC, Banking & other Competitive Exams

- Based on Latest Exam Pattern
- NTA based NEET Preparation
- Get your doubt resolved by mentors
- Practice questions and get detailed solutions
- Previous year paper detailed solution

