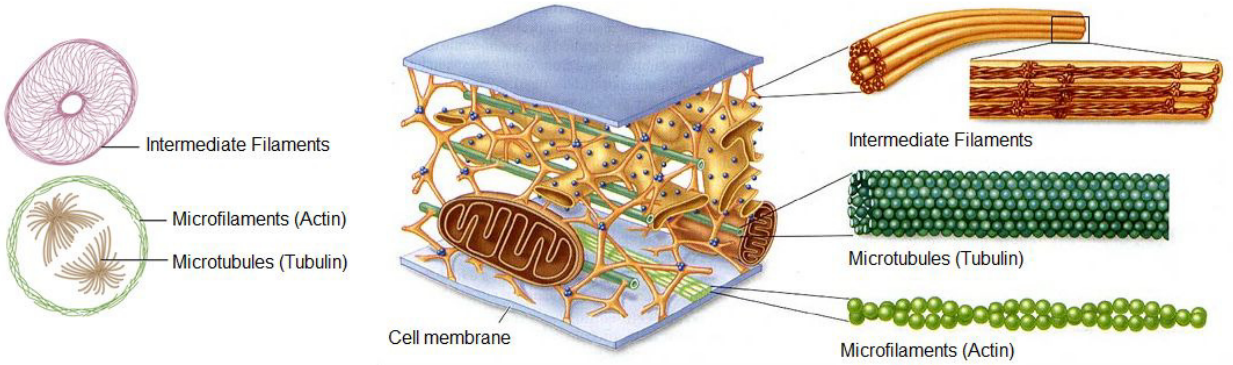
Cytoskeleton

- The cytosol of cells contains fibers that help to maintain cell shape and mobility and that probably provide anchoring points for the other cellular structures.
- Collectively, these fibers are termed as the cytoskeleton.
- The cytoskeleton gives cells structure and shape and allows them to move around. It is also important for intracellular transport.
- At least three general classes of such fibers have been identified in eukaryotic cells. Each of these filaments is a polymer.
- All three filament systems are highly dynamic, altering their organization in response to the needs of the cell.



Microtubules

- The thickest are the microtubules (20 nm in diameter) which consist of tubulin protein.
- Each tubulin subunit is made up of one alpha and one beta-tubulin that are attached to each other, so technically tubulin is a heterodimer, not a monomer. Since it looks like a tube, it is named as microtubule.
- In a microtubule structure, tubulin monomers are linked both at their ends and along their sides (laterally). This means that microtubules are quite stable along their lengths.
- Since the tubulin subunits are always linked in the same direction, microtubules have two distinct ends, called the plus (+) and minus (-) ends.
- On the minus end, alpha-tubulin is exposed, and on the plus end, beta-tubulin is exposed.
- Microtubules preferentially assemble and disassemble at their plus ends.

Functions

1. Transportation of water, ions or small molecules.
2. Cytoplasmic streaming.
3. Formation of fibers or asters of the mitotic or meiotic spindle during cell division.
4. Formation of the structural units of the centrioles, basal granules, cilia, and flagella.

Microfilaments

- The thinnest are the microfilaments (7 nm in diameter) which are solid and are made of two intertwined strands of a globular protein called actin. For this reason, microfilaments are also known as actin filaments.
- Actin is powered by ATP to assemble its filamentous form, which serves as a track for the movement of a motor protein called myosin.
- This enables actin to engage in cellular events requiring motion such as cell division in animal cells and cytoplasmic streaming which is the circular movement of the cytoplasm in plant cells.

Functions

1. They maintain the shape of the cell.
2. Form contractile component of cells, mainly of the muscle cells.
3. WBC can move to the site of an infection and engulf the pathogen due to microfilaments.

Intermediate Filaments

- Fibers of the middle-order are called intermediate filaments having a diameter of 10 nm.
- They are composed of related proteins sharing common structural and sequence features.
- They are classified according to their constituent protein likedesmin filaments, keratin filaments, neurofilaments, vimentin, and glial filaments.

Functions

1. Intermediate filaments contribute to cellular structural elements and are often crucial in holding together tissues like skin.

Functions of cytoskeleton

- In animal cells, which lack a rigid cell wall, cytoskeleton determines cell shape.
- It allows cells to move.
- It engulfs particles.
- Brace them against pulling forces.
- Transport vesicles through the cytosol.
- Separate chromosomes during cell division.
- It allows our muscles to contract.

Source: https://microbenotes.com/cytoskeleton/