جامعة المستقبل
AL MUSTAQBAL UNIVERSITY

كلية العلوم

قسم الادلة الجنائية

المحاضرة الخامسة

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المادة : الخلية The Cell

المرحلة : الأولى

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Cytoskeleton (Microtubules, Filaments: Thick, Thin / Microfilaments, Intermediate)

What Is Cytoskeleton?

Cytoplasm contains a complex network of filaments and microtubules which form a structural framework known as CYTOSKELETON.

Its function as :

1. Maintains cell shape
2. Protects the cell
3. Helps to generate cell motility and regulation
4. Assembles and disassembles dynamically
5. Enables intercellular transport.

The eukaryotic cytoskeleton consists of three main kinds of cytoskeletal filaments:

1. Actin filaments or microfilaments
2. Intermediate filaments, 8-12nm in diameter

Microtubules, hollow cylinders, 25nm in diameter with a 15nm lumen.

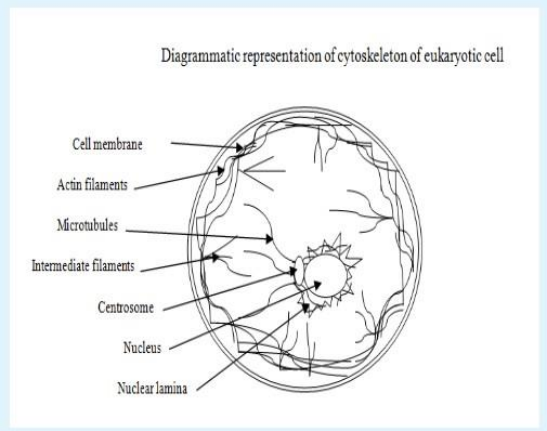

Figure: Main kinds of cytoskeletal filaments:

Actin filaments are 7nm in diameter and consist of two intertwined actin chains. They are tension bearing members of the cell. Being located close to the cell membrane, they are responsible for inter- and intracellular transduction.

Together with myosin, they form the contraction apparatus to generate muscular contraction of skeletal and cardiac muscle.

Intermediate filaments are 8-12nm in diameter and thus more stable than actin filaments. They are also tension bearing within a cell. The functions of intermediate filaments are:

1. They organize and maintain the three-dimensional structure of the cell.
2. Fix organelle location.

Intermediate filaments are built from a diverse class of subunits family of proteins, which are:

1. **Keratin filaments**: it's found in epithelial cells and abundant in stratified squamous epithelium of epidermis. **Function:** Mechanical, Stabilize cell shape, Strengthen its attachment to basal lamina and neighboring cells.

2. **Desmin filaments:** Its Found in skeletal and cardiac muscle cells and abundant in smooth muscle cells. **Function:** transmits pull of contractile proteins

3. **Neurofilaments:** it's found in nerve cells. **Function:** They provide internal support to the cell body and its processes.

4. **Vimentin filaments**: it's found in fibroblasts and other cells of mesenchymal origin. **Function:** They are randomly distributed in cytoplasm in the form of network or gathered in bundles, so it acts as regulating cells mechanics.

Microtubules, The thickest fibers are hollow cylinders, 25nm in diameter. Microtubule fibers are made up of the globular protein ($\alpha-$ and $\beta-$tubulin), and they grow or shrink as more tubulin molecules are added or removed.

The functions of microtubules are:

1. They move chromosomes during cell division.
2. Another function is as tracks that guide motor proteins carrying organelles to their destination.
3. In many cells, microtubules grow out from a centrosome near the nucleus.
4. These microtubules resist compression to the cell.
5. In animal cells, the centrosome has a pair of centrioles, each with nine triplets of microtubules arranged in a ring.