Centrosome

Each cell has a pair of centrioles in the centrosome, a region near the nucleus. The members of each pair of centrioles are at right angles to one another.

Structure

The centrosome is made up of two perpendicular centrioles linked together by interconnecting fibers. It consists of a complex of proteins that helps in the formation of additional microtubules. An amorphous pericentriolarmatrix surrounds the centrioles which are minute-sub-microscopic micro tubular sub cylinders with a configuration of nine triplet fibrils and ability to form their own duplicates, astral poles and basal bodies, without having DNA and a membranous covering. They are approximately 0.3-0.5 µm in length and 0.15µm in diameter. They are visible under light microscope, but details of centriole structure were revealed only under electron microscope. Usually two centrioles are found associated together but at right angles to each other (Fig. 8.49). The pair of centrioles is often called diplosome. Diplosome lies in a common specialized part of cytoplasm called centrosphere or kinoplasm orcytocentrum. Centrosphere is devoid of any other cell organelle. It, however, contains a fine fibrous material. Complex, formed of centrioles and centrosphere, is called centrosome or central apparatus.

A centriole possesses a whorl of nine peripheral fibrils which are absent in centre. It is therefore, called 9 + 0 arrangements. Fibrils run parallel to one another but at an angle of 40°. Each fibril is made up of three sub-fibres. Therefore, it is called triplet fibril. The three sub-fibres are in reality microtubules joined together by their margins and, therefore, sharing the common walls made of 2-3 proto-filaments.

Each sub-fibre has a diameter of 25 nm. From outside to inside, three sub-fibres of a triplet fibril are named as C, B and A. Sub-fibre A is complete with 13 proto-filaments while the B and C are incomplete due to sharing of some microfilaments.

The adjacent triplet fibrils are connected by C—A proteinaceous linkers. The centre of centriole possesses a rod-shaped proteinaceous mass known as hub. The hub has a diameter of 2.5 nm. From the hub, develops 9 proteinaceous strands towards the peripheral triplet fibrils.

They are called spokes. Each spoke has a thickening called X before uniting with A sub-fibre. Another thickening known as Y is present nearby. It is attached both to X thickening as well as C-—A linkers by connectives. Due to the presence of radial spokes and peripheral fibrils, the centriole gives a cart wheel appearance in T.S (Fig. 8.50).

Outside of centriole are present dense, amorphous, protoplasmic plaques in one or more series. They are called massules or pericentriolar satellites. Their position is changeable with different states of the cell. Massules act as nucleating centres for the growth of microtubules during aster formation and production of more centrioles (during G_2 phase).

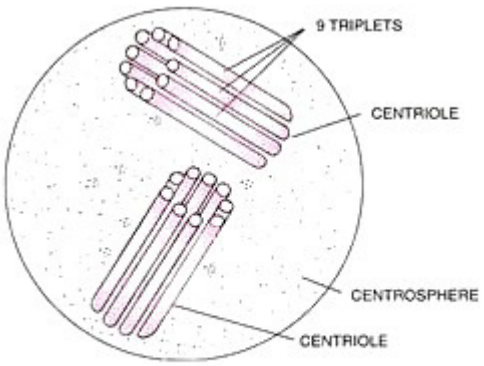

Fig. 8.49. Centrosome with pair of centroles (Diplosome).

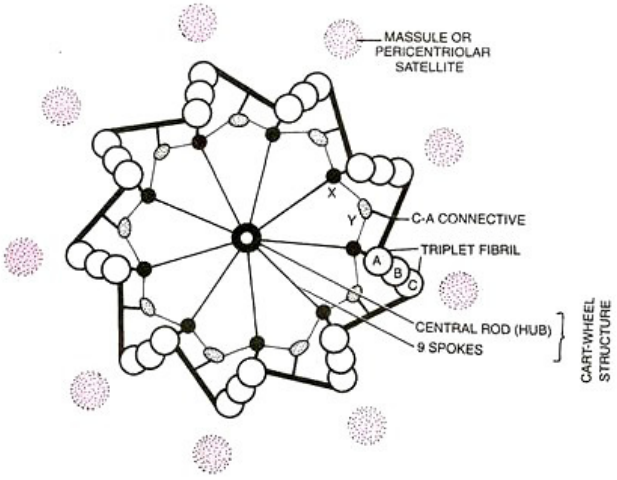

Fig. 8.50. Ultrastructure of centriole as seen in T.S.

Functions

1. It helps in cell division by forming microtubule-organisingcentres (MTOCs).
2. Out of the two centrioles in a spermatozoon, the distal one forms axial filament or tail.
3. Centrioles can be transformed into basal bodies.
4. Basal bodies formed from centrioles give rise to cilia and flagella.
5. They are capable of forming new centrioles with the help of massules.

Centrosome

Each cell has a pair of centrioles in the centrosome, a region near the nucleus. The members of each pair of centrioles are at right angles to one another.

Centrioles are found in almost all eukaryotic animal cells, protozoan protists (except some forms like Amoeba), some fungi and the cells of all those eukaryotic plants where flagellate structures are present in the life cycle (many green algae, bryophytes, pteridophytes and cycads). They are absent in angiosperms, higher gymnosperms, some algae and fungi.

Centrioles are capable of replication. Centriole replication is coordinated in animal cells with cell division. It occurs in S or G_2phase. Prior to nuclear division, the two centrosomes separate and move to the opposite ends where spindle poles are to be established subsequently. Centriole replication also occurs at the time of formation of basal bodies of cilia and flagella.

Source: http://www.biologydiscussion.com/cell/centrioles/centrioles-structure-and-functions-with-diagram/70541

Source: https://microbenotes.com/centrioles-structure-and-functions/

Source: Cell and Molecular Biology, Karp G (1996), 350-354.