

Centriole Encyclopedia Article

Centriole

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Centriole

A pair of interesting and somewhat mysterious cellular organelles called centrioles is found near the nucleus of most animal cells. Each centriole is a hollow, cylindrical structure about 0.66 μm (0.2 μm) in diameter and 1.31 μm (0.4 μm) long made of microtubules--very thin, stiff rods composed of the protein tubulin. Nine groups of fused, triplet microtubules make up the wall of each centriole. Each triplet set is angled inward like the blades of a turbine and adjacent rows are linked periodically by short protein bridges. In the center of some centrioles, faint radial spokes can be seen to point inward toward a hollow central structure. The two centrioles in each pair usually sit at right angles and are separated by a narrow space.

Centrioles appear to be autonomous organelles (new centrioles always arise from pre-existing ones). In each cell cycle, the pair of centrioles separates and a new centriole begins to grow perpendicular to, and some space from, the original one. During cell division, the centrioles serve as the organizing centers for the mitotic spindle--the bundle of microtubules that attach to chromosomes and separate them groups that will become daughter nuclei. How the growth and organization of the new centrioles is controlled is not known, but if the parent centrioles are removed or damaged, new centrioles are not formed.

Centrioles also are related in both structure and function to basal bodies--the structures that anchor cilia and flagella at the periphery of many cells. Basal bodies reproduce by a similar mechanism to that of the centrioles, and they play a comparable role in organizing the microtubules that make up the central skeleton of these organelles. In some cases, a precursor cell that has no cilia or flagella will develop them during differentiation. To do this, the centrioles will undergo repeated replication and the daughter centrioles will move to the cell surface to become basal bodies and organize cilia or flagella.

Plant cells generally lack centrioles, but a fuzzy structure called the centriolar-equivalent or centrosome seems to carry out the same functions as the animal centriole.