Structural Proteins Encyclopedia Article

Structural Proteins

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Structural Proteins

Structural **proteins** fulfill a variety of roles within and outside of cells. Structural proteins within the cell give it shape, and allow it to withstand stress from the environment or from its own motions. Structural proteins are also used during mitosis and cytokinesis, the processes by which a cell reproduces itself. Structural proteins in bone and cartilage provide strength and support for muscles to work against, and structural proteins in skin, hair, and nails provide a tough outer covering to the body.

Within cells, several proteins help create and maintain the cell's dynamic structure. Together, these proteins form the cytoskeleton. Individual molecules of actin link together to form filaments. These actin filaments are often used to form cables or meshwork to counteract stresses. In the amoeba, actin filaments are rapidly disassembled and reassembled, allowing this single-celled organism to rapidly change its shape as it moves. Alpha and beta tubulin link together to form microtubules, the longest structural fibers within the cell. Microtubules are used to transport cell organelles, and during cell division, pull chromosomes apart into the newly formed daughter cells. Microtubules also form the structural scaffolding for cilia and the tails of sperm.

Collagen is secreted by cells of cartilage and bone to form a dense, resilient matrix. Collagen is formed from three helices of protein wound around one another. The triple helix is extensively cross-linked with others, allowing it to be both flexible and tough. The cells of skin, hair, and nails are packed with keratin. Keratin is naturally quite flexible, but can be strengthened and stiffened by increasing the number of disulfide cross-bridges that link different **chains**. Elastin is even more flexible due to its very loose network of cross-links, and the weak **hydrogen** bonds holding different strands together. Elastin gives arteries the ability to expand in response to stretch, and then contract again, an action aided by surrounding muscle tissue.