Cilia and Ciliated Epithelial Cells Encyclopedia Article

Cilia and Ciliated Epithelial Cells

Contents

Cilia and Ciliated Epithelial Cells

Cilia, which are specialized arrangements of microtubules, have two general functions. They propel certain unicellular organisms, such as aramecium, through the water. In multicellular organisms, if cilia extend from stationary cells that are part of a **tissue** layer, they move fluid over the surface of the tissue.

Cilia line the respiratory epithelium of the **nose**, **pharynx**, and trachea. The tracheal cilia sweep dust, pollen and other particulate matter up to the pharynx so that it may be swallowed. Elements in cigarette smoke reduce this motion, allowing particles into the **lungs**. Defects in the respiratory cilia may cause bronchitis and sinusitis.

The oviduct is also lined with cilia. Those in the funnel-like opening of the oviduct attract the newly ovulated egg by drawing in fluid from the body cavity. Cilia farther along in the oviduct help to move the egg toward the uterus. The cilia of the rete testis and ductulus efferens of the testis move newly formed **sperm** from the seminiferous tubules to the vas deferens. Ependymal cells, which line the fluid-filled ventricles of the **brain**, are also ciliated.

Cilia are present in large numbers, as many as 100 per cell. They are about.25 um in diameter and about 2-20 um long. They work like the oars of a crew team, alternating power and recovery strokes in synchrony.

Each cilium is an extension of the cell, and is covered by the cell's **plasma** membrane. The core of the cilium is called the axoneme. It consists of microtubules, which in turn are composed of the protein tubulin, arranged in a characteristic pattern. Nine pairs of microtubules, called doublets, form a ring. Two single microtubules are located in the center of the ring. The doublets are connected to the center of the axoneme by spokes that end near the central microtubules. Each doublet has two "arms" made of the protein dynein. These arms reach toward the neighboring doublet.

Dynein is able to hydrolize **ATP**, allowing the dynein arms to slide one doublet past the other. Because the microtubules are connected at their base by a basal body, however, the amount of sliding is limited by the fixed position of their bases, causing the sliding motion to be translated into bending of the axoneme.

The basal bodies, also made of tubulin, are self-replicating. A newly replicated basal body can move away from its original site and generate a new cilium.