

**CELL TYPES**

There are over 200 types of cells in the human body. These are assembled into a variety of types of tissue such as

- epithelia
- connective tissue
- muscle
- nervous tissue

Most tissues contain a mixture of cell types.

**EPITHELIA**

Epithelial cells form coherent cell sheets called epithelia, which line the inner and outer surfaces of the body. There are many specialized types of epithelia.

**Absorptive cells** have numerous hairlike projections called microvilli on their free surface to increase the area for absorption.

**Ciliated cells** have cilia on their free surface that beat in synchrony to move substances (such as mucus) over the epithelial sheet.

**Secretory cells** are found in most epithelial layers. These specialized cells secrete substances onto the surface of the cell sheet.

The diagram shows a cross-section of epithelial cells. On the left, a cell has numerous small, hair-like projections labeled 'microvilli'. In the center, a cell has long, thin hair-like structures labeled 'cilia'. On the right, a cell contains small, pink, circular granules labeled 'secretory granules'. Labels include 'microvilli', 'intercellular junction', 'basal lamina', 'cilia', and 'nucleus'. A large white arrow points from the secretory cells towards the right.

Adjacent epithelial cells are bound together by cell junctions that give the sheet mechanical strength and also make it impermeable to small molecules. The sheet rests on a basal lamina.

**CONNECTIVE TISSUE**

The spaces between organs and tissues in the body are filled with connective tissue made principally of a network of tough protein fibers embedded in a polysaccharide gel. This **extracellular matrix** is secreted mainly by **fibroblasts**.

**Bone** is made by cells called **osteoblasts**. These secrete an extracellular matrix in which crystals of calcium phosphate are later deposited.

Calcium salts are deposited in the extracellular matrix.

Two main types of extracellular protein fiber are **collagen** and **elastin**.

**Fat cells (or adipose cells)**, among the largest cells in the body, are responsible for the production and storage of fat. The nucleus and cytoplasm are squeezed by a large lipid droplet.

The diagrams show: 1) 'fibroblasts in loose connective tissue' as spindle-shaped cells with long fibers. 2) 'Two main types of extracellular protein fiber are collagen and elastin' as thick, wavy black bands and thin, wavy green bands. 3) 'osteoblasts linked together by cell processes' as a cluster of cells with 'extracellular matrix' between them. 4) A 'fat cell' with a large yellow 'lipid' droplet and a small nucleus, with a height of '60-120 μm'.

**NERVOUS TISSUE**

Nerve cells, or **neurons**, are specialized for communication. The brain and spinal cord, for example, are composed of a network of neurons among supporting **glial cells**.

The axon conducts electrical signals away from the cell body. These signals are produced by a flux of ions across the nerve cell plasma membrane.

Specialized glial cells wrap around an axon to form a multilayered membrane sheath.

A **synapse** is where a neuron forms a specialized junction with another neuron (or with a muscle cell). At synapses, signals pass from one neuron to another (or from a neuron to a muscle cell).

The diagram shows a neuron with 'dendrites' on the left, a 'cell body' in the center, and an 'axon' extending to the right. Green arrows labeled 'INPUTS' point into the cell body, and a green arrow labeled 'OUTPUT' points away from the axon. A cross-section of the axon shows a 'myelin sheath' formed by 'specialized glial cells' wrapping around it. A 'synapse' is shown where the axon terminal meets another cell.