

"Olfactory Nerve (Cranial Nerve I)"

» Origin:

- Arise from olfactory receptor nerve cells in the olfactory mucous membrane in the upper nasal cavity, above the superior concha.
- Receptor cells are small bipolar cells, interspersed among supporting cells.

» Structure of Receptor Cells:

- Each receptor cell has:
 - Coarse peripheral process reaching the membrane surface.
 - Fine central process.
 - Olfactory hairs (cilia) emerge from the peripheral process, projecting into mucus and reacting to odors in the air to stimulate olfactory cells.

» Olfactory Nerve Fibers:

- Central processes form bundles of olfactory nerve fibers.
- These fibers pass through the cribriform plate of the ethmoid bone into the olfactory bulb.
- Unmyelinated fibers covered with Schwann cells.

"Olfactory Bulb"

» Structure:

- An ovoid structure with multiple nerve cell types, primarily mitral cells.

» Mitral Cells:

- Receive synapses from olfactory nerve fibers at synaptic glomeruli.

» Additional Cells:

- Tufted cells and granular cells also synapse with mitral cells.

» Cross-Connection:

- Receives axons from the opposite olfactory bulb through the olfactory tract.

"Olfactory Tract"

» Pathway:

- Runs from the posterior end of olfactory bulb beneath the inferior frontal lobe surface.
- Composed of myelinated axons (white matter) of mitral and tufted cells, and centrifugal fibers from the opposite olfactory bulb.

» Divisions:

- Reaches the anterior perforated substance and splits into:

> Medial olfactory stria:

- Carries fibers crossing the median plane through the anterior commissure to the opposite olfactory bulb.

> Lateral olfactory stria:

- Carries axons to the primary olfactory cortex (periamygdaloid and prepiriform areas).

» Primary and Secondary Olfactory Cortex

> Primary Olfactory Cortex:

- Located in the periamygdaloid and prepiriform areas of the cerebral cortex.
- Responsible for initial olfactory processing.

> Secondary Olfactory Cortex:

- Entorhinal area (area 28) of the parahippocampal gyrus.
- Receives connections from the primary olfactory cortex for further processing and appreciation of smell.

» Unique Pathway Characteristics:

- Olfactory pathway bypasses thalamic nuclei and directly reaches the cortex.
- Only two neurons in the pathway, unlike other sensory pathways.

» Emotional and Autonomic Connections:

- Primary olfactory cortex sends fibers to other brain centers for emotional and autonomic responses to smell.