Human senses

Our senses enable us to make sense of the world around us; they make our environment enjoyable by stimulating our desire to eat giving the body the vital nutrients it needs. They can also alert us to a fire before we see the flames, detect dangerous fumes and smell and taste rotten foods. Out of the five senses, it seems like taste is one of the simplest. There are no cones; rods or lenses, there are no tympanic membranes or miniscule bones. Our sense of smell in responsible for about 80% of what we taste.

Without our sense of smell, our sense of taste is limited to only five distinct sensations: sweet, salty, sour, bitter and savory sensation. All other flavors that we experience come from smell. This is why, when our nose is blocked, as by a cold, most foods seem bland or tasteless. Our sense of smell becomes stronger when we are hungry. Smell and taste are closely linked. The taste buds of the tongue identify taste; the nerves in the nose identify smell. Both sensations are communicated to the brain, which integrates the information so that flavors can be recognized and appreciated.

Some tastes—such as salty, bitter, sweet, and sour—can be recognized without the sense of smell. However, more complex flavors require both taste and smell sensations to be recognized. Different stimuli activate different sensory receptors. Chemical stimuli activate the chemoreceptors responsible for gustatory and olfactory perceptions. Because taste and smell are both reactions to the chemical makeup of solutions, the two senses are closely related. Taste is a chemical sense perceived by specialized receptor cells that make up taste buds.

In humans, the chemoreceptor’s that detect taste are called gustatory receptor cells. About 50 receptor cells as well as basal and supporting cells make up one taste bud. Taste buds themselves are contained in goblet-shaped papillae. Some papillae help create friction between the tongue and food. There are four different types of papillae – three are taste sensitive with the forth one being a mechanical non-gustatory papillae. Every gustatory receptor cell has a spindly protrusion called a gustatory hair.

This taste hair reaches the outside environment through an opening alled a taste pore. Molecules mix with saliva, enter the taste pore and interact with the gustatory hairs. This stimulates the sensation of taste. Once a stimulus activates the gustatory impulse, receptor cells synapse with neurons and pass on electrical impulses to the gustatory area of the cerebral cortex. The brain interprets these sensations as taste. Smell, like taste, is a chemical sense detected by sensory cells called chemoreceptors. When an odorant stimulates the chemoreceptors in the nose that detect smell, they pass electrical impulses to the brain.

The brain then interprets this activity as specific odors and olfactory sensation becomes perception - something we recognize as smell. Smell begins when airborne molecules stimulate olfactory receptor cells. But smell, more so than any other sense, is also intimately linked to the parts of the brain that process emotion and associative learning. The olfactory bulb in the brain, which sorts sensation into perception, is part of the limbic system - a system that includes the amygdala and hippocampus, structures vital to our behavior, mood and memory.

When an air current sweeps an odorant up through the nostrils, the molecules hit the olfactory epithelium which is the center of olfactory sensation. Mucus secreted by the olfactory gland coats the epithelium's surface and helps dissolve odorants. Olfactory receptor cells are neurons with knob-shaped tips called dendrites. Olfactory hairs that bind with odorants cover the dendrites. When an odorant stimulates a receptor cell, the cell sends an electrical impulse to the olfactory bulb through the axon at its base.

Supporting cells provide structure to the olfactory epithelium and help insulate receptor cells. Basal stem cells create new olfactory receptors through cell division. The cells responsible for smell and taste are the only cells within the nervous system that are replaced as they become old or damaged. Each olfactory receptor type sends its electrical impulse to a particular region of the olfactory bulb called the primary olfactory cortex, this in turn passes it on to the thalamus and the limbic system.

There are a number of contrasts between taste and smell, taste comes from direct with the person, usually through the mouth, this is in contrast to smell which is associated with substances reaching a person from a distance through the nose. Our sense of taste is stimulated by fluids and food needs to be dissolved in the mouth to achieve this. Smell however consists of odorous particles conveyed to the cell membrane of the nasal cavity in a gaseous form, here it becomes similar to the taste sensation as the gas molecules come into contact with a film of mucus.