



Sensory system

The ability to sense stimuli is vital to man's survival. If pain could not be sensed, burns would be common. Internal problems such as an inflamed appendix or a stomach ulcer could be unnoticed without pain. Without sight there is a greater risk of injury from obstacles. Harmful gas could be inhaled if there were no sense of smell. Loss of a sense of hearing would keep us from recognizing hazards such as automobile horns. And if there were no taste, toxic substances could be ingested. If we could not "sense" our environment and make the necessary adjustments, we probably could not survive on our own.

THE SENSORY PATHWAYS

a. Sensations. The body is continuously bombarded by types of information called stimuli (stimulus, singular). Those few stimuli which are consciously perceived (in the cerebral hemispheres) are called sensations. Structures that detect changes in man's external and internal environment produce sensations on the senses.

b. Senses and Receptions. The senses and the location of their receptors are as follows:

- (1) Vision--receptors in the eyes.
- (2) Smell--receptors in the nose.
- (3) Hearing--receptors in the ears.
- (4) Taste--receptors in the tongue.
- (5) Touch, heat, cold, pain --receptors in the skin.
- (6) Position--receptors in the muscles, joints, inner ear.



(7) Hunger, thirst--receptors in the tongue, pharynx, mouth.

c. Two Types of Senses. They are differentiated by the type of sensation they cause. Special senses are produced by receptors limited to small areas such as the tongue, nose, balance, hearing, vision, smell, and taste. General senses are produced by receptors scattered throughout the body such as pressure, temperature, pain, position, and touch.

d. Sensation and Perception. In its broadest meaning, sensation refers to man's state of being aware of external or internal conditions of the body. The state of being aware of something through the senses is perception. Four conditions must take place for a sensation to occur.

(1) A stimulus--a change in the environment which causes a response by the nervous system.

(2) A receptor or sense organ-- picks up a stimulus and converts it to a nerve impulse.

(3) Conduction--the impulse must be conducted from the receptor or sense organ along a pathway to the brain.

(4) Translation--the impulse must be translated into a sensation when the impulse is in a region of the brain.

PHYSIOLOGY OF VISION

For vision to occur, light must pass through the cornea, aqueous humor, pupil, lens, and vitreous humor before it (light) can reach the rods and cones. Light reaches the rods and cones of the retina and forms an image on the retina. Next,



nerve impulses are conducted to the visual areas of the cerebral cortex (a part of the brain).

a. Retinal Image Formation. Four basic processes are involved in the formation of an image on the retina: refraction of light rays, accommodation of the lens, constriction of the pupil, and convergence of the eyes. Accommodation and pupil size are caused by intrinsic eye muscles (muscles inside the eyeball). Extrinsic eye muscles control convergence.

THE SPECIAL SENSE OF HEARING (AUDITORY)

The human ear serves two major special sensory functions-- hearing (auditory) and equilibrium (balance). Receptors for sound waves and receptors for equilibrium are located in the ear. The stimulus for hearing is sound waves, and the stimulus for equilibrium is gravitational force.

PHYSIOLOGY OF OLFACTION

The sensation of smell functions in this manner. We breathe in a gaseous substance that dissolves in the fluid of the nasal chamber. The fluid stimulates the olfactory cells in the upper part of the nasal mucosa. Sniffing increases the amount of gaseous substance, and the odor becomes stronger. The sensory pathway for the sense of smell is the olfactory nerve. Olfactory cells transmit impulses from the receptors over the olfactory nerve to the brain.

THE SPECIAL SENSE OF TASTE (GUSTATION)

When a substance is put in the mouth, the substance is exposed to tiny receptors in the taste buds. Each person has about 10,000 taste buds. Most of the taste buds are on the surface of the tongue, but some are on the roof of the mouth and some are in



the throat. We seem to taste many substances, but actually there are only four primary taste sensations: sour, salt, bitter, and sweet. Other tastes such as chocolate, pepper, and coffee are combinations of these four tastes changed by olfactory sensations. If you have a cold or an allergy, you may feel that you cannot taste your food. What is happening is that your taste sensations are operating correctly, but your olfactory (smell) sensations are not. Much of what we think of as taste is actually smell. The odor from food passes upward into the nasopharynx and stimulates the olfactory system. If the sense of smell is greatly impaired, the quality of taste can change completely; fresh onions can taste sweet and limburger cheese taste very bland. Receptors for the four primary tastes are located in different parts of the tongue. The anterior tip of the tongue reacts to all four primary taste sensations, but it is more responsive to sweet substances. Taste buds on the anterior edges of the tongue are responsive to salty substances. Sour substance receptors are located on the lateral margins of the tongue, and receptors for bitter substances are on the posterior mid portion of the tongue.