

SENSORY RECEPTORS

We know about the organisation of the nervous system of vertebrates. The peripheral nervous network of the vertebrates receives information in the form of sensory signals from various sensory receptors. These sensory signals or stimulus or energy in the form of sensations or impulses are relayed to the central nervous system or brain, which interprets them as sensation.

The sensory information that is sent to the sensory receptors and sense organs may be information about the; i) quality of stimulus (such as the colour of light, static pressure, heat, cold, sweat, taste, pain, etc.) and/or ii) the intensity of stimulus (e.g. brightness, how strong) and /or iii) the spatial patterns (location, orientation, distribution).

The sensory neurons are specialized nerve cells and are also called sensory receptors. The sensory receptor functions as a transducer (a device that translates energy from one form into another). Most sensory receptors convert mechanical or light or chemical stimuli or energy into electrical impulses. These sensory receptors can detect and transmit information about the external and internal environment to the peripheral or central nervous system. The tip of the sensory nerve fiber is often associated with tissues that amplify the stimulus and thus, enhance the sensitivity of the receptor.

The various sensory receptors in the vertebrate body can be broadly classified in different ways: i) on the basis of their distribution, ii) on the basis of their location, and iii) on the basis of the kind of energy they are then able to perceive. According to these receptors can be classified and describes as follows:

1) Classification of sensory nerve receptors on the basis of their distribution in the body.

The receptors (Fig. 8.1), which are widely distributed throughout the body are termed as general sensory receptors. These receptors are involved with the sensations of touch, temperature and proprioception (perception or awareness of the position and movement of the body). General receptors maybe of three anatomical categories – (a) free or (b) encapsulated or (c) associated with nerve endings as given in Table 8.1.

Table 8.1: Classification of the General sensory organs.

Sl. No.	Types of General Sensory receptors	Description
1.	Free sensory receptors	The terminus of the sensory neuron process lacks any specialized association, and so is termed as a free nerve ending or free sensory receptor. At its terminus, the free nerve ending may arborize (branch) in order to extensively increase the area to be monitored. Free sensory receptors are primarily concerned with sensations that are interpreted as painful, but can also be stimulated by extremes of heat or cold. Tissue damage can lead to swelling and to direct stimulation of the free sensory receptor.
2.	Encapsulated sensory receptors	In this type of receptor the terminus (terminal end) of the sensory process of the neuron is enclosed or wrapped in a specialized structure formed of mesodermal cells. Such a type of sensory receptor is called an encapsulated sensory receptor. Encapsulated sensory receptors are located in the dermis of the skin just beneath the epidermis (Fig. 8.1) and respond to touch and/or vibration and/or heat. For example: Ruffini sensory receptors in which the nerve endings are responsive to touch, pressure, vibration and heat are encapsulated mechanoreceptors and are located in the dermis.
3.	Associated Sensory receptors	When the terminus of the sensory process of the neuron is wrapped around another organ, then the terminus called an associated nerve ending, and sensory receptor is termed as the associated sensory receptor. For example, nerve endings that are associated with the base of a hair follicle (Fig. 8.1). When a hair is moved, the entwined nerve endings at the base of the hair are stimulated.

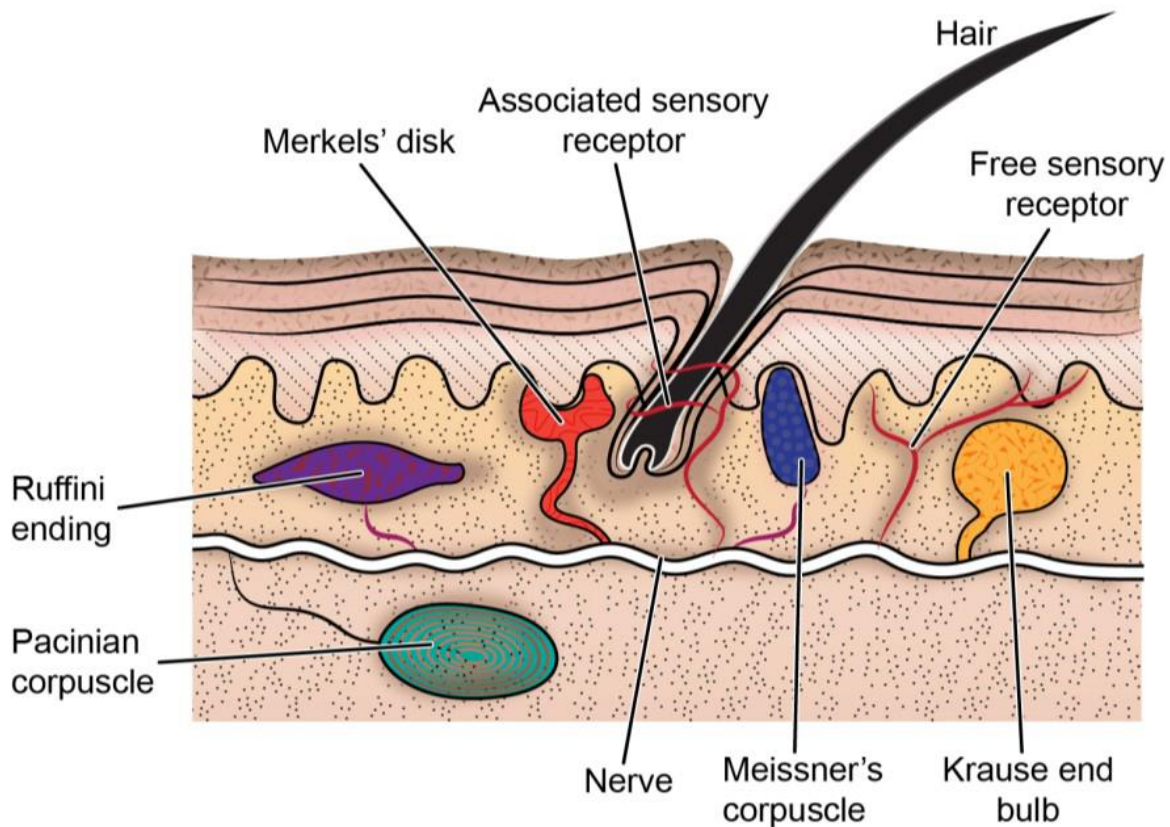


Fig 8.1: General sensory receptors found in the skin

2) Classification of sensory nerve receptors on the basis of their location on/in the body.

i) Sensory receptors (Fig 8.1) that are present on the skin and/or body surface and/or skeletal muscles are called somatic receptors.

ii) Visceral sensory receptors are present in the viscera (abdominal organs).

3) Classification of sensory nerve receptors on the basis of the source from which they are stimulated

Broadly the various sensory receptors in the animal body can be classified according to the kind of energy they are able to perceive i.e. mechanical, chemical, light or thermal (Table 8.2)

Table 8.2: The sensory exteroceptors and sensory interoceptor of vertebrates.

1.	Exteroreceptors (External senses) that receive and respond to sensations from the external environment	Name of the exteroceptors
i.	Sight Hearing Smell Taste Touch Pressure Temperature Pain Currents of water	Photoreceptors Phonoreceptors Olfactoreceptors Gustatoreceptors Tangoreceptors Mechanoreceptors Thermoreceptors Nociceptors Rheoreceptors
2.	Interoreceptors (internal senses) that receive and respond to sensations from the internal environment of the body.	Name of the Interoreceptor
i.	A special type of sensory organ that is located in the striated muscles, joints and tendons.	Proprioreceptors

The information received by a single sensory receptor or the sensory receptors present in the sense organs provides the body of the vertebrate with continuous information of the constantly changing environment.