B.SC - Semester 2

(Core course – Theory)

Course Code – 1ZOOTC0201

Course Title - Comparative anatomy and developmental biology of vertebrates

UNIT: 4

Topic : Classification of sensory receptors and their structural description.

Sense organs.

Organisms are subjected to many influences from their surroundings constituting the environment. All changes in the environment both internal and external are known as stimuli. Organs of the body that detect these changes or stimuli are called receptors or Sense organs. They receive information from environment in the form of energy (mechanical, chemical, electrical, thermal and radiant) and change it into nerves impulse which is transmitted to the brain via sensory nerves fibre to which they are connected.

Why we study the sense organs?

We study the sense organs because they play some important functions as below:

1. Sense organs are able to detect the changes in our own body and in the objects and events in the world around us.

2. Internal sense organs note and report change in condition such as body temperature osmotic relationship and ph.

3. Sense organ are also able to report sight, sound and chemicals in the outer world which are used to find food, shelter, mate, safety from enemies and other adaptive response through environment.

Common Sense.

At least the following five cells are more common which are recognized by the biologist

1**. Touch:** Include contact, pressure, heat, cold etc.

2. **Taste**: For certain substance in solution.

3. Smell: For volatile chemical and gases in air.

4. **Hearing:** For vibration in air, water and solid.
5. **Sight**: For light waves.

Basic structure and working of sense organs.

All sense organs are similar in basic structure and mode of working because each sense organ has specialized neurons called receptor cells or sensory receptors. Each receptor may consist of dendrites of the sensory neurons or distinct non nervous cell near the dendrites of the sensory neurons.

Working: The receptor receives particular stimuli and set up appropriate electrical impulse in the nerve. A stimulus is in the form of energy eg. Light, sound, pressure, heat, osmotic potential, electric current and chemical changes. Each type of receptor is sensitive to the particular kind of stimulus.

Origin of receptor cell.

The origin of receptor cell is derived from the ectoderm because the ectoderm, being in outer layer of the body is most affected by the environmental changes.

Classification of sense organs.

Sense organs are classified in many ways:

1. **General and special receptors**.

(a) **General receptors:** These are various minute sense organs which are distributed widely upon and within the body especially in the skin. These are called as cutineous sense organs and are collectively termed as general receptors.

(b) **Special receptors:** These are concentrated in small area particularly on the cephalic end of the body. They response to particular type of

stimuli or special senses e.g. tounge, nose, eyes and ears are special receptors.

2. Types according to the source of stimuli:

(a) Mechanoreceptors: These are skin and ear receptors. Their functions are detecting touch, cold, hot, pressure (skin receptors), hearing and balancing (ear receptors).

(b) Chemoreceptor's: These are nose and tounge receptors. Their functions are detecting smell or smelling (nose receptors) and detect taste (tongue receptors).

(c) Photoreceptors: These detect light waves. These are sensitive to light.

(d) Thermoreceptors: These are skin receptors. They are sensitive to heat and cold.

(e) Nerve endings: These are also skin receptors. These are sensitive to pain.

3. Types according to location of stimulus:

(a) Exteroceptors: These receptors receive environmental stimuli from outside in the organism and supply information about the surface of the body eg. touch, pressure,heat,taste etc. These include eye,ear,nose, taste buds and cutineous sense organs. The Exteroceptors inform the organism about the food, mate or enemy.

(b) Proprioceptors: These are stretch receptors which are present in the muscles, joint, tendons, connectives and skeleton tissues. These are the sense of equilibrium and are responsible for the maintenance of posture.

4. Somatic and visceral receptors:

(a) Somatic receptors: These carry the sensation from muscles of somite origin like face and muscles of mastication etc.

(b) Visceral receptors: These carry the sensation from branchial arch derivative like pharynx, trachea, esophagus etc. and also special sensation like taste from these derivatives.

Limitations of sense organs:

Each sense organ functions within certain limits. The limit however varies in different animals eg. High frequency sound and very low frequency sound is inaudible to humans, certain insects can perceive ultraviolet Rays which are invisible to man, dogs. Olfactory sense organs for better are superior to that of other animals.

Sensory nerves fiber:

The nerve fibers which carry impulse from the receptor to the central nervous system are called sensory fibers. These are two types.

(a) Somatic sensory fiber: These are associated with the exteroceptors.

(b) Visual sensory fiber: These are associated with the interceptors.