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FACULTY OF AGRICULTURAL SCIENCES & ALLIED INDUSTRIES

ENT-121: Fundamentals of Entomology

Lecture 20: Insect Anatomy: Insect Sensory Organs:

Sensilla are the organs associated with sensory perception and develop from epidermal cells. The different types of sense organs are:

1. Mechanoreceptors

2. Auditory receptors

3. Chemoreceptors

4. Thermo receptors and

5. Photo receptors.

1. Mechanoreceptors: Detect mechanical senses

A. Trichoid sensilla: Hair like little sense organ. Sense cell associated with spur and seta, located at antennae.

B. Campaniform sensilla: Mechanical sensilla associated with pressure

C. Chordotonal organ: The specialized sensory organs that receive vibrations

Functions:

i. Proprioception (positioning of their body parts in relation to the gravity).

ii. Sensitive to sound waves, vibration of substratum and pressure changes.

iii. Johnston's organ: All adults' insects and many larvae have a complex

Chordotonal organ called Johnston's organ lying within the second antennal segment (Pedicel).

2. Auditory receptors (detect sound waves):

A. Delicate tactile hairs: Present in plumose antenna of male mosquito.

B. Tympanum: This is a membrane stretched across tympanic cavity responds to sounds produced at some distance, transmitted by airborne vibration.

Tympanal organs are located

* Between the metathoracic legs of mantids.

* The metathorax of many nectuid moths.

* The prothoracic legs of many orthopterans.

* The abdomen of short horned grasshopper, cicada.

* The wings of certain moths and lacewings.

3. Chemoreceptors (detect smell and taste): Detect chemical energy. Insect chemoreceptors are sensilla with one pore (uniporous) or more pores (multiporous). Uniporous chemorceptors mostly detect chemicals of solid and liquid form by contact and are called as gustatory receptor. Many sensor neurons located in antenna are of this type.

4. Thermoreceptors (detect heat): Present in poikilothermic insects and sensitive to temperature changes. In bed bug it is useful to locate the host utilizing the temperature gradient of the host.

5. Photoreceptors (detect light energy):

A. Compound eyes: The compound eye is based on many individual units called ommatidia. Each ommatidium is marked externally by a hexagonal area called facet. Compound eye is made up of two parts called optic part and sensory part. Optic part contains a cuticular lens called corneal lens secreted by corneagenous cells and crystalline cone covered by primary pigment cells. Function of the optic part is to gather light.

Type of Vision:

a. Apposition type (light tight): Due to the presence of primary pigment cells light cannot enter the adjacent cells. The mosaic image formed is very distinct. The image formed by the compound eye is of a series of opposed points of light of different intensities. This functions well in diurnal insects.

b. Super position type: Primary pigment cells are absent allowing light to pass between adjacent ommatidia. Image formed in this way are indistinct, bright and blurred. This type is seen in nocturnal and crepuscular insects.

B. Lateral ocelli (Stemmata): Visual organs of holometabolous larva. Structure is similar to ommatidium. It helps to detect form, colour and movement, and also to scan the environment.

C. Dorsal ocelli: Visual organs of nymph and it vary from 0-3 in numbers. It contains a single corneal lens with many visual cells individually secreting the rhabdomere. Dorsal ocelli perceive light to maintain diurnal rhythm and is not involved in image perception. Known as Fenestrae in case of cockroach.