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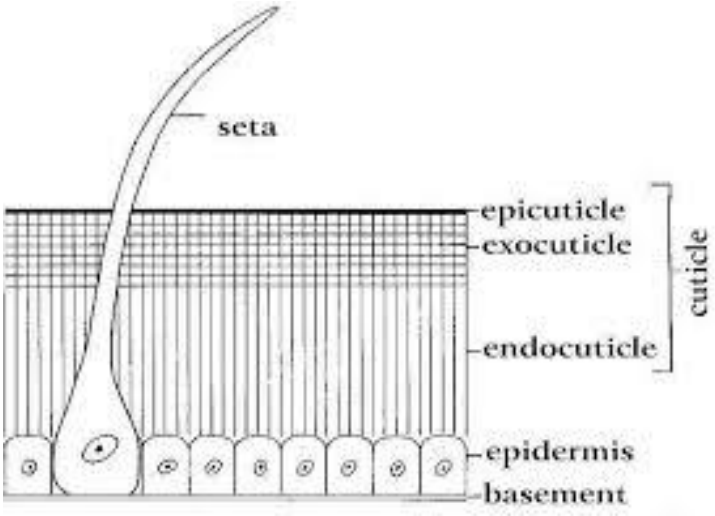
FACULTY OF AGRICULTURAL SCIENCES & ALLIED INDUSTRIES

ENT-121: Fundamentals of Entomology

Lecture 6: Insect Cuticle and Moulting:

The body wall or integument of insects forms an exoskeleton covering of the insect body. It provides protection from desiccation, physical/mechanical injuries and gives shape, strength to the body and its appendages.



Basement Membrane: It is the innermost or basal part of the body wall formed from degenerated epidermal cells and appears as non-living granular layer of integument.

Epidermis: It is a unicellular layer formed from polygonal cells. These cells consist of well developed nucleus and other cytoplasmic contents. Adjacent epidermal cells are held together by means of certain cytoplasmic processes which are known as desmosomes**.**

A. Dermal glands producing cement layer

B. Trichogen cell producing hair like seta or trachome.

C. Moulting glands secreting moulting fluid which digests the old cuticle

D. Peristigmatic glands around the spiracles in case of Dipteran larvae

Cuticle: Divided into upper Epicuticle and inner Mesocuticle and Endocuticle (Procuticle)

The Epicuticle further has total 4 parts

1. Cement

2. Wax

3. Polyphenol

4. Cuticulin

Exocuticle: It is darkly pigmented, hard and sclerotized. It offers rigidity to the cuticle and consist mainly chitin and a hard protein called sclerotin.

Endocuticle: It is soft, light coloured and unsclerotized. It contains more chitin but lacks hard protein sclerotin

Pore canals: These are numerous fine vertical channels traversing both exo and endocuticle measuring < 1μ (0.1 – 0.15μ) in diameter.

Chitin: It is a nitrogenous polysaccharide. It accounts for 25-60 per cent of the dry weight of the cuticle. It is named by Odier in 1834. It consists of high molecular weight polymer of N-acetyl glucosamine (99%) and N-acetyl muramic acid (1%) joined by β-glycosidic linkages. It is insoluble in water, alcohol, organic solvents dilute acids and concentrated alkalies, but soluble only in concentrated mineral acids and sodium hypochlorite.

Proteins: Cuticle consist a total three types of protein, Arthropodin, Sclerotin and Resilin.

Cuticular Outgrowth: Apodeme and Apophysis, spine, setae and spurs etc.

Moulting: Periodic shedding of skin in insects and divided into these three steps

Apolysis: [Apo = formation; Lysis = dissolution] the dissolution of old cuticle and formation of new one is known as Apolysis.

Ecdysis: Detachment of old cuticle. Old detach cuticle is called exuvie and stage is called instar while gap between two moult is called stadium

Sclerotization: hardening process of cuticle includes melonization (darkening)

Hormones involve: JH: Juvenile Hormone: Produced from corpora allata of brain that helps the insects to be in immature stage.

MH: Moulting hormone (Ecdysone) produced from prothoracic glands of brain that induces the process of moulting

Eclosion Hormone: Released from neurosecretory cells in the brain that help in the process of Ecdysis or eclosion.