

LECTURE 3. Anatomy: Excretory system

Excretory system

Removal of waste products of metabolism, especially nitrogenous compounds

from the body of insects is known as excretion. The excretion process helps the insect to

maintain salt water balance and thereby physiological homeostasis.

Following are the excretory organs.

Near the junction of the midgut and hindgut are long, thin structures called

Malpighian tubules. These range in number from a few to hundreds, but only aphids

(Order Homoptera) are currently known to have none. Malpighian tubules are creamy to

yellow in color and work in conjunction with the ileum to provide the primary site for

osmoregulation and excretion.

1. **Malpighian tubules**: Thin, blind-ending tubules, originating near the junction of mid

and hindgut, predominantly involved in regulation of salt, water and nitrogenous waste

excretion. This structure was discovered by Marcello Malpighi.

2. **Nephrocytes**: Cells that sieve the haemolymph for products that they metabolize

(pericardial cells).

3. **Fat bodies** : A loose or compact aggregation of cells, mostly trophocytes, suspended in

the haemocoel, responsible for storage and excretion.

4. **Oenocytes**: These are specialised cells of haemocoel, epidermis or fat body with many

functions. One of the function is excretion.

5. **Integument**: The outer covering of the living tissues of an insect.

6. **Tracheal system**: The insect gas exchange system, comprising tracheae and

tracheoles.

7. **Rectum**: The posterior part of hind gut.

Among the above organs, malpighian tubules are the major organ of excretion.

Excretion and Osmoregulation: Insect faeces, either in liquid form or solid pellets, contains both undigested food and metabolic excretions. Aquatic insects excrete dilute wastes from their anus directly into water by flushing with water. But, Terrestrial insects must conserve water. This requires efficient waste disposal in a concentrated or even dry form, simultaneously avoiding the toxic effects of nitrogen. Both terrestrial and aquatic insects must conserve ions, such as sodium (Na), potassium (K) and chloride (Cl), that may be limiting in their food or lost into the water by diffusion. Therefore the production of insect excreta (urine or pellets) is a result of two related processes: excretion and osmoregulation (maintenance of favourable osmotic pressure and ionic concentration of body fluid). The system responsible for excretion and osmoregulation is referred to as excretory system and its activities are performed largely by the Malpighian tubules and hindgut. However in fresh water insects, haemolymph composition is regulated in response to loss of ions to the surrounding water, with the help of excretory system and special cells. Special cells are called Chloride cells which are present in the hindgut, capable of absorbing inorganic ions from the dilute solutions. (e.g. Naids of dragonflies and damselflies).

Sources

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