

LECTURE 7.

Haemolymph and its functions

Haemolymph is a watery fluid containing ions, molecules and cells. It is often clear and

colourless but may be variously pigmented or rarely red due to haemoglobin in the

immature stages of few aquatic and endoparasitic flies (e.g., Chironomid larva).

Haemolymph performs the function of both blood and lymph. It is not involved in gas

transporting function (respiration). Haemolymph contains a fluid portion called plasma

and cellular fractions called haemocytes.

1. Plasma: Plasma is an aqueous solution of inorganic ions, lipids, sugars (mainly

trehalose), amino acids, proteins, organic acids and other compounds. pH is usually

acidic (6.7). Density is 1.01 to 1.06. Water content is 84-92 per cent.

Inorganic ions

present are 'Na' in predators and parasites, 'Mg' and 'K' in phytophagous insects.

Carbohydrate is in the form of trehalose sugar. Major proteins are

lipoproteins,

glycoproteins and enzymes. Lipids in form of fat particles or lipoproteins.

Higher

concentration of amino acids leads to a condition called aminoacidemia which effects the

osmosis process. In high altitude insects glycerol is present which acts as a anti freezing

compound. Nitrogenous waste is present in the form of uric acid.

2. Haemocytes: The blood cells or haemocytes are of several types and all are nucleate.

Different types of haemocytes are as follows:

- a. Prohaemocyte : Smallest of all cells with largest nucleus.
- b. Plasmacyte (Phagocyte) aids in phagocytosis
- c. Granular haemocyte: Contains large number of cytoplasmic inclusions
- d. Spherule cell: Cytoplasmic inclusions obscure the nucleus

- e. Cystocyte(Coagulocyte): Role in blood coagulation and plasma precipitation.
- f. Oenocytoids: Large cells with ecentric nucleus
- g. Adipo haemocytes: Round or avoid with distinct fat droplets
- h. Podocyte: Large flattened cells with number of protoplasmic projections.
- i. Vermiform cells: Rare type, long thread like.

Functions of haemolymph

1. **Lubricant** : Haemolymph keeps the internal cells moist and the movement of internal organs is also made easy.
2. **Hydraulic medium** : Hydrostatic pressure developed due to blood pumping is useful in the following processes.
 - a) Ecdysis (moulting)
 - b) Wing expansion in adults
 - c) Ecolosion in diptera (adult emergence from the puparium using ptilinum)
 - d) Eversion of penis in male insects
 - e) Eversion of osmeteria in papilionid larvae
 - f) Eversion of mask in naiad of dragonfly
 - g) Maintenance of body shape in soft bodied caterpillars.
3. **Transport and storage** : Digested nutrients, hormones and gases (chironomid larva) were transported with the help of haemolymph. It also removes the waste materials to the excretory organs. Water and raw materials required for histogenesis is stored in haemolymph.
4. **Protection**: It helps in phagocytosis, encapsulation, detoxification, coagulation, and wound healing. Non cellular component like lysozymes also kill the invading bacteria.
5. **Heat transfer**: Haemolymph through its movement in the circulatory system regulate the body heat (Thermoregulation).
6. **Maintenance of osmotic pressure**: Ions, amino acids and organic

acids present in the haemolymph helps in maintaining osmotic pressure required for normal physiological functions.

7. **Reflex bleeding:** Exudation of haemolymph through slit, pore etc. repels natural enemies. e.g. Aphids.

8. **Metabolic medium:** Haemolymph serves as a medium for on going metabolic reactions (trahalose is converted into glucose).

Sources

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