

## Lec. 8

# Muscular system in insects

**Myology** : Is the study of the **muscular system**, including the study of the structure, function and diseases of muscle. The muscular system consists of **Skeletal muscles & Visceral muscles** which contracts to move or position parts of the body.

**Muscles power all the movements, external and internal, in insects.** All insect muscles are **striated, like vertebrate cardiac and skeletal muscle.** Insect muscles show high levels of homology to these vertebrate muscles in their structure, protein content, contractility, and regulation.

Insect muscles are mostly translucent, colorless, or grey, though the flight muscles often show a yellowish or brown.

In most skeletal muscles, especially those of the appendages, one end of the muscle is attached to a movable part.

Insects possess two to three times the number of muscles than humans possess.

### HUMANS

1. Cardiac muscle type
2. Smooth muscle type
3. Striated muscle type
4. Myotendonous connections

### INSECTS

1. No cardiac muscle type
2. No smooth muscle type
3. Yes, striated muscle type
4. Myocuticular connections

## Functions Of the Muscular System

1. Support of the body.
2. Helps maintain posture.
3. Movement of the limbs and ovipositor.
4. Movement of the wings.

5. Movement of the viscera.
6. Locomotion.
7. Closure of spiracles.
8. Operation of various pumps such as cibarial pump and the pumping of the poison glands.
9. Generation of heat by 'shivering'.

## TYPES OF MUSCLES BASED ON MORPHOLOGY

1. Cardiac muscles: - not found in insects.
2. Smooth muscles: - not found in insects.
3. **Striated muscles:- found in insects.**

The only muscle type found in insects is striated muscle. **Insects do not have cardiac or smooth muscle types.** Fig :- Cardiac Muscle Fig :- Smooth Muscle Fig :- Striated Muscle.

### ➤ TYPES OF MUSCLES BASED ON MORPHOLOGY

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Fig :- Cardiac Muscle

Fig :- Smooth Muscle

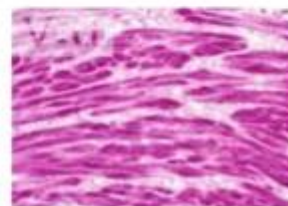


Fig :- Striated Muscle



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## **TYPES OF MUSCLES BASED ON LOCATION**

### **1.Skeletal muscle**

### **2.Visceral muscle**

#### **a. Alary muscle**

#### **b. Dorsal blood vessel**

#### **c. Alimentary canal, including the crop**

#### **d. Reproductive organs and ducts**

#### **e. Venom glands**

#### **f. Organs of defense**

#### **g. Malpighian tubules**

## **Histology of the Muscles**

Each muscle is made up of a number of fibers, which are long, usually multinucleate cells running the length of the muscle. The characteristic feature of muscle fibres is the presence of myofibrils, these are embedded in the cytoplasm i.e Sarcoplasm and extend continuously from one end of the fibre to the other. The fibrils are long serial arrays of contractile units known as Sarcomeres.

## **The structure of skeletal muscles of insects**

The skeletal muscles have a complex structure, which have:

- i. The fibrous contractile system
- ii. The mitochondria
- iii. The tracheal and nervous supply
- iv. The membrane systems
- v. Variations in the histology and ultrastructure of these components are associated with functional differences between different groups of muscles.

## **Types of Skeletal Muscles**

**A.** Cephalic Muscles, The principal muscles of head may be divided into:-

1. Cervical Muscles: - These control the movement of head.
2. Muscles of the Mouthparts
3. Muscles of Antennae

**B.** Thoracic Muscles , The principal Thoracic Muscles may be divided as follows:-

- 1) Longitudinal                      2) Sternal
- 3) Dorsoventral                      4) Leg Muscles    5) Pleural

**C.** The Abdominal Muscles

- Longitudinal
- Transverse

**D.** Muscles Of Flight, The flight movements are caused by three sets of muscles , the direct, indirect and accessory.

### **Degeneration of Musculature**

Degeneration of the flight muscles occur after sexual maturity in many spp. In queen ants and termites due to degeneration of flight muscles reproduction is promoted by releasing amino acids that can be used in egg formation. The alate forms of aphids also undergo flight muscles histolysis after settling on their host plants. } These changes and accompanying hypertrophy of the fat body and resumption of embryo development in the ovaries are caused by hormonal changes. } Degeneration of the indirect flight muscles also occurs in adult females of *Dysdercus* spp where it coincides with oocytes growth and is under endocrine control. } Interesting changes take place in the segmental muscles of the abdomen of *Rhodnius*

spp which undergo periodic regressive and regenerative changes associated with the moulting cycle.