UNIT 1 : SKELETAL MUSCLE AND SENSORY ORGAN

UNIT STRUCTURE

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1.1 LEARNING OBJECTIVES

After going through this unit, you will able to-

- know about the skeletal muscle of human body
- describe the function of skeletal muscle system
- identify the special sensory organs
- know the functions of special organs.

1.2 INTRODUCTION

It is the first unit of this course. At first we will study about the skeletal muscle system of human body. Thereafter we will describe about the most essential special sensory organs of human body.

1.3 SKELETAL MUSCLE SYSTEM OF HUMAN BEING

Skeletal muscle system of human body is also termed as locomotory system. The organ system provide locomotion or in simple word motion to human body with definite co-ordination of muscle and skeleton. Skeletal system consists of a framework of bones, a few ligaments, tendons, cartilage, muscles and some other connective tissues. The system plays

main role in locomotion, protection of the delicate organs as will as the a whole body.

Muscular system : The physical structure of the human body is made up of tissues. Muscle is a specialised connective tissue. These tissues have special properties like excitability, contractility, extensibility and elasticity. Based on their location, the muscles can be identifed as three types.

1. **Skeletal muscle :** Muscles which hold the human skeleton are called skeletal muscles under microscope, they have a striped appearance and so they are named as striated muscles. They are also known as voluntary muscle as their activities are under voluntary control of the nervous system.
2. **Smooth muscle :** The muscles which are on the walls of internal canals of the body are the smooth muscle. They do not exhibit any striation and their activities are not under he voluntary control of the nervous system.
3. **Cardiac muscle :** Muscle of heart are known as cardiac muscle. Though the cardiac muscle appear as the striated muscle their activities are under indirect control of the nervous system.

Structure of Skeletal muscles : There are many types of skeletal muscles. Skeletal muscle consists of various muscle bundles. Some skeletal muscles are comprise of collagenous connective tissue. Muscle fibres are lined by sarcolemma (Plasma membrane) enclosing the sarcoplasm (Cytoplasm of muscle cell). Each muscle fibre is composed of numerous myofilaments or myofibrils. The actin and myosin proteins are found in myofibrils which are the functional unit of muscle contraction and relaxation. Actin and myosin form the light and dark bands respectively. Muscle fibres contract whenever light filament slide over the dark filaments (bands). This phenomenon is known as sliding filament theory. Muscle fibre remain stable during resting (relax) period as no Actomyosin Adenosine Triphosphate (ATP) complex is produced bythe actins and myosins. When neural signals reaches the nerve endings of muscle fibres, then sarcolema get ionised. Ionised sarcolema become active and release calliumion, which changes the structure of actin filament. In this moment, the actin becomes active,

and active actin activates myosin and combine it with ATP energy. As a result cross bridge between actin and myosin break down initiating sliding of light and dark filament which lead to muscle contraction. When nerve impulse decreases binding between myosin and ATP breaks down which create a resting state for myosin and actin filaments leading muscle relaxation. These rhythmic contractions and relaxations provide motion to the voluntary muscle of human body, like the muscles of hands toot etc.

Skeletal system : Skeletal system of the human body consists of bones and cartilages. Bones and cartilages are some specialised connective tissues. Bone cells ie., osteocytes have very hard matrix due to calcium salt in it and cartilages have slightly pliable matrix due to chondroitin salts.

Skeletal system of human beings is made up of 206 bones and a few cartilages. It is grouped into two main divisions–

1. Axial skeleton, 2, Appendicular skeleton.

1. **Axial Skeleton :** It is comprised of 80 bones distributed along the main axis of the body. It consist of the skull, vertebral column, sternum and ribs.

   Skull : The skull is composed of two sets of bones-cranial and facial, with a total of 22 bones. 8 cranial bones form the hard protective outer covering, of the brain and the rest 14 bones form the facial region. Each middle ear consist of three tiny bones– Malleus, Incus and stapes. The skull region articulates with the superior region of vertebral columna with the help of two occipital condyles.

   Vertebral Column : The skeletal axis which keep human body in a straight posture is known as vertebral column. It is dorsally placed. The spinal cord passes through the neural canal of vertebral. The vertebral column protects the spinal cord as well as it keeps our body active. Vertebral column is differentiated into cervical, thoracic, lumber, sacral and coccygeal regions starting from the skull.

   Sternum : It is a flat bone an the ventral midline of thorax. There are 12 pairs of ribs in human body. Out of 12 pairs first 7 pairs are called as true ribs. Rest of the pairs are called false ribs as they do not articulate directly with the sternum.

2. **Appendicular Skeleton :** The bones of the limbs alongwith their girdles constitute the appendicular skeleton. The bones of the hand are humerous, radius and ulna, carpels, metacarpals and phalanges. Bones of the legs are– femur, tibia and fibula, tarsals, metatarsals and phalanges. Knees are covered ventrally by a cup shaped bone called patella. The upper and lower limbs are articulated with the axial skeleton by pectoral and pelvic girdle bones respectively

The point of contact between bones or between cartilages and bones are called 'Joints'. Joints are classified into three major forms depending on the structure. They are– fibrous joint, cartilaginous and synovial joint.

Fibrous joints are seen on the flat skull bones fusing end to end to form the cranium. They don't provide any motion to the body.

The bones involved in the cartilaginous joints are joined together by cartilages. The adjacent vertebrae of vertebral column are joined by cartilaginous joint which permit limited movement.

In synovial joints a fluid filled synovial cavity persist between the articulating surface of bones. Due to such structural arrangements, synovial joints allow considerable movement to body. Some example of synovial joints are–

a) Hinge joint (knee and elbow joint).
b) Ball and socket joint between arm and soldier).
c) Pivot joint etc.

Joints articulate the bones and provide motion to the skeletal system : Cartilages arrange themselve between bones so as to check abrasion or friclion. These arrangements of bones, cartilages and muscle allow human body to carry out the daily activities.

Locomotion need co-ordination between the function of muscle and skeletal system and hence bones must be articulated with muscles, skeleton, ligament and tendon provide locomotion to our body.

'Disorders of skeletal muscle system'

Arthritis, Rheumatism, Bursaitis, carpel tunnel syndrome, dislocation, sealiosis, sprain, tendonitis, Mysthenia gravis, muscular distrophy, tetany, gout etc.

1.4 SPECIAL SENSORY ORGAN

There are many types of sensory organs in human body. These organs play important role to provide sense of the environment or surroundings. The special sensory organs of human body are–

Olfactory organ – Nose

Hearing organ – Ear

Taste organ – Tongue

Optic organ – Eye

Sense organ – Skin.

Eye : Human beings have two eyes on their face. The eyes are their optical organs. They see the world with the help of these two eyes. The eyes are composed of eyeball, eyelid, eyelash etc.

The wall of the eye ball is composed of three layers. The external, middle and inner layers are called sclera, choroid and retina respectively. The anterior portion of the sclera is called cornea. It is covered by another thin layer embedded with blood capillaries. It is known as conjunctiva. Choroid hold the eye ball through which light emerges to eye. Size of the eyeball varies depending on the intensity of the light onsided. There is a lens inside the eye balled which is held by two pairs of muscle tissues. With the help of this lens image is sent inside the eyes. The most important part of eye is 'retina'. With the help of the retina, man performs the work of seeing. It is composed of some nerve fibres and light sensitive cells. Two types of special cells are found in retina namely rods and cones. Rod cells are responsible for twilight vision. They cannot analyx colour vision. Daylight and colour vision analysed by the cone cells.

Eye is a spherical cave like-organ. There is a cave inside the spherical organ and the cavity is filled with thin liquid substance. This fluid maintain the definite size of eye and it keep the different parts of the eye in fresh condition. Light refracts through the fluid and talls in the retina. There are two tear glands in the upper part of the eyes. Tear keeps our eyes clean and moist.

Retina accept the scenes which enters through the lenses from

outside. Thus retina mainly provide us vision. In absence of ratiner, man loses vision.

Disorders of eye : The outer cover of eye may acquire various infections. As a results of infection of the onter cover of the eyes, the eyes may be attacked by different kinds of disease. Due to fault in the different parts of the eye a person may have defective vision or may be become blind also, chance of developing eyes discases is more in Diabetes patients.

Hearing Organ : The Ear : The ear is the hearing organ of human being. There are three main section of human ear. The external ear articulate from our head called vestigeal organs. They do not perform hearing function. The external ear just create a wave sound. The next part near the outer ear is middle ear. It consist of the sound amplifying membrane called tympanix membrane (ear drum). The extreme internal section of ear is the inner ear. It accept the sound. It is a complex organ comprising of many small parts. The sound accepting phenomenon of the inner ear is very complex. The measuring unit of sound is herty. Human being can hear the sound between 20 hz to 20,000 hz. Ear performs not only sound receiving function but also controls balancing function of the body.

Man become deaf, when he loses hearing capacity. Deafness is the principal disorder of ear. Some people are deaf by birth ie., they suffer from sound receiving problem from birth. This problem may arise even after birth also. Deafness occur due to different illness of the organs of the ear.

Olfactory Organ : The Nose : The nose exists on our face just between the two eyes. Nose is the olfactory organ of human being. It has two nasal pathways. These nasal paths are connected with the environement by two nosetrils. Human being take breath and get smell with the help of nose. Wall of the nose remain moist due to presence of numerous hair and glands. There are some olfactory cells on the internal surface of the nose. The olfactory cells on the nose provide the sense of smell.

Taste Organ : The Tongue : The tongue which lies inside the mouth cavity is the tongue. The prime function of the tongue is to sense taste.

Another major function of it is to control sound. About ten thousand taste cells are there in our tongue. These cells protrude out as taste buds from the tongue. These tast buds are responsible for different taste of foods.

Sense Organ : The Skin : The skin that covers the hole body is the main sense organ of human being. Skin enables us to feel touch and hence it is called as sensory organ. Skin also provide the feeling of cold, heat, strain, stress, pain etc. along with the feeling of touch. Skin contain numerous sweat glands to accept stimuli. There are numerous sensory nerve cells in the skin to accept stimuli. These nerve cells send the stimuli to brain via the nerve fibres. Different types of cells are there in the skin to accept different types feelings. Some of them accept the feeling of heat whereas others accept the sense of touch. These sensory cells are spread through out the skin.



CHECK YOUR PROGRESS

Q 1: What is the main function of skeletal muscle system?

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Q 2: What is vertebral column ?

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Q 3: What is tendon ?

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Q 4: Which is the most important past of eye ?

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Q 5: Which is the sense organ of human body ?

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1.5 LET US SUM UP

- The skeletal muscle system of human body is also termed as locomotor system. This system provide motion to human being with the help of muscles and skeleton. This system is consisted of skeleton, muscle, cartilage, bone tendon, ligament, joint and other connective tissues.
- The skeletal system of human body is made up of bones and cartilages. Bones and cartilages are some special connective tissue. Bone cells have very hard matrix due to presence of calcium salt in it, whereas cartilages have slightly pliable matrix due to condroitin salts. Human skeleton is consist of 206 bones and a few cartilages.
- Eye is a sperical cave like organ. The cavity fills with some thin liquid substance fluid. This fluid maintains the definite structure of the eyes and keep the internal organelles of the eye fresh. Light refracts through the fluid and falls on the retina. There are two tear glands in the upper portion of the eyes. Tear keeps the eye moist and clean.



1.6 FURTHER READINGS

1) ‘Nesvous System - Human body. Pegasus.
2) ‘Glenco Science - Human body System, Mc Graw.



1.7 ANSWERS TO CHECK YOUR PROGRESS

Ans to Q No 1: The main function of the skeletal muscle is to provide protection to the body and its delicate organs. It also provide locomotion to human being.

Ans to Q No 2: The skeletal axis that keeps human body in a straight posture is known as vertebral column.

Ans to Q No 3: In human body, some wire like tisure articulate muscle with bones. These are called tendons.

Ans to Q No 4: Retina.

Ans to Q No 5: The skin that covers the human body is the sensory organ.



1.8 MODEL QUESTIONS

Q 1: Define skeletal muscle system.

Q 2: How many types of muscle are here ?

Q 3: Write short note on–

a) Vertebral column, b) The skull, c) Sternum.

Q 4: Write the name of special sensory organs.

Q 5: Draw a labelled diagram of the eye ball.

Q 6: Which is the hearing organ ?

Q 7: Which is the olfactory organ ?

Q 8: Write short note on–

a) The tongue b) The nose c) Skin

d) Inner ear e) Retina.

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