Unit 9  Types of Muscle Tissues

1. Warm-up

What is your opinion?
Information is not knowledge. (A. Einstein)

2. Reading

Task 1

Following terms are related to muscle tissue. The three types of muscle tissue are: voluntary, involuntary and cardiac. Indicate to which type of muscle the following statements relate.

a) ……………………… also called striated.
b) ……………………… the muscle of the heart.
c) ……………………… also called skeletal.
d) ……………………… also called smooth muscle.

There are over 650 muscles in the body, including 100 muscles in the face. It takes about 17 muscles to smile, but about 43 to frown.

Over 600 skeletal muscles function for body movement through contraction and relaxation of voluntary, striated muscle fibers. These muscles are attached to bones, and are typically under conscious control for locomotion, facial expressions, posture, and other body movements. Muscles account for approximately 40 percent of body weight. The metabolism that occurs in this large mass-produces heat essential for the maintenance of body temperature.

There are three different types of muscle tissue. These include the skeletal muscles which are under voluntary control and are made of striated muscle tissue, the visceral muscles which are under involuntary control and are made of smooth muscle tissue, and cardiac muscle tissue which is found only in the heart. All muscles always work in pairs because they can contract and relax but cannot push or stretch themselves.

Skeletal muscles

Skeletal muscles are also called striped muscles or voluntary muscles, they are attached to bones and move the skeleton. They control the movement of the body in relation to the environment, e.g., hands, arms, legs, neck, trunk, eyes.

Skeletal muscles have three main functions:
1. movement of bones (by contraction and relaxation of muscles, e.g. when one muscle contracts in response to a nerve impulse, the other must relax or stretch),
2. maintenance of body posture,
3. production of body heat.

They can be found on the legs, arms, face and jaw, often in pairs of antagonistic muscles. A pair of muscles, the biceps and triceps, are used to bend and straighten the elbow. A skeletal muscle has regular, ordered groups of fascicles, muscle fibers, myofibrils, and myofilaments. Epimysium (thick connective tissue) binds groups of fascicles together. A fascicle has muscle fibers; perimysium (connective tissue) envelops the fascicle. Endomysium (connective tissue) surrounds the muscle fibers.

Skeletal muscle is a system of pairs that relax and contract to move a joint. For example, when front leg muscles contract, the knee extends (straightens) while back leg muscles relax. Conversely, to flex (bend) the knee, back leg muscles contract while front leg muscles relax.

Some muscles are named for their ability to extend or flex a joint; for example, extensor carpiradialis longus muscle and flexor digitorum brevis muscle. Skeletal muscles have muscle tone (remain partly contracted), which helps maintain body posture. On going signals from the nervous system to the muscle cells help maintain tone and readiness for physical activity.

Skeletal muscle aids in heat generation. During muscle contractions, muscle cells expend much energy, most of which is converted to heat. To prevent overheating, glands in the skin produce sweat to cool the skin; and, the body radiates heat from the blood and tissues through the skin. When the body is chilly, shivering causes quick muscle contractions that generate heat.
Figure 9.1 Skeletal muscles - frontal view

(available on <http://www.fitstep.com/advanced/anatomy/bodyfront.htm>)
Smooth muscles

Smooth muscle is throughout the body, including in visceral (internal) organs, blood vessels, and glands. Like cardiac muscle, smooth muscle is involuntary. Unlike skeletal and cardiac muscle, smooth muscle is nonstriated (not banded). Smooth muscle, which is extensively within the walls of digestive tract organs, causes peristalsis (wave-like contractions) that aids in food digestion and transport.

Except the heart, any action that the body performs without conscious thought is done by smooth muscle contractions. This includes diverse activities such as constricting (closing) the bronchioles (air passages) of the lungs or pupils of the eye. Smooth-muscle cells lack striations, have just one nucleus, and have rather simple, relatively unordered contractile systems. Smooth-muscle contractions are usually slow.
Cardiac muscle

Cardiac muscle contracts and relaxes to pump blood automatically without thinking about it. Cardiac muscle is only in the heart and makes up the atria and ventricles (heart walls). Like skeletal muscle, cardiac muscle contains striated fibers. Cardiac muscle is often called involuntary muscle because conscious thought does not control its contractions. Specialized cardiac muscle cells maintain a consistent heart rate. Cardiac-muscle cells have only a single nucleus and typical sarcomeres and are tightly bound to each other by specialized junstions – intercalated disks. Such disks pass ions and electrical currents, so that the cardiac-muscle cells are coupled electrically.

Figure 9.3 Three types of muscle fibres
(available on <http://www.mona.uwi.edu/skel/card/smooth.jpg>)
Task 2

Fill-in the missing prepositions.

1. There are three different types ___________ muscle tissue.
2. These include the skeletal muscles which are ___________ voluntary control, smooth muscle tissue and cardiac muscle tissue which is found ___________ the heart.
3. Skeletal muscles are attached _______ bones and can be found _______ the arms and legs.
4. Smooth muscles contract to move substances ________ the organs.
5. Cardiac muscle contracts and relaxes to pump blood automatically ________ thinking about it.

3. Grammar Presentation

Adverbs of frequency

Adverbs of frequency tell how often something happens. These words come after a form of the verb to be: *Cardiac muscle tissue is usually found in the heart.*

Adverbs of frequency come before other main verbs besides to be: *Cardiac muscle usually contracts and relaxes to pump blood automatically.*
Task 1

Read the text about types of muscle tissues once more and underline all adverbs formed by adding the ending –ly to the adjective and adverbs of frequency.

Task 2

Complete each sentences using adverbial or adjectival form of the given expressions.

careful/carefully, serious/seriously, bad/badly, heavy/heavily

1. Tom is a ___________ driver.
2. He drove ___________ along the narrow road.
3. He has ___________ injuries.
4. We didn’t go out because of the ___________ rain.
5. She fell and hurt herself quite ___________.

4. Communication Activity

Put the sentences in the correct order and then make similar conversations with other symptoms at the doctor’s.

1. I didn’t feel well.
   _ She took my temperature and examined me.
   _ After a few days, I started to feel better.
   _ I went to the surgery and saw the doctor.
   _ I went to the chemist’s, paid for the perscription, and got some antibiotics.
   _ I phoned the doctor’s surgery and made an appointment.
   _ She told me I had an infection.
   _ I explained what was wrong.
   _ She gave me a prescription.

Use these useful phrases.

➢ What’s the matter with you?
➢ What’s the trouble?
➢ How do you feel?
➢ What happened to you?
➢ Where do you feel pain?
➢ I have trouble with….
➢ I feel faint.
➢ I feel dizzy.
➢ I feel very bad (poorly).
➢ My nose is bleeding.
➢ Let me examine you.
➢ Does it hurt all the time?
- The nurse will give you an injection.
- Have you got a cough?
- Open your mouth and stick out your tongue.
- Put cold compresses on it.
- Take these pills three times a day.
- He is badly hurt/injured.
- I feel pains in my muscles and joints.
- I have a headache.
- I have a bad cough.
- I have a cold.
- I have a sore throat.
- I have a stomachache.
- I have a backache.
- I have a toothache.
- I must send you to hospital.
- You must stay in bed for several days.

**Revision Unit 5-9**

**Answer the questions**

1. Describe the short bones and give some examples of them.
2. What is your suggestion how to be healthy and slim?
3. What types of examinations do you know if a patient has a broken leg?
4. What is the ligament and what is its function in the body?
5. Describe the characteristics of muscles.

**Translate into English language**

1. - priečne pruhovaný a hladký sval
2. - uvoľnený a skrátčený sval
3. - pohyblivý a nepohyblivý kĺb
4. - začervenanie, opuch a odumretie kostného tkaniva
5. - komplikovaná zlomenina je vážna, pretože cievy, svaly a nervy môžu byť poškodené.

**Translate into Slovak language**

1. - sesamoid bones develop in some tendons where is considerable pressure, tension, friction or stress
2. - ligaments support many internal organs
3. - cardiac muscle contracts and relaxes to pump blood
4. - skeletal muscle aids in heat generation
5. - after reduction the bone is immobilized with a cast, traction or both.
Vocabulary

antagonistic [æntægə'nistɪk] – protikladný, protiľahlý
bend [bend] – ohnutie, ohyb
blood [blad] – krv
conscious [kon'shɑs] - vedomý, vedomie
consistent [kən'sistnt] - súdržný, konzistentný
heart [ha:t] – srdce
heat [hi:t] – teplo
hollow [holəu] – vyhlíbť, dutina
jaw [dʒo:] – čeľusť, ďasno
elbow [ˈelbʊ] – laket'
endomysium [endə'miziəm] – väzivo oddeľujúce svalové vlákna
epimysium [epi'miziəm] – väzivová pokrývka, svalová pošva
fascicle [fæsikl] – zväzok, povrazec
involuntary [ɪn'vɔləntəri] – nedobrovoľný
intercalated [ɪntəˈkeɪtɪd] – vložený, vsunutý, medzitkaniovový
intestines [ɪn'teɪstɪn] – vnútornosti
iris [ˈaɪrɪs] – dúhovka
maintenance [ˈmeɪntənəns] – udržba, podpora
multiple [ˈmʌltɪpl] – mnohonásobný
nucleus, pl. nuclei ['nju:kliəs] – jadro, jadrový
posture [ˈpɔstʃə] – pozícia
pump [pʌmp] – pumpovať
skeletal [ˈskeɪtl] – kostrový
smooth [smu:θ] – hladký
stretch [streʧ] – natiahnuť, natiahnutie
striated [straiˈeɪtɪd] – pruhovaný, ryhovaný
straighten [ˈstreɪtn] – narovnať sa
striped [ˈstraipt] – pruhovaný
substance [ˈsʌbsntɪs] – podstata, jadro
viscera [ˈvɪsərə] – útroby
visceral [ˈvɪsərəl] – útrobný
voluntary [ˈvɒləntri] – dobrovoľný