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Department of Biomedical Engineering

Vision Title 2

Vision Title 3

Course Name: 23BMT201 Human Anatomy & Physiology

I Year : II Semester

Topic : UNIT 2- Structure of Muscles and its Function

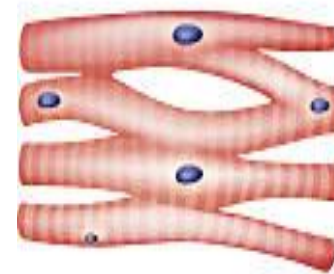
Muscle

- Muscle is a **soft tissue** ,one of the animal tissues that makes up the three different types of muscle.
- Muscle is formed during embryonic development, in a process known as **Myogenesis**.
- Muscle growth is determined by an increase in muscle fiber number (**hyperplasia**) as well as an increase in muscle fiber size (**hypertrophy**).
- **Tendons** are made of strong fibrous connective tissue and they connect muscle to bones.

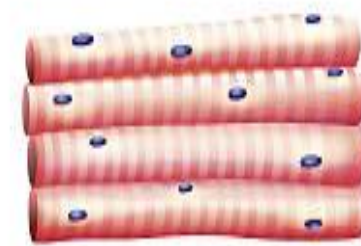
Types of Muscle

- There are three major muscle types found in the human body: **skeletal**, **cardiac**, and **smooth muscle**.
- The **gluteus maximus** is the largest muscle in the human body.
- **Stapedius muscle** is termed to be the smallest skeletal muscle in human body which has a major role in **otology**.
- There are more than **600 muscles** present in the human body.

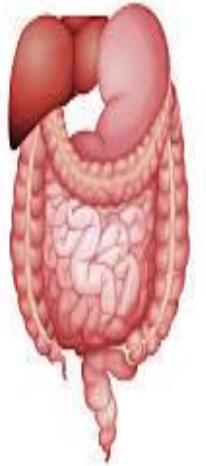
Types of Muscle



Cardiac muscle



Skeletal muscle

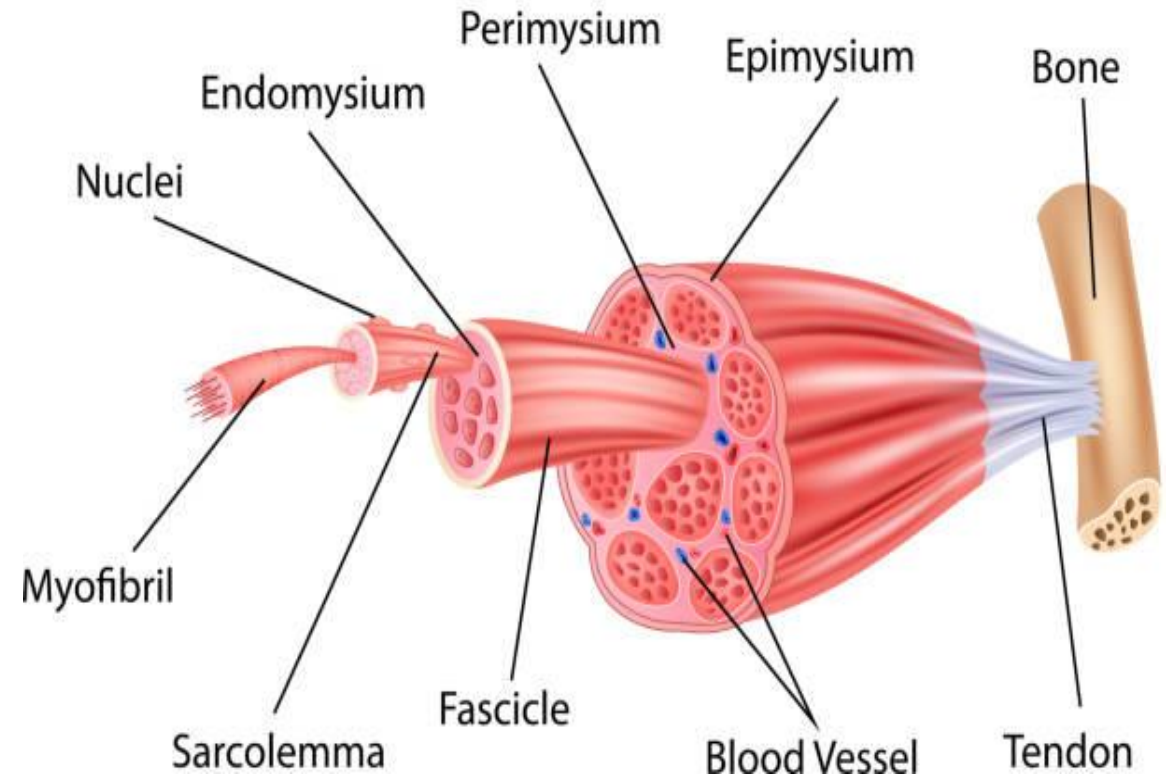


Smooth muscle

Skeletal muscle

- Skeletal muscles comprise **30 to 40%** of your total body mass.
- These muscles are also called **voluntary muscles** as they come under the control of the nervous system in the body.
- Each skeletal muscle consists of thousands of muscle fibers wrapped together by **connective tissue sheaths**.
- The individual bundles of muscle fibers in a skeletal muscle are known as **fasciculi**.
- Skeletal muscles contain connective tissue, blood vessels, and nerves.
- There are three layers of connective tissue: epimysium, perimysium, and endomysium.

Structure of Skeletal Muscle

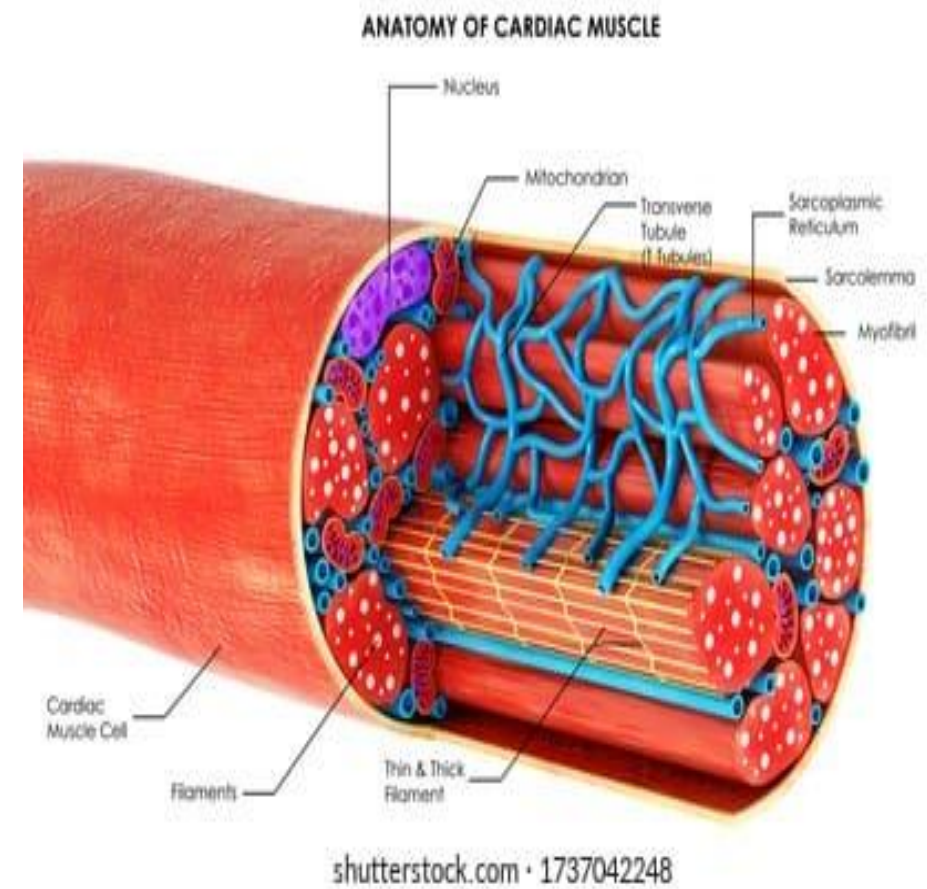


Functions of skeletal muscle:

- Skeletal muscles enable humans to move and perform daily activities.
- They play an essential role in respiratory mechanics and help maintain posture and balance.
- They also protect the vital organs in the body.
- The main functions of skeletal muscle are to contract to produce movement, sustain body posture and position, maintain body temperature, store nutrients, and stabilize joints.

Cardiac muscle:

- The individual cardiac muscle cell (**cardiomyocyte**) is a tubular structure composed of chains of myofibrils, which are rod like units within the cell.
- The myofibrils consist of repeating sections of **sarcomeres**, which are the fundamental contractile units of the muscle cells.
- Cardiomyocytes cells are sometimes called **contractile myofibrils** because they are long and cylindrical and contract at a regular rate to keep blood flowing through the heart.
- Longer refractory period than skeletal muscle (**slower contract**).
- Fibers are branched; connect to one another at intercalated discs.
- The discs contain several gap junctions.

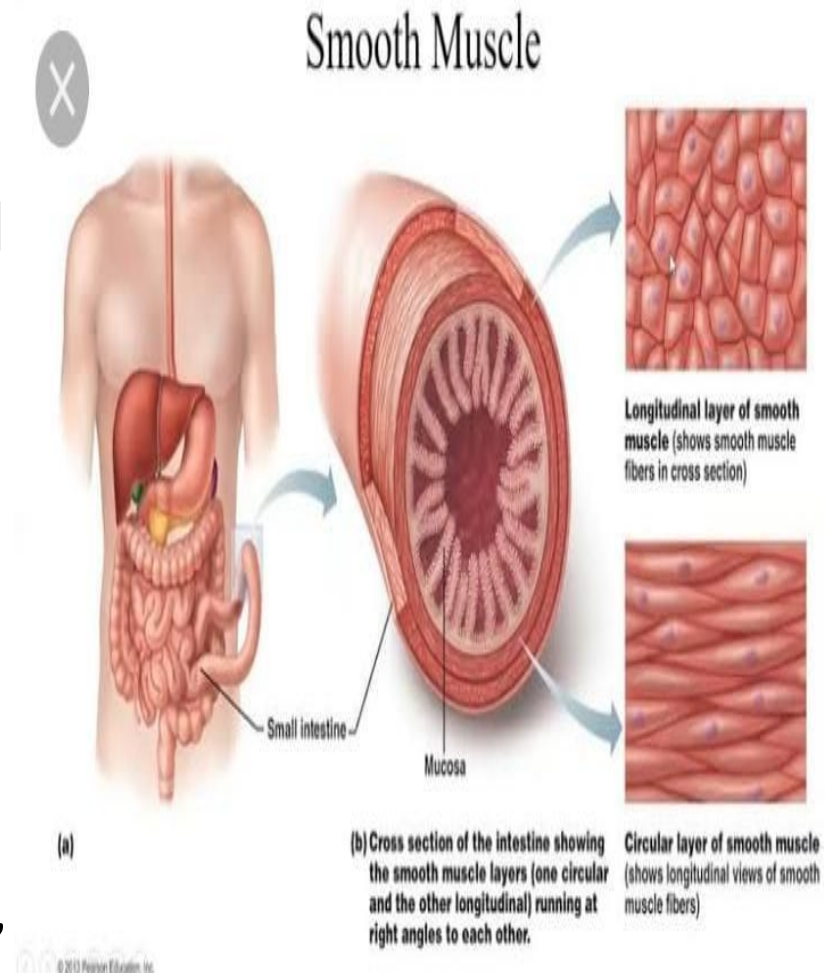


Functions of cardiac muscle:

- Increase refractory period.
- Increase blood flow to the heart- capillary density is 4 times higher.
- Aerobic metabolism – lactic acid formation is not there.
- Cardiac muscle helps to conduct electric impulse.
- The contractions of cardiac muscle cells pump blood through the heart and through the blood vessels of the circulatory system.

Smooth muscle:







- Smooth muscles fibers contain **numerous myofibrils** that are oriented along the long axis of the fiber, and which extend from end to end within the fiber.
- These myofibrils are composed of the same thin myofilaments of **actin** and **myosin** contained in the other muscle tissues, except that they are arranged in a more random fashion.
- They are involuntary also called **visceral muscle**.
- The smooth muscle are **fusiform** in shape.
- Smooth muscle is found in the wall of hollow organs, passageways, tracts, eyes and skin.



Functions of smooth muscle:

- Smooth muscles helps to control diameter, regulate blood flow, and also regulate air flow.
- Smooth muscle helps to move food through the digestive tract.
- Smooth muscles helps to regulate air flow in lungs.
- Activation is involuntary.
- It is fatigue resistant.

Comparison of Muscles:

	Skeletal Muscle	Cardiac Muscle	Smooth Muscle
			
Location	Attached to bone	Heart	Walls of hollow organs, blood vessels, and glands
Appearance			
Cell Shape	Long, cylindrical	Branched	Spindle-shaped
Nucleus	Multiple, peripheral	Usually single, central	Single, central
Special Features	—	Intercalated disks	Cell-to-cell attachments
Striations	Yes	Yes	No
Autorhythmic	No	Yes	Yes
Control	Voluntary	Involuntary	Involuntary
Function	Move the whole body	Contract heart to propel blood through the body	Compress organs, ducts, tubes, and so on