



**Faculty of Biological Science and Technology**  
**Zoology and Botanical Department**  
**Practical Histology**

## **Muscular Tissue**

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## Muscular tissue

- ▶ Muscular tissue is composed of cells that specialized for constriction; so they are able to move different part of body
- ▶ Muscular tissues are highly cellular and have a well-developed supply of blood vessels
- ▶ Special terminology for muscular tissue

<b>muscular cell</b>	<b>muscular fiber</b>
cell membrane	sarcolemma
cytoplasm	sarcoplasm
endoplasmic reticulum	Sarcoplasmic reticulum

- ▶ There are three types of muscular tissue:

striated (skeletal) muscular tissue



cardiac muscular tissue



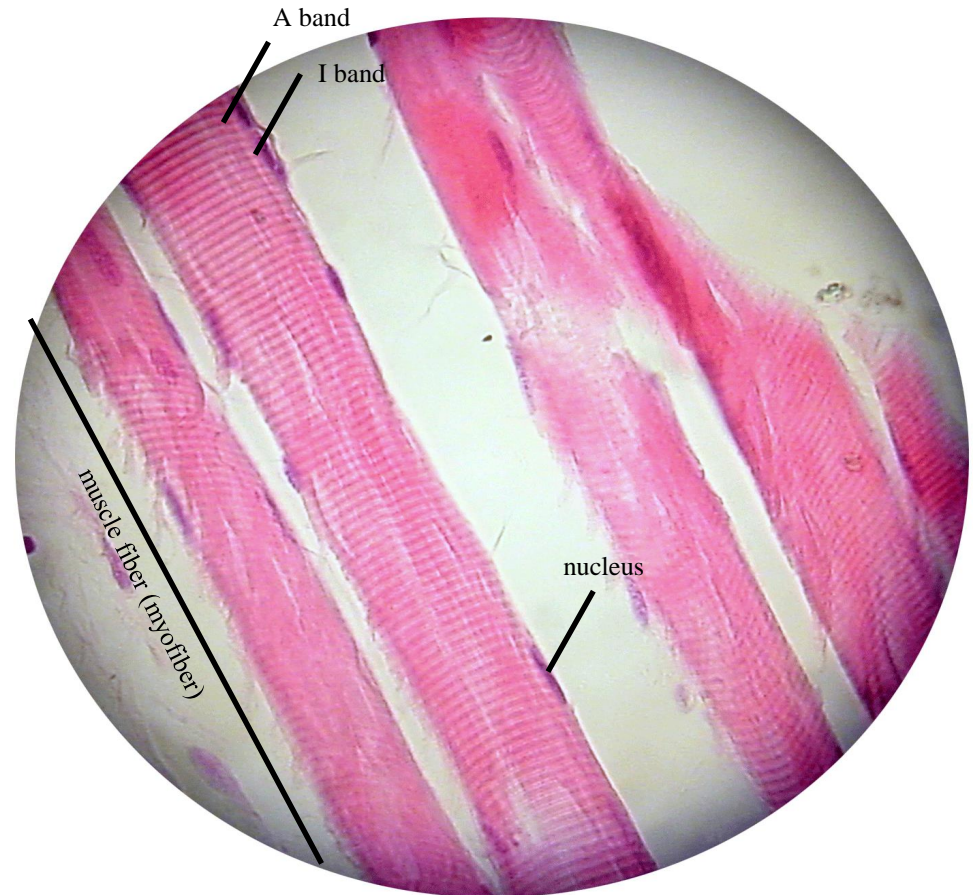
smooth (visceral) muscular tissue





## Striated (skeletal muscular tissue)

- ▶ Skeletal muscle tissue is composed of cylindrical fibers, with about 10-100 $\mu$ m diameter and many centimeters long. Because of special development during embryogenesis, each skeletal fiber has more than one nucleus (multinucleated)
- ▶ Nuclei normally are located at periphery of the myofibers just below the sarcolemma. This placement order makes an important hallmark of skeletal muscle fibers
- ▶ Skeletal fibers appear striated, when is observed under a light microscopy. The striation is due to the regular repetitions of contractile proteins along the length of myofibrils. This arrangement is known as dark and light band. The dark bands contain myosin and refract light; so is called anisotropic band (A-band). There are light areas between dark bands which contain actin; so is called isotropic band (I-band)

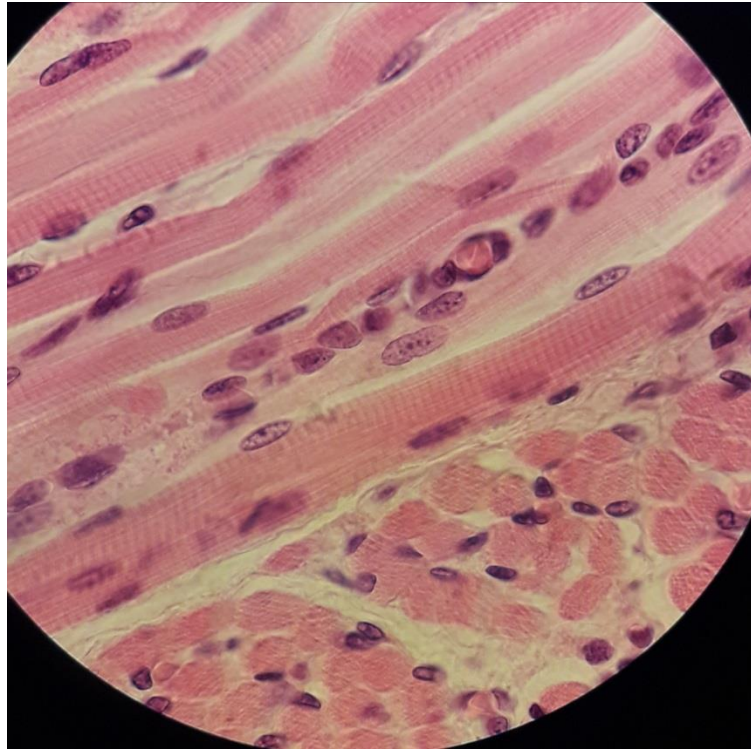


Longitudinal section of skeletal muscle fibers, H&E, 100X. This picture is taken from histological slide in histology laboratory of Isfahan University



## Striated (skeletal muscular tissue)

- ▶ The striated pattern of skeletal fibers are just observed in longitudinal sections

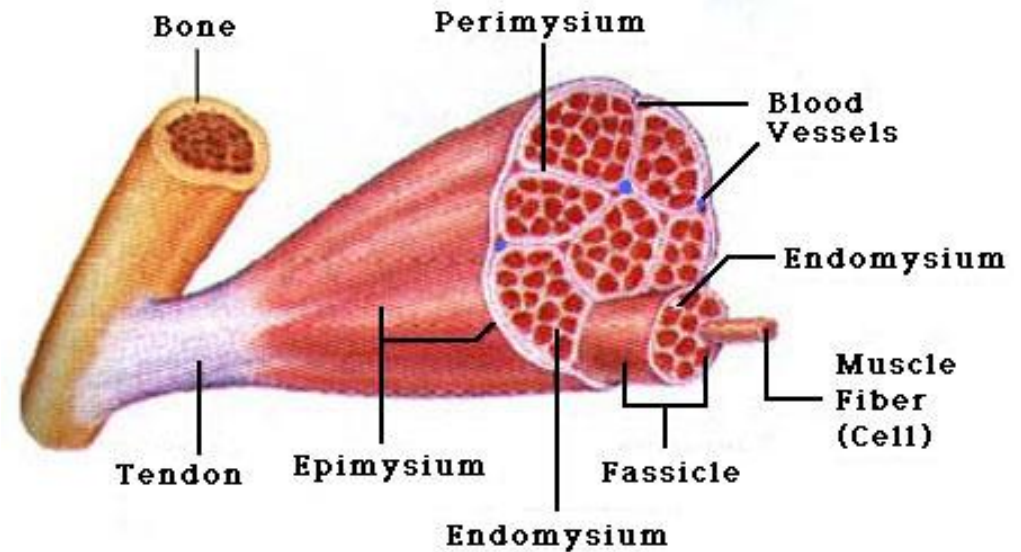


Skeletal muscle fibers, H&E, 100X. Compare longitudinal section (above) and cross section of skeletal muscle fibers. This picture is taken from histological slide in histology laboratory of Isfahan University



## Skeletal muscle structure

- ▶ Skeletal muscle fibers are surrounded by connective tissue layers
- ▶ Skeletal muscle is surrounded by a sheath of dense connective tissue which is known as epimysium. It consists mainly of collagen fibers. Connective tissue that is called septum radiate from epimysium into the muscle and dividing it into bundles of muscle fiber which is known as fascicles. Large vessels and nerves move through septa
- ▶ Perimysium is another connective tissue layer which surrounding each fascicle
- ▶ There is a thin layer of reticular fiber and fibroblasts that surrounds every single muscle fiber. It is known as endomysium. There are many capillaries and nerve ending in endomysium

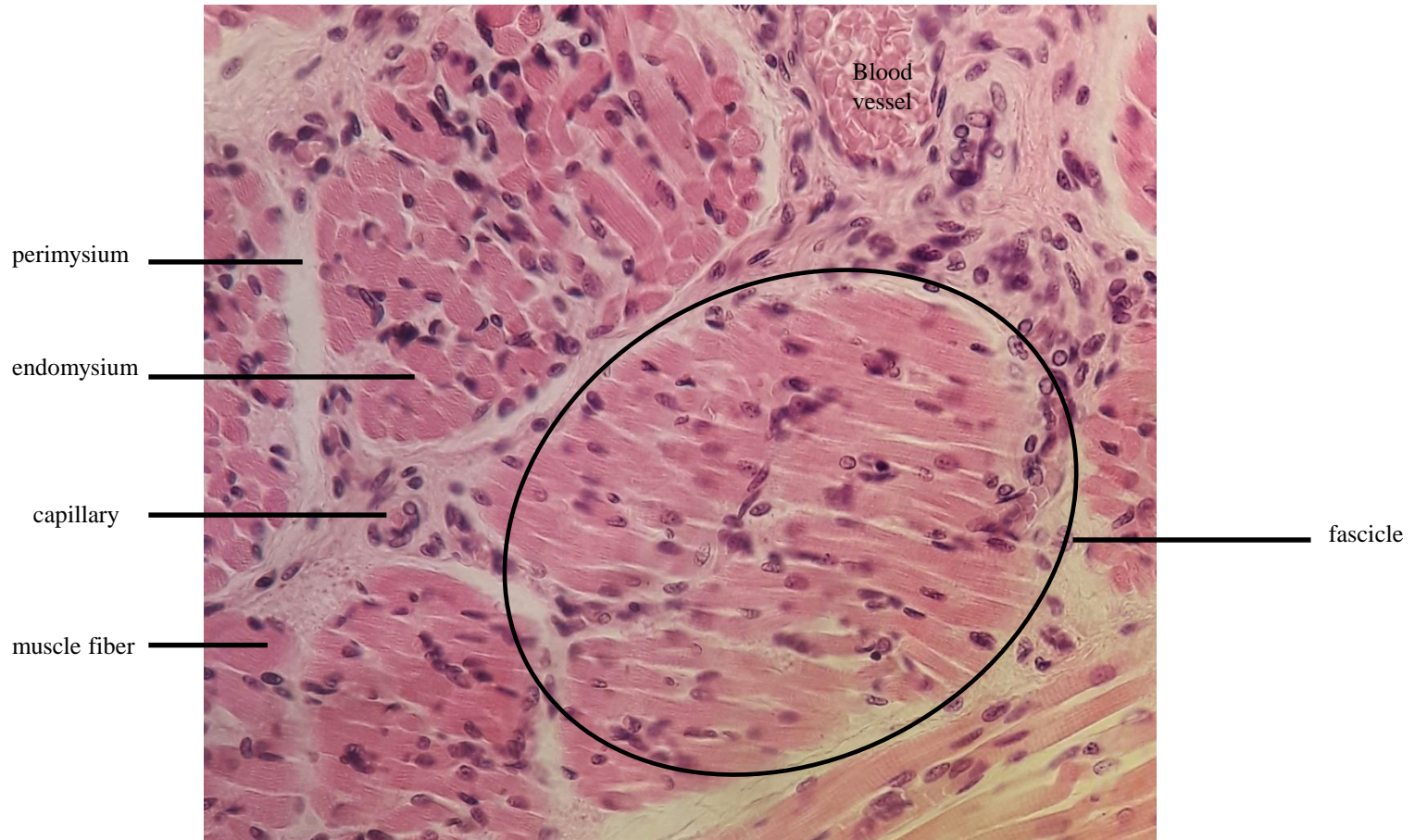


Skeletal muscle structure. From [http://people.eku.edu/ritchisong/378\\_muscle.htm](http://people.eku.edu/ritchisong/378_muscle.htm)





## Skeletal muscle structure



Skeletal muscle structure, H&E, 40X. This picture is taken from histological slide in histology laboratory of Isfahan University



## Cardiac muscle tissue

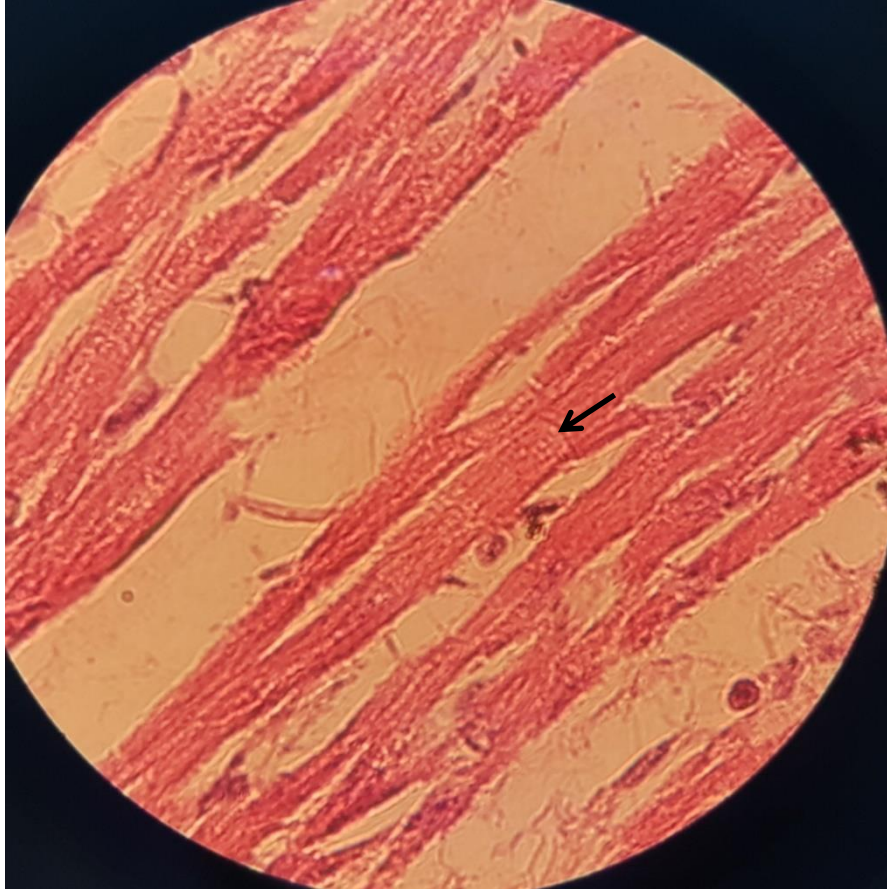
- ▶ Cardiac muscle fibers are also striated
- ▶ Mature cardiac fiber has a 15-30  $\mu\text{m}$  diameter and 85-120  $\mu\text{m}$  length; so they are shorter and smaller than skeletal muscle fibers
- ▶ Cardiac muscle fibers are cylindrical branched and join together by intercalated disk
- ▶ Intercalated disks are the most characteristic feature of cardiac muscles. They are look like dark-staining lines under a light microscopy dividing adjacent cardiac muscle fibers and running perpendicular to the direction of muscle fibers
- ▶ Cardiac muscle fibers have a one or two pale nuclei located centrally



Longitudinal section of cardiac muscle fibers; black arrow depicts branch location; H&E, 100X. This picture are taken from histological slide in histology laboratory of Isfahan University



## Cardiac muscle tissue



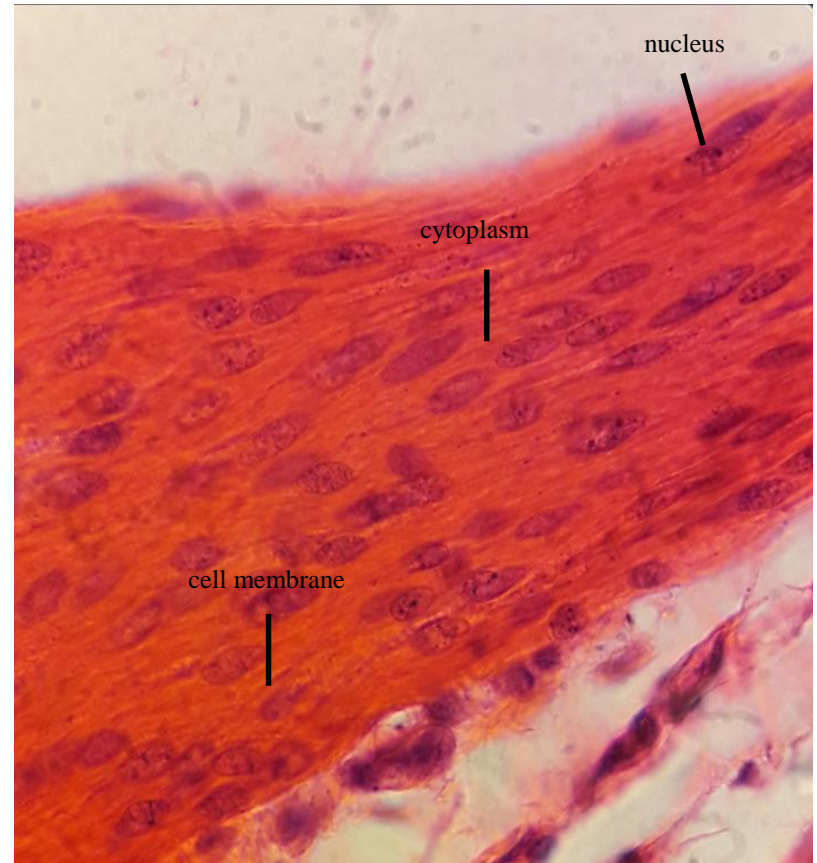
Longitudinal section of cardiac muscle fibers; black arrow depicts intercalated disk; H&E, 40X. This picture is taken from histological slide in histology laboratory of Isfahan University





## Smooth (visceral) muscle tissue

- ▶ Smooth muscle fibers are non-striated, spindle shaped, and have a single centrally located nucleus in the widest part of the cell
- ▶ Usually the narrowest part of smooth muscle fiber is located adjacent to widest part of surrounding fibers
- ▶ Each smooth muscle fibers is 20-500  $\mu\text{m}$  in length



Cross section smooth muscle fibers; H&E, 40X. This picture is taken from histological slide in histology laboratory of Isfahan University