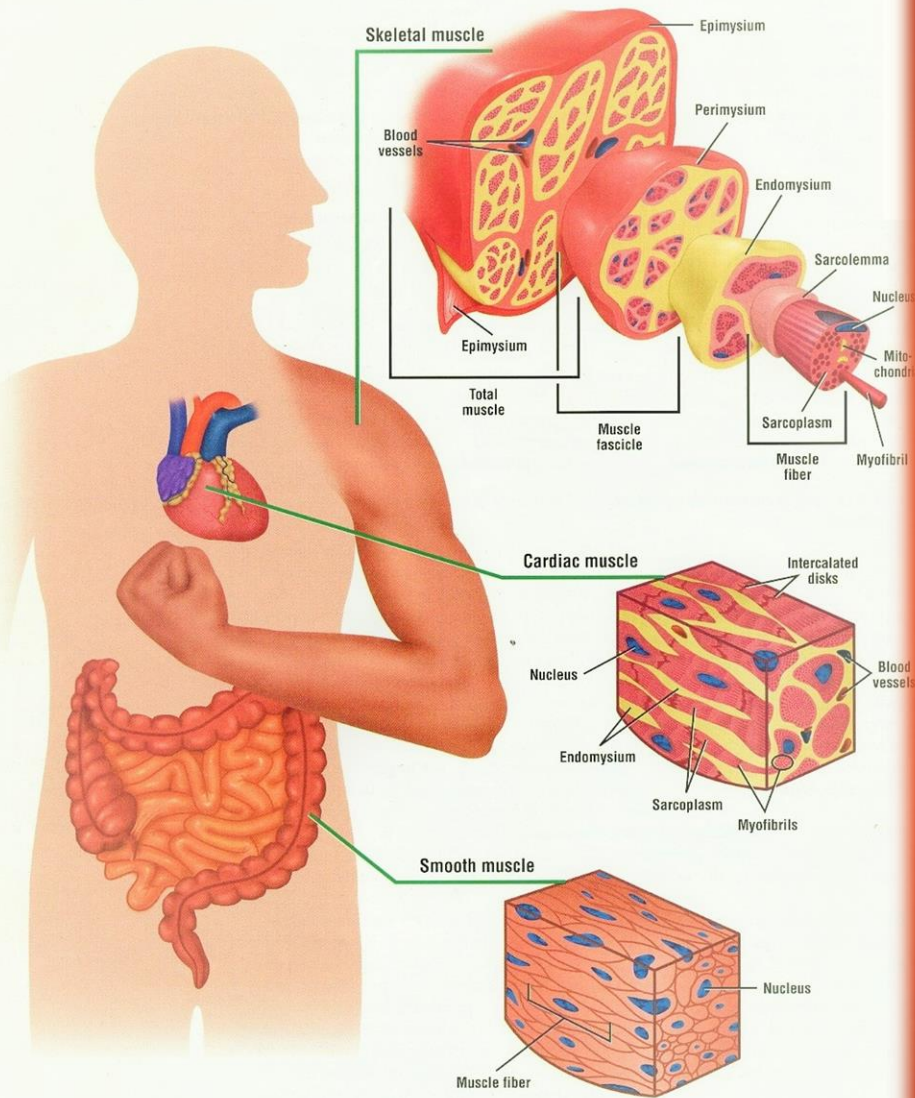


In The Name Of God

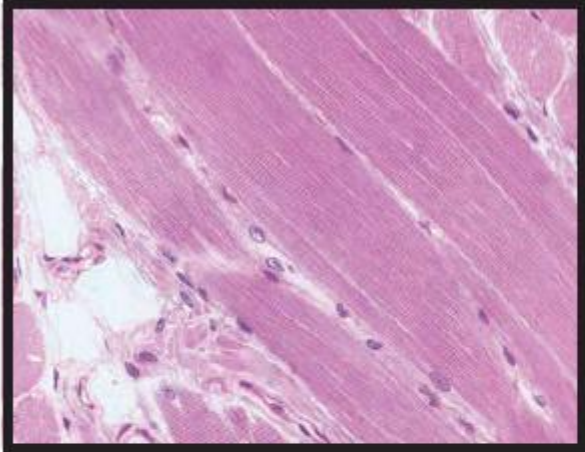




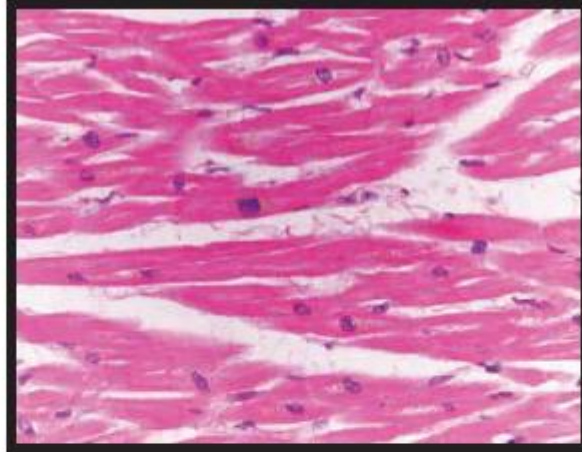
OVERVIEW FIGURE ■ Microscopic illustrations of the three types of muscles: skeletal, cardiac, and smooth.

MUSCULAR TISSUE

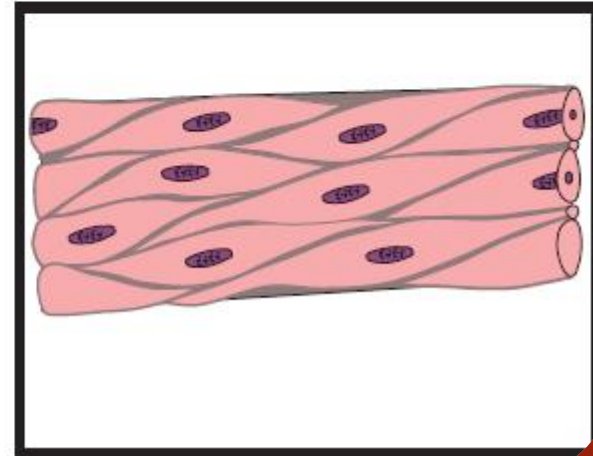
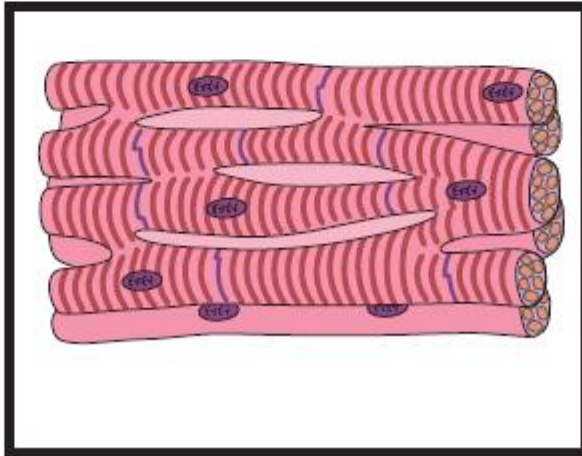
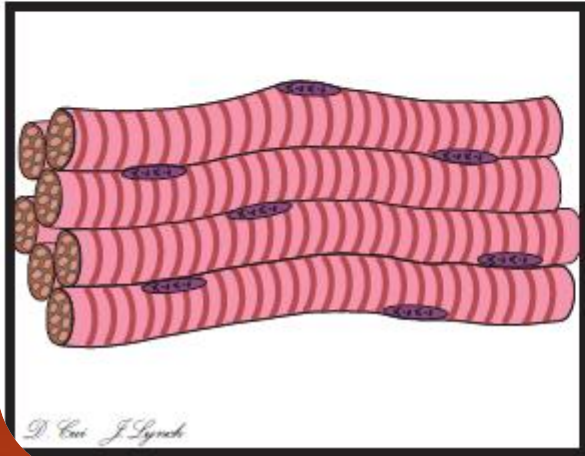
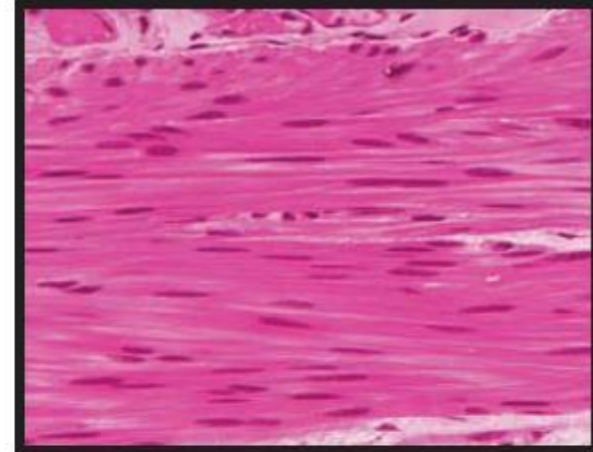
Skeletal muscle



Cardiac muscle

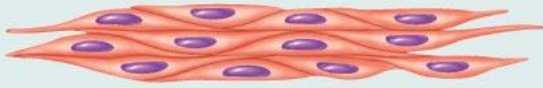


Smooth muscle



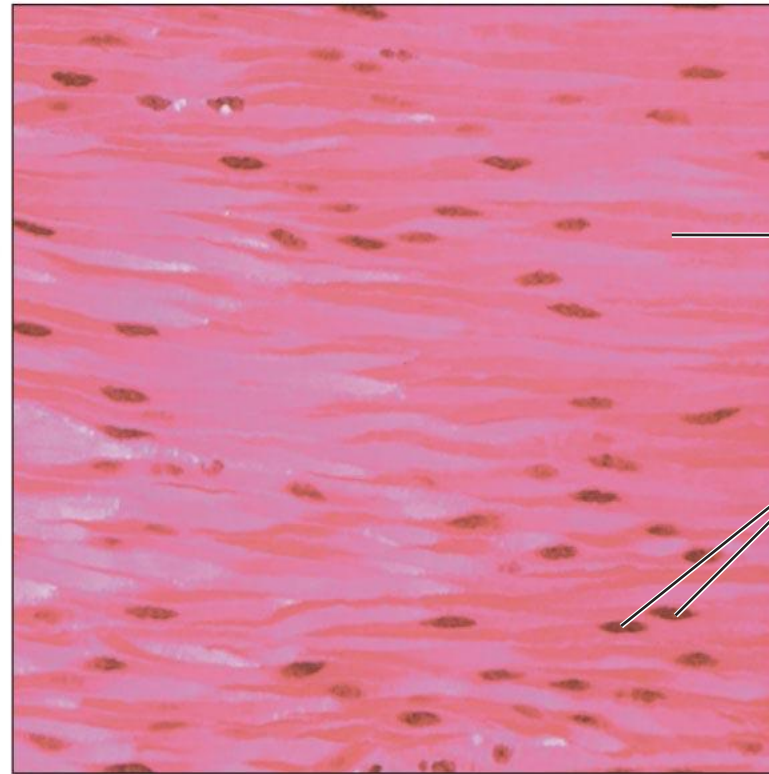
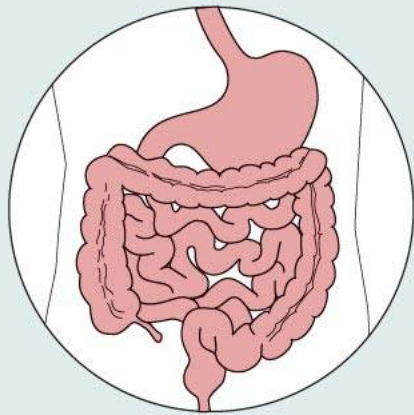
Smooth muscle

Description: Spindle-shaped cells with central nuclei; no striations; cells arranged closely to form sheets.



Function: Propels substances or objects (foodstuffs, urine, a baby) along internal passageways; involuntary control.

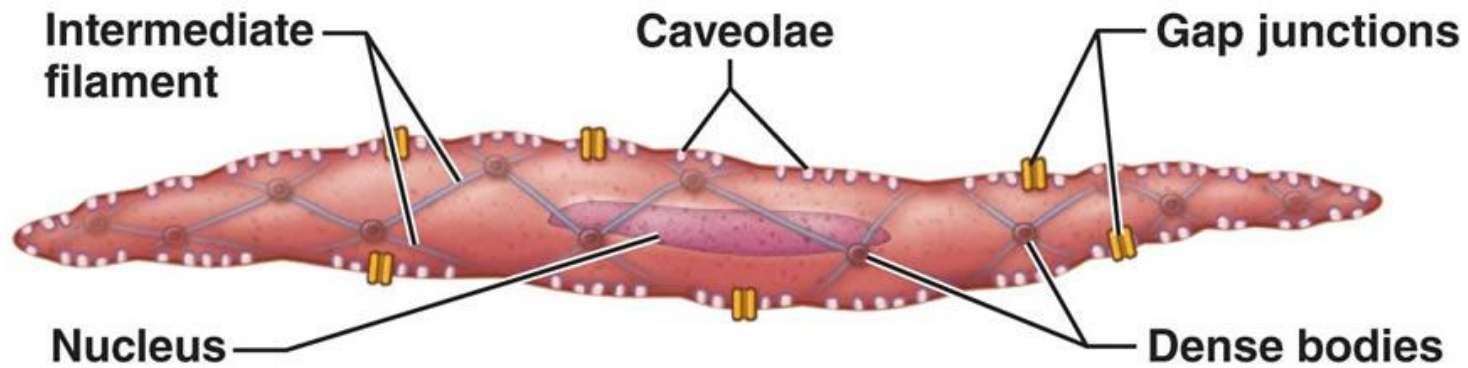
Location: Mostly in the walls of hollow organs.



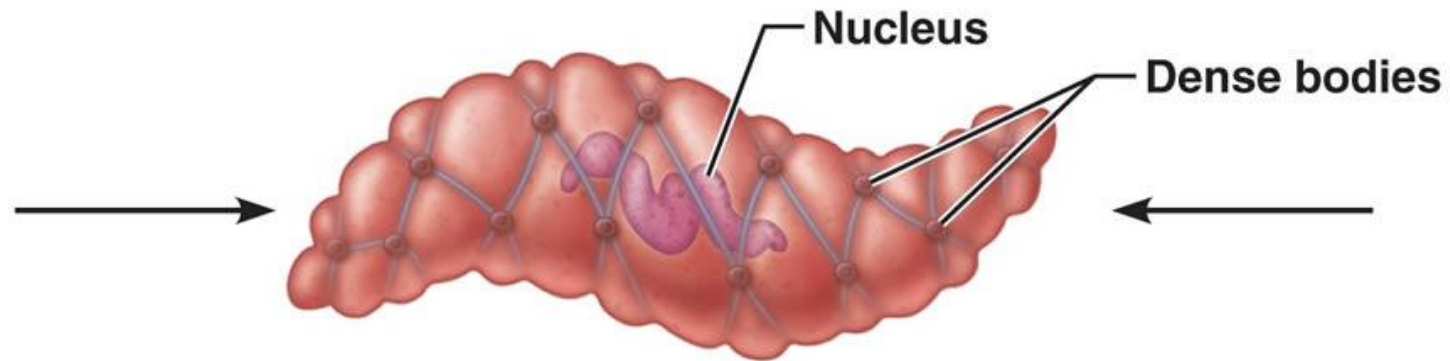
Smooth muscle cell

Nuclei

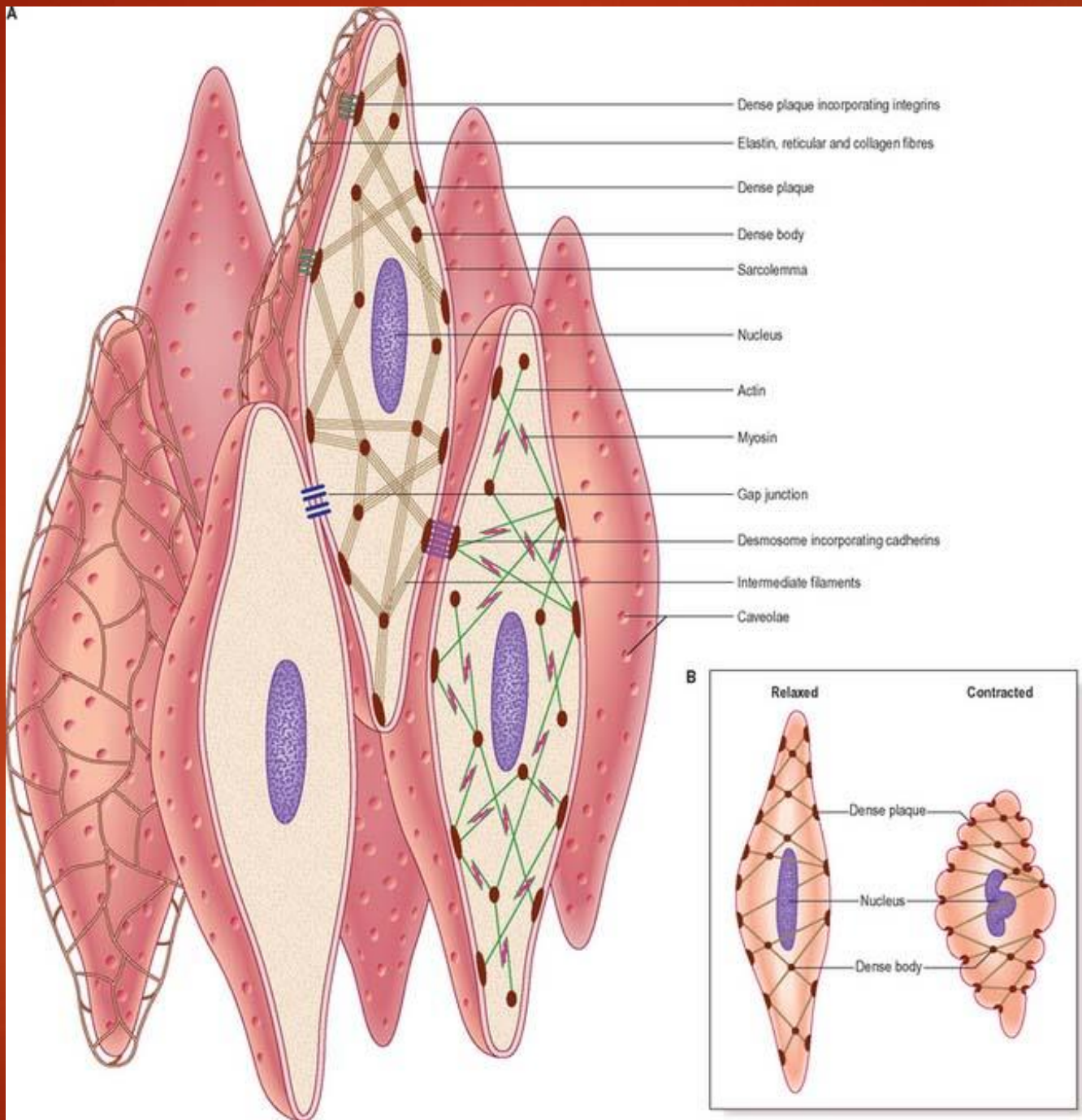
Photomicrograph: Sheet of smooth muscle (200x).



(a) Relaxed smooth muscle fiber (note that gap junctions connect adjacent fibers)



(b) Contracted smooth muscle fiber



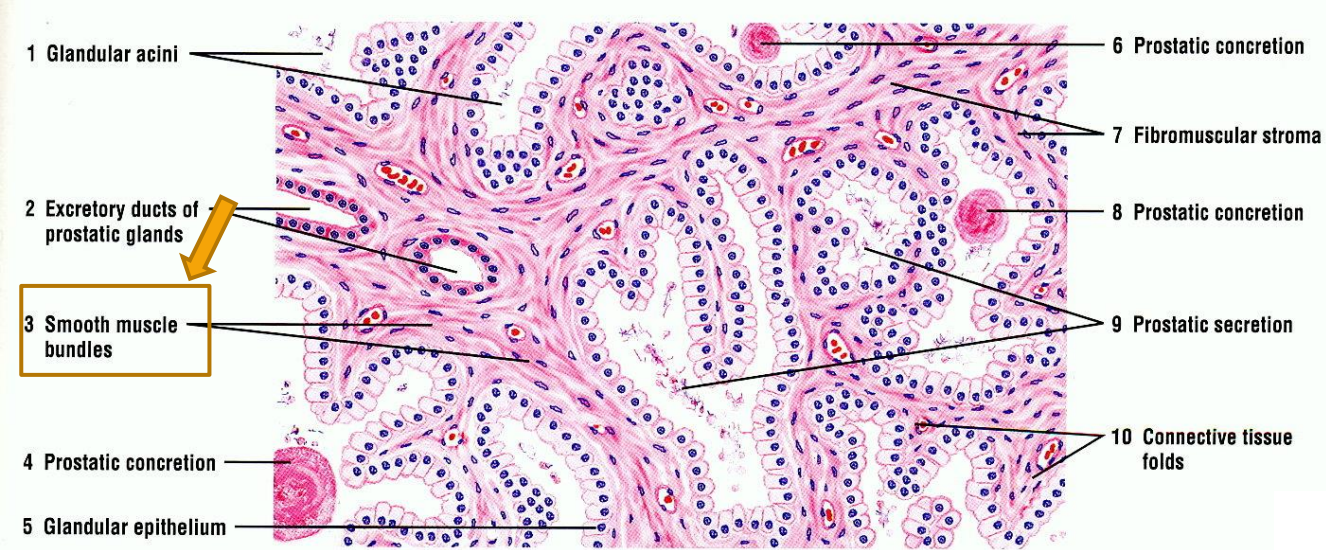
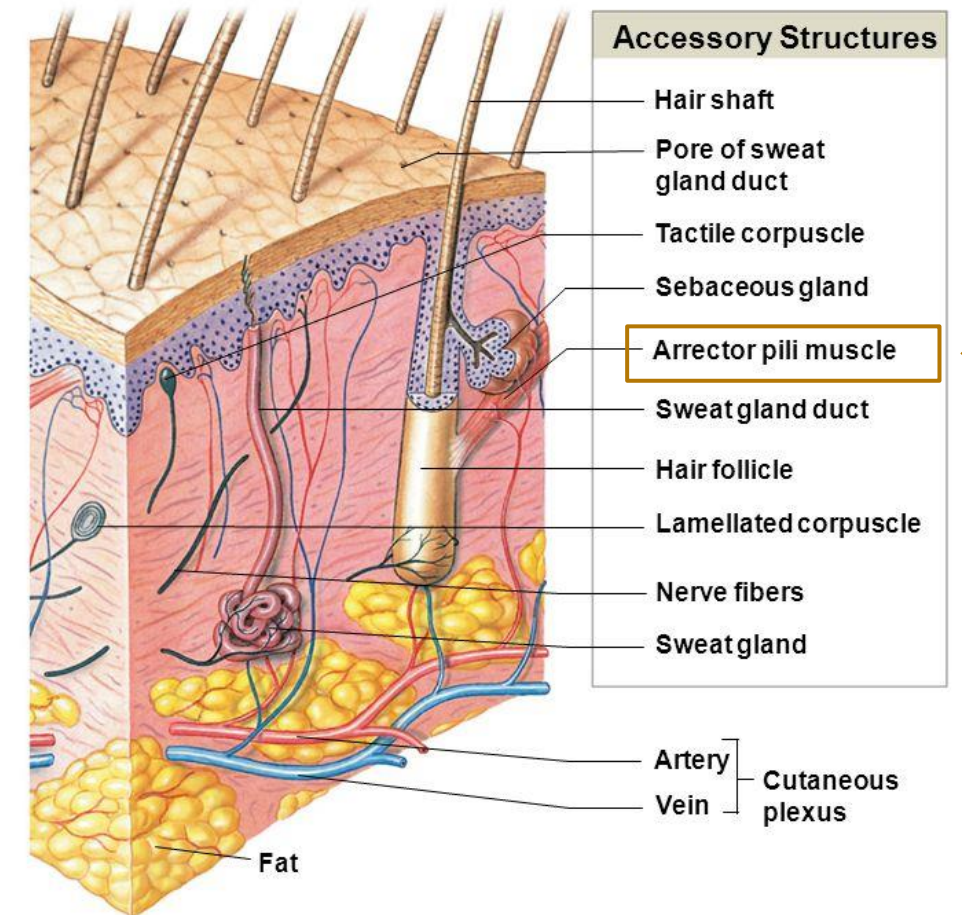


FIGURE 18.11 ■ Prostate gland: glandular acini and prostatic concretions. Stain: hematoxylin and eosin. Medium magnification.



Figure 5-1 The Components of the Integumentary System



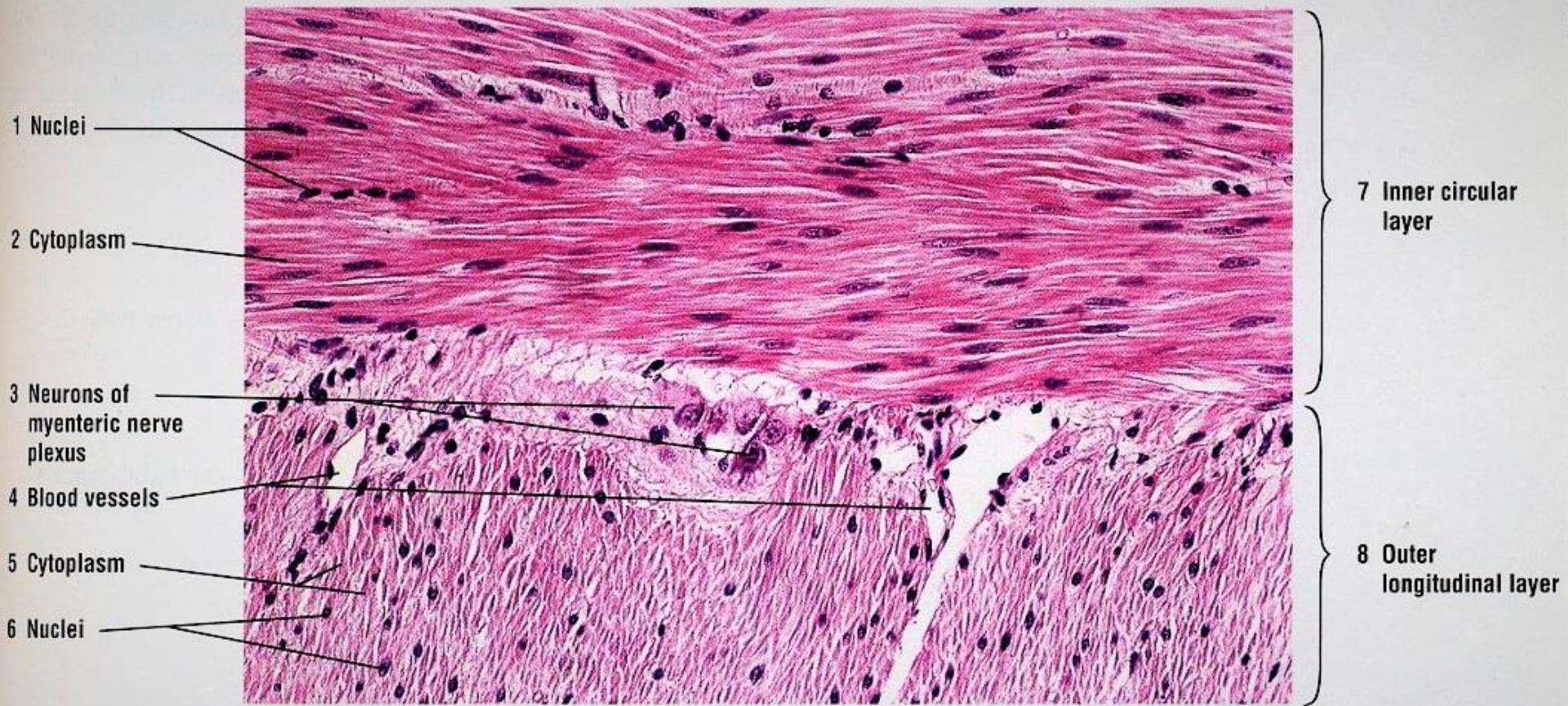


FIGURE 6.2 ■ Smooth muscle: wall of the small intestine (transverse and longitudinal sections). Stain: hematoxylin and eosin. 80×



FIGURE 6.1 ■ Smooth muscle layers of the small intestine. Stain: hematoxylin and eosin. High magnification.

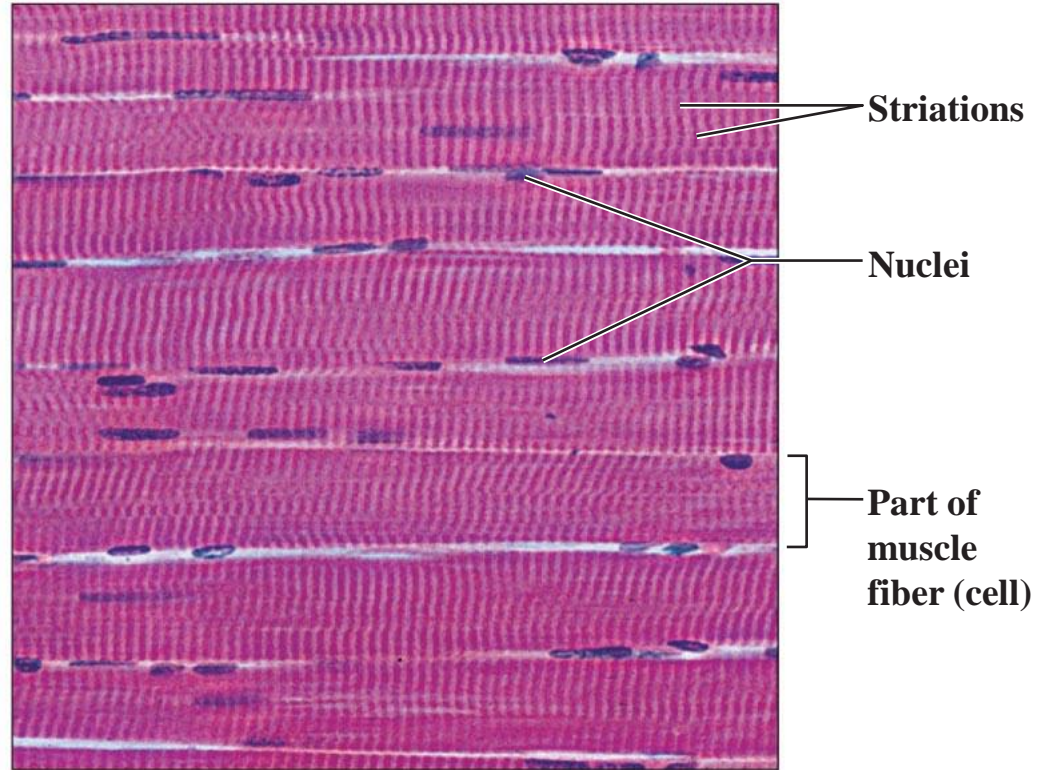
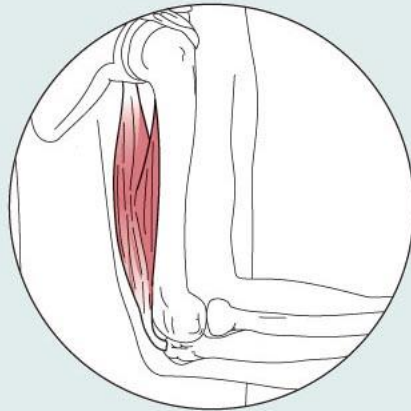
Skeletal muscle

Description: Long, cylindrical, multinucleate cells; obvious striations.

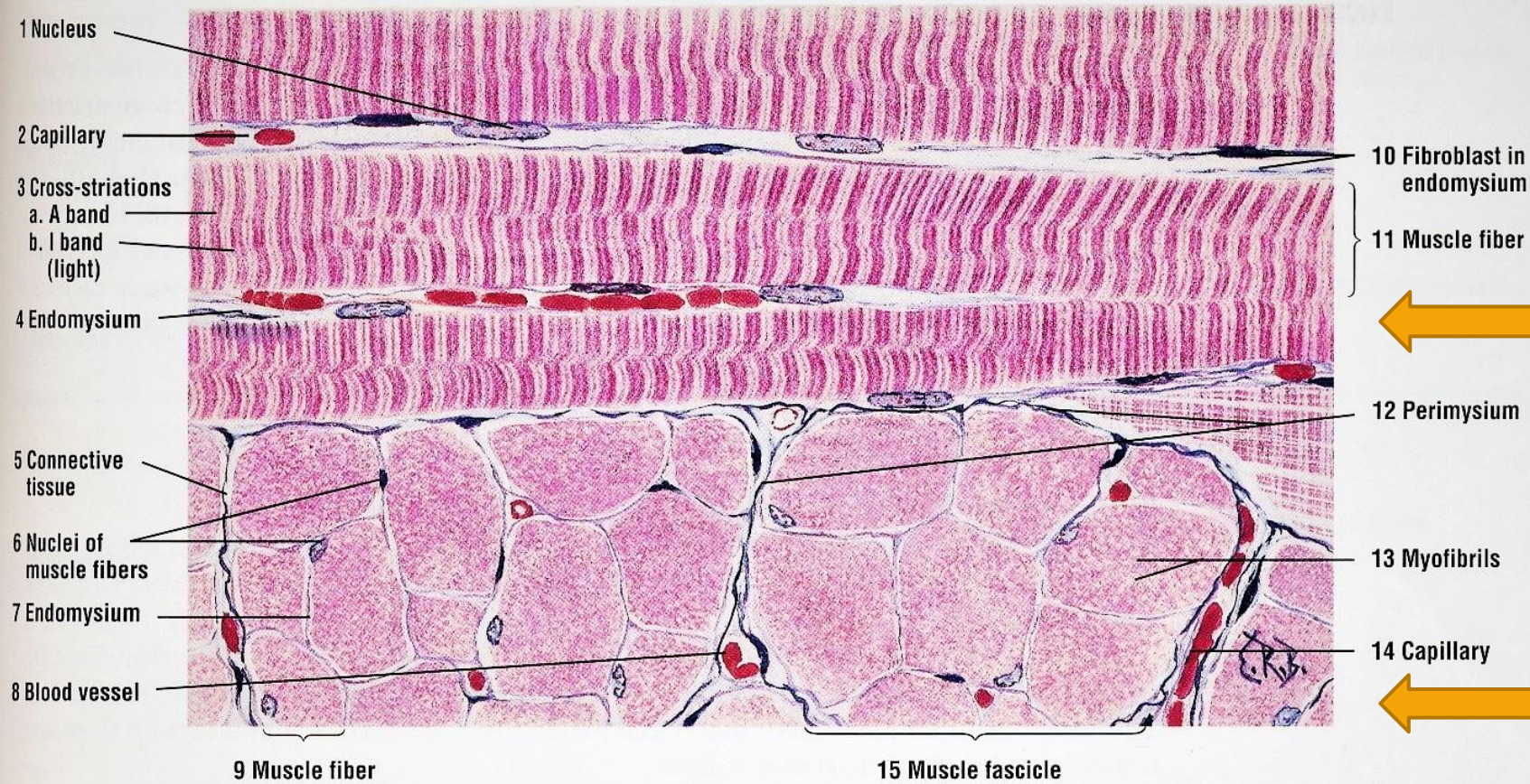


Function: Voluntary movement; locomotion; manipulation of the environment; facial expression; voluntary control.

Location: In skeletal muscles attached to bones or occasionally to skin.



Photomicrograph: Skeletal muscle (approx. 460x). Notice the obvious banding pattern and the fact that these large cells are multinucleate.



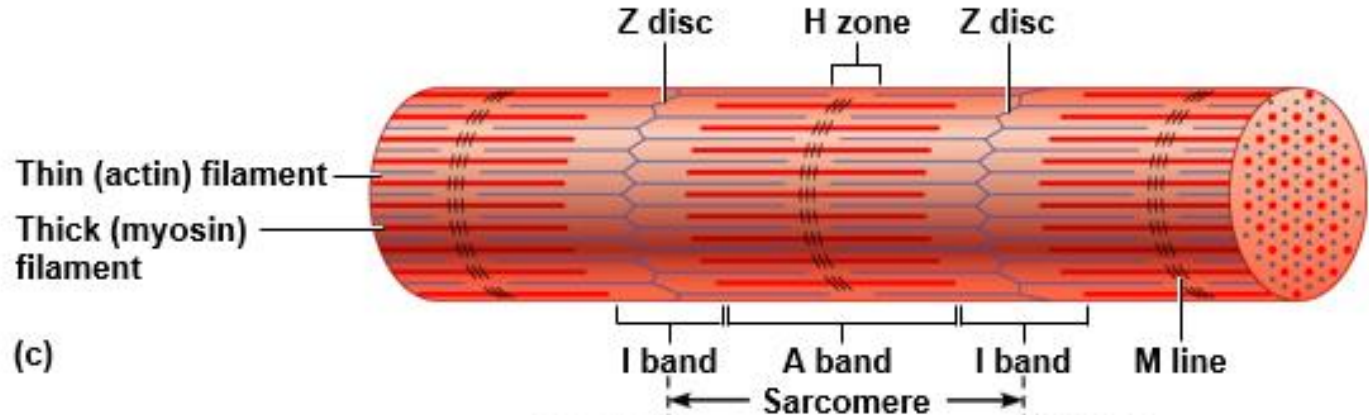
Koelliker Column



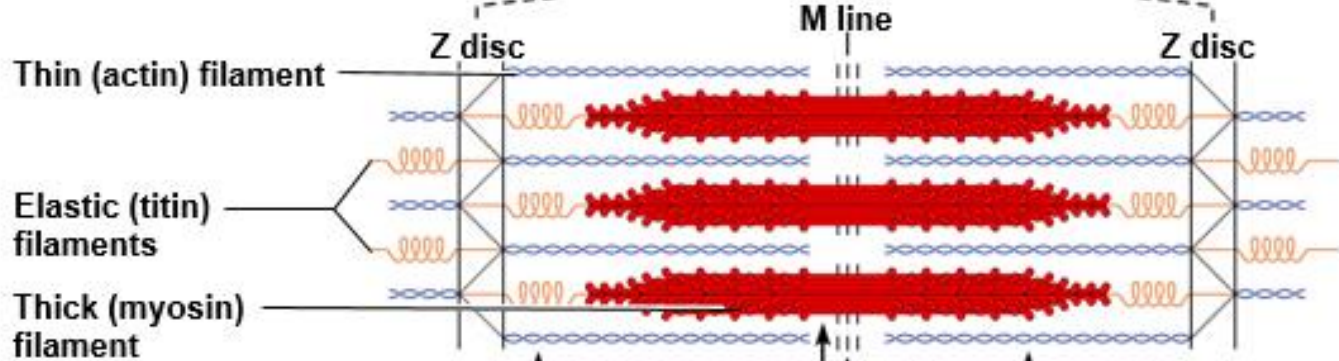
Chonheim Area

FIGURE 6.3 ■ Skeletal (striated) muscles of the tongue. Stain: hematoxylin and eosin. High magnification.

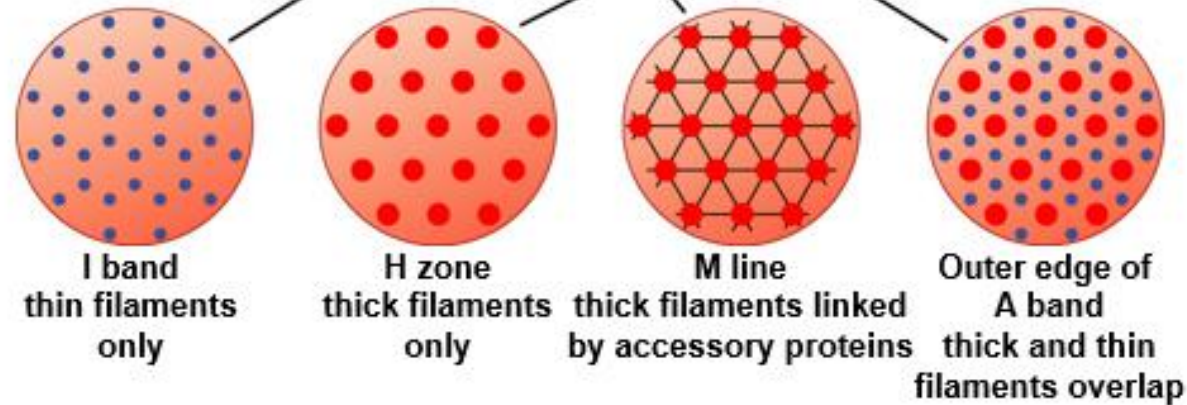
Microscopic anatomy of a skeletal muscle fiber



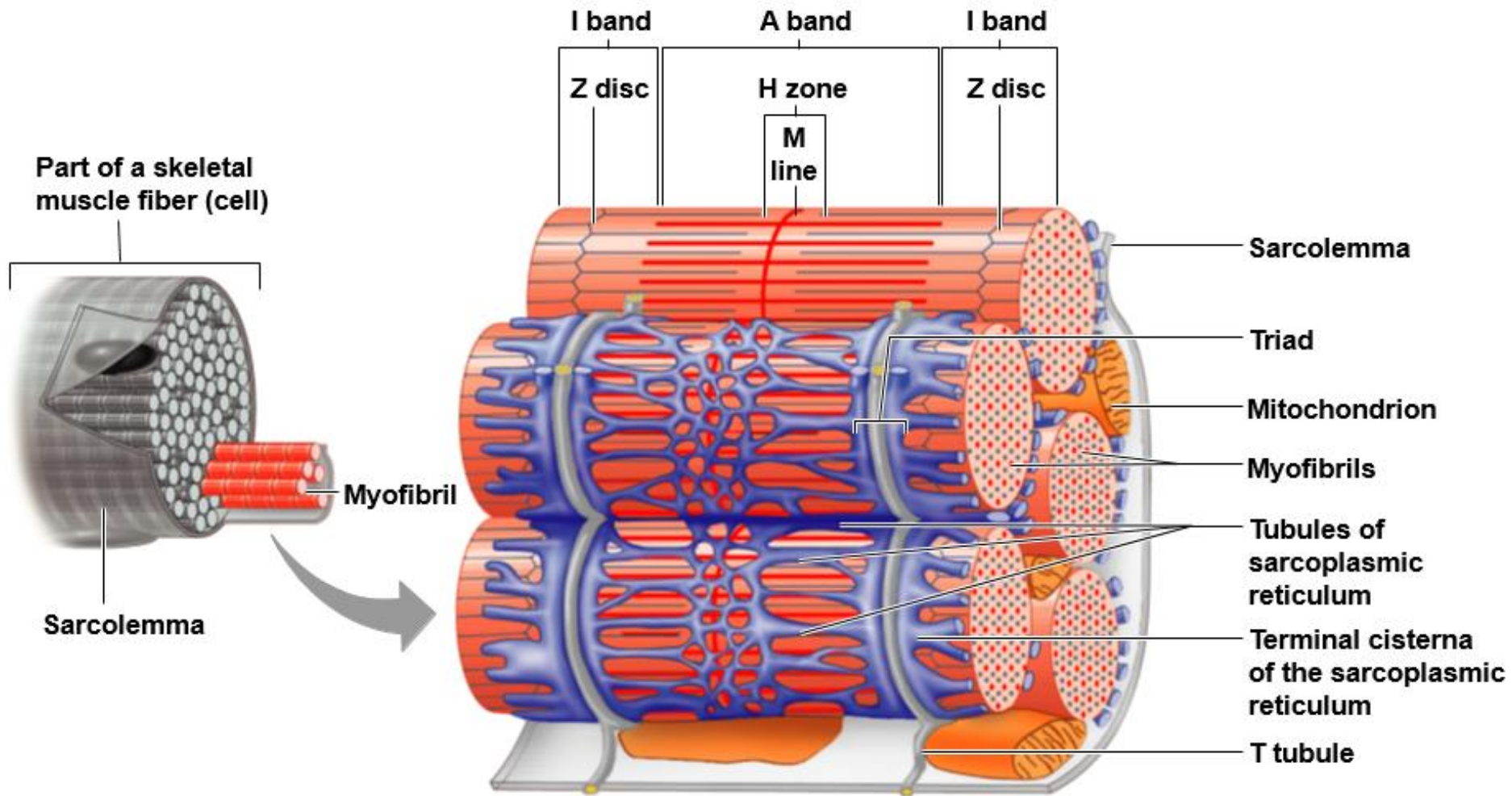
(c)

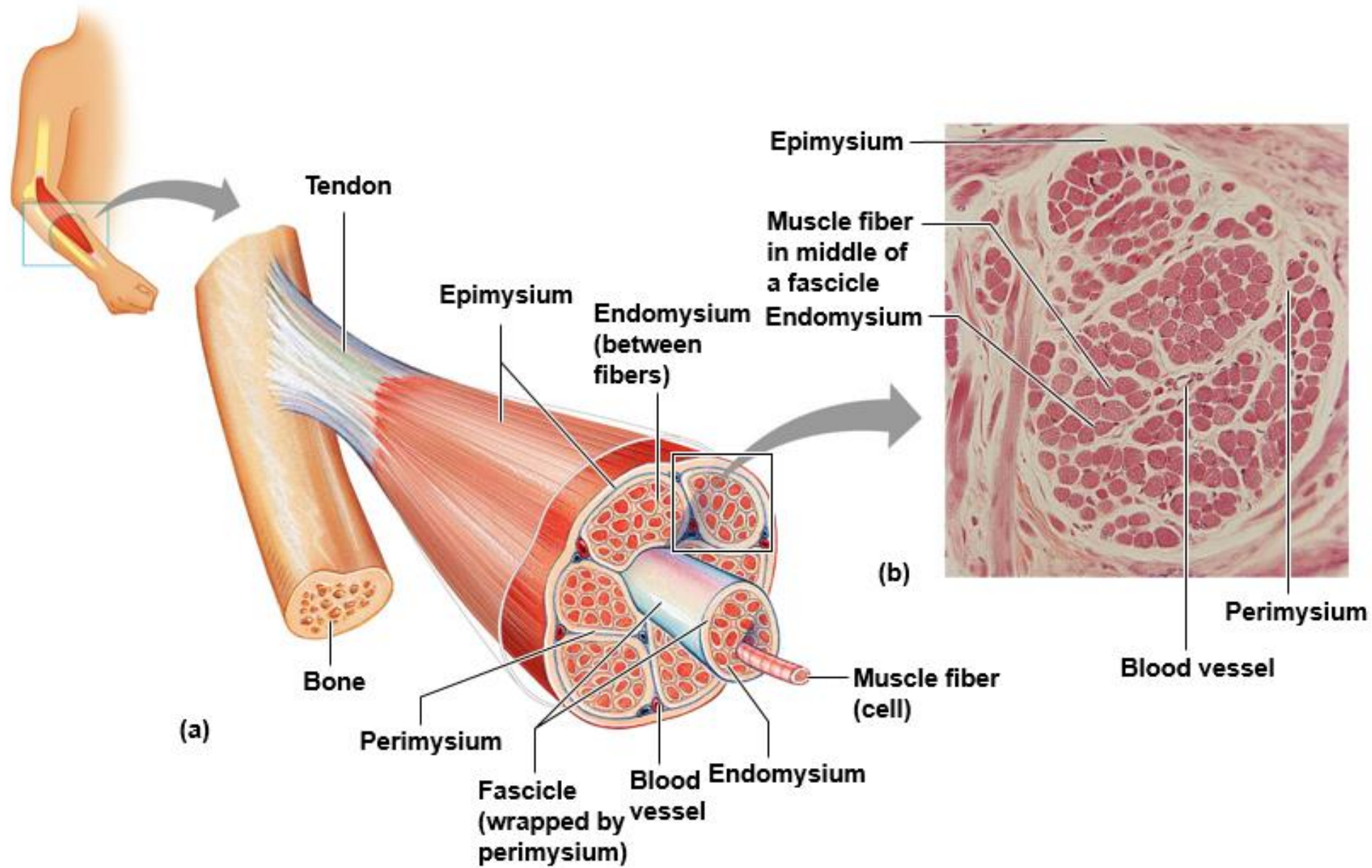


(d)



(e)





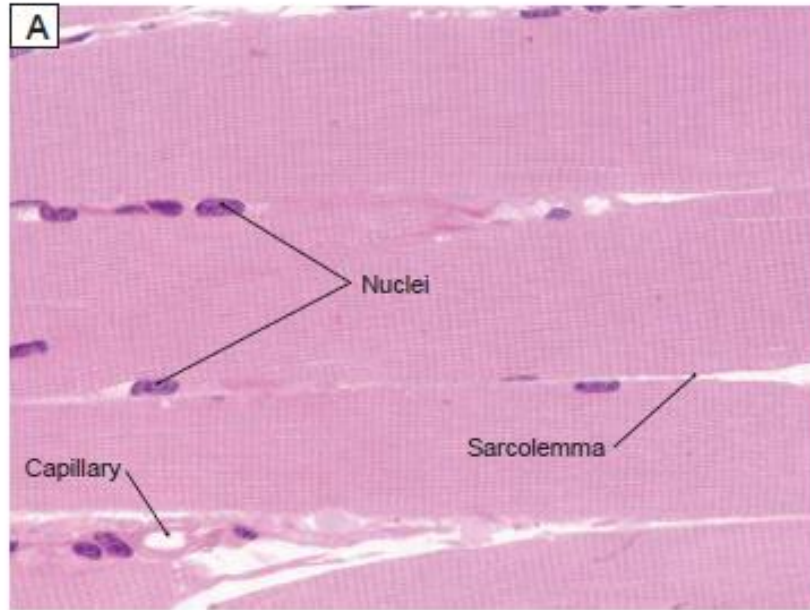


Figure 6-3A. Longitudinal section of striated muscle. H&E, $\times 400$

The cellular units of skeletal muscle are called **muscle fibers**. Each fiber is a long, roughly cylindrical cell bounded by a plasma membrane, the **sarcolemma**. Muscle fibers range from 10 to 100 μm in diameter and may be many centimeters in length in mature muscles. This large size presents a problem for a single cell nucleus serving far distant cytoplasm and cell membrane. In skeletal muscle, this problem is solved by the formation of a **syncytium**, resulting from the fusion of several **myoblasts**, during development. A single muscle fiber will therefore have many nuclei. A distinctive feature of skeletal muscle, visible in this section, is a repeating pattern of dark and light bands oriented at right angles to the length of the fiber. These bands are designated **A bands** and **I bands** (see Fig. 6-4A). Capillaries and myelinated nerve fibers are often observed in sections of skeletal muscle tissue.

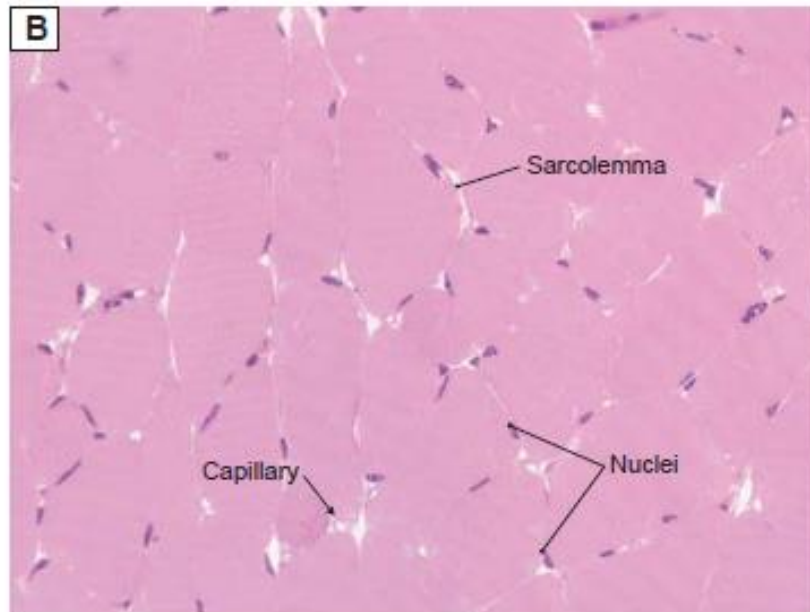
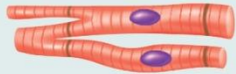


Figure 6-3B. Transverse section of skeletal muscle (tongue). H&E, $\times 272$

Muscle fibers in the tongue run in several different directions, so, although most fibers in this section are cut transversely (in cross section), some are cut diagonally. Skeletal muscle fibers are round or polygonal in cross section, and, in a normal muscle, the fiber diameter is relatively uniform. The nuclei are flattened and lie peripherally in each fiber, just beneath the **sarcolemma**.

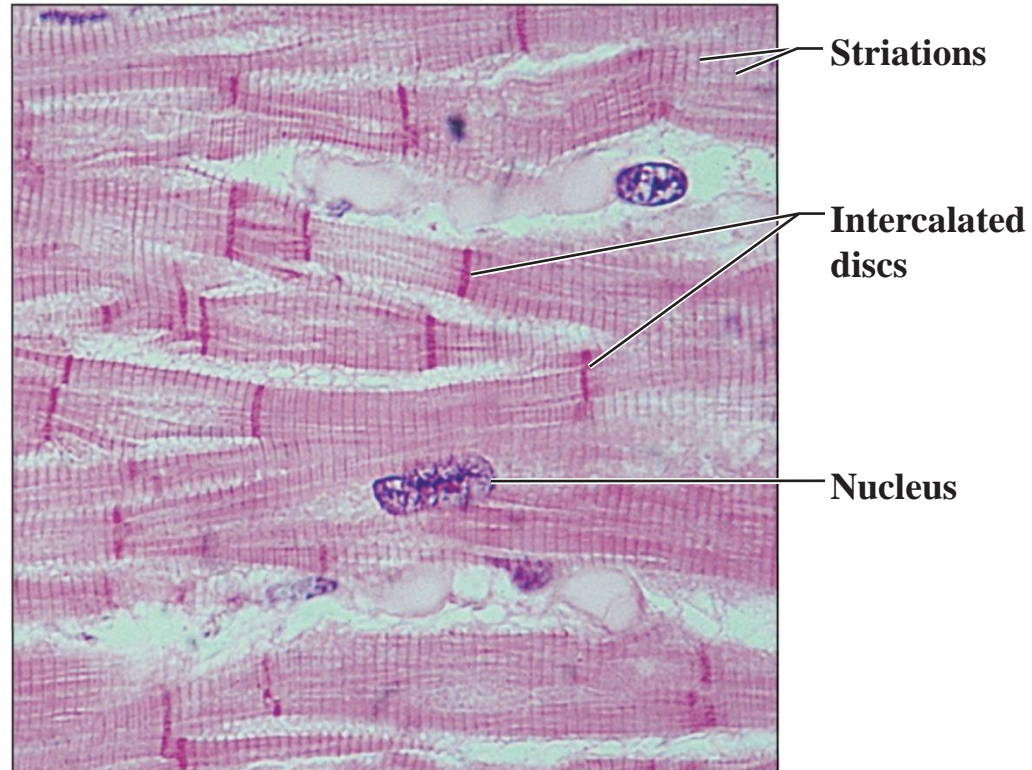
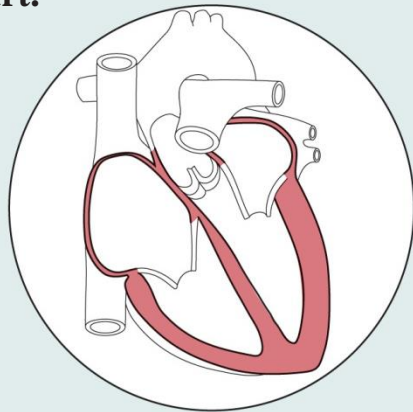
Cardiac muscle

Description: Branching, striated, generally uninucleate cells that interdigitate at specialized junctions (intercalated discs).



Function: As it contracts, it propels blood into the circulation; involuntary control.

Location: The walls of the heart.



Photomicrograph: Cardiac muscle (500X); notice the striations, branching of cells, and the intercalated discs.

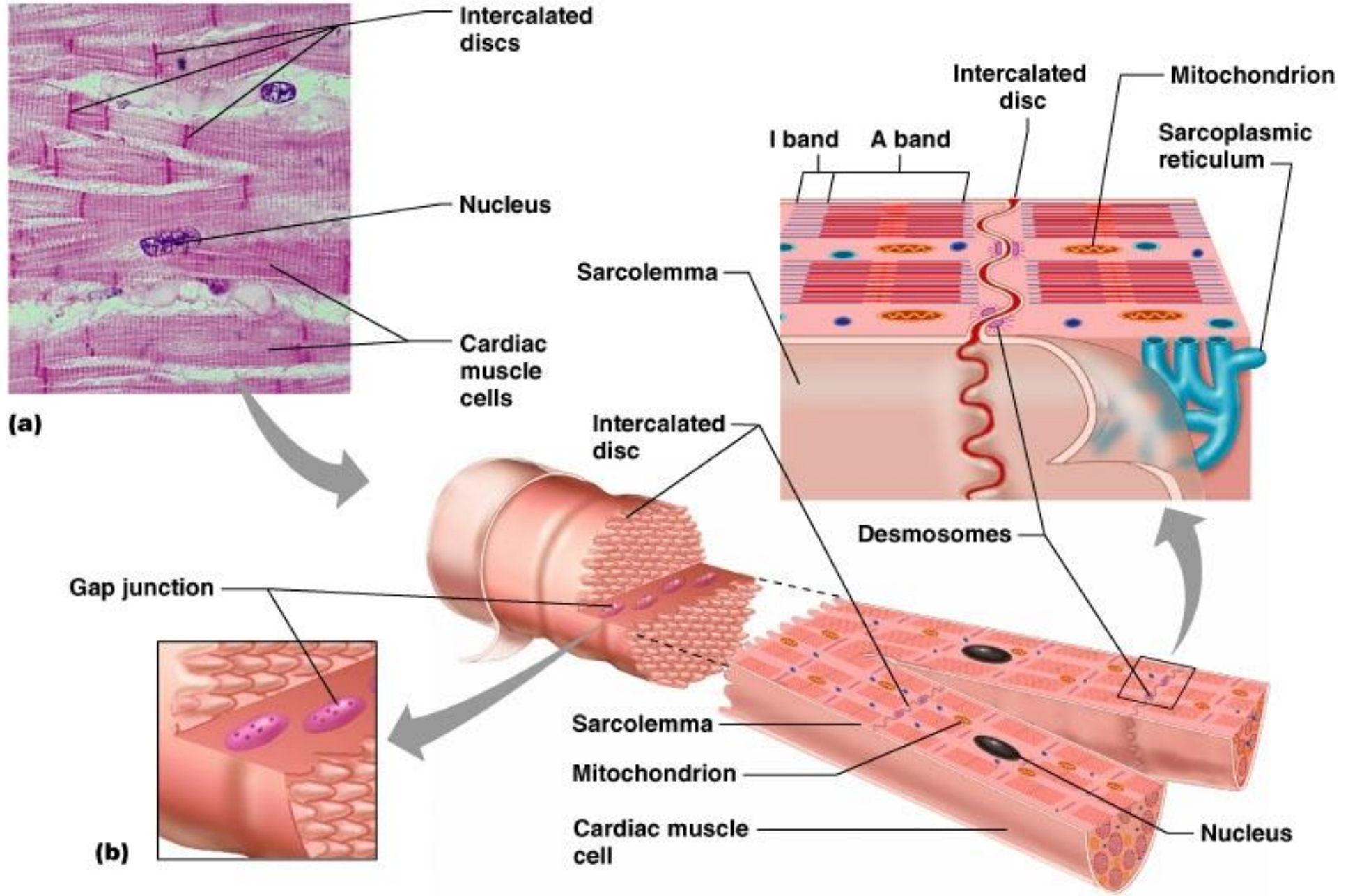




FIGURE 6.7 ■ Cardiac muscle (longitudinal and transverse sections). Stain: hematoxylin and eosin. High magnification.

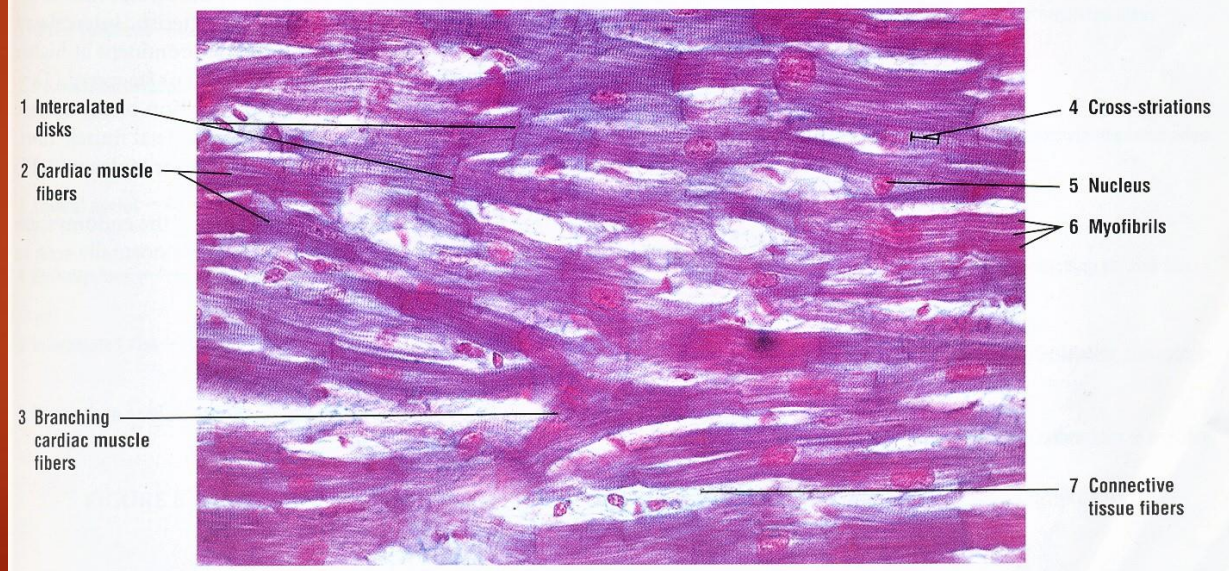


FIGURE 6.8 ■ Cardiac muscle (longitudinal section). Stain: Masson's trichrome. 130×

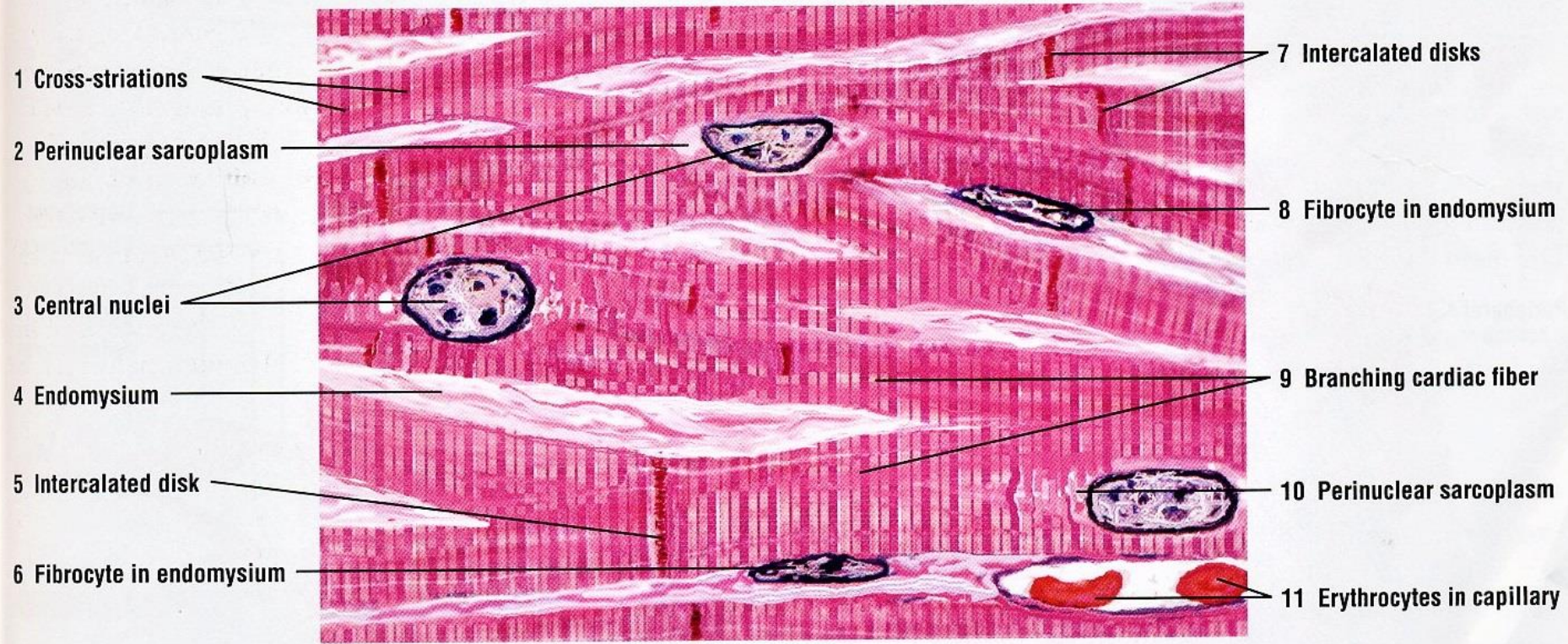


FIGURE 6.10 ■ Cardiac muscle (longitudinal section). Stain: hematoxylin and eosin. High magnification.

TABLE 6-1 Muscle Characteristics

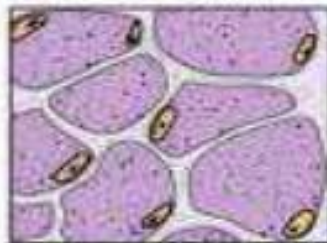
Features	Skeletal Muscle	Cardiac Muscle	Smooth Muscle
Striations	Yes	Yes	No
Fibers	Long, cylindrical, unbranched	Short, branched, anastomosing	Short, spindle shaped
Nuclei	Multiple, peripheral in cell	Single, central in cell	Single, central in cell
Cell junctions	No	Intercalated disks	Gap (nexus) junctions
T tubules	Well developed	Well developed	No
Sarcoplasmic reticulum	Highly developed; has terminal cisterns	Less well developed; small cisterns	Present, but poorly developed
Regeneration	Yes, satellite cells	No	Yes, mitosis
Contraction	Initiated by nerve action potential	Spontaneous; pacemaker system; modulated by nervous system and hormones	Spontaneous; modulated by nervous system and hormones
Main function	Voluntary movement of limbs, digits, face, tongue, and other muscles	Involuntary rhythmic contractions; pumps blood to muscles and organs; modulated by physiological and emotional factors	Involuntary control of blood vessel diameter, gut peristalsis, uterine contractions during childbirth, airway diameter, and others

Muscle types

Skeletal muscle



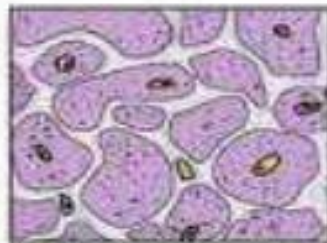
Cross sections



Activity

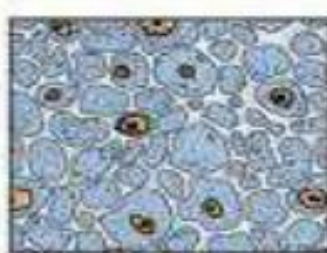
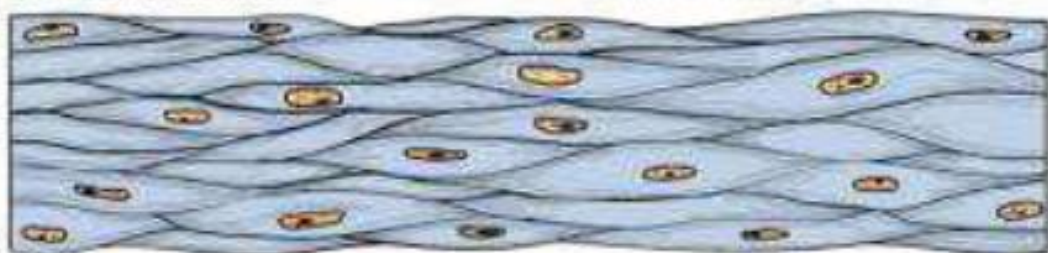
Strong, quick
discontinuous
voluntary
contraction

Cardiac muscle



Strong, quick
continuous
involuntary
contraction

Smooth muscle



Weak, slow
involuntary
contraction



THANKS FOR YOUR NICE ATTENTION