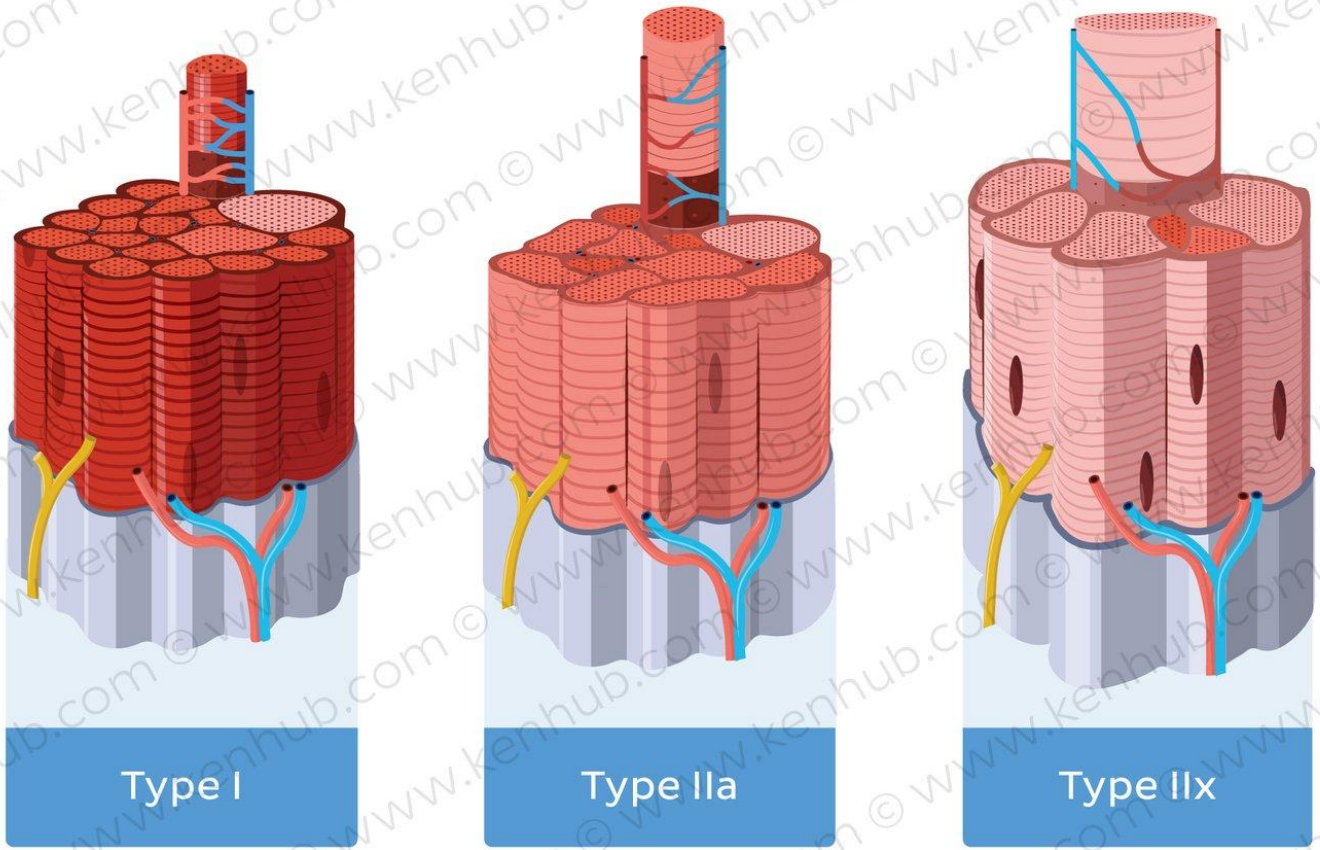
Medical Biology

Classification of skeletal muscle fibers

- Type I or slow, red oxidative fibers:
- Type IIa or fast, intermediate oxidative-glycolytic fibers:
- Type IIb or fast, white glycolytic fibers:

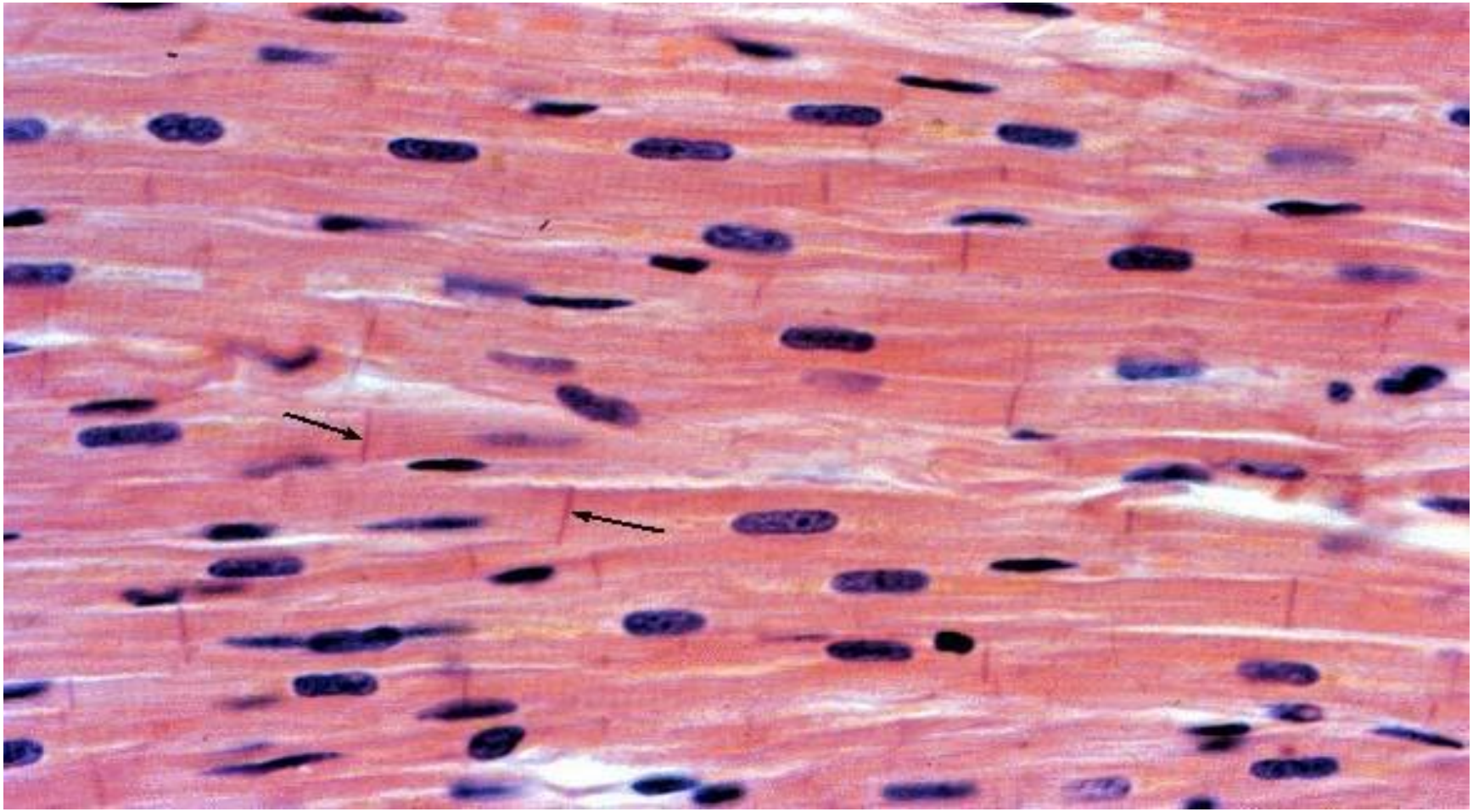


Atypical Striated Muscle

- cremaster muscle (near the spermatic cord).
- esophageal striated muscle, external urethral sphincter, external anal sphincter.

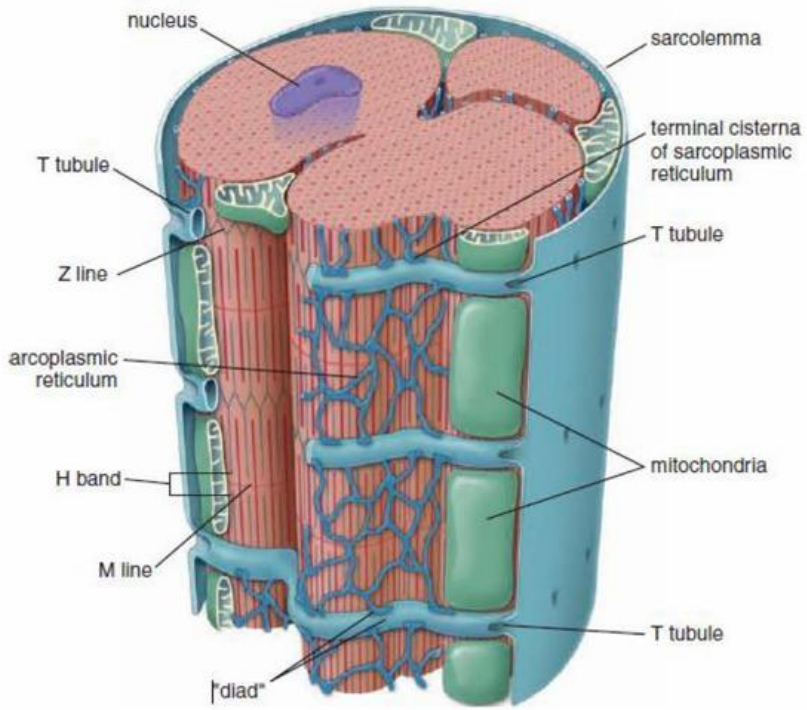
CARDIAC MUSCLE

- The muscle **fibers branch** (bifurcate) and are arranged in series to form an anastomosing network.
- Each myocyte has one or two **central nuclei** (unlike the many peripheral nuclei of syncytia of skeletal muscle fibers).
- The fibers have more sarcoplasm.
- The mitochondria are larger and better developed.
- **All the fibers are Type I** (red fibers, with abundant myoglobin).
- **Glycogen** may also present.
- The myocytes have specialized areas of contact - the **intercalated disks**.
- **Contractions are rhythmic, spontaneous and involuntary**.
- Delicate sheath of **endomysium** with a rich capillary network.
- A thicker **perimysium** separates bundles and layers of muscle fibers.

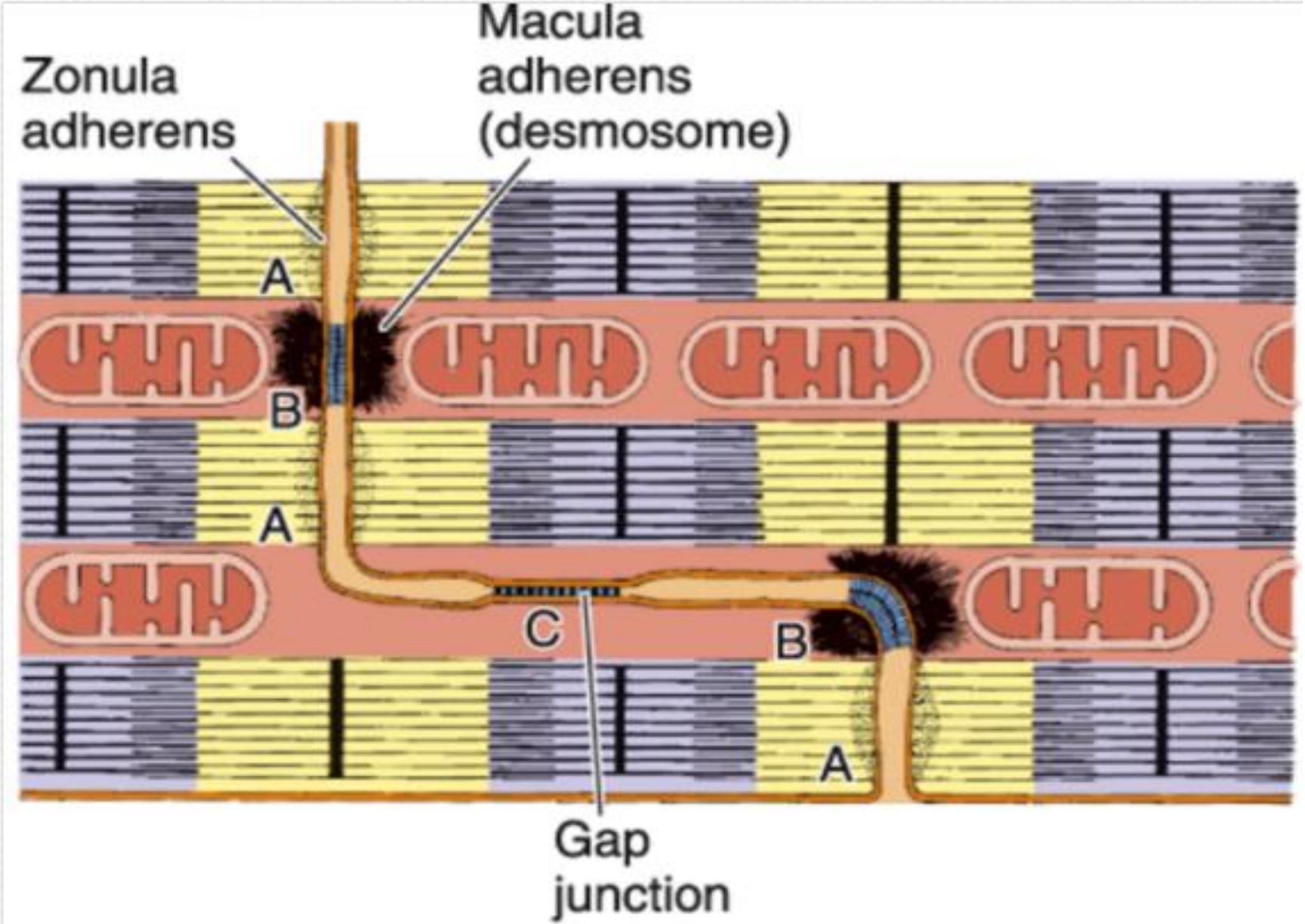


Cardiac muscle cells

- The **T tubule system** and **sarcoplasmic reticulum** are not as regularly arranged in the cardiac myocytes.
- **Diads end near Z disc**
- sarcomere
- Lipofuscin pigment granules (aging pigment)



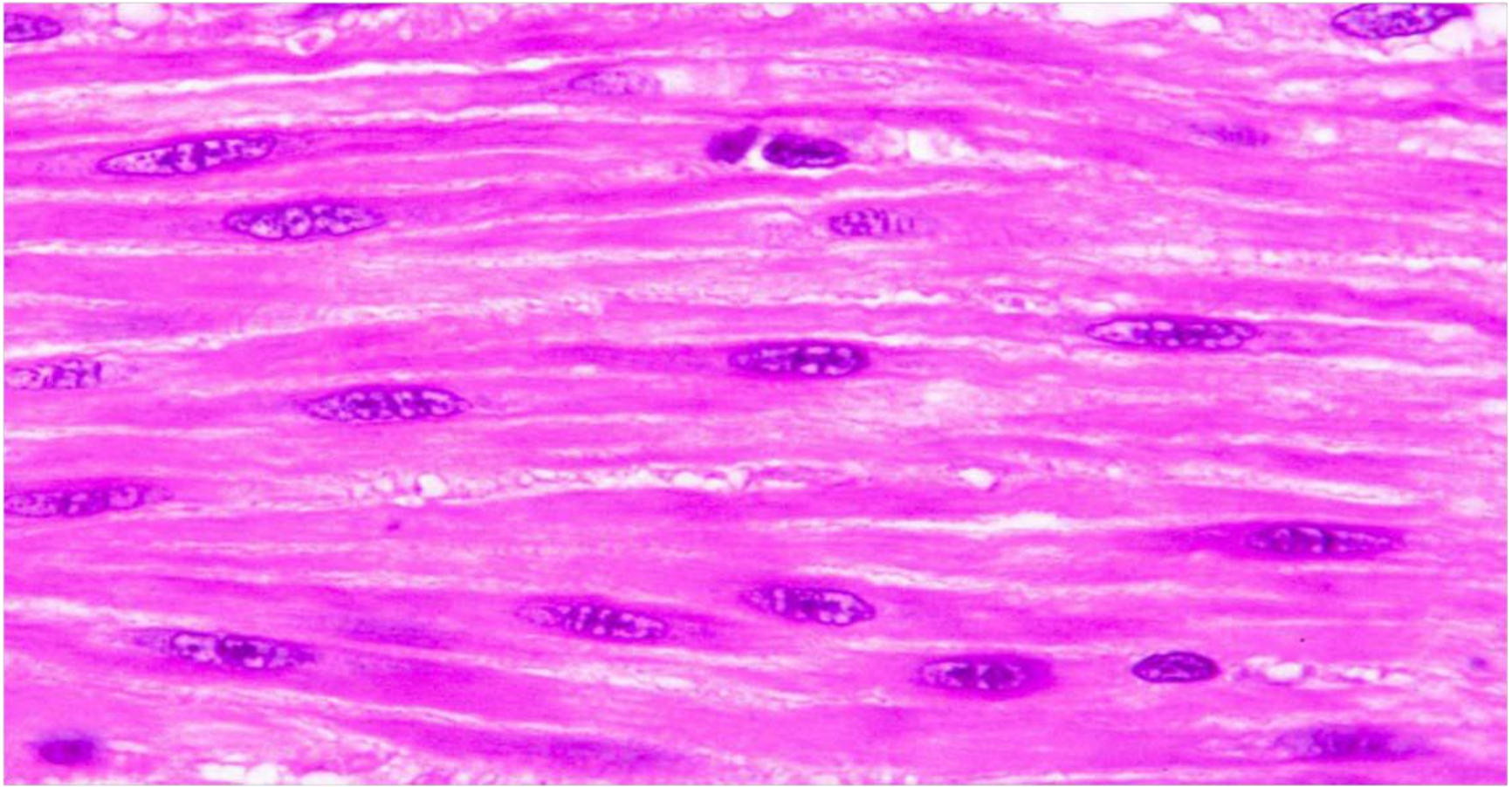
Intercalated disks



SMOOTH MUSCLE

innervated by the **autonomic nervous system**

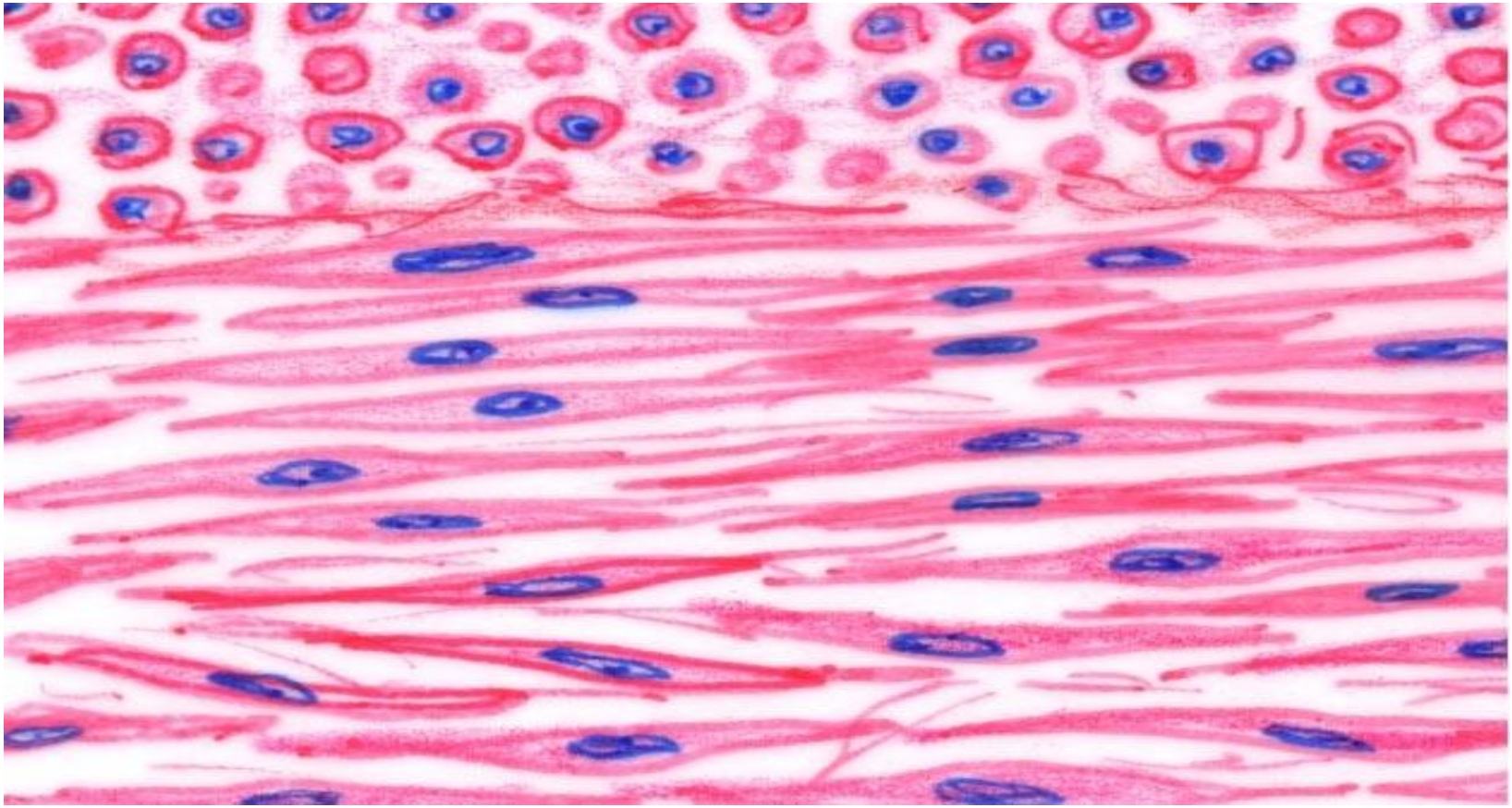
involuntary muscle



Location of smooth muscle

- Smooth muscle is found in the **walls of the hollow internal organs**
- **walls of blood vessels** (vascular smooth muscle, especially in arterial vessels).
- Smooth muscle is found in the **dermis of the skin** (arrector pili).
- Smooth muscle is found in the eye (**iris diaphragm,** controlling the amount of light reaching the retina).

Structure of smooth muscle fibers



Smooth muscle sheath

- **Sheath (proteoglycan,reticular, collagen & elastic fibers)**
- **Myofilaments:**

1.thin myofilaments (actin) which are the most common type

2.thick myofilaments (myosin) which are less common

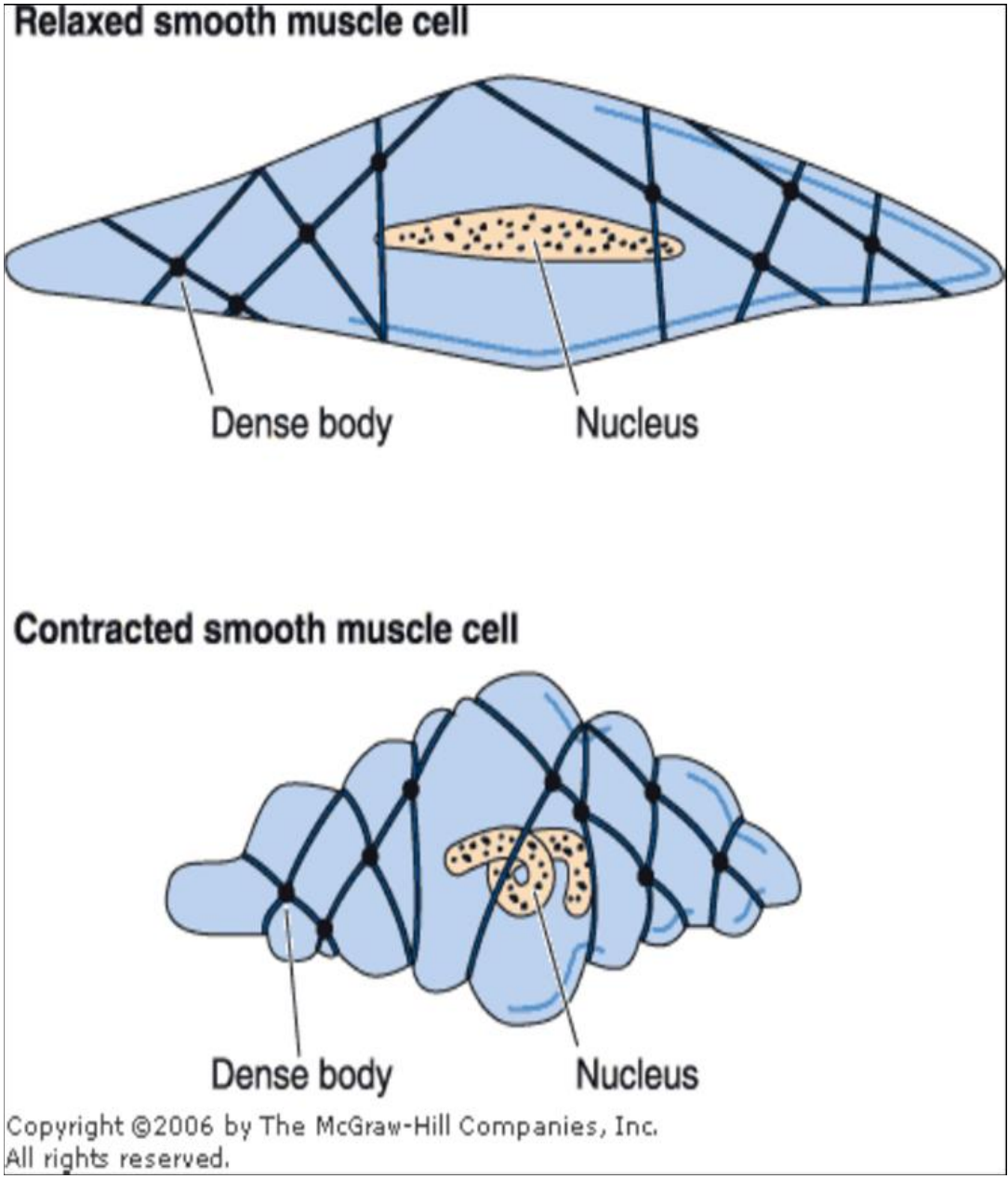
3.intermediate filaments (desmin) These may be grouped as "dense bodies" and are also found in contact with the sarcolemma (attachment plaques of thin ad intermediate filaments that are functionally similar to Z disc of skeletal and cardiac muscles).

-

No T- tubule

saccules

caveolae.



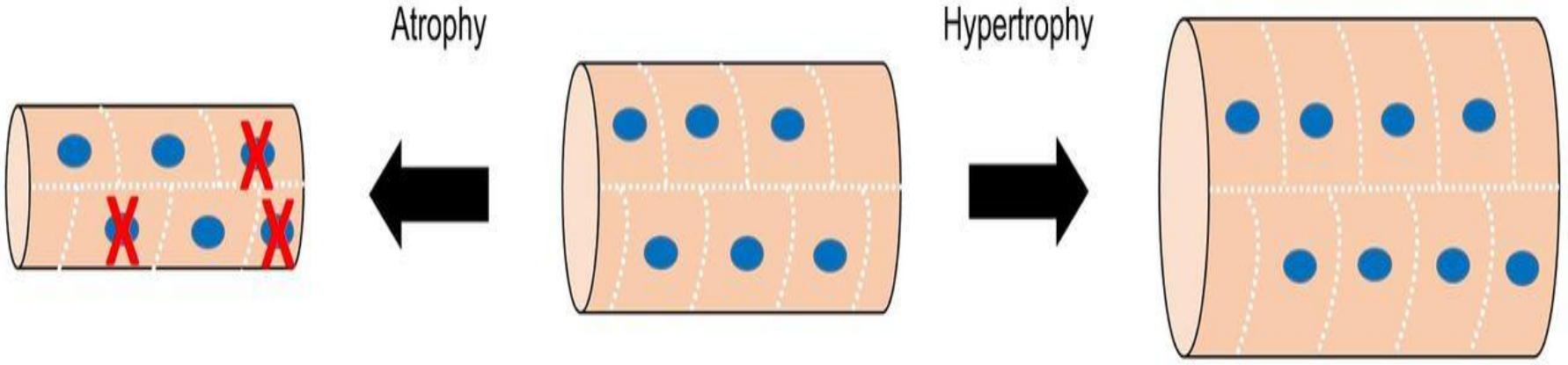
Origin of smooth muscle

- **Mesoderm**
- **From mesnchyme as connective tissue cells**
- **myoepithelial cells**
- part of the esophagus, anal sphincter, tarsi of eyelids

Repair and regeneration after injury

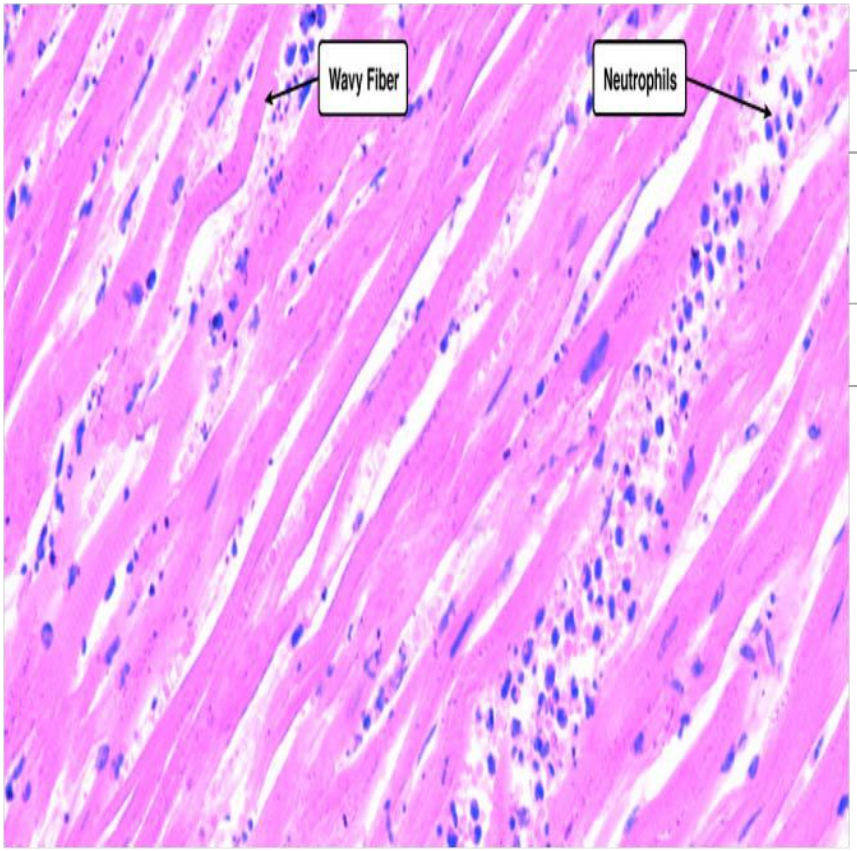
Skeletal muscle

- **hypertrophy of use**
- **disuse myopathy** or **atrophy**

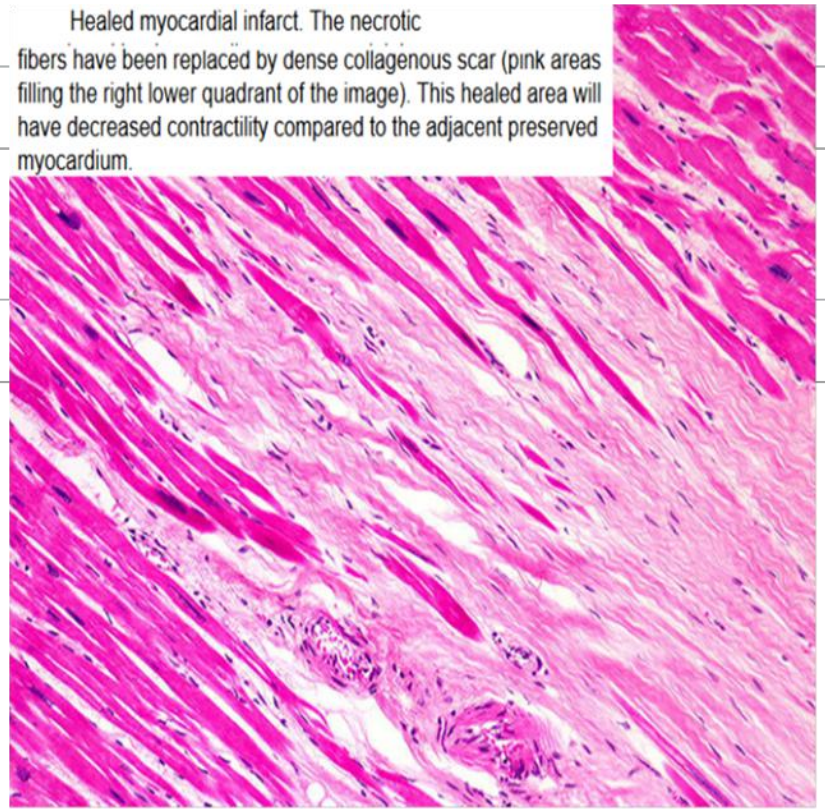


Regeneration of cardiac muscle

Acute Myocardial Infarction



Healed myocardial infarction



Regeneration of Smooth muscle

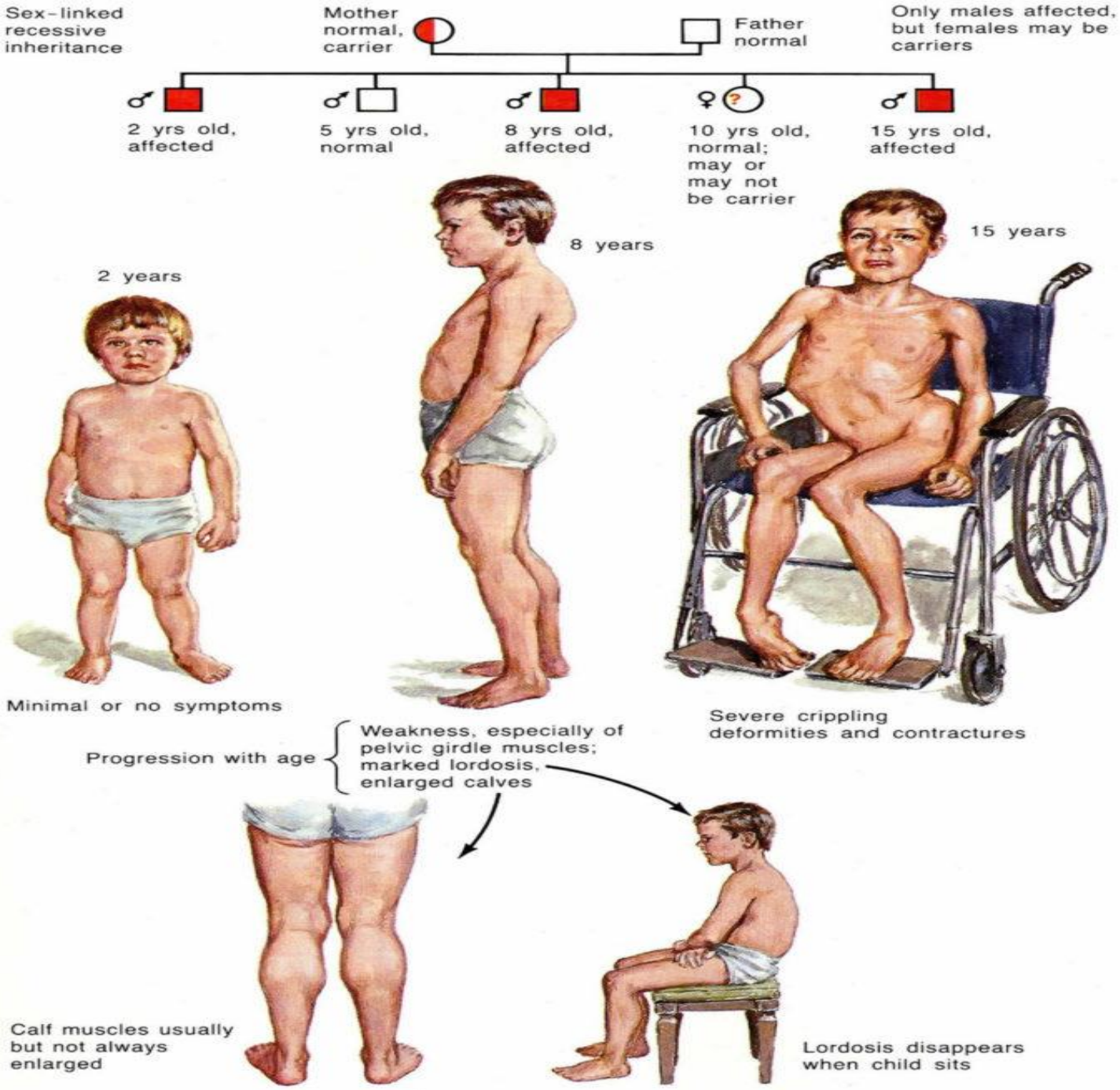
hyperplasia and hypertrophy

Muscular dystrophy

Duchenne muscular dystrophy

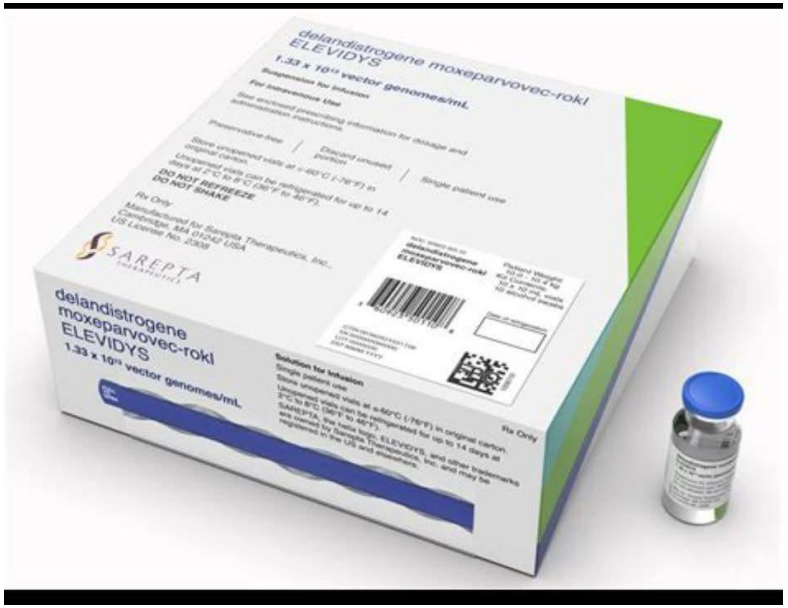
- Typical feature – the child uses his hands to climb up, while getting up from the floor.
- Wheelchair by age 12
- Fatal by age 30

Duchenne's Muscular Dystrophy



Elevidys (delandistrogene moxeparvovec-rokl) is a one-time gene therapy treatment for Duchenne muscular dystrophy (DMD), made by the pharmaceutical company Sarepta. Approved by the U.S. Food and Drug Administration (FDA) in 2023, Elevidys is designed to strengthen muscles by delivering a shortened version of the dystrophin gene, known as micro-dystrophin. This compensates for the missing or broken dystrophin gene that is the cause of DMD.

To deliver the micro-dystrophin gene, Elevidys uses a "vector" made from a harmless virus called *AAVrh74* that is good at getting inside of cells. Once infused into the bloodstream, Elevidys gets into muscle cells, prompting them to produce the micro-dystrophin protein. This protein helps protect muscle cells and prevent them from degenerating.



Thank you &
Good luck