Muscle Development

Muscle types – Skeletal, Cardiac, Smooth

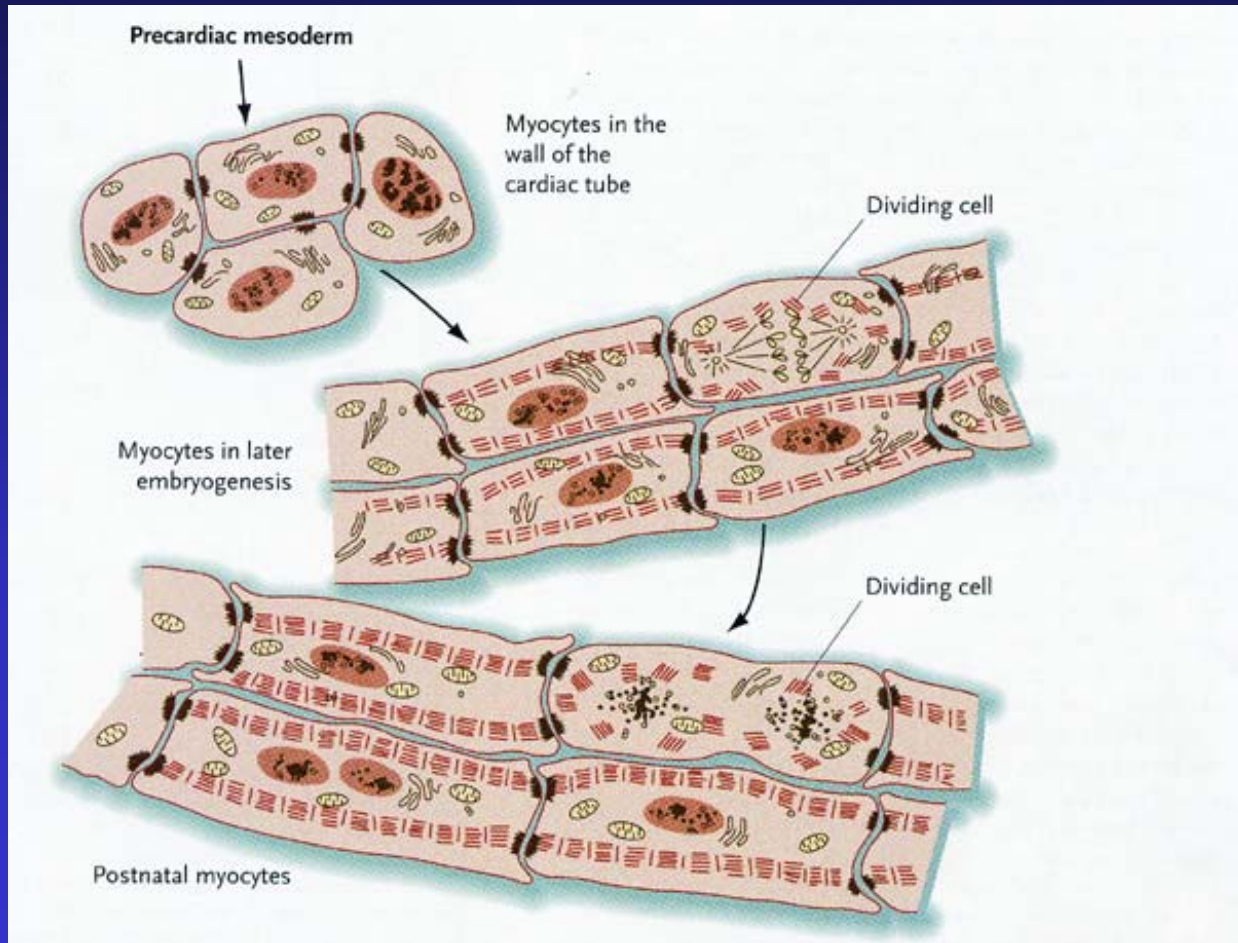
Smooth muscle : Derived from splanchnic mesoderm surrounding gut. Cellular elongation without cell fusion

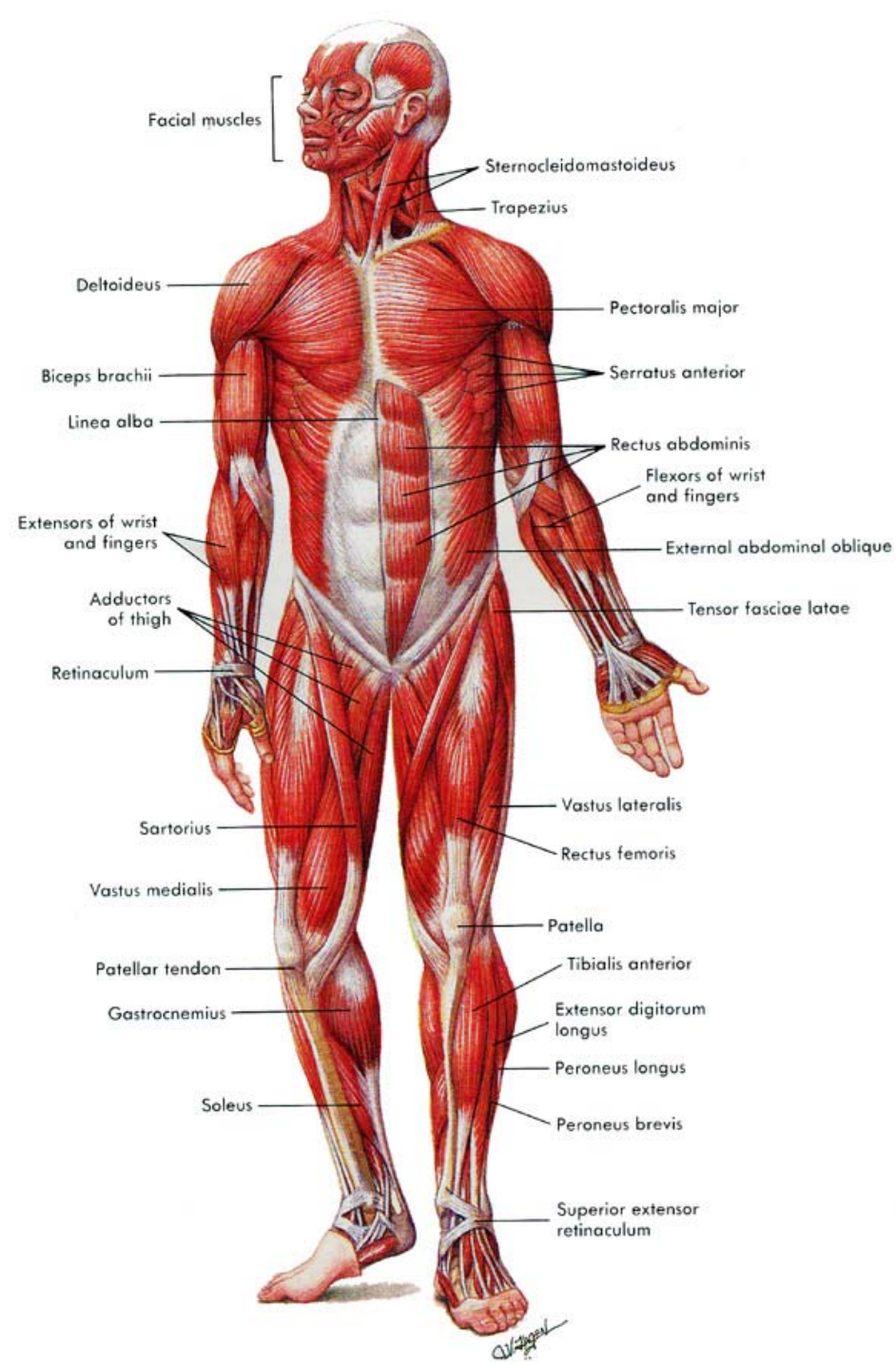
Cardiac muscle

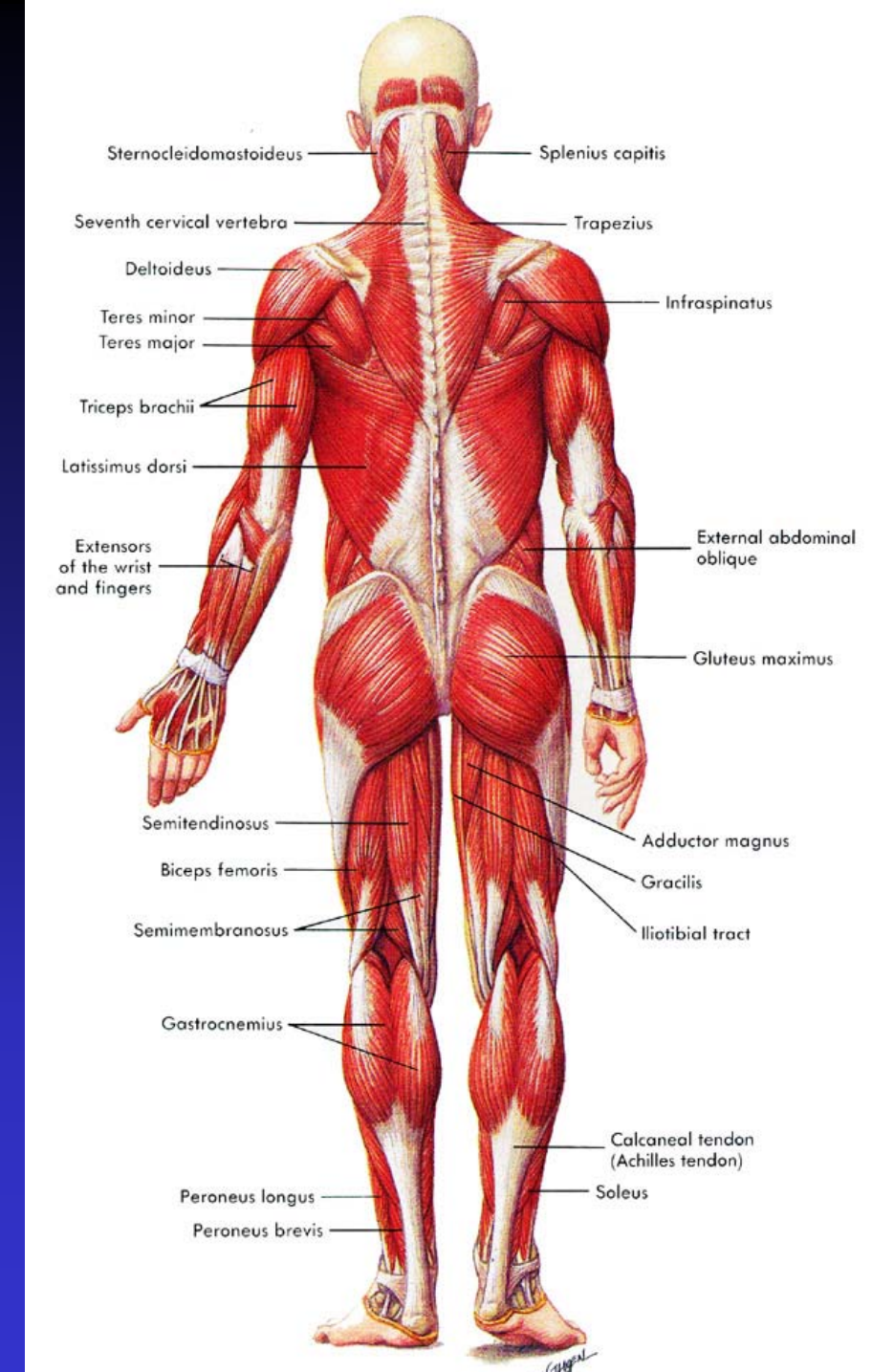
Derived - splanchnic mesoderm

Myoblasts adhere but do not fuse

Form intercalated discs




Facial muscles
Sternocleidomastoideus
Trapezius
Deltoideus
Pectoralis major
Biceps brachii
Serratus anterior
Linea alba
Rectus abdominis
Flexors of wrist and fingers
Extensors of wrist and fingers
External abdominal oblique
Adductors of thigh
Tensor fasciae latae
Retinaculum
Vastus lateralis
Sartorius
Rectus femoris
Vastus medialis
Patella
Patellar tendon
Tibialis anterior
Gastrocnemius
Extensor digitorum longus
Peroneus longus
Soleus
Peroneus brevis
Superior extensor retinaculum


Sternocleidomastoideus
Splenius capitis
Seventh cervical vertebra
Trapezius
Deltoideus
Infraspinatus
Teres minor
Teres major
Triceps brachii
Latissimus dorsi
External abdominal oblique
Extensors of the wrist and fingers
Gluteus maximus
Semitendinosus
Adductor magnus
Biceps femoris
Gracilis
Semimembranosus
Iliotibial tract
Gastrocnemius
Calcaneal tendon (Achilles tendon)
Peroneus longus
Soleus
Peroneus brevis

Skeletal Muscle

Head region skeletal musculature
- Derived from head mesenchyme
- Migration from the cranial somitomeres

Trunk region skeletal musculature
- Myoblasts derived from somites
- Migration - FGF controlled
- Spindle shaped cells - line up and fuse
- Multinucleated syncitium
- Myofibrils with cross-striations - actin-myosin

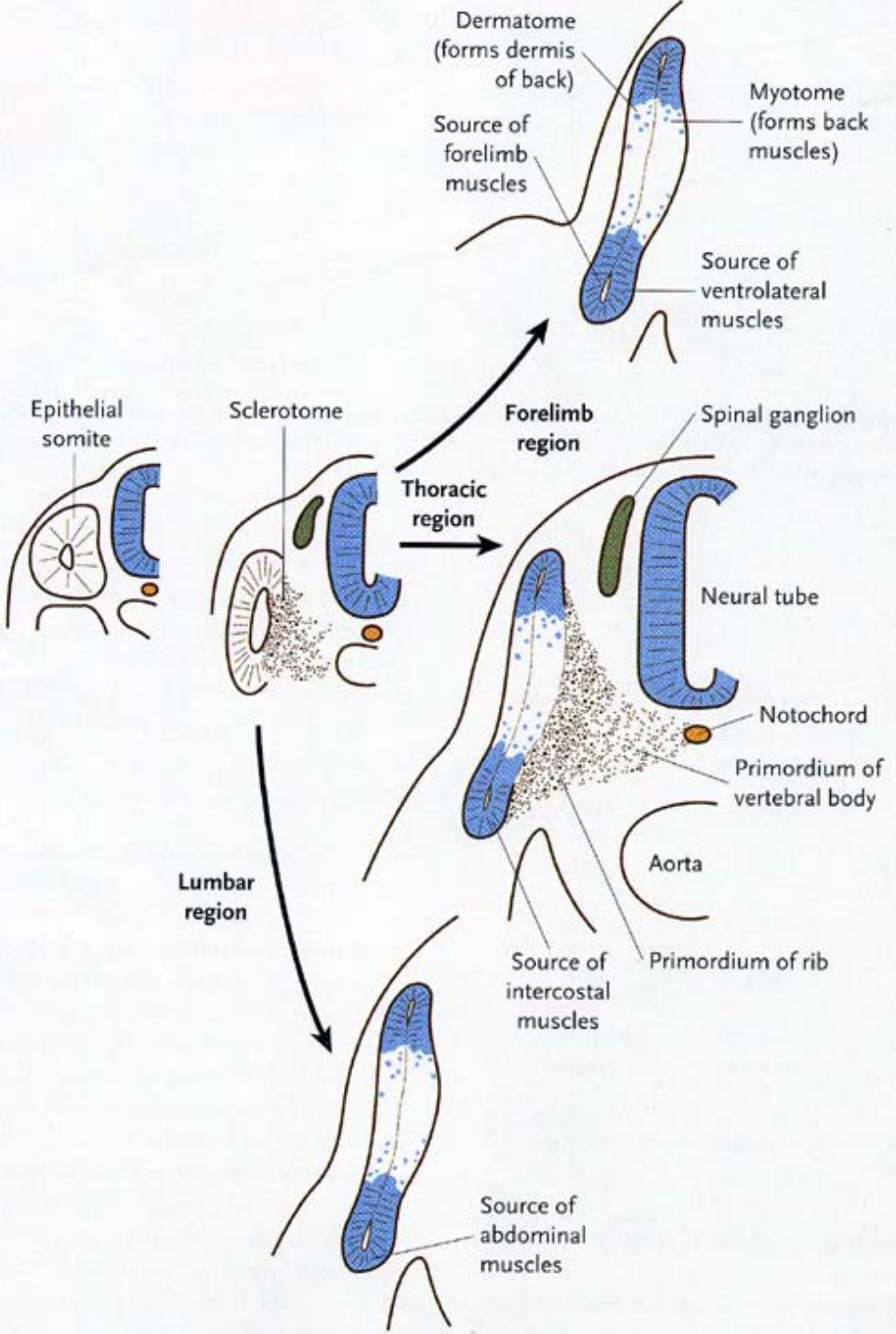
Region-Specific myoblast behavior

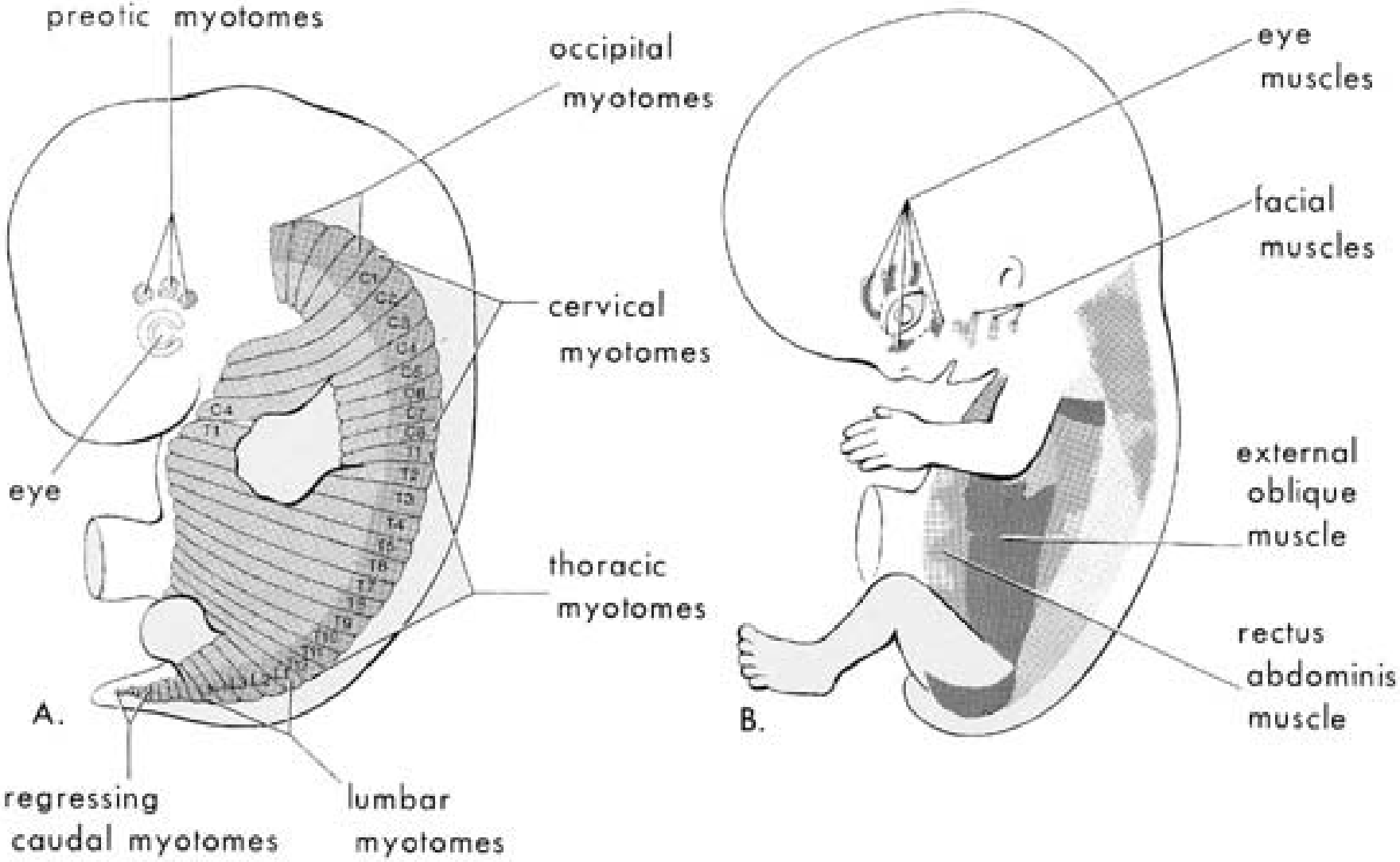
Limb Region – myoblast migration into limb primordia, Differentiation is delayed

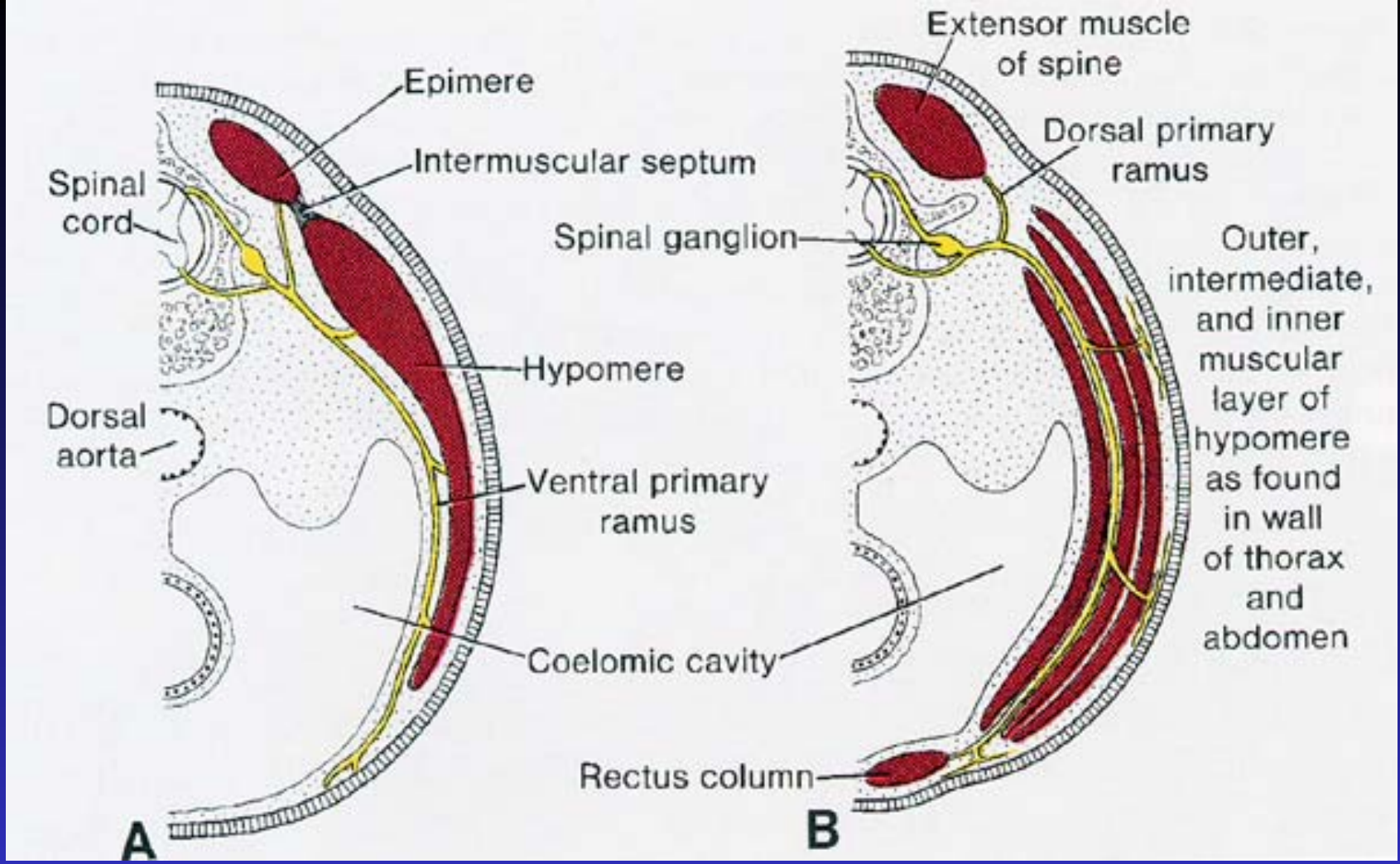
Thoracic Region – myotubes form at the somite – then invade the body wall to form the intercostal muscles

Lumbar Region – myoblast migrate to form the abdominal muscles

Myoblast behavior is controlled by their environment



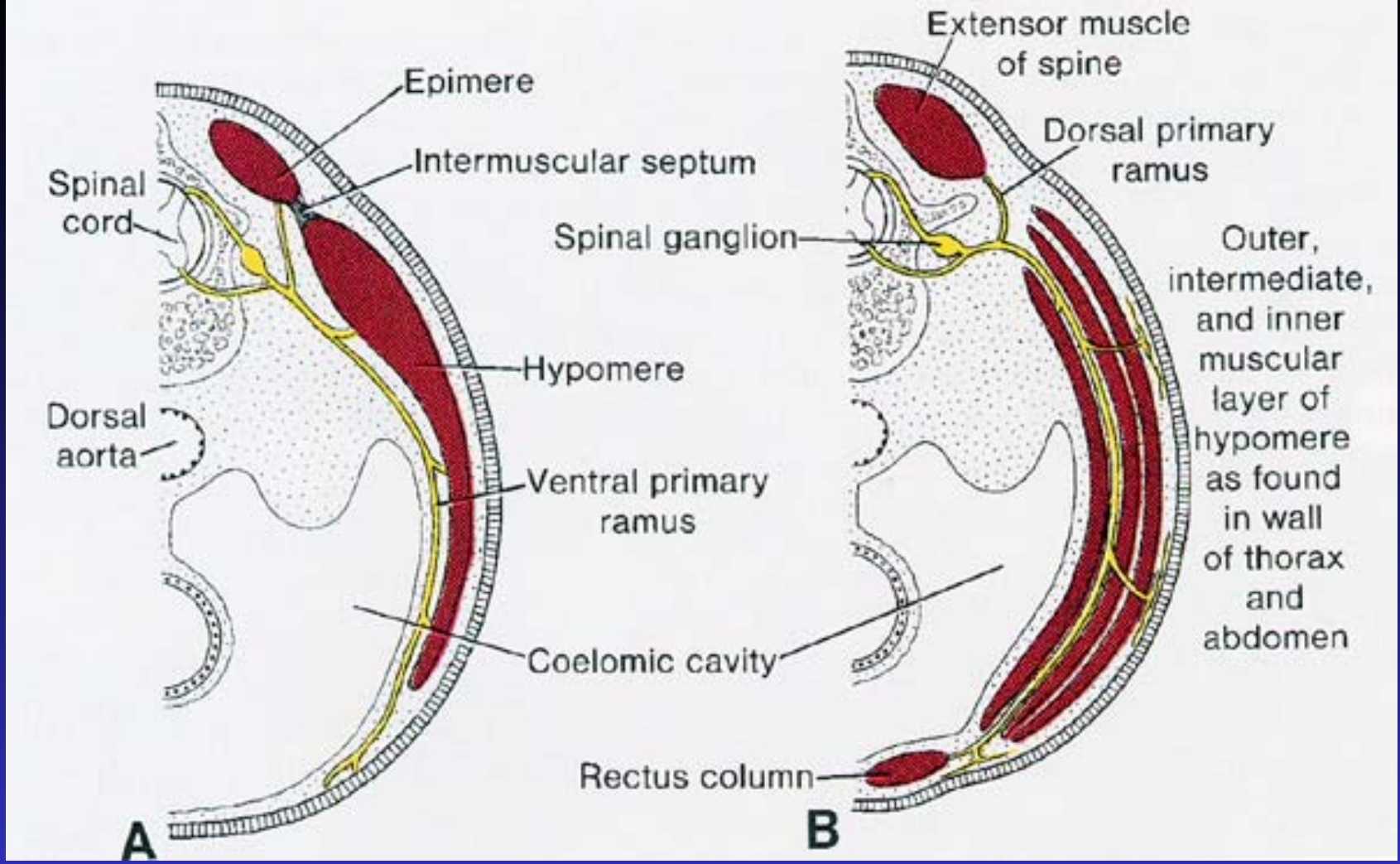

preotic myotomes
occipital myotomes
cervical myotomes
thoracic myotomes
eye
A.
regressing caudal myotomes
lumbar myotomes
eye muscles
facial muscles
external oblique muscle
rectus abdominis muscle
B.



Myotome: two parts

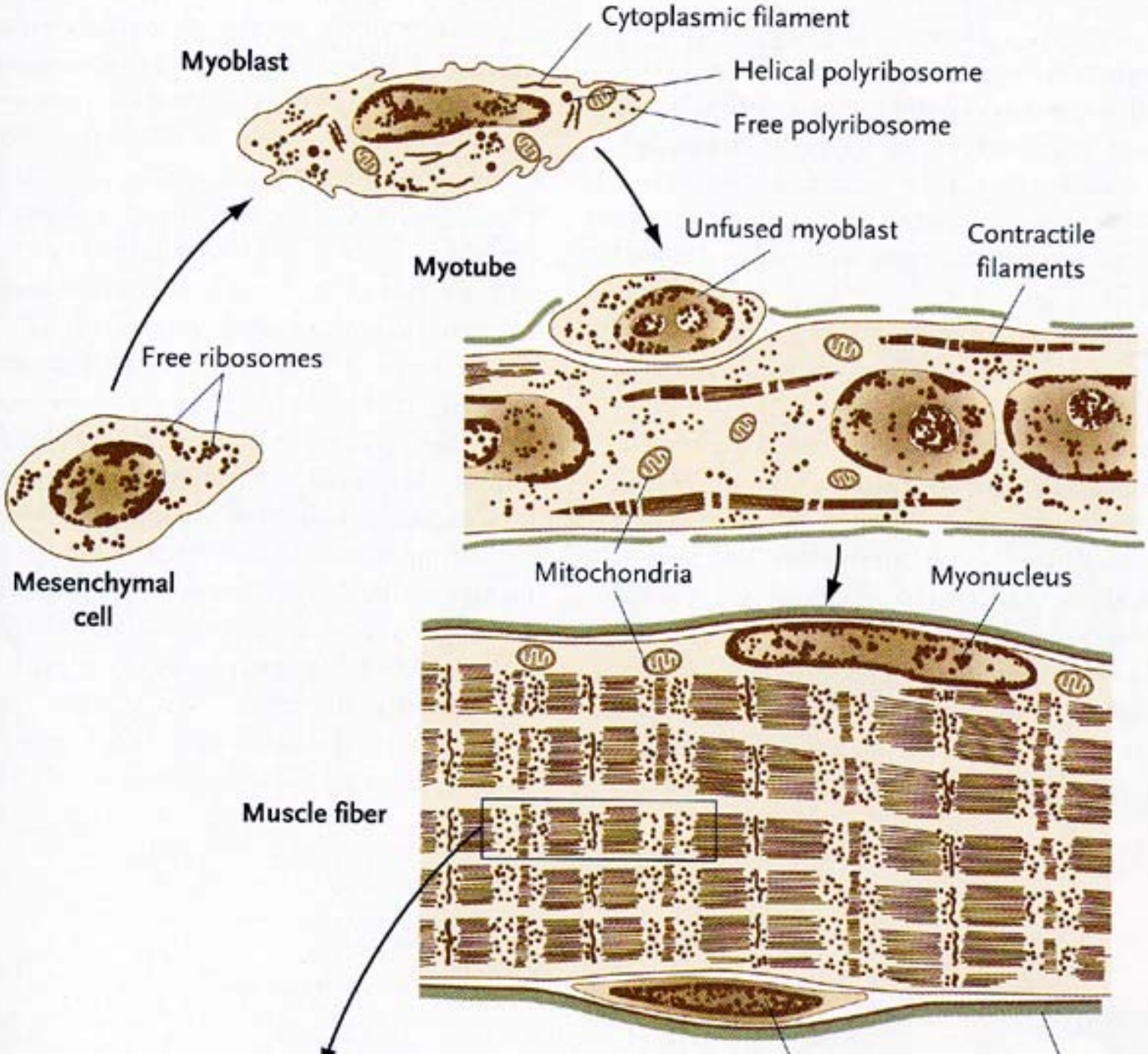
Epimere→Dorsomedial → Extensors of Vertebral column
Hypomere→Ventrolateral → limb/body wall

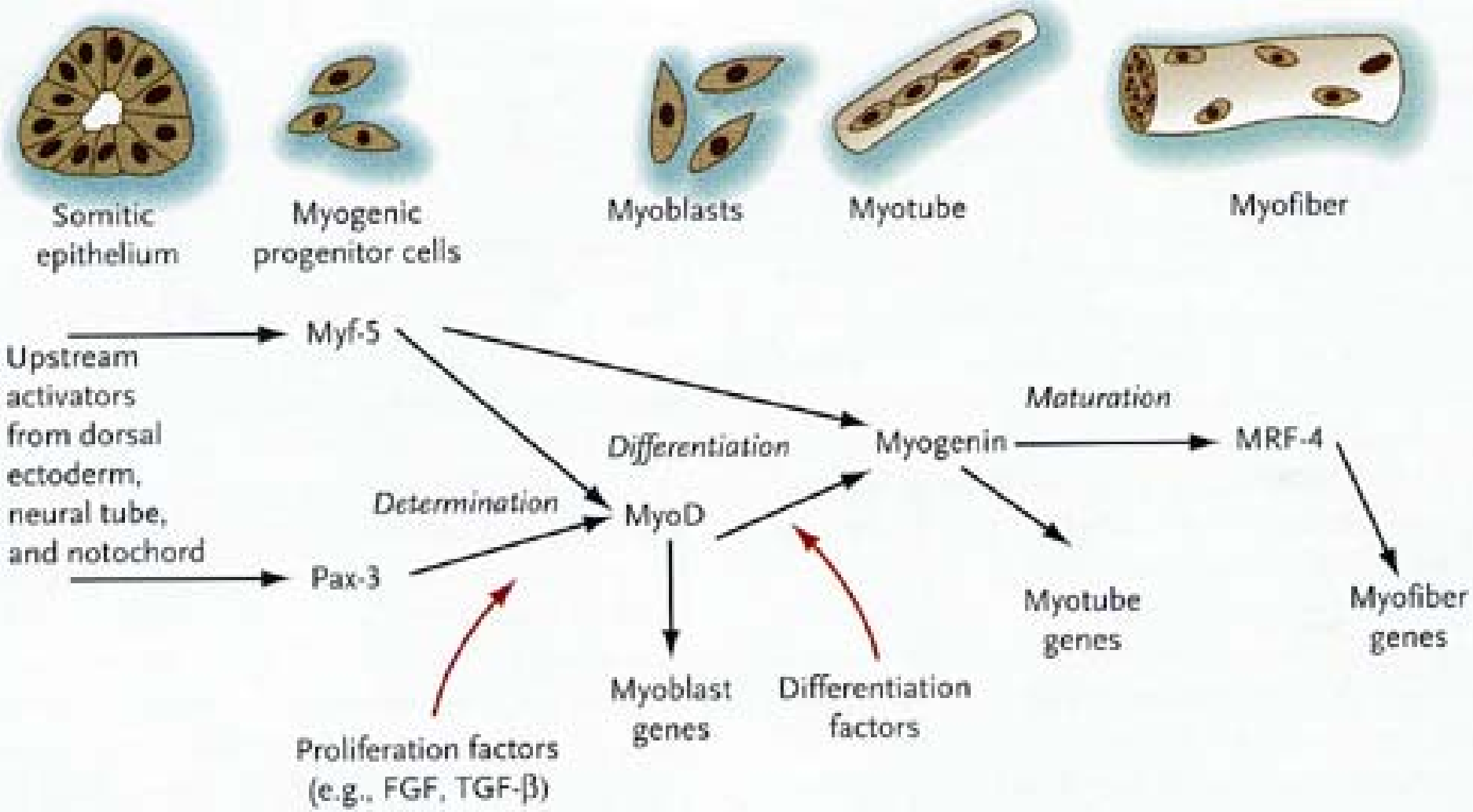
Innervating nerves – Dorsal ramus; Ventral ramus



Thoracic level – 3 myogenic layers – external intercostal, internal intercostal, transversus abdominis muscles

Ribs maintain segmented musculature, elsewhere fusion → large muscle sheets


Cytoplasmic filament
Myoblast
Helical polyribosome
Free polyribosome
Unfused myoblast
Myotube
Contractile filaments
Free ribosomes
Mitochondria
Myonucleus
Mesenchymal cell
Muscle fiber



Determination of myoblast occurs very early

Key regulators – Myf-5, Pax3, MyoD