

Muscular System

Chapter 11

Muscle Structure

- 3 types of muscle tissue
 - **Striated** - contains alternating bands of actin & myosin
 - each fiber multinucleated; called a **syncytium**
 - functional contractile unit is a **sarcomere**
 - multiple syncytium work together as a motor unit
 - **Cardiac Muscle** - similar to striated muscles but differs:
 - 1) uninucleated
 - 2) cells separated by **intercalated disks**
 - 3) can contract without nervous stimulation
 - 4) under the control of the autonomic nervous system

Muscle Structure

- **Smooth Muscle** - uninucleated without striations
 - usually in sheet associated with organs
 - under autonomic nervous system control

• Muscular System Categories

- 1) **Somatic musculature**
 - striated muscle attached to skeletal system and body walls
- 2) **Visceral musculature**
 - smooth muscle associated with major organ system. Also includes cardiac musculature and internal musculature of the eye.
- 3) **Branchiomeric musculature**
 - muscles associated with the gill arches and structures derived these elements.

- Skeletal (somatic) musculature

- Structure

- fibers consist of multiple strands of alternating, interwoven actin and myosin (**myofibril = syncytium**)
 - each multinucleated fiber is surrounded by the **endomysium**
 - striated muscle fibers bundled together to form **fascicles**.
 - fascicles surrounded by **perimysium**
 - all of the fascicles of a single muscle encased by **epimysium**
 - ends of the epimysium become **tendons** for attachment
- each muscle has an **origin** (brace) and **insertion** (lever)

- Muscle actions

- muscles can be categorized by action

- | | |
|----------------|------------|
| • Extension | Flexion |
| • Adduction | Abduction |
| • Protraction | Retraction |
| • Levate | Depress |
| • Supination | Pronation |
| • Constriction | Dilation |
| • Tensors | |

- 5 major divisions of the vertebrate musculature

- 1) Axial musculature

- fish - **epaxial** and **hypaxial** segments of the myomeres
- tetrapods - myospeta lost
 - epaxial muscles present in longitudinal bundles
 - » **intervertebrals**
 - » **longissimus**
 - » **spinales**
 - » **iliocostales**
 - hypaxial muscles divided into:
 - » **subvertebrals**
 - » **obliques** (includes intercostals, scalenus, transversus costarum, as well as "obliques")
 - » **transversus abdominus**
 - » **rectus abdominus**
 - » in mammals, the **diaphragm** is also included

- 5 major divisions of the vertebrate musculature

- 2) Hypoglossal muscles (below the gill regions)

- Fish:
 - **coracomandibular** and **coracohyoid**
- tetrapods
 - **sterno-**, **thyro-** & **geniohyoid**
 - **hyo-** **stylo-** and **genioglossus**

- 5 major divisions of the vertebrate musculature

- 3) Appendicular musculature

- fish:
 - levators and depressors
- tetrapods:
 - divided into **extrinsic** (attach limb structures to the axial skeleton) and **intrinsic** (attaches limb to limb girdle)
 - Pectoral musculature:
 - » Extrinsic dorsal -
 - » Extrinsic ventral -
 - » Intrinsic dorsal -
 - » Intrinsic ventral -

- Pelvic musculature:

- Extrinsic - small musculature due to the immobility of pelvic girdle
- Intrinsic -
- Hip musculature -
- Quadriceps -
- Other extensors & adductors-
- Flexors & abductors -

- Musculature of the lower hindlimb:

- 5 major divisions of the vertebrate musculature

- 4) Mandibular Arch Musculature

- Fish:
 - **palatoquadrate levator, mandibular adductor, and intermandibularis**
- Tetrapods:
 -

- 5) Integumentary musculature

- Only well developed in mammals
 - **cutaneous maximus**
 - **mimetics**
 - **platysma**