7 The Muscular System

Chapter Summary

Chapter seven describes smooth, cardiac, and skeletal muscle structure and function. Smooth muscle fibers (cells) are found in the walls of hollow internal organs and are uninucleate, spindle-shaped, and under involuntary control. Cardiac muscle fibers comprise much of the heart and are uninucleate, branched, striated, and also under involuntary control. Skeletal muscle fibers are multinucleate, cylindrical, striated, and under voluntary control. Muscle contraction maintains posture, allows for the movement of the body and internal organs, and generates heat to warm the body. Skeletal muscle structure and contraction are discussed. The contractile elements of skeletal muscle fibers are myofibrils which contain actin and myosin filaments. During muscle contraction these filaments slide over each other, causing the entire muscle fiber to shorten. Muscle fibers contract in an all-or-none fashion. The importance of exercise in maintaining good health is discussed as are muscle twitch, summation, and tetanus. Muscle contraction can be isometric or isotonic. During isometric contraction muscles do not shorten and no movement occurs. Muscle names often contain information regarding size, shape, attachments, location, and action. The origins, insertions, and actions of major muscles are both listed in tables and explained in the text.

Chapter Outline

I. Functions and Types of Muscles
   - A. Smooth
   - B. Cardiac
   - C. Skeletal
     1. Connective Tissue Coverings
     2. Functions of Skeletal Muscles

II. Microscopic Anatomy and Contraction of Skeletal Muscle
   - A. Muscle Fiber
     1. Myofibrils and Sarcomeres
     2. Myofilaments
   - B. Skeletal Muscle Contraction
   - C. The Role of Actin and Myosin
   - D. Energy for Muscle Contraction
     1. Creatine Phosphate Breakdown
     2. Cellular Respiration
     3. Fermentation
   - E. Oxygen Deficit

III. Muscle Responses
   - A. In the Laboratory
   - B. In the Body
     1. Athletics and Muscle Contraction

IV. Skeletal Muscles of the Body
   - A. Basic Principles
   - B. Naming Muscles
   - C. Skeletal Muscle Groups
   - D. Muscles of the Head
     1. Muscles of Facial Expression
        - a. Frontalis
        - b. Orbicularis oculi
        - c. Orbicularis oris
        - d. Buccinator
        - e. Zygomaticus

2. Muscles of Mastication
    a. Masseter
    b. Temporalis

C. Muscles of the Neck
1. Swallowing
2. Muscles That Move the Head
    a. Sternocleidomastoid
    b. Trapezius

D. Muscles of the Trunk
1. Muscles of the Thoracic Wall
    a. External Intercostal
    b. Diaphragm
    c. Internal Intercostal
2. Muscles of the Abdominal Wall
    a. External oblique
    b. Internal oblique
    c. Transversus abdominis
    d. Rectus abdominis

E. Muscles of the Shoulder
1. Muscles That Move the Scapula
    a. Sarratus Anterior
2. Muscles That Move the Arm
    a. Deltoid
    b. Pectoralis major
    c. Latissimus dorsi
    d. Rotator Cuff

F. Muscles of the Arm
    a. Biceps brachii
    b. Brachialis
    c. Triceps brachii

G. Muscles of the Forearm
    a. Flexor carpi
    b. Extensor carpi
    c. Flexor digitorum
    d. Extensor digitorum

H. Muscles of the Lower Limb
1. Muscles That Move the Thigh
    a. Iliopsoas
    b. Gluteus maximus
    c. Gluteum medius
    d. Adductor group

2. Muscles That Move the Leg
    a. Quadriceps femoris group
        —Rectus femoris
        —Vastus lateralis
        —Vastus medialis
        —Vastus intermedius
    b. Sartorius
        —Biceps femoris
        —Semimembranosus
        —Semitendinosus
    c. Hamstring group
3. Muscles That Move the Ankle and Foot
    a. Gastrocnemius
    b. Tibialis anterior
    c. Peroneus
    d. Flexor digitorum longus
    e. Extensor digitorum longus

V. Effects of Aging

VI. Homeostasis
    A. Muscular Disorders
        1. Spasms and Injuries
        2. Diseases

Suggested Student Activities

1. Investigate how athletic training may relate to muscle function.
2. Discuss the various types of movements that muscles produce and demonstrate them.
3. Identify muscles on charts and dissectable models of arms and legs.

Answers to Objective Questions

1. smooth
2. endomysium
3. actin
4. ATP
5. tone
6. prime mover, synergists
7. biceps brachii
8. iliac crest, humerus
9. temporalis
10. deltoid
11. triceps brachii
12. gluteus maximus
13. h
14. e
15. c
16. f
17. b
18. a
19. g
20. d

Answers to Medical Terminology Reinforcement Exercise

1. hyper/kinesis - excessive movement (over active)
2. dys/trophy - bad nourishment (nutritional or metabolic defect)
3. electro/myo/gram - record of electrical activity of muscle
4. menis/ectomy - excision of meniscus (cartilage of knee)
5. ten/orrhaphy - to suture (sew) a tendon
6. my/a/trophy - without development/nourishment of muscle
7. leio/my/oma - tumor of smooth muscle

8. kinesio/therapy - treatment by movement/exercise
9. myo/cardio/pathy - disease of heart muscle
10. my/asthenia - muscle weakness

Audiovisual Materials

1. Charts and Posters of the Muscular System
2. Dissectable Models of Arm and Leg Muscles