

Course: Anatomy and Physiology Honors Introduction to Anatomy and Physiology ©2014

Introduction to Anatomy and Physiology offers an engaging, scientifically sound, skills-based approach that provides students with a solid foundation in the structure and functions of the human body systems. Up-to-date, evidence-based, comprehensive information about anatomy and physiology is presented in a manner that addresses the complexity of science education and helps teachers develop educational plans that fully meet students' needs. The material is supported by rich, scientifically accurate illustrations that captivate students' interest and reinforce their understanding of anatomy and physiology concepts. Thorough coverage of the Florida Department of Education Standards is reinforced throughout the book with reading strategies, key concept features, tools for differentiated learning, and a variety of methods for assessing students' performance.

Print and Digital Materials

ISBN

Student Textbook

978-1-61960-412-4

Workbook

978-1-61960-417-9

Preview at
www.g-wonlinetextbooks.com

Login: apflorida
Password: aphonors17

CONTENTS

1. Foundations of Human Anatomy and Physiology
2. Cells and Tissues
3. Membranes and the Integumentary System
4. The Skeletal System
5. The Muscular System
6. The Nervous System
7. The Sensory Systems
8. The Endocrine System
9. The Respiratory System
10. The Blood
11. The Cardiovascular System
12. The Lymphatic and Immune Systems
13. The Digestive System and Nutrition
14. The Urinary System
15. The Male and Female Reproductive Systems

112 Introduction to Anatomy and Physiology

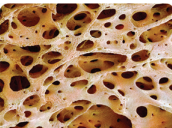


Figure 4.1 A micrograph of trabecular bone tissue. How would you describe the difference between trabecular and cortical bone to someone who knew nothing about these two types of bone tissue?

Most bones include both cortical and trabecular tissue. The function of a given bone determines whether it is composed mostly of cortical or trabecular bone. The outer layer of a bone is always composed of hard, protective cortical bone, with spongy trabecular bone present to varying degrees in the interior of bones. The long bones in the arms and legs are primarily composed of strong cortical bone tissue, although there is trabecular bone inside the ends. The bones in the spinal column contain a large amount of trabecular bone inside their cortical encasings, giving them a certain amount of shock-absorbing capability. Figure 4.2 compares the properties of these two types of bone tissue.

	Cortical Bone	Trabecular Bone
Structure	dense	porous (honeycomb structure)
Mineral content	relatively high	relatively low
Strength	relatively high	low
Flexibility	low	relatively more
Shock-absorbing ability	low	relatively more
Primary locations	outer surfaces of all bones, long bones of limbs	interior of vertebrae, femoral neck, wrist, and ankle bones

Memory Tip
The word *cortical* (coming from *cortex*) pertains to the outer layer of something. For example, the outer layer of the brain is known as the *cerebral cortex*. The outer layer of many structures and objects, including a plant stem or even a rock, is also known as its *cortex*. The type of bone tissue forming the outer layer of bone is therefore called *cortical* bone.

Shape Categories of Bones
Because of the large variety of sizes and shapes of the bones in the human skeleton, for purposes of discussion bones are traditionally divided into four categories (Figure 4.3):

1. **Long bones** have a long, somewhat round shaft made of cortical bone, with bulbous kinds of trabecular bone encased in cortical bone at both ends. The shafts enclose the central hollow medullary cavity or canal. The major bones of the arms and legs are long bones.
2. **Short bones** are shaped like a cube and are composed mostly of trabecular bone. The bones of the wrists and ankles are short bones.
3. **Flat bones** are thin, relatively large in surface area, and generally curved to some extent. Structurally, they consist of two thin layers of cortical bone with a layer of trabecular bone in between. These bones function to protect underlying organs and also provide

Chapter 4 The Skeletal System 113

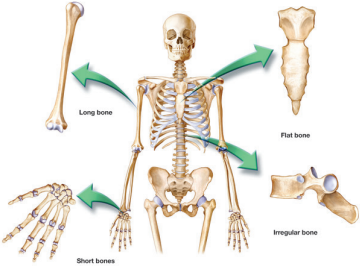


Figure 4.3 The four shape categories of bones.

large areas for muscle attachments. The scapula and the bones of the skull are considered flat bones.

4. **Irregular bones** are all those bones that do not fit into one of the preceding categories. They have individualized shapes to fulfill specific functions. The bones of the spinal column and hip girdle are in this category.

Anatomical Structure of Long Bones
The **diaphysis** (digh-AF-i-iss) of a long bone is the hollow shaft of the bone composed of cortical bone (Figure 4.4 on the next page). A fibrous connective tissue membrane called the **periosteum** (PER-ee-AHS-tee-um) surrounds and protects the diaphysis. The periosteum contains blood and lymph vessels, as well as nerves. It is involved in bone growth, repair, and nutrition. The hollow center of the diaphysis, as discussed, is the medullary canal, or cavity. Beginning when a person is about five years old, this cavity is filled with yellow bone marrow, which has a rich supply of blood vessels and is a storehouse for fat. The medullary cavity is lined by a membrane known as the **endosteum** (en-DAH-see-um).

Check Your Understanding

1. What percentage of bone weight comes from its mineral content?
2. What is collagen?
3. Where is cortical bone typically found?
4. Where is trabecular bone typically found?
5. List the four shape categories of bone.