CHAPTER 6: OSSEOUS TISSUE AND THE SKELETAL SYSTEM

READING ASSIGNMENT: Read pages 179-201. Bone markings will be covered in topics in Chapter 7 (axial skeleton).

Overview

A. Functions -

B. Classification of Bones
C. Structure of Bones
1) Long Bones
2) Flat, Short, and Irregular Bones
How many different types of bones are described for the body?

**Puzzler**

List the types and give an example in the space below.

<table>
<thead>
<tr>
<th>Type of Bone</th>
<th>Example</th>
</tr>
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<tbody>
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D. Microscopic Structure of Bone

1) The Osteon
2) Composition of Bone

a) Cells

b) Matrix
E. Bone Development

Two Types =

1) Intramembrane Ossification

**SUMMARY:**

STEP 1:
Mesenchymal cells aggregate, differentiate, and begin the ossification process. The bone expands as a series of spicules that spread into surrounding tissues.

STEP 2:
As the spicules interconnect, they trap blood vessels within the bone.

STEP 3:
Over time, the bone assumes the structure of spongy bone. Areas of spongy bone may later be removed, creating marrow cavities. Through remodeling, spongy bone formed in this way can be converted to compact bone.
2) Endochondral Ossification

**Step 1:** As the cartilage enlarges through appositional and interstitial growth, chondrocytes near the center of the shaft increase greatly in size. The matrix is reduced to a series of small struts that soon begin to calcify. The enlarged chondrocytes then die and disintegrate, leaving cavities within the cartilage.

**Step 2:** Blood vessels grow around the edges of the cartilage, and the cells of the perichondrium convert to osteoblasts. The shaft of the cartilage then becomes enmeshed in a superficial layer of bone.

**Step 3:** Blood vessels penetrate the cartilage and invade the central region. Fibroblasts migrating with the blood vessels differentiate into osteoblasts and begin producing spongy bone at a primary center of ossification. Bone formation then spreads along the shaft toward both ends.

**Step 4:** Remodelling occurs as growth continues, creating a marrow cavity. The bone of the shaft becomes thicker, and the cartilage near each epiphysis is replaced by shafts of bone. Further growth involves increases in length and diameter.
SUMMARY OF ENDOCHONDRAL OSSIFICATION:

**STEP 5:**
Capillaries and osteoblasts migrate into the epiphyses, creating secondary ossification centers.

**STEP 6:**
Soon the epiphyses are filled with spongy bone. An articular cartilage remains exposed to the joint cavity; over time it will be reduced to a thin superficial layer. At each metaphysis, an epiphyseal cartilage separates the epiphysis from the diaphysis.
F. Bone Growth

1) Appositional Growth

**STEP 1:**
Bone formation at the surface of the bone produces ridges that parallel a blood vessel.

**STEP 2:**
The ridges enlarge and create a deep pocket.

**STEP 3:**
The ridges meet and fuse, trapping the vessel inside the bone.

**STEPS 4-6:**
Bone deposition then proceeds inward toward the vessel, creating a typical osteon. Meanwhile, additional circumferential lamellae are deposited and the bone continues to increase in diameter. As it does, additional blood vessels will be encased.

**(a) Steps in appositional bone growth**
Unit 2: Introduction to Skeletal System
2) In Length
3) Bone Remodeling

4) Factors Affecting Bone Growth
ASSIGNMENTS

Lecture Guide
1) List the functions of the skeletal system. How does the microscopic structure of bone contribute to these functions?
2) Why is bone classified as a connective tissue? List the different types of bone and give an example of each.
3) Label the diagram below with the follow terms: articular cartilage, compact bone, spongy bone, periosteum, red marrow, yellow marrow, endosteum.

4) Draw a cross-section of an osteon (Haversion system) and label the following terms: osteon, blood vessels, nerve, osteocytes, lacuna, canaliculi, lamella.
5) Name and describe two types of ossification. What is the difference between each type of ossification? What types of bones are formed by each process and name some specific examples.
6) What are the components of the matrix in bone? List the cells found in bone and their functions.
7) How does bone grow in length and width?
8) In Harry Potter and the Chamber of Secrets, Harry’s arm is broken in a quiddich match. One of his professors mistakenly removes the bones from his arm. He is given skeleto-gro potion to grow his bones back to normal. Supposing that the bones grow just as embryonic bone, what describe the whole process of bone formation and remodelling that Harry will have to experience. Be sure to discuss the roles of chondrocytes, osteoblasts, osteocytes, and osteoclasts as well as changes in the composition of the matrix.

9) What factors would influence the regrowth of the bone in Harry’s arm?

Textbook Chapter 6 (page 203)
Level 1: Reviewing Facts and Terms: 1-7, 10-15
Level 2: Reviewing Concepts: 20, 21, 23
Level 3: Critical Thinking and Clinical Application: 32, 33

Answers to text questions are in the back of your text on pages A-5 and A-6.

Study Guide Chapter 6 (pages 103-118)
(L1) Multiple Choice: 1-11, 13-15, 18, 21
Completion: 1, 3, 15, 19
Drawing/Illustration labeling: Fig 6.1, Fig 6.2
(L2) Concept Map 1
Body Trek: all
Multiple Choice: 3, 13, 15-17
Completion: 3, 6
Short Essay: 1, 2, 3, 5, 7
(L3) Critical Thinking: 1

Answers to Chapter 6 Study Guide Questions are located at the back of the Study Guide.