Objectives

- Be able to name and identify the different types of connective tissue.
- Be prepared to give examples of where connective tissues are found and their function(s).
- Define and label the microscopic structures of compact bone.
- Label the principal components of long bone.
- Be able to identify several principal bones of the human skeleton.

Introduction

Your body is held together by specialized tissues called connective tissue. This is one of the four principal tissue types found in mammals. Rigid support for your body is provided by one type of connective tissue, bone tissue. This is organized into the skeletal system. Muscles attached to the skeletal bones allow the body to move.

In the BiologyOne DVD, go to the Connective Tissues simulation to complete this exercise.
Activity 32.1
Connective Tissues

Connective tissue is the most diverse of the four tissue types. The cells of connective tissue are found in a noncellular matrix. Connective tissue can be found either connecting, supporting, or surrounding other tissue types. The types of connective tissue that you will observe include bone, hyaline cartilage, areolar tissue, tendon, adipose tissue, and blood.

Bone Tissue
View the micrograph showing a cross section of compact bone. The actual cells are called osteocytes and are found in the lacunae. What you see is primarily the noncellular matrix made up of calcium and other minerals. Identify the Haversian system, Haversian canal (carrying blood vessels and nerve fibers), the lamellae, and the lacunae. Make a labeled drawing of bone tissue in the Results Section. Bone will be examined more closely in activity 2 and 3.

Areolar Tissue
Areolar tissue could be considered your body’s packing material. It is generally located under epithelial tissue, and also softly packs and holds your organs. It is a loose connective tissue that contains collagen, elastic, and reticular fibers in the matrix. Other than these fibers, the matrix is mostly made of fluid. The fluid serves as both the source of nutrients and the site of waste disposal for other body cells.

Micrograph of Compact Bone Tissue

Micrograph of Areolar Tissue

Cells other than fibroblasts (fiber forming cells) found in the areolar matrix are mast cells and macrophages. Both mast cells and macrophages are important in your body’s defense. The mast cells “sound the alarm” when foreign substances (e.g., bacteria) enter the body, and macrophages dispose of foreign or waste particles by engulfing them. Try to locate mast cells, and the larger fibroblasts, as well as some of the fibers in the matrix. Make a labeled drawing of areolar tissue in the Results Section.
Dense Regular Connective Tissue
Tendons are made of dense connective tissue. As the name implies, the protein fibers of the matrix (primarily collagen) are densely packed and provide a great deal of strength, flexibility, and also resistance to forces pulling in one direction. Tendons connect muscle to muscle or muscle to bone. This is a good example of how “form follows function” in the body, for this is an area in need of great strength and resistance. Examine the micrographs of the tendon. In this preparation, the densely packed fibers have been teased apart making them easier to view. Make a labeled drawing of the dense regular connective tissue in the Results Section.

Hyaline Cartilage
Gently touch your trachea and larynx (Adam’s apple). Feel the flexibility of your nose. You have just been introduced to hyaline cartilage. Look at the slide of hyaline cartilage. You will notice that there is a great deal of matrix. The matrix contains undetectable collagen fibers, and the actual cells (called chondrocytes) are located in tiny depressions called lacunae. Make a drawing of hyaline cartilage in the Results Section.

Adipose Tissue
Adipose tissue is simply fat. There is little matrix, and the cells look empty because they are so packed with lipid droplets. The cell membranes and the nuclei are all that is visible, other than the glistening puddles of oil. This type of connective tissue is found under the skin and around internal organs. Though it generally has negative connotations, some fat is important as a reserve energy supply, an insulator to prevent loss of heat, and in protecting some delicate organs. Observe the slide of adipose tissue and identify the lipid droplets, the cell nuclei, and the cell membrane. Notice the tiny amount of matrix. Make a labeled drawing of adipose tissue in the Results Section.

Blood
One of the reasons blood is classified as a connective tissue is that its cells are separated by a nonliving matrix, the plasma. Examine the micrographs of blood. You should be able to distinguish the red and white blood cells. Make a drawing of blood cells in the Results Section. A closer examination of blood is conducted in the Circulatory System lab exercise.
Activity 32.2
Bones

In the Connective Tissues simulation in the BiologyOne DVD, study the structure of long bones. At the end of these bones, the epiphysis, the bone has a thin covering of compact bone over a mass of spongy bone. The spaces within the spongy bone are filled with the bone’s red marrow that is responsible for producing blood cells.

You should be able to find a line through the epiphysis. This is the epiphyseal line. While the individual is growing, this region of the bone is composed of cartilage and is the site of bone growth. When growth has stopped, the cartilage becomes ossified and remains as the epiphyseal line.

The shaft of a long bone is called the diaphysis. In this region the walls of the bone are usually composed of a thick layer of compact bone tissue. In the medullary canal of the diaphysis you will find the yellow marrow, a site for nutrient storage.

The bone is covered by a thin membrane called the periosteum.

Using the BiologyOne simulation, examine the structure of a long bone and label the illustration in the Results Section.

Activity 32.3
Skeleton

After studying the structure of bone, use the Connective Tissue simulation or other source to identify and label the bones of the skeleton indicated in the Results Section.
Lab Exercise 32

Results Section

Activity 32.1
Connective Tissues

- compact bone tissue
- areolar tissue
- dense regular connective tissue
- hyaline cartilage tissue
Activity 32.2
Bones

1. ______________________ (growth line)
2. ______________________ (bone type)
3. ______________________ (bone type)
4. ______________________ (fills cavities)
5. ______________________ (fills cavity)