The Foot Bone is connected to the leg bone. The leg bone is connected to the...sesamoid bone inside a synovial joint. Learning the names of common bones is probably not a favorite activity of most high school students. As students of animal science, however, it has great importance. Understanding the skeletal system of common animals will lay the foundation for a proper study of animal anatomy.

Objectives:

1. Examine the skeletal system, and describe its functions.
2. Identify the components of bone, discuss the three cell types found in bones, and discuss how bones are classified.

Key Terms:

- flat bones
- long bones
- osteoblasts
- osteoclasts
- osteocytes
- osteoid
- red marrow
- sesamoid bones
- short bones
- skeletal system
- yellow marrow

The Skeletal System

As humans, the ability to walk upright and to perform a large number of tasks with amazing precision is often taken for granted. These abilities that give us an edge over most other animals on our planet are the result of our skeletal systems. The skeletal system consists of bones, teeth, joints, and structures that connect bones to other bones or muscles (e.g., ligaments, tendons, and cartilage). Most animals, excluding insects, have internal skeletal systems that serve a variety of functions, including support, protection, storage, and healing. Whether you are a pet owner or become a livestock producer, a knowledge of the basic structure and
function of the skeletal system will help you become more educated and more effective in the care of these animals.

FUNCTIONS OF THE SKELETAL SYSTEM

The skeletal system has many functions, most of which we do not realize are taking place. These various functions enable organisms to grow larger, move better, protect effectively, and heal faster. Functions of the skeletal system include support, protection, movement, mineral and energy storage, and blood-cell formation.

Support

Without the support of the skeletal system, animals would all be confined to smaller, more compact designs. In addition, animals mainly would inhabit waters where gravity would not create much strain on internal organs. Many bones of the body provide support, but it is especially true of the long bones. For example, the long bones in legs help support the trunk. Bones other than long bones also provide support. For example, the first vertebra supports the skull, the second vertebra supports the first, and so on. With the support of bones, animals were able to develop into larger organisms with greater chest and
organ capacities. Even the massive bones found from dinosaurs prove that large growth is not possible without strong bones.

**Protection**

An important function of the skeletal system is the protection of vital internal organs. The skull protects the brain just as the rib cage protects the heart, lungs, and abdominal organs. Being encased and protected allowed these organs to develop and to increase in size and performance. Without protection from bones, a simple bump to the head or abdomen could be a fatal injury.

**Movement**

In combination with the muscular system, the skeletal system provides for bodily motion. Skeletal muscles are attached to bones by tendons. The tendons act as a lever to move bones. All bones are pulled by muscles, not pushed, so each moveable bone must be strong enough to withstand the pulling force exerted upon it.

**Mineral and Energy Storage**

The outer layers of bony tissues are used for the storage of minerals, primarily calcium and phosphorus. Deposits and withdrawals of mineral ions from bone are continuous, which helps to maintain blood levels of calcium and phosphorus. Yellow marrow, found in the shaft of long bones and other mature bones, consists mostly of fat and serves as an energy reserve.

**Blood-Cell Formation**

The inner core of bone is a soft tissue called bone marrow. Red marrow is a major site of blood cell and platelet formation. Platelets help to heal wounds by surrounding injury sites and stopping external blood flow, eventually forming a scab. Blood cells produced by the marrow are red or white. Red blood cells carry oxygen to tissues by way of the circulatory system. Meanwhile, white blood cells identify foreign and potentially infectious cells in the body, which they attack and destroy.
Components of Bone

Bone formation in our bodies is kind of a strange event, with our bodies actually creating and destroying bone tissue constantly. Bone is composed of organic and inorganic materials. Inorganic or mineral components of bone account for 65 percent of the total bone mass. Most of the 65 percent is made of calcium phosphate, which gives bone its hardness and rigidity. The organic component consists of the three cell types found in bones and osteoid, which is primarily collagen and gives bone its high tensile strength. The three cell types found in bones are osteoblasts, osteocytes, and osteoclasts. Bone tissue first forms in prenatal development where many bones are built on cartilage models. Then the osteoblasts form bone matrix by secreting collagen. The osteoblasts become enclosed in the matrix and develop into osteocytes, which are the principle bone cells that maintain daily cellular activities, such as the exchange of nutrients and wastes with blood. Whereas osteoblasts deposit bone, osteoclasts secrete enzymes that digest bone. As a living tissue, bone is continually remodeled in response to the body’s need for calcium and for repairing damaged tissue. Osteoclasts are important in the development, growth, maintenance, and repair of bone. Bones are classified by shape as long, short, flat, sesamoid, and irregular.

CLASSIFICATION OF BONE

There is no single bone from which entire organisms are built. Instead, many different types of bones—each with different functions—work together to give the skeletal system strength and effectiveness. Long bones are cylindrical in shape and consist of a shaft with two ends. Found in limbs, long bones typically support body weight and act as levers. The femur, or thighbone, is an example of a long bone. Short bones are cube-like in that they are nearly equal in length and width. Short bones are found in the knee and hock and help to absorb the shock of impact. Generally thinner and usually curved, flat bones (e.g., ribs, scapula, and some bones in the skull) surround and protect vital organs. Sesamoid bones are small and embedded in tendons. The patella, known commonly as the knee cap, is the only human sesamoid bone. Irregular bones have a variety of shapes and sizes. Vertebrae and some bones in the skull are examples of irregular bones.

FIGURE 5. Skeletal system strength comes from many different types of bones.
Summary:

Since we rarely see bones on living organisms, they often are unnoticed until an injury or defect brings them to our attention. In reality, bone provides a variety of services behind the scenes to animal bodies. From support and movement to the protection of vital organs, bones provide for everyday routines. On the microscopic scale, bones are fighting viruses and infections that pose threats to our bodies with the production of blood cells.

Different types of bones work together in our body to perform all the functions that we require. Long bones, short bones, flat bones, and sesamoid bones all work seamlessly to allow animals to move, eat, and grow normally. Without the skeletal system, our lives just would not have any...structure!

Checking Your Knowledge:

1. What are the four classifications of bones?
2. List five functions of bones in the animal body.
3. Identify the two types of blood cells formed in bone, and give a brief description of the function of each.
4. What are the only sesamoid bones in the human body?
5. Define the following terms: osteoblast, osteoclast, and osteocytes.

Expanding Your Knowledge:

Visit a local veterinarian and discuss the functions of bone. Questions could pertain to the differences in bones in various common livestock or nutrition for healthy bones in animals.

Web Links:

Equine (Horse) Veterinary Anatomy
http://vetmedicine.about.com/od/equinehorseanatomy/Equine_Horse_Veterinary_Anatomy.htm

Interactive Games—Livestock Identification
http://www.ca.uky.edu/agripedia/AGMANIA/Interactive/

Skeletal System
http://www.agedtechprep.com/content/hs/supplemental/200Animal/240/248/248.ppt