

UNIT TWO



Animal Biology and Technology

Animals as Organisms

OBJECTIVES

This chapter covers the basic anatomy and physiology of common animals. It has the following objectives:

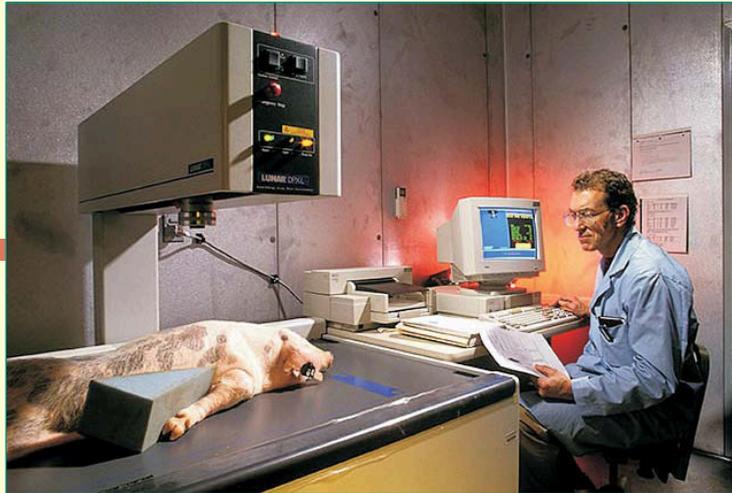
- 1** Explain taxonomy and scientific names
- 2** List and describe the major animal groups
- 3** Identify the life processes of animals
- 4** Explain the structural basis of animals
- 5** Describe the anatomy of common animals
- 6** Explain the structure and parts of bones
- 7** Identify the major organ systems of animals and explain the physiology of each

TERMS

anatomy
bone
cartilage
cell division
cell specialization
circulatory system
connective tissue
digestive system
epithelial tissue
excretory system
growth plate

homeostasis
integumentary system
invertebrate
Kingdom Animalia
lymphatic system
mammal
marrow
meiosis
mitosis
muscular system
muscular tissue

nervous system
nervous tissue
organ
organ system
physiology
reproductive system
respiratory system
skeletal system
tissue
vertebrae
vertebrate



2-1. A scientist is using a type of x-ray to measure the body composition of a live pig that has been anesthetized. (The x-ray is DEXA, or dual-energy x-ray absorptiometry. This does not injure the pig.) (Courtesy, Agricultural Research Service, USDA)

ANIMALS are complex creatures. Most have the same basic systems and needs for life to occur. Cells, tissues, and organs of an animal serve important roles. Organ systems carry out life processes. While much has been learned about animals, there is a lot more to learn.

Just as animals have many similarities there are differences. The differences are greater between species that are not so closely related. For example, birds have greater differences with livestock than with other birds. A fish species is more like other fish than it is like dogs or guinea pigs. Unique life processes must occur if members of a species are to thrive.

People are better producers, care-givers, and friends of animals if they know animal biology. Knowledge helps people understand why animals respond as they do and how to respond to their. Learning the major internal and external parts and functions of animals is a good place to begin. This chapter provides a good starting point.

is an animal without a backbone. Examples of invertebrates include shrimp, crawfish, honeybees, spiders, mites, earthworms, and snails.

Vertebrates belong to the Phylum Chordata and to the Subphylum Verbrata. They have many common characteristics. They have vertebrae (bones and cartilage) that surround the nerve cord. Bones make up the internal skeleton that provides the body's framework. Vertebrates have a skull that protects the brain. They also have an axial skeleton made of the backbone and skull. Paired limbs (arms and legs) are attached to the axial skeleton. Finally, muscles provide movement by being attached to the skeleton.



2–4. Birds, such as this Tucan, belong to the class Aves. The Tucan is more like other birds than it is like mammals and fish.

CLASSES

Animals are in several classes. The three main classes are birds (Aves), bony fish (Osteichthyes), and mammals (Mammalia). Snakes, shellfish, turtles, and alligators are examples in other classes.

Birds

Some 9,000 species of birds have been identified. Birds belong to the class Aves. Birds can live in the air, on land, or in the water. Most birds are wild; a few have been

CAREER PROFILE

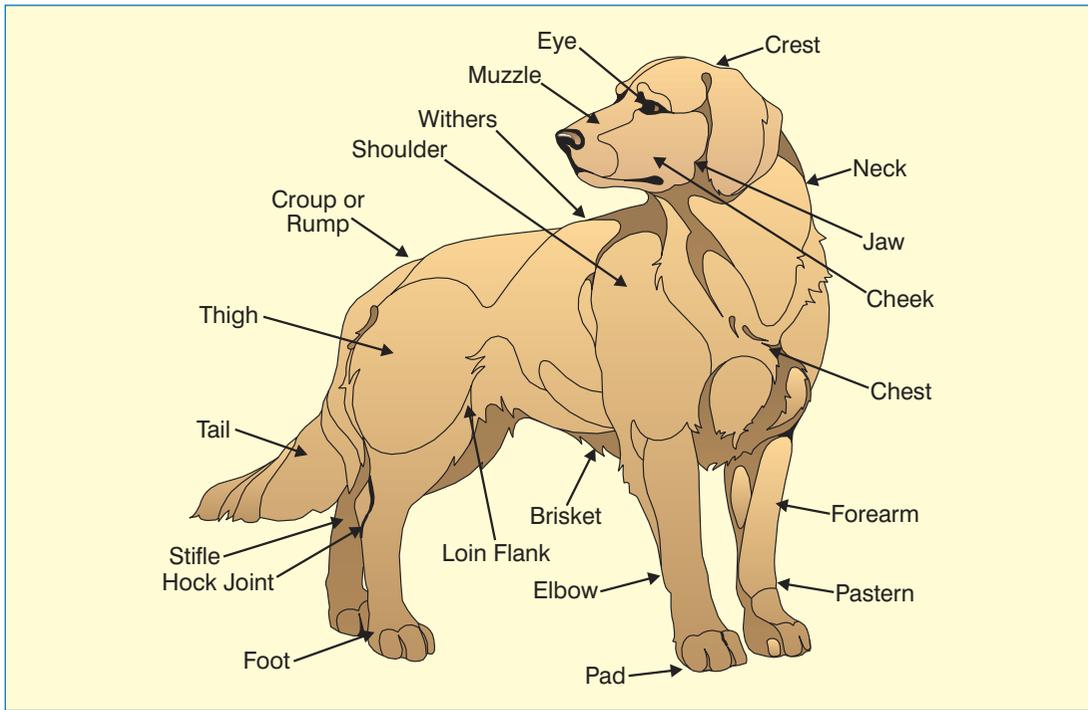
ANIMAL TRAINER

An animal trainer works with animals to help them gain the desired skills to meet human needs. Training varies with the kind of animal and the behavior that is desired. Horses are trained for riding. Mules may be trained to pull a heavy load. Cattle are trained to lead in a show halter or to enter a stanchion.

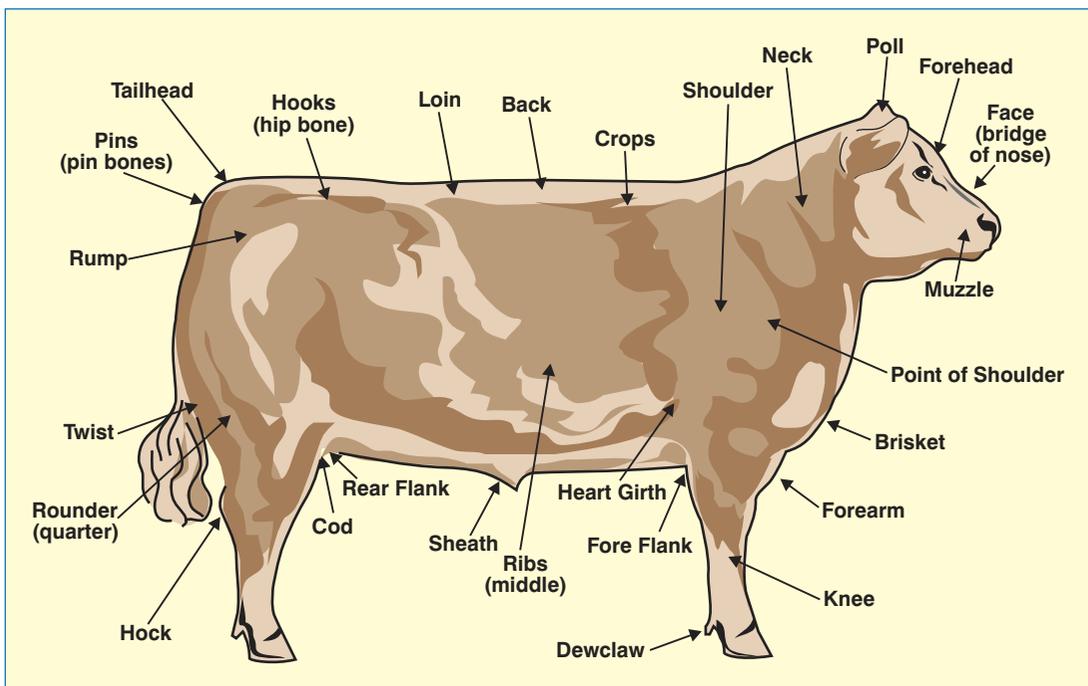


Animal trainers need a good understanding of the biology of the animals they are working with. They need to understand the nature of the animal and how it responds to human demands. Animal trainers need to be patient and always consider the well-being of an animal. Practical experience with animals is essential. Many animal trainers learn the trade under the direction of an experienced trainer.

Jobs for animal trainers are found on farms or ranches where animals are trained. This photo shows a trainer working with a mule to teach it a desired behavior. (Courtesy, Lucky Three Ranch, Inc.)



2-11. Major external parts of a dog.



2-12. Major external parts of a steer.

BONES

Bone is the hard, semirigid tissue that forms the skeleton of an animal. Bone structures give the body shape and support and protect the internal organs. It is important in all animals having vertebrae. Wings, legs, backbones, and other body parts are strong because of bone. Muscles and tendons are connected to bones and make movement possible. Bone is also known as osseous tissue. It is in a wide range of shapes and sizes. Osteology is the study of bones.

Bone is made up of minerals. Calcium, phosphate, and carbonate are the major minerals in bone. This means that young, growing animals need diets high in calcium and other minerals. Without an adequate amount of these minerals, bone may not develop properly.

Bone is an active tissue. It is constantly being used or dissolved and rebuilt. This process is known as bone turnover. It occurs more rapidly in young animals and declines as an animal ages. This decline with aging may explain why the bones of older animals are increasingly brittle and easily broken.

KINDS OF BONES

Bones are classified by their structure and shape. The two major classes by structure are compact and cancellous. Compact bone is bone that looks solid. It is contrasted with

CONNECTION



CAT PARTS

Knowledge of anatomy helps people care for animals. It helps in providing for their well-being. Most people use a preserved specimen in their study. Once opened, organ systems are observed. Skeletal, muscular, digestive, circulatory, and respiratory systems are the easiest to see.

These students are studying the anatomy of a cat as part of their small animal class. They are using a specimen that has been carefully preserved by a biological supply company. The students are following proper safety procedures by using gloves, goggles,

and aprons. The specimen has been properly opened and positioned on a dissection tray. Students are in a well-ventilated laboratory.

Students will apply what they have learned in the school lab, on the job, and in caring for their own animals.

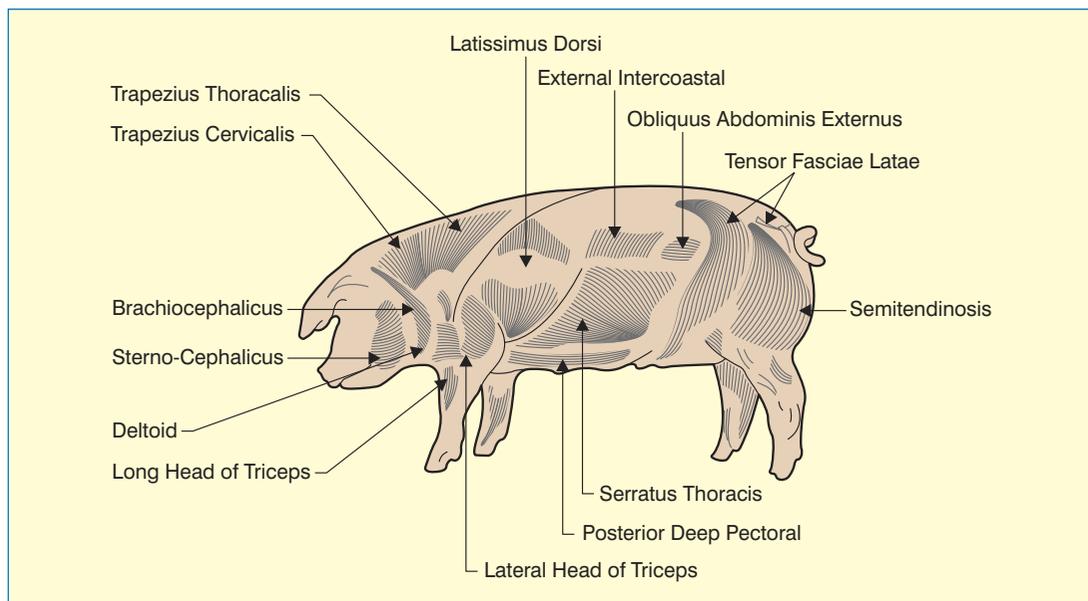
MAJOR ANIMAL SYSTEMS AND PHYSIOLOGY

As organisms, animals have several systems that make the living condition possible. The physiology of these organ systems involves essential functions for an animal. The major organ systems and the chief structures in the systems are shown in Table 2–3.

- Muscular system—The **muscular system** acquires materials and energy. It creates body movements, maintains posture, supports the body, and produces heat. In meat animals, good muscling is needed because of its value as food. Figure 2–19 outlines parts of the hog's muscular system.
- Skeletal system—The **skeletal system** provides the framework for the body. The major

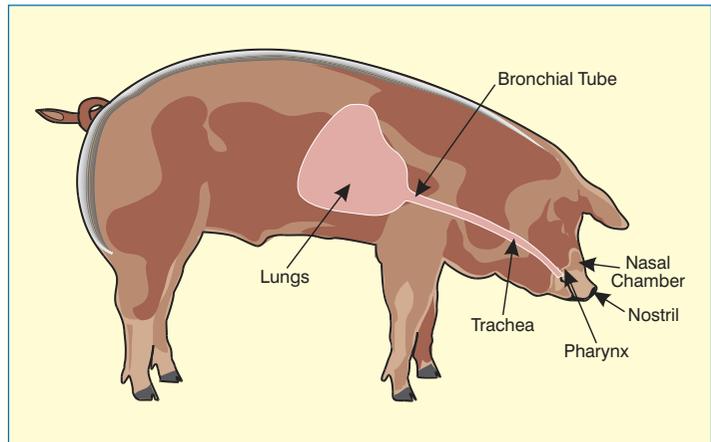
Table 2–3. Organ Systems and Structures

System	Chief Structures
Circulatory	Heart
Digestive	Stomach and intestines
Integumentary	Skin
Endocrine	Ductless glands
Excretory	Kidneys and bladder
Muscular	Muscles
Nervous	Brain, spinal cord, nerves
Reproductive	Ovaries and testes
Respiratory	Lungs
Skeletal	Bones, joints

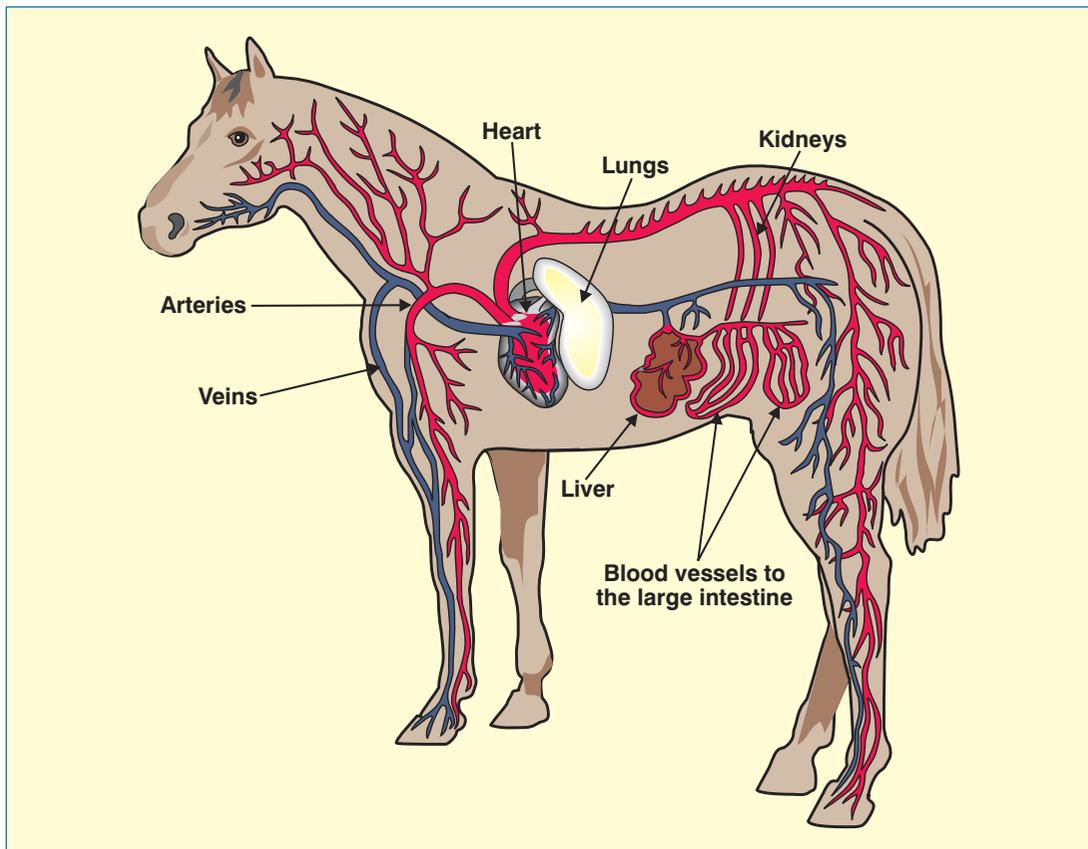


2–19. The muscular system of a hog.

- Circulatory system—Nutrients, oxygen, and metabolic wastes are moved by the **circulatory system**. Oxygen (from the lungs) and nutrients (absorbed in the small intestine) are transported to the cells, while wastes are removed. The circulatory system also moves hormones and protects against injury and microbes. The system consists of blood, heart, arteries, capillaries, and veins. The circulatory system of a horse is shown in Figure 2–24.



2–23. The respiratory system of a hog.



2–24. The circulatory system of a horse.

REVIEWING

MAIN IDEAS

The Kingdom Animalia includes all agricultural animals. Organisms in the Kingdom Animalia are made of cells, can move about on their own, and get their food from other sources. Many common animals belong to the phylum Chordata and the subphylum Vertebrata. Birds, fish, and mammals are among the most common Chordata.

Animals carry out life processes. When these processes stop, the animal is no longer in the living condition. A structure is needed for an animal to survive. The structure begins with the cell. Cells specialize to carry out unique activities for an organism. Groups of specialized cells form tissues. Tissues form organs. Organs form organ systems. Animals have the following organ systems: circulatory, digestive, integumentary, endocrine, excretory, muscular, nervous, reproductive, respiratory, and skeletal. These systems have important tissues, such as bones, and organs, such as eyes and ears.

A knowledge of anatomy and physiology helps animal producers understand their animals. They are better able to provide conditions that meet the needs of the animals. They can help animals grow efficiently and have healthy lives. A thorough knowledge of anatomy and physiology is needed by veterinarians, animal researchers, and others involved with animals.

QUESTIONS

Answer the following questions using complete sentences and correct spelling.

1. What are the three traits of organisms in the Kingdom Animalia?
2. What are the common characteristics of vertebrates?
3. Compare and contrast birds, bony fishes, and mammals.
4. What are the life processes of animals?
5. What is a cell? Cell specialization?
6. What is an organ system?
7. Distinguish between anatomy and physiology.
8. What are the major systems of animals? What is the function of each?
9. Compare and contrast the digestive systems of a hog, a cow, and a chicken.
10. Why is good muscle development important in selecting animals for meat production?

EVALUATING

Match the term with the correct definition. Write the letter of the term on the line provided.

- | | | |
|-------------------|----------------|-----------------|
| a. vertebrate | e. physiology | i. growth plate |
| b. anatomy | f. homeostasis | j. organ system |
| c. nervous tissue | g. taxonomy | |
| d. invertebrate | h. mammal | |

- _____ 1. Responds to stimuli and transmits nerve impulses.
- _____ 2. Animal with backbone.
- _____ 3. Constancy of the internal environment of an organism.
- _____ 4. Function of cells, tissues, organs, and systems.
- _____ 5. Form, shape, and appearance of animals.
- _____ 6. Females give birth to live young and secrete milk.
- _____ 7. Animal that does not have a backbone.
- _____ 8. Science of classifying organisms.
- _____ 9. Location in bone development where cartilage is formed.
- _____ 10. A group of organs that works together to carry out a specific function.

EXPLORING

1. Dissect a pig or other farm animal. Compare the various types of tissue and organ systems and their functions. Use proper procedures in your work. Follow all safety practices.

2. Visit a local farm or ranch that raises various agricultural animals or attend a livestock show. Compare and contrast the external parts of the animals. Use a camera to make photographs of the different animals. Prepare a poster or bulletin board that summarizes your observations.

3. Make a sketch on a separate sheet of paper of an animal that is raised on local farms or kept as a companion. Label the major external parts.

4. Visit a local pet shop. Observe the animals that are for sale. Compare the traits of animals of different species. Investigate the care needs of each species for its well-being.