

Anatomy and Physiology of Animals

UNDERSTANDING the anatomy and physiology of animals is important to anyone involved in the animal industry. Knowledge of the function and location of internal and external parts by animal industry employees will ensure animal well-being.



Objectives:



1. Describe the importance of anatomy and physiology in animal production.
2. Explain the role of cell specialization in organisms.
3. Identify external parts of selected agricultural animals.

Key Terms:



anatomy	comparative anatomy	organ
animal well-being	embryology	organ system
cell	gross anatomy	physiology
cell differentiation	microscopic anatomy	tissue

Importance of Anatomy and Physiology in Animal Production

Animals are complex organisms, and understanding anatomy and physiology is important in knowing how they carry out life processes. **Anatomy** is the study of the form, shape, and appearance of an animal. Since mammals are among the most common animals, most of the

information on anatomy will focus on these animals. Scientists divide anatomy into the following branches:

- ◆ **Gross anatomy** is the study of body features that can be seen with the naked eye. As an example, gross anatomy includes studying feet, tails, tongues, and teeth.
- ◆ **Microscopic anatomy**, or histology, is the study of tissue and tissue features that can be seen only with magnification. Microscopic anatomy includes the study of features such as cells and sperm.
- ◆ **Comparative anatomy** is the study of similarities and differences in the structure of different species.
- ◆ **Embryology** is the study of the body as it develops in utero in mammals and in the eggs of poultry.



FIGURE 1. Microscopic anatomy is the study of tissue and tissue features that can be seen only with magnification. (Courtesy, Agricultural Research Service, USDA)

Physiology is the study of the functions of the cells, tissues, organs, and organ systems of a living organism. Physiology includes relationships between functions by different systems of an organism.

People who care for animals need to understand the fundamentals of anatomy and physiology to promote animal well-being. **Animal well-being** is the state in which animals' needs are met and the animals do not suffer. Conditions for raising and keeping animals must be considered for their well-being.

Species have different environmental requirements. Animal producers are more effective in meeting these requirements when they know the unique anatomy and physiology of a species. For example, some breeds of cattle are more resistant to extreme temperatures than others. Producing a breed outside its preferred tem-



FIGURE 2. Conditions for raising and keeping animals must be considered for their well-being.

perature range means that steps must be taken to provide shade to protect from the heat or housing to protect from the cold.

The design of facilities can accommodate the unique anatomy needs of organisms. The size, shape, and form influence facility arrangement and design. For example, keeping dairy cattle housing clean requires a way to handle animal wastes, including feces and urine. Facility design can help collect and remove wastes from the area.

Young animals require different care than older animals. Feed for young animals should be appropriate to their digestive system and nutrient needs. For example, young animals typically require feed with a higher percentage of protein than older animals.

Animal productivity is based on animal capacity. Meat animals are required to have muscling in areas used to make the higher-priced cuts. Examples include the loin and hams of hogs. Dairy animals need to have the capacity for high milk production. For example, a dairy cow needs a well-developed mammary system. Animals used for other products are required to have the capacity to produce those products, including egg-laying capacity of chickens and wool quality of sheep.

Knowledge of the reproductive system of animals helps a producer provide conditions that promote reproduction.

Cell Specialization

Animals are very complex organisms, yet the structural basis of all animals begins with cells. A **cell** is the most basic structure of an animal and is considered the building block from which an animal's body is made.

All cells of an embryo have the same number and kinds of genes because they all descended from the same zygote. In the development process, cell differentiation occurs. In **cell differentiation**, or cell specialization, cells become specialized in structure and function by activating and suppressing their genes in selective and unique ways. Specialization is different in each cell, allowing the cell to perform unique activities for an organism. Cell differentiation is very important because organisms could not exist if all cells were alike. Tissues, organs, and organ systems would not exist, and life processes in multicellular organisms would not occur.

Specialized groups of cells that are organized to perform a specific function are called tissues. A **tissue** could also be defined as a group of cells that are alike in activity and structure. The primary types of tissues are epithelial, connective, muscle, and nervous.

An **organ** is a group of tissues that perform a specific function. The tissues work cooperatively so that the organ can carry out its purpose. Examples of organs are the liver, lungs, heart, and brain.

An **organ system** is a group of organs that work together to carry out a specific activity. The following are major organ systems: circulatory, digestive, integumentary, endocrine, urinary, muscular, nervous, reproductive, respiratory, and skeletal.

External Parts of Animals

Producers must be able to describe animals and use the information in selecting and examining animals and in providing health care. The descriptions are based on the external parts of the animals.

The presence of various qualities in the external parts indicates the value, health, and condition of an animal. This means that animal producers not only know the names of the parts but they also know the qualities that should be evident upon visual examination of the parts.

Qualities vary with the species and the way the species is used. For example, cattle raised for beef have qualities that vary from those raised for dairy production. Considerable study is needed to learn the qualities that indicate the desired characteristics of animals.

Summary:



Understanding animal anatomy and physiology is very important for individuals involved in animal production. Anatomy is the study of the form, shape, and appearance of an animal. Physiology is the study of the functions of the cells, tissues, organs, and organ systems of a living organism.

Checking Your Knowledge:



1. Name and define the branches of anatomy.
2. Compare and contrast anatomy and physiology.
3. Define *cell differentiation* and explain its importance.
4. Define *cell*, *tissue*, *organ*, and *organ system*.

Expanding Your Knowledge:



Visit a local livestock farm and explore the livestock buildings and facilities. Determine how the facilities are designed differently for various animal species to accommodate their unique anatomy.

Web Links:



Anatomy for the Pet Owner

<http://www.vetmed.wsu.edu/ClientED/anatomy/index.asp>

Animal Systems

http://www.biology4kids.com/files/systems_main.html

Agricultural Career Profiles

<http://www.mycart.com/career-profiles>