Organization of the Human Body
Lesson Objectives

- Outline the levels of organization of the human body.
- Explain how organ systems maintain homeostasis of the body.

Vocabulary

- connective tissue
- epithelial tissue
- muscle tissue
- nervous tissue

Introduction

Many people have compared the human body to a machine. Think about some common machines, such as drills and washing machines. Each machine consists of many parts, and each part does a specific job, yet all the parts work together to perform an overall function. The human body is like a machine in all these ways. In fact, it may be the most fantastic machine on Earth, as you will discover when you learn more about it in this and the remaining chapters of this resource.

As a preview of the human machine, the Emmy award-winning video at this link is highly recommended: http://www.youtube.com/watch?v=chqwSh4ii84.

Levels of Organization

The human machine is organized at different levels, starting with the cell and ending with the entire organism (see Figure 1.1). At each higher level of organization, there is a greater degree of complexity.
FIGURE 1.1
Just like this bird, the human organism has several levels of organization.

Cells

The most basic parts of the human machine are cells—an amazing 100 trillion of them by the time the average person reaches adulthood! Cells are the basic units of structure and function in the human body, as they are in all living things. Each cell carries out basic life processes that allow the body to survive. Many human cells are specialized in form and function, as shown in Figure 1.2. Each type of cell in the figure plays a specific role. For example, nerve cells have long projections that help them carry electrical messages to other cells. Muscle cells have many mitochondria that provide the energy they need to move the body.

You can watch a video about some of the specialized cells of the human body and how they function at this link: http://www.youtube.com/watch?v=I8uXewS9dJU.
Tissues

After the cell, the tissue is the next level of organization in the human body. A tissue is a group of connected cells that have a similar function. There are four basic types of human tissues: epithelial, muscle, nervous, and connective tissues. These four tissue types, which are shown in Figure 1.3, make up all the organs of the human body.

Four Types of Tissues

- **Connective tissue** is made up of cells that form the body’s structure. Examples include bone and cartilage.
- **Epithelial tissue** is made up of cells that line inner and outer body surfaces, such as the skin and the lining of the digestive tract. Epithelial tissue protects the body and its internal organs, secretes substances such as hormones, and absorbs substances such as nutrients.
- **Muscle tissue** is made up of cells that have the unique ability to contract, or become shorter. Muscles attached to bones enable the body to move.
- **Nervous tissue** is made up of neurons, or nerve cells, that carry electrical messages. Nervous tissue makes up the brain and the nerves that connect the brain to all parts of the body.

Organs and Organ Systems

After tissues, organs are the next level of organization of the human body. An organ is a structure that consists of two or more types of tissues that work together to do the same job. Examples of human organs include the brain, heart, lungs, skin, and kidneys. Human organs are organized into organ systems, many of which are shown in Figure 1.4.

An organ system is a group of organs that work together to carry out a complex overall function. Each organ of the system does part of the larger job.

You can watch overviews of the human organ systems and their functions at the links below.

- [http://www.youtube.com/watch?v=po8D290YF9o](http://www.youtube.com/watch?v=po8D290YF9o)
- [http://www.youtube.com/watch?v=SSqwRkDLyH4](http://www.youtube.com/watch?v=SSqwRkDLyH4)
- [http://www.youtube.com/watch?v=KidJ-2H0nyY](http://www.youtube.com/watch?v=KidJ-2H0nyY)
Many of the organ systems that make up the human body are represented here. What is the overall function of each organ system?
A Well-Oiled Machine

All of the organs and organ systems of the human body work together like a well-oiled machine. This is because they are closely regulated by the nervous and endocrine systems. The nervous system controls virtually all body activities, and the endocrine system secretes hormones that regulate these activities. Functioning together, the organ systems supply body cells with all the substances they need and eliminate their wastes. They also keep temperature, pH, and other conditions at just the right levels to support life processes.

Maintaining Homeostasis

The process in which organ systems work to maintain a stable internal environment is called homeostasis. Keeping a stable internal environment requires constant adjustments. Here are just three of the many ways that human organ systems help the body maintain homeostasis:

- Respiratory system: A high concentration of carbon dioxide in the blood triggers faster breathing. The lungs exhale more frequently, which removes carbon dioxide from the body more quickly.
- Excretory system: A low level of water in the blood triggers retention of water by the kidneys. The kidneys produce more concentrated urine, so less water is lost from the body.
- Endocrine system: A high concentration of sugar in the blood triggers secretion of insulin by an endocrine gland called the pancreas. Insulin is a hormone that helps cells absorb sugar from the blood.

Failure of Homeostasis

Many homeostatic mechanisms such as these work continuously to maintain stable conditions in the human body. Sometimes, however, the mechanisms fail. When they do, cells may not get everything they need, or toxic wastes may accumulate in the body. If homeostasis is not restored, the imbalance may lead to disease or even death.

Lesson Summary

- The human body is organized at different levels, starting with the cell. Cells are organized into tissues, and tissues form organs. Organs are organized into organ systems such as the skeletal and muscular systems.
- All of the organ systems of the body work together to maintain homeostasis of the organism. If homeostasis fails, death or disease may result.

Lesson Review Questions

Recall

1. What are the levels of organization of the human body?
2. Which type of tissue covers the surface of the body?
3. What are the functions of the skeletal system?
4. Which organ system supports the body and allows it to move?
5. What is homeostasis?
6. Describe how one of the human organ systems helps maintain homeostasis.

Apply Concepts

7. A house has several systems, such as the electrical system, plumbing system, and heating and cooling system. In what ways are the systems of a house similar to human body systems?

Think Critically

8. Explain how form and function are related in human cells. Include examples.
9. Compare and contrast epithelial and muscle tissues.

Points to Consider

In this lesson, you learned that an organ system is a group of organs that work together to do a common job. You also learned that organ systems help maintain homeostasis of the body.

- The skeletal system is one of the human organ systems. Can you name the organs of the skeletal system?
- How do you think the skeletal system helps the body maintain homeostasis?

References

1. Mariana Ruiz Villarreal (LadyofHats) for CK-12 Foundation. CK-12 Foundation . CC BY-NC 3.0
3. Zachary Wilson. CK-12 Foundation . CC BY-NC 3.0