

Interactions Among Animal Body Systems

TEKS 10A

★ READINESS ★

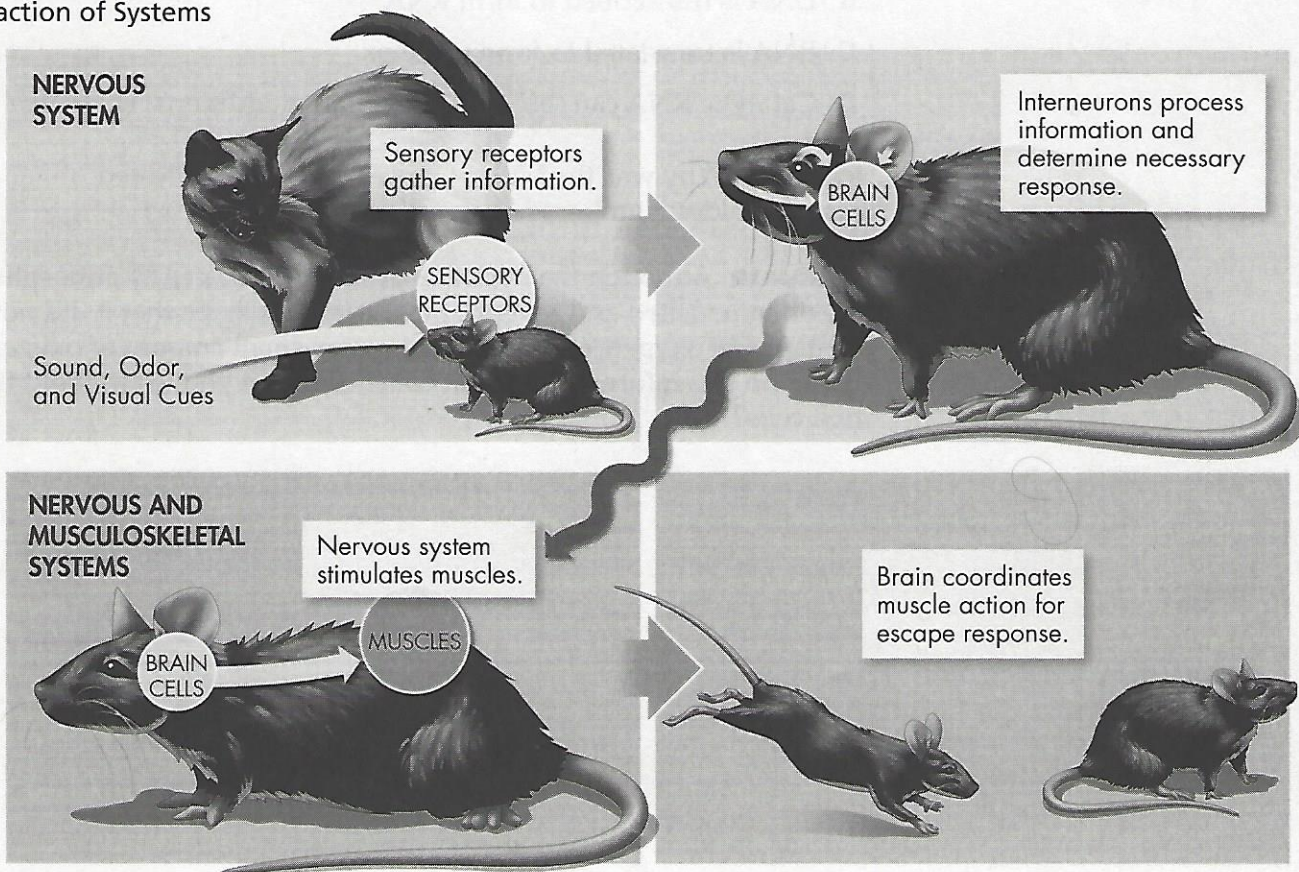
Describe the interactions that occur among systems that perform the functions of regulation, nutrient absorption, reproduction, and defense from injury or illness in animals.

How do systems interact to regulate an animal's body?

Animals have many different body systems that perform specific tasks. Although each body system may have unique tasks, overall they must work together as one system to maintain homeostasis throughout the body.

The nervous system is the master control center for regulation. Nervous system complexity varies among animals. Most chordates have a concentrated nerve center called a brain. Some invertebrates have just a loose network of nerves. All nervous systems collect information from the internal and external environment and send out commands to the rest of the body. **Figure 1** shows how a mouse's nervous system interacts with its muscular and skeletal systems as the mouse tries to escape from a cat.

Figure 1
Interaction of Systems



Study Tip

Remember that body systems are constantly interacting, even to complete relatively simple tasks such as picking up a pencil from the floor.

For another example, in humans sensory nerves carry information about body temperature to the brain. The brain processes this information and decides whether to raise or lower body temperature. The brain then stimulates the release of chemical signals (hormones) that affect things such as sweating, shivering, and cellular metabolism. To regulate temperature, the nervous system interacts with the endocrine system, which interacts with the circulatory system. Hormones travel in blood from glands of the endocrine system to other parts of the body.

The regulatory effects of the nervous system tend to be rapid but short-lived. Other examples of nervous system regulations include the control of muscle movements, stimulation of the heart and lungs during exercise, and relaxation of the body during rest and sleep.

The endocrine system works more slowly than the nervous system, but its effects often last longer. Many hormones help prepare the body for physical exertion. One example is adrenaline, which quickens the heart rate and makes more glucose available for cells to access energy.

How do systems interact to absorb nutrients?

All animals are heterotrophs, which means they obtain their energy by eating food. To locate and obtain food, animals must use their nervous, muscular, and skeletal systems to some degree. Sensory clues such as sights and smells may alert an animal that food is near. Muscles pull on bones or other skeletal structures to move the animal toward the food.

The shape and size of teeth and jaws provide clues about an animal's diet. Those that eat meat (carnivores) will likely have powerful jaws and sharp teeth that can slice and tear. Those that eat plants (herbivores) will likely have jaws that move from side to side and flatter teeth that grind plants.

In some less complex animals, such as sponges, digestion occurs within specialized cells. In more complex animals, digestion occurs in a continuum of organs that process and digest food until it can be absorbed and delivered to cells throughout the body by the circulatory system. To a certain degree, the nervous and endocrine systems also regulate functions of the digestive system. For example, the nervous system controls the muscles that move food through digestive organs. Hormones stimulate the pancreas to release enzymes critical in breaking down food.

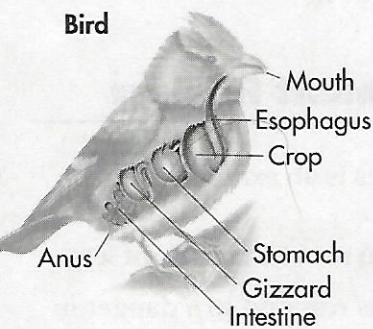
How do systems interact in reproduction?

Most animals reproduce sexually, which maintains genetic diversity in a population. Some invertebrates and a few vertebrates reproduce asexually, which allows for rapid reproduction, but little genetic variation.

The main job of the reproductive system is to produce haploid gametes. Males typically produce sperm and females typically produce eggs. When a sperm and egg join, the result is a diploid zygote.

The reproductive system is largely influenced by the nervous and endocrine systems, which send signals to the reproductive system when conditions are right for reproduction. In many environments, offspring need to be born during a certain season to have a chance at survival.

Figure 2
Example of a Digestive System



In many animals, the female lays eggs. But in most mammals, known as placental mammals, offspring develop inside the female. The developing offspring is called an embryo. Many systems interact in the mother's body to allow an embryo to develop. A placenta grows from the tissues of the mother and the embryo. Blood vessels in the placenta carry food and oxygen to the embryo and wastes away from it. The endocrine system also stimulates milk production in the mother to feed the offspring after birth.

How do systems interact to defend the body?

The immune system defends the body from illness. It includes a variety of white blood cells that recognize and attack pathogens.

Other systems also defend the body against pathogens. In the digestive system, acid in the stomach helps kill pathogens that enter the body with food and saliva. In the integumentary system, skin acts as the main barrier between pathogens and internal body tissues. Mucous membranes line the nose, mouth, and other body cavities, and the mucus that they secrete helps trap pathogens and small foreign objects.

The nervous system also protects the body from injury. The brain can process sensory information to recognize danger and react accordingly. When an animal feels threatened, body systems interact for the sake of protection. Adrenaline from the endocrine system and messages from the nervous system help the animal fight or flee its attacker. The circulatory, respiratory, and muscular systems all work harder and faster than normal to give the animal oxygen and energy to fight or flee.



End-of-Course Assessment Review

- 1. Describe** Which interaction of body systems is an example of homeostasis?
 - A** The nervous system stimulates muscles to move in the right leg.
 - B** The endocrine system helps other systems respond to a danger in the environment.
 - C** When blood sugar is high, hormones stimulate cells to take up sugar from the blood.
 - D** You remember a happy moment, and you smile.
- 2. Describe** Which process involves the nervous system and endocrine system working together?
 - A** moving the hand and fingers to scratch an itch
 - B** jerking the arm away when the hand touches something hot
 - C** digesting food after it is swallowed
 - D** swallowing food after it is chewed
- 3. Apply Concepts** How is it helpful for the body to have more than one system defend it from injury and illness?