

Adolescence—A Time Of Change

HEALTH TERMS

endocrine system
hormones
puberty
pituitary gland
gonads
testosterone
estrogen
progesterone

HEALTH CONCEPTS

- Hormones cause changes during adolescence.
- Everyone's developmental time line is different during puberty.
- Secondary sex characteristics occur during adolescence when sex hormones are released.

NOTE. *Endo-* means "within." Other glands in the body—tear and oil glands, for example—release their secretion into ducts. Endocrine glands do not have ducts, but release their secretions into the blood.

The body is complex and amazing. It is made up of a system of checks and balances. No one body system works independently of the others. The nervous system is the primary regulating system of the body. The nervous system works closely with the endocrine system in regulating body functions. The **endocrine system** is a body system made up of ductless (tubeless) glands that secrete chemicals called hormones. **Hormones** are substances that regulate the activities of different body cells and organs. Blood carries hormones to various parts of the body. You have no conscious control over your endocrine system.

Hormones play a major role during puberty. **Puberty** is the period of growth from physical childhood to physical adulthood—a time when an individual becomes capable of reproduction. Puberty is marked by rapid, uneven physical growth. As you learn what happens during puberty and why, you may better understand the period of adolescence.

Puberty

Although most adolescents go through all the changes of puberty, each person's time line is different. There is no other time in life when there is such a wide variation in sizes and shapes of people who are the same age.

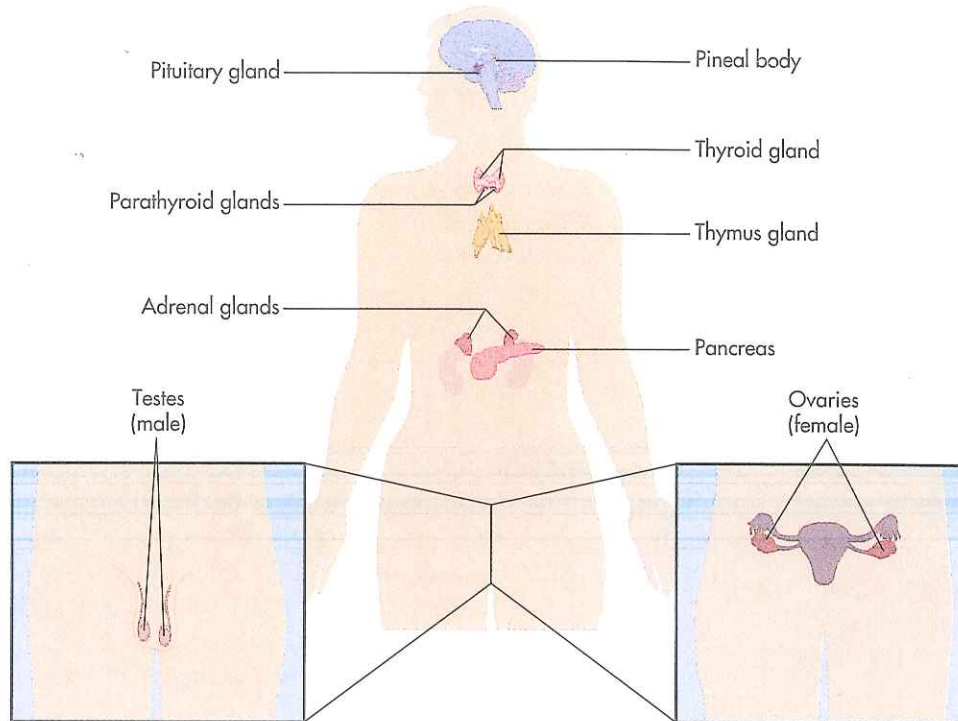
Such size variation can cause concern—especially for the person who is bigger or smaller than everyone else. It is important to know that everyone grows at a rate just right for them. The growth spurt during puberty depends largely on each individual's genetic inheritance and is set in motion by hormones. These hormones also cause feelings and sensations never experienced before. The body begins to respond differently. It is important to understand these changes to be able to handle them appropriately.

The Function of Hormones


The word *hormone* means "to excite or set in motion." Hormones act as chemical regulators in three ways.

1. Hormones can stimulate a reaction in a certain part of the body. For example, hormones work with the nervous system to stimulate the bodily activities needed in an emergency situation. The feelings of fright result in an increase in your heart rate, a physical change that occurs because of hormones. You do not have any control over the secretion of a hormone; that is, you cannot keep your heart rate from increasing when you are frightened. This is an important point to remember as you read about the changes that hormones cause in the body during adolescence.

The Endocrine System



- Hormones play an important role during periods of growth by producing changes in body structures. These changes include bone development, maturation of the reproductive organs, and the development of secondary sex characteristics.
- Hormones regulate the rate of the body's metabolism, the rate at which body cells produce energy.

 **Hormones secreted by your endocrine glands cause many changes during adolescence.**

The Pituitary Gland

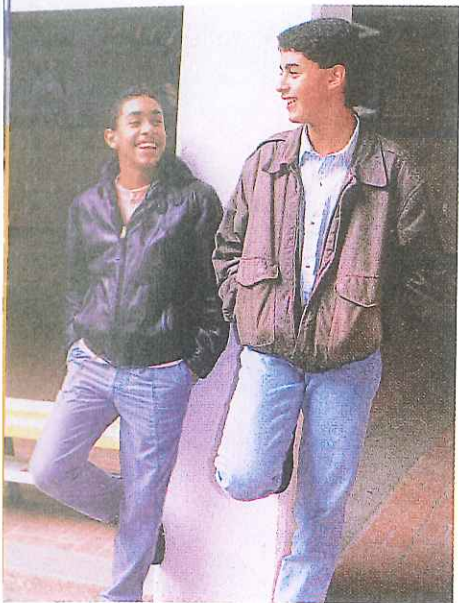
Hormones have a central role during puberty. The hormones that activate the adolescent's growth spurt appear to be controlled by the hypothalamus, a nerve center in the brain. Nerve impulses from the hypothalamus stimulate the pituitary gland to release the hormone that results in body growth. The **pituitary gland** is the gland that controls much of the endocrine system. It is about the size of a pea and is located at the base of the brain. Besides growth hormones, the pituitary gland releases other hormones that affect the brain, glands, skin, bones, muscles, and reproductive organs.

The pituitary gland secretes two gonadotropic hormones that are responsible for the development of the **gonads**, or *reproductive organs*. Specifically, gonads are the testes in the male and the ovaries in the female. The gonadotropic hormones are LH (luteinizing hormone) and FSH (follicle-stimulating hormone).

- In the male, LH controls the amount of testosterone produced. Testosterone is the sex hormone produced by the testes. FSH controls sperm production.

Did You Know?

There is nothing wrong with a high school student who isn't really interested in dating. Just as physical growth is very individual, so is social growth. Unfortunately, people are often pushed into social situations and dating at younger and younger ages, a time when they are not ready for this type of social interaction. A person who is in high school and involved in school activities with his or her peers, and not dating, is very normal and is practicing healthy behaviors.



Secondary sex characteristics develop with the onset of puberty.

NOTE. Growth in puberty happens in a specific order. Feet grow first, then hands, then arms and legs. This is one reason that adolescence can be a clumsy, awkward time.

THINKING SKILLS. Have students compare the changes that take place in males during puberty with those occurring in females. Ask them to be sure to look for similarities as well as differences.

- In the female, FSH and LH control the levels of **estrogen** (ES-truh-juhn) and **progesterone** (proh-JES-tuh-rohn)—the two sex hormones produced by the ovaries.

Secondary Sex Characteristics

Secondary sex characteristics are those changes that occur during adolescence when progesterone and estrogen are produced by the ovaries and testosterone is produced by the testes. Prior to the production of these sex hormones, there is little physical difference between males and females other than the type of genital organ present. With the onset of puberty, the physical differences become apparent. Secondary sex characteristics for males include broadened shoulders; facial, underarm, and pubic hair; deepened voice; increased muscular development; and longer and larger bones. For females, secondary sex characteristics include breast development; underarm and pubic hair; and widened hips. Both males and females will experience the beginning of sexual desire.

Remember, everyone goes through these changes, but some will experience them earlier than others. These changes are very individual. For instance, breast development in females differs from person to person.

Breasts may not grow at the same rate or evenly. This means that one breast will likely be slightly smaller, perhaps even shaped a little differently from the other. Such variations are perfectly normal. The size of a female's breasts is an inherited characteristic—something she cannot control. The size of the female's breasts has nothing to do with what kind of person she is.

The sex hormones released during puberty cause the oil and sweat glands in the body to become more active. This is one of the reasons acne becomes a problem during adolescence. As the sweat glands become more active, body odor can become a problem. Cleanliness and good health habits become more important than they were in the past.

LESSON

3

Review

LESSON 3 REVIEW ANSWERS ARE FOUND ON PAGE TM15.

Reviewing Facts and Vocabulary

1. Name three ways in which hormones act as chemical regulators.
2. Explain why the rate of development during puberty is varied among teenagers.
3. Discuss the functions of the pituitary gland.
4. List the gonads found in males and those found in females.

Thinking Critically

5. **Synthesizing.** How might the development of secondary sex characteristics affect an adolescent's social and emotional development?

6. **Analyzing.** Compare the secondary sex characteristics that develop during puberty for females with those that develop for males.

Applying Health Skills

7. **In Your School.** Find out more about the nervous system or the endocrine system. Choose one system to research and present a report to your class.
8. **In Your Home.** What would you say to your younger sister who asks you about differences in growth rate among your group of friends?

Reviewing Facts and Vocabulary

1. Why is it important to have factual information about sexual activity?
2. What does your sexuality include?
3. Explain the three aspects of health and give one example of a decision that could affect your total health in a positive way.
4. What is *self-concept*?
5. Identify the six steps in the decision-making process.
6. List the goal-setting steps.
7. Define *empathy*.
8. What term refers to the rate at which body cells produce energy?
9. Growth spurts appear to be controlled by what nerve center in the brain?
10. What gland controls the endocrine system? Where is it located?
11. Identify the male gonads and the female gonads.
12. Name the two gonadotropic hormones secreted by the pituitary gland.
13. Name three secondary sex characteristics that occur in males and three that occur in females.
14. Do changes during puberty occur very rapidly, or do they develop over time? Explain your answer.
15. What mainly determines the size of a female's breasts?

Thinking Critically

16. **Applying.** List ten factors from your environment that can influence the development of your sexuality.
17. **Synthesizing.** Give a specific example of a choice that could affect your physical, mental, emotional, and social well-being.
18. **Analyzing.** Write five positive outcomes of choosing not to engage in sexual activity.
19. **Synthesizing.** Give an example of something you can do to succeed in all nine of Robert Havinghurst's developmental tasks.
20. **Evaluating.** What might you say to help a friend who has poor self-esteem and is feeling depressed because he is shorter than all of his peers?

21. **Synthesizing.** You've noticed that your friend has facial hair that he did not have last year. You've also noticed that he develops body odor by the end of the school day. What might your friend not realize about the changes that occur during puberty, and what might you tell him?

Applying Health Skills

22. **In Your Home.** For one day, make notes on how you are feeling about yourself. Try to identify specific ways you tried to meet your emotional needs.
23. **In Your Home.** For the next few months, keep a private journal on the changes you notice in your intellectual development. Make note of new abstract thinking abilities, solutions you find for more complicated problems, and situations in which you exhibit more flexible thinking.

BEYOND THE CLASSROOM

24. **Parental Involvement.** With the help of a parent or other family member, use the decision-making process to make a decision in the following situation: Nick has asked Carrie to the school dance. Carrie is reluctant to go because she has heard that Nick tries to pressure girls into engaging in sexual activity. Nick is very popular so the date could help Carrie socially. What should Carrie do?
25. **Community Involvement.** Take a survey of five adult family members or friends to find out whether they enjoyed their adolescence. Ask one of them to tell you about an important decision he or she had to make during that time. Find out how they arrived at that decision and whether they believe it was the right choice.
26. **Further Study.** Look up information about the endocrine system in a resource book. Choose two endocrine glands not discussed in this chapter. Write a paragraph about each gland, listing the hormone each gland produces and the effect of the hormone on the body.