

chapter 29

Androgens and Anabolic Steroids

Objectives

AFTER STUDYING THIS CHAPTER, THE STUDENT WILL BE ABLE TO:

1. Discuss effects of endogenous androgens.
2. Discuss uses and effects of exogenous androgens and anabolic steroids.
3. Describe potential consequences of abusing androgens and anabolic steroids.
4. Counsel clients about the physiologic effects of the dietary supplements androstenedione and dehydroepiandrosterone (DHEA).

Critical Thinking Scenario

You are a nurse working in a rural high school. The wrestling coach asks you to talk with his wrestling team about anabolic steroids.

Reflect on:

- ▶ Why adolescents might want to use anabolic steroids.
- ▶ Potential dangers of anabolic steroid use.
- ▶ Confusion regarding the difference between anabolic steroids and corticosteroids.
- ▶ Strategies that might be effective in limiting the use of anabolic steroids among young athletes.

OVERVIEW

Androgens are male sex hormones secreted by the testes in men, the ovaries in women, and the adrenal cortices of both sexes. Like the female sex hormones, the naturally occurring male sex hormones are steroids synthesized from cholesterol. The sex organs and adrenal glands can produce cholesterol or remove it from the blood. Cholesterol then undergoes a series of conversions to progesterone, androgenic prohormones, and testosterone. The androgens produced by the ovaries have little androgenic activity and are used mainly as precursor substances for the production of naturally occurring estrogens. The adrenal glands produce several androgens, including androstenedione and dehydroepiandrosterone (DHEA). Androstenedione and DHEA are weak androgens with little masculinizing effect that are mainly converted to estrogens.

TESTOSTERONE

Testosterone is normally the only important male sex hormone. It is secreted by the Leydig's cells in the testes in response to stimulation by luteinizing hormone from the anterior

pituitary gland. The main functions of testosterone are related to the development of male sexual characteristics, reproduction, and metabolism (Box 29–1).

About 97% of the testosterone secreted by the testes binds to plasma albumin or to sex hormone-binding globulin and circulates in the blood for 30 minutes to several hours. The bound testosterone is either transferred to the tissues or broken down into inactive products that are excreted. Much of the testosterone that transfers to tissues undergoes intracellular conversion to dihydrotestosterone, especially in the external genitalia of the male fetus and the prostate gland in the adult male. The dihydrotestosterone combines with receptor proteins in the cytosol; the steroid-receptor combination then migrates to the cell nucleus where it induces transcription of DNA and RNA and stimulates production of proteins. Almost all testosterone effects result from the increased formation of proteins throughout the body, especially in the cells of target organs and tissues responsible for development of male sexual characteristics.

The portion of testosterone that does not become attached to tissues is converted into androsterone and DHEA by the liver. These are conjugated with glucuronic or sulfuric acid and excreted in the bile or urine.