

menarche. As puberty progresses, one ovarian follicle becomes dominant during each menstrual cycle and produces increasing amounts of estrogen that releases an ovum, a process called *ovulation*. After ovulation, the follicle involutes and estrogen production decreases. The pituitary gland responds to the decreased estrogen production by increasing production of FSH which initiates a new menstrual cycle. **Androgens**, the masculinizing hormones, are also secreted in small and gradually increasing amounts up to about 7 or 9 years old, at which time there is a more rapid increase in both sexes, especially boys, until about 15 years old. These hormones have tremendous growth-promoting properties that result in rapid increases of muscle mass, skeletal growth, and bone density. Androgens are responsible for the development of pubic, axillary, facial, and body hair, acne, body odor, and an increase in height.

Boys do not experience a discrete event analogous to menstruation or ovulation in girls; however, FSH and LH act on testicular cells to stimulate production of testosterone and sperm. The production of viable sperm tends to follow boys' first ejaculation. The capacity to ejaculate occurs approximately 1 year after initial testicular enlargement and pubic hair appearance.

Sexual Maturation

The visible evidence of sexual maturation is achieved in an orderly sequence, and the state of maturity can be estimated on the basis of the appearance of these external manifestations. The age at which these changes are observed and the time required to progress from one stage to another may vary among children. The time from the appearance of breast buds to full maturity may be $1\frac{1}{2}$ to 6 years for adolescent girls. It may take 2 to 5 years for male genitalia to reach adult size. The stages of development of secondary sex characteristics and genital development have been defined as a guide for estimating sexual maturity and are referred to as the **Tanner stages** (Box 15-1). The usual sequence of appearance of maturational changes is presented in Box 15-2.

Box 15-1

Tanner Stages