

**Chapter 39 Endocrine and Reproductive Systems****Summary****39–1 The Endocrine System**

The endocrine system consists of glands that release secretions into the bloodstream. The secretions are called hormones. Hormones are chemicals released in one part of the body that travel throughout the body and affect cells elsewhere. Hormones bind to specific chemical receptors on cells called target cells. A gland is an organ that produces and releases a secretion. In addition to endocrine glands, there are exocrine glands, such as sweat glands. Exocrine glands release their secretions through ducts directly to tissues and organs.

There are two types of hormones. Steroid hormones can cross cell membranes of target cells, enter the nucleus, and turn genes on or off. Nonsteroid hormones cannot cross cell membranes. Compounds called secondary messengers carry the messages of nonsteroid hormones inside target cells. All cells also produce hormonelike substances called prostaglandins that affect only nearby cells.

The endocrine system is regulated by feedback mechanisms that help maintain homeostasis. For example, the level of a hormone in the blood may be the feedback that signals a gland to produce more or less of the hormone. Two hormones with opposite effects may work together to maintain homeostasis. This is called complementary hormone action.

**39–2 Human Endocrine Glands**

Human endocrine glands include the pituitary gland, hypothalamus, thyroid gland, parathyroid glands, adrenal glands, pancreas, and reproductive glands.

The nine pituitary hormones either directly regulate body functions or control the actions of other endocrine glands. Hormones from the hypothalamus control the pituitary gland. The thyroid gland regulates metabolism. Hormones produced in the parathyroid gland help regulate calcium

levels in the blood. The adrenal gland produces hormones that help the body deal with stress. Insulin produced by the pancreas keeps the level of sugar in the blood stable. Without insulin, diabetes mellitus occurs. Reproductive glands, or gonads, produce gametes. Gonads also secrete sex hormones that produce male and female physical characteristics.

**39–3 The Reproductive System**

Sex hormones produced by the gonads of an embryo cause the embryo to develop into either a female or a male. Sex hormones also cause puberty to occur. Puberty is a period of rapid growth and sexual maturation that usually begins between ages 9 and 15. At the end of puberty, the male and female reproductive organs are fully developed and able to function.

The main function of the male reproductive system is to produce and deliver sperm. The main organs of the male reproductive system are the testes, which are held in a sac called the scrotum. In the testes, sperm are produced in tiny tubes called seminiferous tubules. Sperm then mature in a structure known as the epididymis. They leave the body through a tube called the vas deferens and then through the urethra. The urethra is the tube in the penis that leads to the outside. Sperm are ejected from the penis by contractions. This is called ejaculation.

The main function of the female reproductive system is to produce eggs and prepare the female body to nourish an embryo. The main organs of the female reproductive system are the ovaries. Each ovary contains thousands of follicles. A follicle is a cluster of cells surrounding a single egg. The follicle helps the egg mature. About once a month, an egg matures and is released from the ovary. The egg moves through the Fallopian tube, where it can be fertilized if sperm are present.

After a few days, the egg reaches the uterus. The uterus is connected to the outside of the body by a canal called the vagina.

One egg develops each month during the menstrual cycle. The cycle is controlled by hormones. It has four phases: follicular phase, ovulation, luteal phase, and menstruation. During the follicular phase, an egg matures in its follicle and the uterus is prepared to receive a fertilized egg. Then, the egg is released from the ovary. This is called ovulation. The luteal phase follows. During the luteal phase, the follicle turns into a structure called the corpus luteum. If the egg has been fertilized, it implants in the lining of the uterus. If the egg has not been fertilized, it passes through the uterus without implanting, and menstruation occurs. During menstruation, the lining of the uterus falls away and leaves the body through the vagina.

Diseases that are spread during sexual contact are called sexually transmitted diseases (STDs). STDs can be caused by bacteria and viruses. Common STDs include chlamydia, syphilis, gonorrhea, and AIDS. Abstinence is the only sure way to avoid being infected with STDs.

### **39–4 Fertilization and Development**

Fertilization is the process of a sperm joining an egg. A fertilized egg is called a zygote. The zygote undergoes repeated mitosis and soon develops into a hollow ball of cells called a blastocyst. About a week after fertilization, the blastocyst imbeds itself in the lining of the uterus. This is called implantation.

The cells of the blastocyst begin to specialize in a process called differentiation. Some cells migrate to form three cell layers. This process is called gastrulation. The three layers eventually develop into the different organs of the embryo. Researchers are just beginning to understand what controls the development of specialized cells and organs. Gastrulation is followed by neurulation, or the development of the nervous system. As the embryo develops, membranes also form to protect and nourish it. One of these membranes develops into the placenta. The mother and embryo exchange gases, food, and waste products across the placenta.

After eight weeks of development, the embryo is called a fetus. By the end of three months, most of the major organs are fully formed. During the remaining six months before birth, the organ systems mature, and the fetus grows in size and mass.

Childbirth occurs when hormones stimulate the mother's uterus to contract. The contractions push the baby from the uterus and out through the vagina. Twins are born if more than one egg was fertilized or if one zygote split into two embryos during early development.

Growth and development continue throughout infancy and childhood. Adolescence begins with puberty and ends with adulthood. Development continues during adulthood. The first signs of aging usually appear in the thirties.