The Endocrine System

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The endocrine system is responsible for controlling all of the hormones and their functions within the body by way of glands found throughout the body.

Anatomy and Physiology—Pituitary Glands

The pituitary gland is actually two glands: the anterior and posterior pituitary glands found in the bony cranial structures housed within the sella turcica, which is part of the sphenoid bone. Each gland secretes a different hormone to serve a separate function. The pituitary gland connects to the hypothalamus.

The anterior pituitary gland is responsible for secreting six different hormones as follows (Thibodeau & Patton, 2005):

- thyroid-stimulating hormone (TSH)
- adrenocorticotropic hormone (ACTH)
- follicle-stimulating hormone (FSH)
- luteinizing hormone (LH)
- growth hormone (GH)
- prolactin

Each hormone serves a separate function. The thyroid-stimulating hormone (TSH) stimulates the thyroid to increase production of its hormone. Adrenocorticotropic hormone (ACTH) stimulates the adrenal gland causing it to enlarge and secrete its hormone. Follicle-stimulating hormone (FSH) acts to cause the ovarian follicles to grow and mature; it is also responsible for estrogen secretion. In men, the FSH hormone controls the growth of the seminiferous tubules and sperm growth. Luteinizing hormone (LH) has separate functions for females and males. In females, it functions to mature the ovarian follicle and ovum, helps with the secretion of estrogen, sparks ovulation, and helps with development of corpus luteum (a process known as luteinization). In males, this hormone acts on the testes to produce testosterone. Growth hormone (GH) is responsible for all organ growth and also the speed at which proteins are moved to the cells (ultimately affecting cell nutrition and growth). The last hormone produced in the anterior pituitary gland is prolactin, which stimulates the production of milk in the breasts during and following pregnancy.

The posterior pituitary gland secretes two hormones: antidiuretic hormone (ADH) and oxytocin. The antidiuretic hormone helps the kidneys to retain water. Oxytocin is important during labor and following delivery; it causes uterine contractions during labor and is responsible for the release of milk into the mammary ducts for breast milk secretion.

Anatomy and Physiology—Hypothalamus
The hypothalamus is connected to the pituitary gland, and partners in the process of hormone secretion and production. The hormones released from the posterior pituitary glands, antidiuretic hormone, and oxytocin are produced in the hypothalamus and travel to the posterior pituitary gland for release. The hypothalamus has another function; it produces releasing and inhibiting hormones, which control the release of the anterior pituitary hormones. The hypothalamus also plays a part in maintaining body temperature, hunger, and thirst.

**Anatomy and Physiology—Thyroid Gland**
The thyroid gland is responsible for three hormones: thyroxine (T4), triiodothyronine (T3), and calcitonin. The thyroid structure acts as a housing facility to store thyroxine and triiodothyronine for release only when needed. Combined, thyroxine and triiodothyronine are responsible for cell metabolism. Calcitonin helps regulate calcium levels in the body by decreasing the concentration when needed.

**Anatomy and Physiology—Parathyroid Glands**
There are normally four parathyroid glands located posterior to the thyroid gland. These glands secrete parathyroid hormone (PTH), which decreases the level of calcium when needed. Together, the hormones PTH and calcitonin have an antagonistic relationship.

**Anatomy and Physiology—Adrenal Glands**
The adrenal glands sit as caps on top of each kidney. Each adrenal gland is actually two separate glands: the adrenal cortex and the adrenal medulla (Thibodeau & Patton, 2005). Each is responsible for different hormones with separate functions. The adrenal cortex secretes three hormones: mineralocorticoids (MC), glucocorticoids (GC), and sex hormones. The mineralocorticoids control the body’s electrolyte and fluid balance. The glucocorticoids stimulate increases in blood glucose concentration, help decrease inflammation, and affect allergies and immunity. The sex hormones of the adrenal glands stimulate sex drive in females but have little function in males. The adrenal medulla secretes epinephrine and norepinephrine, which help the body control stress through what is known as the *fight-or-flight* response.

**Anatomy and Physiology—Pancreas Glands**
The pancreas houses the islets of Langerhans (or pancreatic islets), which contain two kinds of cells, alpha cells and beta cells (both secrete hormones). The alpha cells release glucagons, which increases blood sugar concentration. The beta cells release insulin, which is responsible for decreasing blood sugar concentration. Insulin and glucagon act as antagonists in the fight to regulate blood sugar in the body.

**Anatomy and Physiology—Sex Glands**
Both males and females have sex glands. The ovaries are the female sex glands, and they have two different glands: the ovarian follicle and the corpus luteum. The ovarian follicles secrete estrogen, and the corpus luteum secretes progesterone and also some estrogen. The testes are the male sex glands, which contain cells that secrete
Anatomy and Physiology—Thymus Gland
The thymus helps the body defend against infection. It secretes several hormones, which are collectively called thymosin. The thymosin helps with the development of the immune system.

Anatomy and Physiology—Pineal Gland
The pineal gland releases a number of hormones, but the most significant hormone produced is melatonin. Melatonin helps regulate puberty and the menstrual cycle of females. It also regulates the body’s internal clock, wake, and sleep cycles.

Reference