



## **The Endocrine System** <sup>[1]</sup>

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The endocrine system is a chemical communication system in the body that is composed of glands and target cells. The ductless glands release chemical messengers called hormones, while the target cells respond to such hormones. The endocrine system works hand-in-hand with the nervous system to achieve and maintain homeostasis (state of balance) through the regulation of internal body functions.

The endocrine system is mainly composed of the hypothalamus, pituitary gland, pancreas, thyroid gland, adrenal glands, pineal gland, and the gonads. Each gland secretes one or more hormones into the bloodstream for the purposes of growth, metabolism, development and even regulation of emotions.

### **Hypothalamus**

The hypothalamus is considered the relay center of the endocrine system. It secretes hormones that stimulate other endocrine glands to release their own hormones. The hypothalamus produces the Growth Hormone Releasing Hormone (GHRH), Corticotropin Releasing Hormone (CR) and other hormones that trigger the release of crucial hormones for body growth, development and regulation.

### **Thyroid Gland**

The hormone thyroxin is secreted by the thyroid gland for the regulation of the basal metabolic rate (BMR). BMR is defined as the amount of energy used by the body at rest. Increase in thyroxin levels, a condition called hyperthyroidism, causes a high rate of metabolism, weight loss and hyperactivity. The opposite of these symptoms occur in decreased thyroxin levels associated with hypothyroidism. The thyroid gland also secretes calcitonin, a hormone that helps in the bone uptake of calcium.

### **Parathyroid Gland**

Located within the thyroid gland, the parathyroid is a small gland that releases parathormone. This hormone regulates serum calcium and phosphate levels, which influences the nervous system's level of excitability.

## **Pancreas**

Located between the stomach and the small intestine, the pancreas is a gland that has two general functions. As an exocrine gland, the pancreas releases organic catalysts that break down complex substances into simpler ones that the body can absorb (starch to sugar, fats to fatty acids, proteins to dipeptides). Within the pancreas lies the Islet of Langerhans composed of two kinds of cells: the beta cells that release the hormone insulin, and the alpha cells that secrete the hormone glucagon. These are the endocrine functions of the pancreas. The insulin facilitates the uptake of glucose and its conversion to glycogen for energy. On the other hand, glucagon converts glycogen into the more complex glucose.

## **Pituitary Gland**

Known as the “master gland”, the pituitary gland secretes the most number of hormones out of all the members of the endocrine system. It is divided into two parts: the anterior and posterior. In particular, the term master gland applies to the anterior pituitary gland, as it releases many hormones into the bloodstream to influence the activity of body organs as well as other glands in the endocrine system. Examples of hormones secreted by anterior pituitary gland are prolactin, growth hormone, thyroid-stimulating hormone, and luteinizing hormone. On the other hand, the posterior pituitary gland has the nervous system as its controller. It releases the hormones vasopressin (blood pressure elevation and body fluid regulation) and oxytocin (uterine contraction and lactation).

## **Gonads**

The gonads are primary parts of the reproductive system. In males, the testes secrete testosterone. In females, the ovaries release estrogens. These hormones play vital roles in sexual development.

## **Adrenal Glands**

Situated above the kidney, the adrenal glands have two crucial parts- the adrenal medulla and adrenal cortex. The adrenal medulla secretes adrenalin and norepinephrine, hormones that are able to prepare the body for fight-flight or fright response. The adrenal cortex releases natural steroids that help in the utilization of energy in the body.

## **Thymus**

The thymus gland, located in across the trachea and bronchi, releases thymosin. This hormone stimulates the immune system via the activation of the T-Cells.

## **Pineal Gland**

The pineal gland is a pea-sized endocrine gland that releases melatonin, a hormone associated with the biological clock.

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