

Human endocrine system

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Endocrine System The endocrine system plays a vital role in controlling the long term processes of our bodies. It maintains homeostasis and regulates growth, development, metabolic activities, reproduction and tissue function. Various hormones in the endocrine system act as chemical messengers and are released into the circulatory system to communicate with specific cells in other tissues and organs (Martini 606). Hormones are specific to their target cells which have receptors that bind to individual hormones. These messages perform a variety of tasks, such as, controlling enzyme production and modifying cell structure and activity (607). These activities are strictly controlled by a negative feedback system in order to maintain homeostasis and coordination between cells and tissues. The endocrine system is composed of many glands which produce hormones and communicate with the rest of the body. The hypothalamus forms a link with the nervous system and secretes chemicals controlling hormone stimulation and/or suppression from the pituitary gland (616). This gland, sometimes also referred to as the master gland, plays an important role in a female's reproductive cycles (617). For example, it releases follicle stimulating and luteinizing hormones controlling ovulation and maintaining the menstrual cycle (607, 620). It also regulates the production of growth hormone for the development of bone and its nutrients and minerals. The pituitary gland also communicates with the nervous system by secreting endorphins when stimulated by sensations of pain (617). The thyroid gland helps to regulate metabolism and body temperature and produces hormones like thyroxine and triiodothyronine which control energy production and chemical reactions in our bodies (607, 620-621). The parathyroids are attached to the thyroid gland and use the hormone calcitonin to maintain blood calcium levels (625-626). Another set

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of glands called the adrenal glands are situated on top of the kidneys and have two parts, the medulla and the cortex. The cortex produces hormones like cortisol and corticosterone to aid the body when stimulated by stress and help regulate metabolic activity and responses with the immune system (627-628). It also releases androgens to control sexual development and its related functions. The medulla secretes epinephrine and norepinephrine hormones to regulate various activities like, heart rate, blood sugar, and blood pressure when the body is stimulated by stress (630). The pineal gland, located in the middle of the brain is stimulated by chemical messages from the nerves of the eyes and helps regulate sleep cycles through the production of the hormone melatonin (631). The gonads in both males and females control the production of sex hormones. In males, the gonads secrete androgens, like testosterone, to help regulate normal sexual development, male characteristics, and sperm production. It is responsible for the changes that occur throughout puberty. For females, the gonads are the ovaries which secrete hormones like progesterone and estrogen. These play a significant role in female sexual development, reproduction, and the menstrual cycle (607, 638). The pancreas is also an important part of the endocrine system and regulates the production of insulin and glucagon to maintain normal blood glucose levels (631). These various glands within the endocrine system relay messages and control their designated activities through the specific hormones travelling in the bloodstream. These hormones target specific cells and the amount of these hormones interacting with the target cells is controlled by carrier proteins which bind to them (612). Each target cell has specific receptors which can only bind to the specific hormones secreted. Once attached to the receptors, the hormones

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send chemical signals to stimulate various cellular activities, like enzyme production. Hormone levels and their secretion are in turn also controlled and maintained through negative feedback and regulatory hormones (612-613). For example, if the thyroid gland is stimulated to secrete thyroid hormones, their levels in the blood are detected by the pituitary gland and adequately controlled. The endocrine system is an intricate network of glands and hormones to help maintain homeostasis and healthy bodily development and function. However, sometimes the overstimulation of hormones or lack thereof leads to problems and disorders. Type 1 and type 2 diabetes is one of the most common disorders in children and adults (633). Type 1 occurs when the pancreas is unable to produce an adequate amount of insulin. This autoimmune disorder in children results in frequent urination and weight loss (634). When left untreated, the antibodies and the immune system continue to attack insulin producing cells of the pancreas which can lead to blindness, kidney and heart failure, and severe nerve damage. To greatly reduce its risk, the person has to be administered regular insulin injections. In type 2 diabetes the pancreas produces the normal amount of insulin, but the body fails to respond to it, leading to weight gain and obesity (634). Also, disorders related to the thyroid glands result in hypothyroidism and hyperthyroidism. Hypothyroidism is a result of low levels of thyroid hormones in the blood. In infants it leads to cretinism where skeletal and nervous development and metabolic rate are below normal (624, 638). In younger children it can delay the onset of puberty and slow the overall growth of the body. In adults it results in muscle weakness, low body temperatures, and slower reflexes. Hyperthyroidism is a result of too much thyroid hormones in the blood resulting in increased metabolic rate, heart

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rate and blood pressure. This can lead to increased nervousness and agitated emotional states. In children it is caused by Graves disease as a result of antibodies produced by the immune system over stimulating the thyroid gland (624). Works Cited Martini, F., H. Fundamentals of Anatomy and Physiology. San Francisco, CA: Pearson Education, 2004. 606-638. Print.