

The endocrine system.

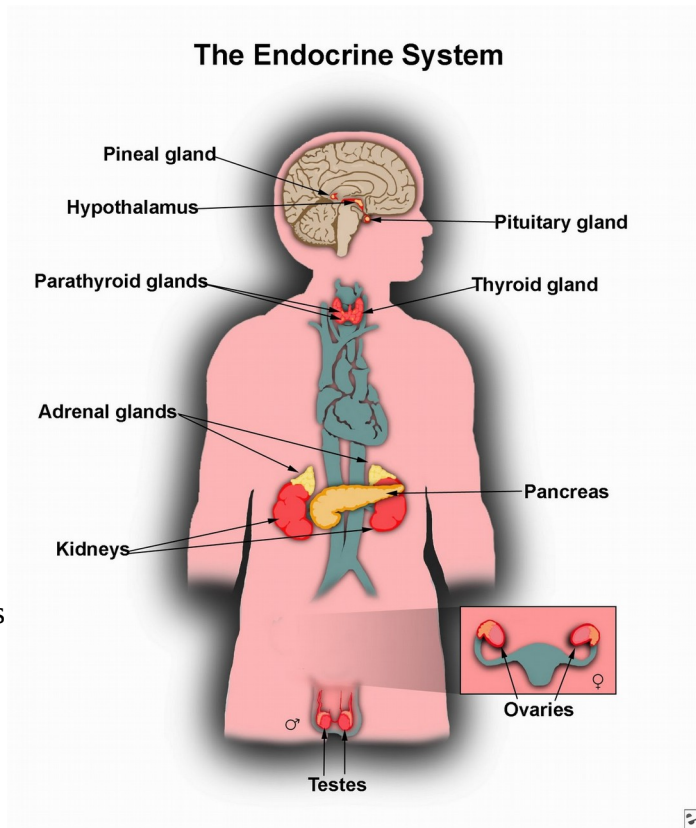
The endocrine system is a set of organs that communicate among themselves and regulate the function of other organs and systems.

They do so by releasing certain substances into the bloodstream. Said substances are then received by specific organs and stimulate or reduce their activity.

The substances the endocrine system releases are called hormones, and each organ in the system can produce and release only one or a small set of hormones that are usually not produced by any other organ in the body.

Most hormones only act upon one specific type of cell, and therefore only can regulate the function of one single organ. We call this the “target” organ or cell.

It is also important to mention that many organs in the endocrine system have other functions beside the production and release of hormones, for example the pancreas, which produces two hormones, has the function of producing substances needed for digestion.



Parts of the endocrine system.

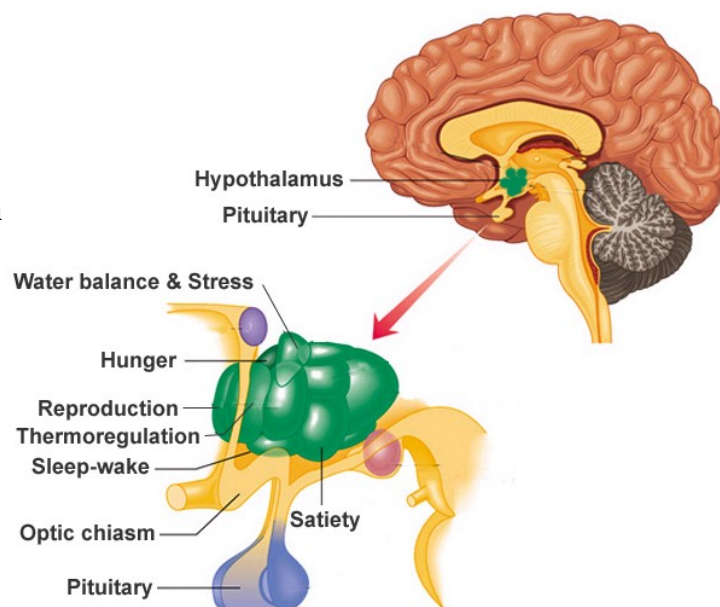
The hypothalamus.

We have already studied the hypothalamus as part of the brain, and one of its most important functions is to serve as a link between the central nervous system and the endocrine system.

The hypothalamus produces and releases hormones that control the pituitary gland, and it can even control parts of that gland through direct nervous connections.

The pituitary gland.

It resides roughly in the center of the cranium, behind the nose and below the hypothalamus. It is a secretory organ (that is, a gland)



approximately the size of a pea and it controls, through the production and release of hormones, most of the rest of the endocrine system.

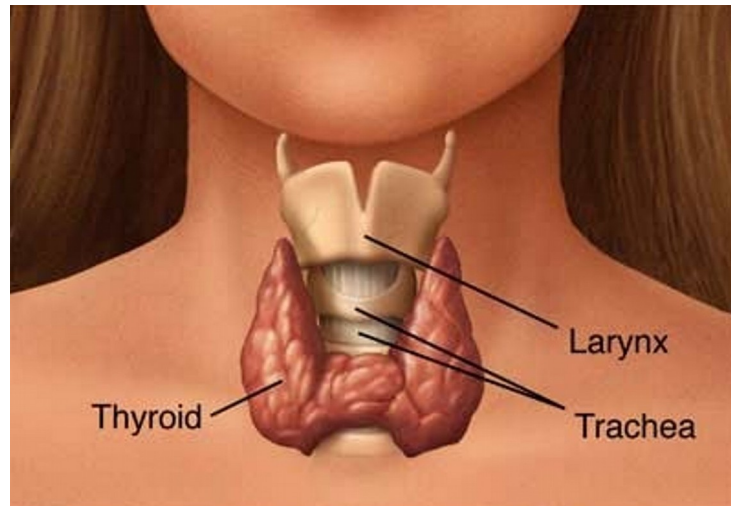
Essential hormones such as the **growth hormone** (GH), the **thyroid stimulating hormone** (TSH), the **follicle-stimulating hormone** (FSH) or the **luteinizing hormone** (LH) are secreted by the pituitary gland.

All of this means that the endocrine system is controlled directly by the pituitary gland and indirectly by the hypothalamus, which is part of the central nervous system.

The thyroid gland.

It is located in the throat, in front of the trachea, and it has one major function: produce and release thyroxine, a hormone that controls metabolism all over the body.

It is one of the few chemical compounds our body produces that contains three or four atoms of iodine, and that is why the lack of iodine can cause a condition called hypothyroidism.

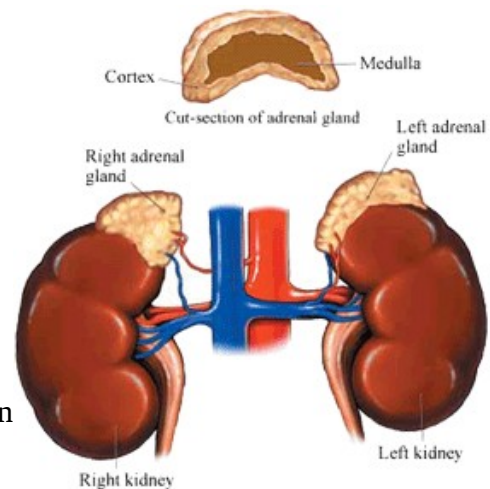


Adrenal glands.

They are two crescent-shaped glands that reside over the kidneys. They are divided into the outer layer (cortex) and the inner layer (medulla).

The cortex produces and releases aldosterone (which control how much sodium is discarded by the kidneys), cortisol (which turns down the immune system and also regulates metabolic pathways), and androgens (will be studied in other gland).

The medulla is controlled by the nervous system rather than the pituitary gland, and is the part that produces and releases adrenaline.

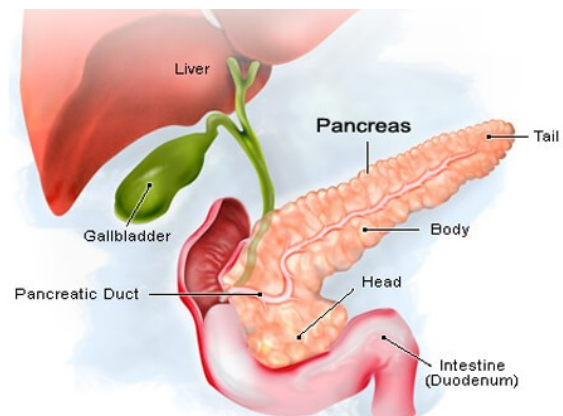


Pancreas.

The pancreas is a gland that is located below the stomach and has, as primary function, the role of producing pancreatic juice, which contains substances needed for digestion.

However, the pancreas also secretes insulin, glucagon and other hormones.

Insulin is a hormone that signals for abundance in the blood. The pancreas releases it when the digestive system receives food, and it signals the cells that the blood is about to become very rich in all kinds of nutrients, and that the cells should seize the chance to gather everything they need



from the bloodstream.

The pancreas does not prepare the insulin on the spot, it spends hours preparing and storing it and then releases the insulin when food intake is detected.

Glucagon is the opposite signal to the cells (that is, opposite to insulin), it signals for scarcity. When glucagon is released, the reserve tissues respond by releasing back into the blood what they have gathered while digestion was taking place, therefore maintaining an acceptable level of nutrients in the blood until the next meal.

Gonads.

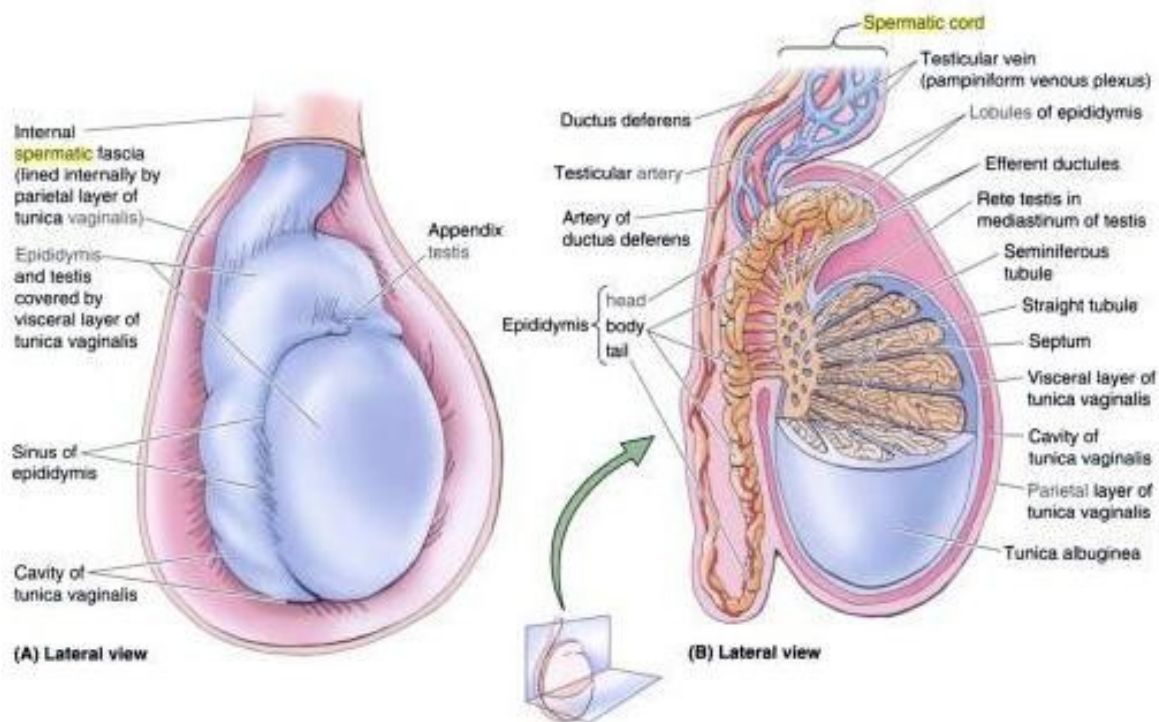
Testicles.

They produce androgens, mainly testosterone.

Testosterone is the hormone that causes the appearance of some secondary sex characteristics in males, such as increase in muscle and bone mass, growth of penis and testicles and appearance of body hair.

Testosterone is also produced by the adrenal glands and the ovaries, and also has some effect in females (such as the growth of body hair).

It is also responsible for minor sexual characteristics such as the enlargement of jaw bone, development of Adam's apple. During puberty it also causes increased libido and frequency of erection/clitoral engorgement and a stimulation of the sebaceous glands that might cause acne.



Ovaries

They produce testosterone (already explained) alongside the adrenal glands, but also produce two essential hormones:

Estrogen.

It is a hormone that, among other functions, stimulates the maturation of the ovary itself, and also keeps them active for the duration of the menarche.

It is the hormone responsible for the appearance of secondary sex characteristics, including breast growth, enlargement of the uterus and widening of the hips.

Progesterone.

It is one of the most important hormones in human life. Among many other functions, it is the hormone that prepares the uterus for the reception of the zygote. The levels of progesterone stay high during pregnancy and that is responsible for a partially decreased activity of the immune system and, after birth, its absence triggers the production of milk by the mammary glands.

