

Endocrine system 2

Adrenal gland

WHAT YOU NEED TO KNOW

- Adrenal glands, also known as suprarenal glands, are small, triangular-shaped glands located on top of both kidneys.
- Adrenal glands produce hormones that help regulate your metabolism, immune system, blood pressure, response to stress and other essential functions.
- Adrenal glands are composed of two parts — the cortex and the medulla — which are each responsible for producing different hormones.
- When adrenal glands don't produce enough hormones, this can lead to adrenal insufficiency (Addison's disease).
- Adrenal glands may develop nodules that can be benign or malignant, which can potentially produce excessive amounts of certain hormones leading to various health issues.

Anatomy of the Adrenal Glands

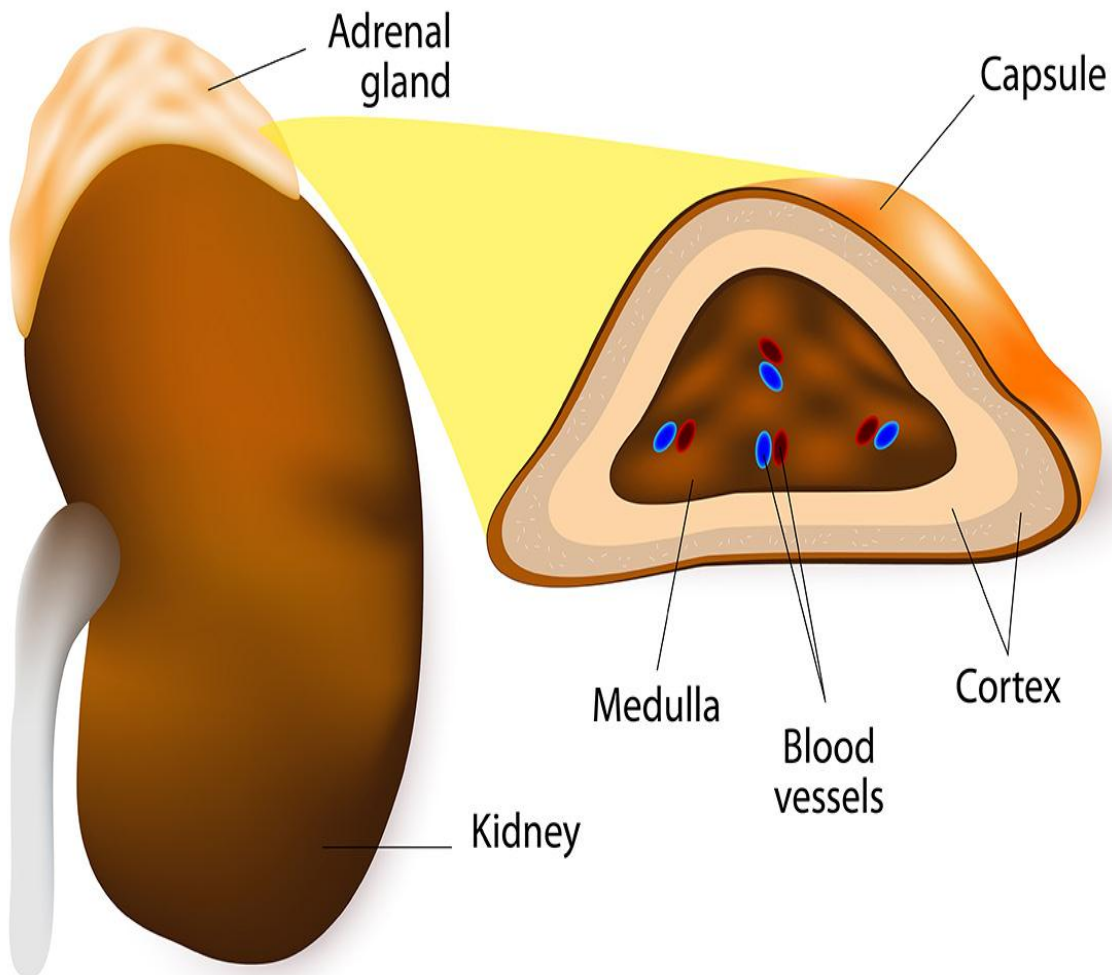
An adrenal gland is made of two main parts:

- The **adrenal cortex** is the outer region and also the largest part of an adrenal gland. It is divided into three separate zones: zona glomerulosa, zona fasciculata and zona reticularis. Each zone is responsible for producing specific hormones.

- The **adrenal medulla** is located inside the adrenal cortex in the center of an adrenal gland. It produces “stress hormones,” including adrenaline.

The adrenal cortex and adrenal medulla are enveloped in an **adipose capsule** that forms a protective layer around an adrenal gland.

ADRENAL GLAND



Can you live without an adrenal gland?

The adrenal glands are small glands located on top of each kidney. They produce hormones that you can't live without, including sex hormones and cortisol. Cortisol helps you respond to stress and has many other important functions. With adrenal gland disorders, your glands make too much or not enough hormones

Hormones of the Adrenal Glands

The role of the adrenal glands in your body is to release certain hormones directly into the bloodstream. Many of these hormones have to do with how the body responds to stress, and some are vital to existence. Both parts of the adrenal glands — the adrenal cortex and the adrenal medulla — perform distinct and separate functions.

Each zone of the adrenal cortex secretes a specific hormone. The key hormones produced by the adrenal cortex include:

Cortisol

Cortisol is a glucocorticoid hormone produced by the zona fasciculata that plays several important roles in the body. It helps control the body's use of fats, proteins and carbohydrates; suppresses inflammation; regulates blood pressure; increases blood sugar; and can also decrease bone formation.

This hormone also controls the sleep/wake cycle. It is released during times of stress to help your body get an energy boost and better handle an emergency situation.

How Adrenal Glands Work to Produce Cortisol?

Adrenal glands produce hormones in response to signals from the pituitary gland in the brain, which reacts to signaling from the hypothalamus, also located in the brain. This is referred to as the hypothalamic pituitary adrenal axis. As an example, for the adrenal gland to produce cortisol, the following occurs:

- The hypothalamus produces corticotropin-releasing hormone (CRH) that stimulates the pituitary gland to secrete adrenocorticotropin hormone (ACTH).
- ACTH then stimulates the adrenal glands to make and release cortisol hormones into the blood.
- Normally, both the hypothalamus and the pituitary gland can sense whether the blood has the appropriate amount of cortisol circulating. If there is too much or too little cortisol, these glands respectively change the amount of CRH and ACTH that gets released. This is referred to as a negative feedback loop.
- Excess cortisol production can occur from nodules in the adrenal gland or excess production of ACTH from a tumor in the pituitary gland or other source.

Aldosterone

This mineralocorticoid hormone produced by the zona glomerulosa plays a central role in regulating blood pressure and certain electrolytes (sodium and potassium). Aldosterone sends signals to the kidneys, resulting in the kidneys absorbing more sodium into the bloodstream and releasing potassium into the urine. This means that aldosterone also helps regulate the blood pH by controlling the levels of electrolytes in the blood.

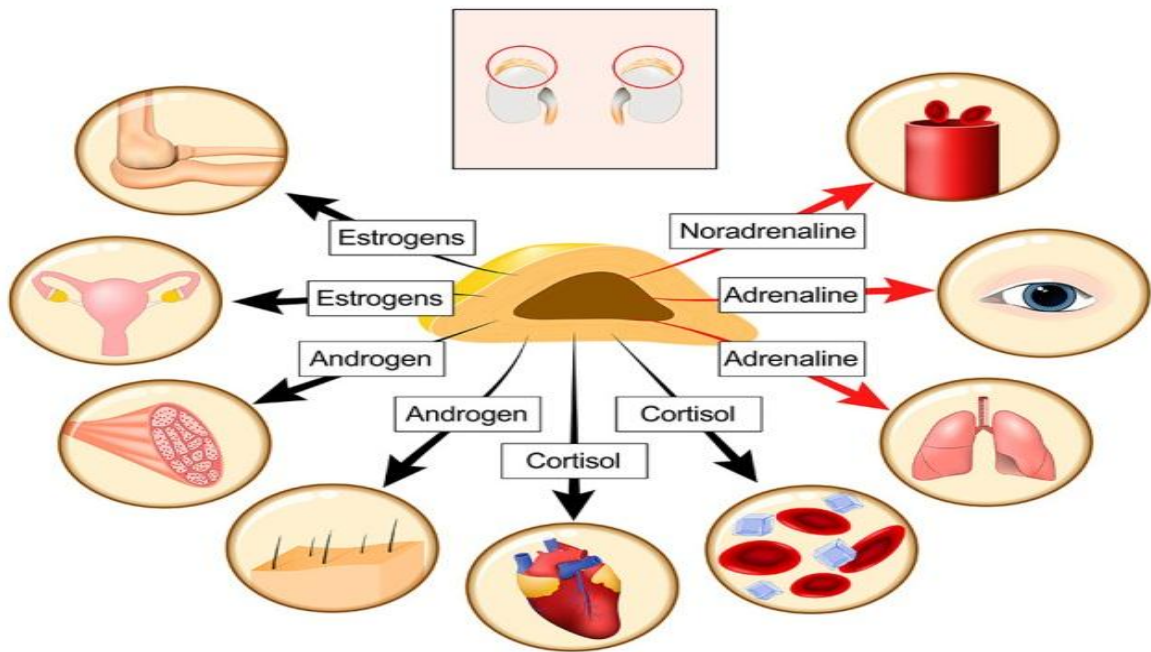
DHEA and Androgenic Steroids

These hormones produced by the zona reticularis are weak male hormones. They are precursor hormones that are converted in the ovaries into female hormones (estrogens) and in the testes into male hormones (androgens). However, estrogens and androgens are produced in much larger amounts by the ovaries and testes.

Epinephrine (Adrenaline) and Norepinephrine (Noradrenaline)

The adrenal medulla, the inner part of an adrenal gland, controls hormones that initiate the flight or fight response. The main hormones secreted by the adrenal medulla include epinephrine (adrenaline) and norepinephrine (noradrenaline), which have similar functions.

Hormones of adrenal gland

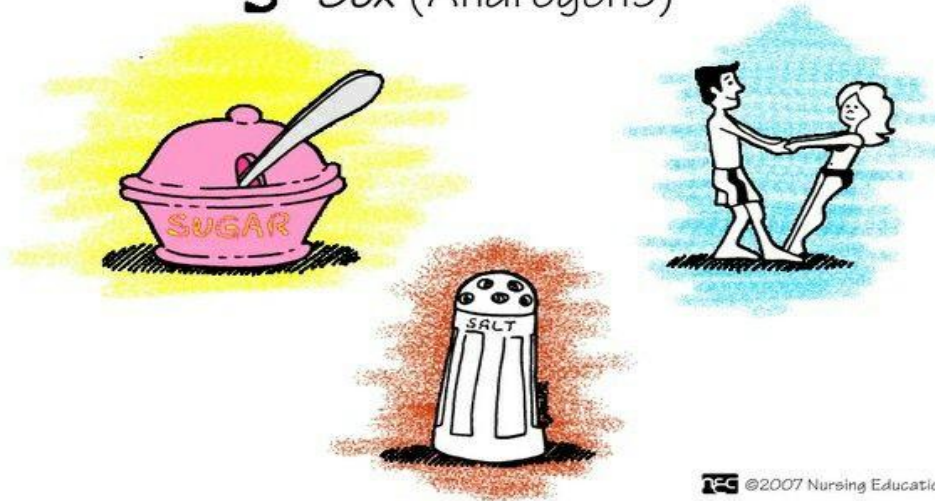


ADRENAL GLAND HORMONES

S Sugar (Glucocorticoids)

S Salt (Mineralcorticoids)

S Sex (Androgens)



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- ❖ Among other things, these hormones are capable of increasing the heart rate and force of heart contractions, increasing blood flow to the muscles and brain, relaxing airway smooth muscles, and assisting in glucose (sugar) metabolism. They also control the squeezing of the blood vessels (vasoconstriction), helping maintain blood pressure and increasing it in response to stress.
- ❖ Like several other hormones produced by the adrenal glands, epinephrine and norepinephrine are often activated in physically and emotionally stressful situations when your body needs additional resources and energy to endure unusual strain.

What are the symptoms of adrenal gland disorders?

- Upper body obesity, round face and neck, and thinning arms and legs.
- Skin problems, such as acne or reddish-blue streaks on the abdomen or underarm area.
- High blood pressure.
- Muscle and bone weakness.
- Moodiness, irritability, or depression.
- High blood sugars.
- Slow growth rates in children

What happens when the adrenal gland is not functioning properly?

With **adrenal** insufficiency, the inability to increase cortisol production with stress can lead to an Addisonian crisis. An Addisonian crisis is a life-threatening situation that results in low blood pressure, low blood levels of sugar and high blood levels of potassium. You will need immediate medical care.