

Location



The two adrenal glands sit above the kidneys on each side of the body.

Each adrenal gland has an outer layer, called the 'adrenal cortex' and an inner layer, called the 'adrenal medulla'.

Functions/Roles

The adrenal glands make hormones that help control:

- Blood pressure regulation
- Salt and water balance
- Control blood sugar levels
- Energy production
- Sex organ development
- Stress response
- Heart rate
- Attention
- Inflammation
- Fetal development

Hormones

Aldosterone is the main type of mineralocorticoid. Aldosterone signals the kidneys to change the amount of salt released into the urine. This keeps salt and water levels in balance, which helps maintain blood volume, controls blood pressure and avoids dehydration.

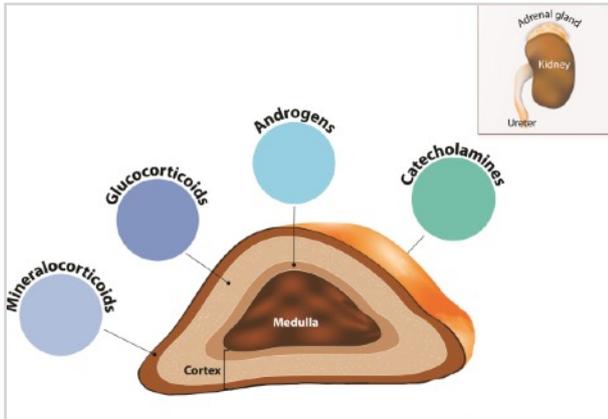
Cortisol is the main type of glucocorticoid hormone. Cortisol helps control metabolism, inflammation, bone health, attention and memory, reproductive function, heart rate and blood pressure. It is a key hormone in the stress response, and is essential for growth and development of the unborn baby.

DHEA is an androgen that mostly gets converted into other hormones, such as estrogen and testosterone. DHEA is important for the development of the male sex organs before birth and in early childhood, and also plays a role during puberty for both men and women.

Testosterone is an androgen made in small amounts by the adrenal glands in both men and women. Testosterone is the main hormone in men responsible for male sex organ development and male secondary sex characteristics (e.g. facial and body hair, increased body size and mass and deepening of the voice). In men, most of the circulating testosterone is made by the testes. In women, testosterone is also made by the ovaries, however most of this is quickly converted to estrogen. In both men and women, testosterone is important for controlling bone density, muscle mass and strength, and libido (sex drive).

Adrenaline (or epinephrine) is the main catecholamine produced by the adrenal medulla. It drives the 'fight or flight' response immediately following exposure to stress or a potential threat. It increases breathing rate, blood pressure, blood flow to the heart and lungs, awareness and pain thresholds.

Keeping adrenal hormones in balance



Aldosterone is controlled through a negative feedback loop. The adrenal glands produce aldosterone in response to a protein in the blood called angiotensin. Angiotensin is formed when blood flow to the kidneys drops (e.g. as a result of low blood pressure or low blood volume). Aldosterone increases blood pressure and blood volume. This leads to less angiotensin being produced. This loop keeps aldosterone in a normal range.

Cortisol is controlled through a negative feedback loop. CRH from the hypothalamus signals the pituitary gland to make adrenocorticotrophic hormone (ACTH). ACTH then signals the adrenal glands to make and release cortisol. When a threshold is reached, cortisol signals the hypothalamus and pituitary to make less CRH and ACTH. This loop keeps cortisol in a normal range.

Adrenaline is released when nerves connected to the adrenal glands become activated following exposure to real or perceived stress. When the stressful situation passes, the nerves stop sending messages to the adrenal glands, which stop producing adrenaline.

Common problems and conditions of the adrenal gland

Primary Adrenal Insufficiency
Cushing's Syndrome
Addison's Disease
Congenital Adrenal Hyperplasia
Primary Aldosteronism