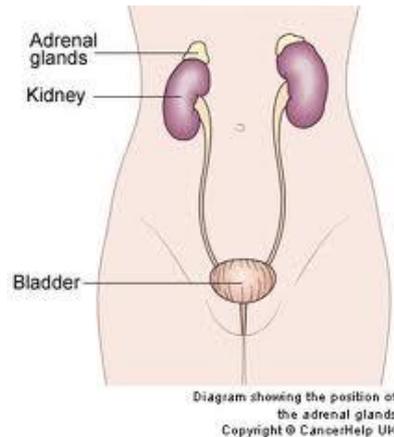


## ADRENAL INSUFFICIENCY

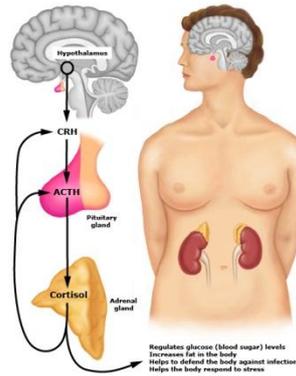
The adrenal glands are located on top of the kidneys.



The adrenal glands produce three types of hormones:

- 1) Glucocorticoid (steroid) hormones. Cortisol is the main of these hormones. Cortisol is a vital “stress hormone” which helps with the stress response of the body (maintaining Blood Pressure and circulation in times of physical stress), storing fat, fighting infection and regulating blood glucose levels
- 2) Mineralcorticoid hormones. The main of these is Aldosterone, which helps regulate sodium levels, potassium levels, body fluid balance and blood pressure
- 3) Androgens – testosterone, DHEA and DHEAS. In women, androgens are produced in the adrenal glands and the ovaries. In women, adrenal androgens promote the development of sex characteristics such as underarm and pubic hair. In men, most androgens (eg, testosterone) are produced in the testes. Androgens made by the adrenal glands are not as important for normal sexual function.

Cortisol levels are normally regulated by the hypothalamus and pituitary gland. The hypothalamus sends corticotropin releasing hormone (CRH) to the pituitary gland. The pituitary gland responds by producing several hormones, one of which is ACTH (adrenocorticotropin hormone). ACTH stimulates the adrenal gland to produce cortisol. Cortisol levels help to control the pituitary's production of ACTH.



## Addison’s disease

Addison’s disease, or primary adrenal insufficiency, is a disorder causing dysfunction of the adrenal glands. Despite increased stimulation through high ACTH, the adrenal glands cannot produce enough hormones. This is most often due to autoimmunity – the body incorrectly recognises the adrenal glands as foreign tissue and produces antibodies which attack the adrenal glands. It is a rare condition, affecting only 25-130 people per 1 million people.

Symptoms of Addison’s disease can include:

- Weight loss
- Dizziness
- Fatigue
- Darkening of skin, particularly around old scars, elbow creases, creases in the palms, abdominal creases
- Salt craving
- Aches and joint pains
- Symptoms of low blood sugar levels (sweating, shaking, nausea)
- Diarrhoea

## Secondary or Tertiary Adrenal insufficiency

Diseases of the pituitary gland, which produces ACTH, or hypothalamus, which produces CRH, can lead to underactive adrenal glands, as there is insufficient stimulation of the adrenal glands to produce cortisol. This may be due to long-term treatment with prednisolone tablets, abnormal growth of these glands, tumours or autoimmune disease.

Darkening of the skin, salt cravings, and fluid problems do not occur in this situation but patients still develop dizziness, weight loss, symptoms of low blood sugar levels and possibly diarrhoea.

## Diagnosis

Blood cortisol at 8am will be measured. If the result is very low, this confirms the diagnosis. ACTH levels will also be checked.

If the result is moderately low, a short synacthen test may be ordered. In this test, blood is tested then synthetic ACTH is admitted via injection. Blood is then tested after 30mins and 60mins. If there is an adequate rise in cortisol levels as a result of the injection, this excludes adrenal disease as

the cause of symptoms. (It does not necessarily exclude pituitary or hypothalamic disease as the cause – discuss this with your doctor)

If the rise of cortisol in response to synthetic ACTH is blunted/inadequate, this would confirm the diagnosis of adrenal insufficiency.

## **Treatment**

Treatment aims at replacing hormone levels. In Addison's disease (primary adrenal insufficiency), both cortisol and mineralcorticoid needs to be replaced. In pituitary and hypothalamic disease, only cortisol needs to be replaced.

Cortisol replacement (hydrocortisone/ cortisone acetate) is generally at a higher dose in the morning and a lower dose in the evening, to mimic the body's own cyclical release of cortisol.

Mineralcorticoid replacement (Fludrocortisone) is generally taken once daily.

**ADRENAL CRISIS** — Adrenal crisis refers to overwhelming and life-threatening adrenal insufficiency. The most common signs of adrenal crisis are shock (very low blood pressure with a loss of consciousness), dehydration, and an imbalance of sodium and potassium levels in the body. In some cases, shock is preceded by fever, nausea, vomiting, and abdominal pain, weakness or fatigue, and confusion. Adrenal crisis usually occurs after an infection, trauma, or another stressor.

Adrenal crisis is a life-threatening condition that requires emergency medical treatment. The patient or a family member or friend should immediately give an emergency injection of a glucocorticoid at the first signs of adrenal crisis. In the emergency department or ambulance, treatment usually includes giving several liters of a salt solution (saline) and an injection of a glucocorticoid (hydrocortisone or another form of cortisol) into a vein. Mineralocorticoid treatment (if needed) is usually started at a later time, when the saline treatment is completed.

Following treatment, it is important look for and treat any factors that may have triggered the crisis, such as infection.

**ADRENAL INSUFFICIENCY PRECAUTIONS AND SPECIAL SITUATIONS** — People with adrenal insufficiency should learn as much as possible about their condition and should be aware of early warning signs of hormone deficiency. It is also wise to share this information with family, friends, and any caregivers, so that they can also identify signs of trouble and be prepared to act in case of adrenal crisis.

**General precautions** — People with adrenal insufficiency should wear a medical alert bracelet or necklace. They should also carry an emergency medical information card that lists the names and doses of their daily medications and the clinician and family member(s) to call in case of emergency. It is extremely important to identify early symptoms of adrenal deficiency and adrenal crisis; a clinician can describe subtle symptoms that should not be ignored. In the presence of diarrhoea/ intercurrent infection/ physical stress, the regular dose of corticosteroid should be doubled and medical attention should be sought.

## Emergency precautions

Even with careful use of medications and medical monitoring, some people with primary adrenal insufficiency will experience adrenal crisis. As a safety measure, the patient should always carry a syringe and a vial of hydrocortisone (or another glucocorticoid). This system should be stored at home, at work or school, and in the patient's handbag or backpack.

The patient or a family member or friend should give the injection into a muscle (usually the thigh) if any of the following occurs:

- After a major injury with substantial blood loss, fracture, or shock
- During an episode of nausea and vomiting if oral medications are thrown up
- If there are any signs or symptoms of adrenal crisis
- If the person is found unconscious