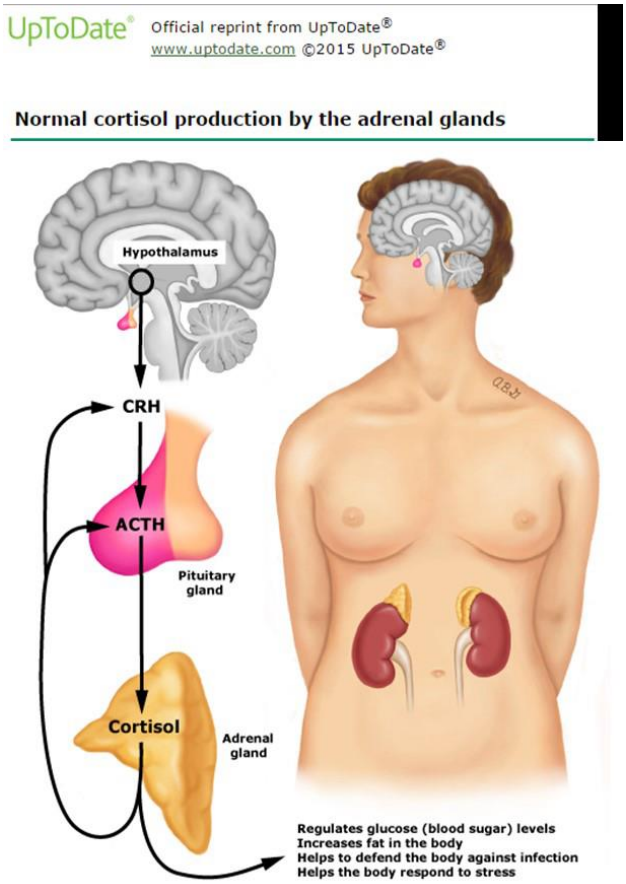
Steroid Therapy & the Pituitary – Part 1

Thank you to Prof Ian Holdaway for expert review of this article
Written by Dr Catherine Chan

Cortisol is a steroid hormone or glucocorticoid, the use of these terms is interchangeable. It is usually known as the "stress hormone" and is essential for survival. As you can see in the diagram below, under natural conditions the amount of cortisol present in the blood varies, controlled by a part of the brain called the hypothalamus, which sends chemical (hormonal) messages to the pituitary gland and then down to the adrenal glands, where cortisol is made. This pathway allows the right amount of cortisol to be produced depending on the body's requirements, with higher production rates in the morning and less in the evening. The highly regulated production of cortisol is hard to replicate using oral replacement cortisol therapy.



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 in turn help to control the pituitary's production of

Acromegaly patients can develop problems with low cortisol levels when their pituitary glands no longer produce enough ACTH, either by direct mass effect of the pituitary adenoma, or as a side effect of their treatment e.g. transphenoidal surgery or pituitary radiotherapy. We term this "secondary" adrenal insufficiency, primary adrenal insufficiency is when the adrenal glands themselves are damaged and cannot produce enough cortisol.

Adrenal insufficiency is treated by taking cortisol hormone replacement, the goal being to relieve the symptoms of hormone deficiency without developing features of hormone excess. Treatment is usually lifelong. With appropriate treatment and precautions people with adrenal insufficiency can lead active lives and have a normal life expectancy.

Symptoms of low cortisol levels

The severity of symptoms depend on the severity of hormone deficiency and the speed of onset. After transphenoidal surgery for pituitary tumours, patients are usually put on short term hydrocortisone steroid replacement until their steroid levels can be checked, in case surgery has disrupted the normal pituitary gland function Symptoms of low cortisol include:

- Fatigue, muscle weakness, inability to cope with stress, palpitations, social anxiety, energy lag particularly in the afternoon, "brain fog", mild dizziness, irritability, low blood sugar, loss of appetite, mild nausea, clumsiness, confusion.
- "Hitting the wall" – patients with low cortisol rely on stored adrenaline to get through stressful events to compensate for the cortisol boost healthy bodies produce. Then when the adrenaline rush finishes, we 'hit the wall'.
- Severe nausea +/- vomiting, diarrhoea, vertigo, headaches, joint aches, prostration – these are signs of an impending or established adrenal crisis.

Adrenal crisis refers to life threatening adrenal insufficiency that requires emergency medical treatment with an emergency intramuscular injection of hydrocortisone. The most common symptoms are nausea and vomiting, abdominal pains, fever, fatigue, weakness, confusion, and shock (very low blood pressure with a loss of consciousness). Adrenal crisis usually occurs after an infection, trauma, or another stressor.

Given the dangers of an adrenal crisis, acromegaly patients with adrenal insufficiency on long term steroid use should wear a medic alert bracelet, and should always have a vial of hydrocortisone injection at home, at work, and especially when travelling. It is also wise to share this information with family and friends so that they can identify signs of trouble and be prepared to act.

Effects of excessive levels of cortisol

Acromegaly patients who need to take cortisol replacement faces the challenge of finding the right replacement dose, in order to avoid both (1) symptoms of low cortisol and (2) side effects of taking too much. Excessive corticosteroid dosing can have the following adverse effects:

- Metabolism. Corticosteroids affect glucose metabolism and increase the likelihood of high blood sugar levels and the development of diabetes mellitus. Steroids increase appetite and can result in weight gain. Excess steroids affects protein metabolism causing muscle wasting, proximal muscle weakness, weakening of connective tissues causing stretch marks (striae), and easy bruising. Effects on fat metabolism causes trunk obesity, increase fat in the abdomen and liver, "moon face", and "buffalo hump" (fat deposition between the shoulder blades)

- Osteoporosis – thinning of the bones leading to an increased risk of fractures

- Inhibition of inflammatory responses and impairing white blood cell function. Prolonged excessive steroid dosing can cause reduced healing and increased risk of infections.

- Memory - long term excessive steroid dosing results in damage to cells in the hippocampus region of the brain involved with memory.

- Psychological effects range from mild irritability and depression, to euphoria and psychosis. Steroids can inhibit pain.

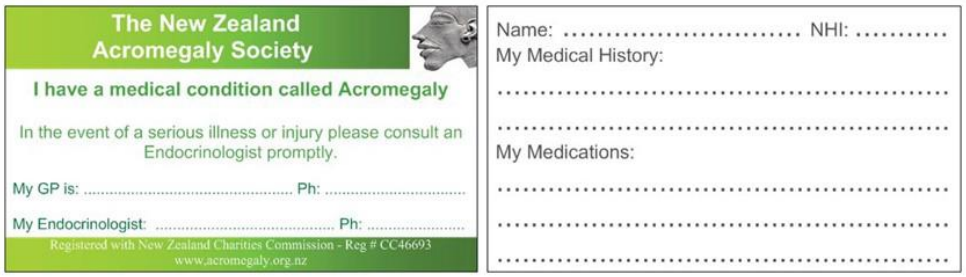
Remember, for those with secondary adrenal insufficiency steroids are essential for life, therefore reducing the dose after long term treatment, if thought to be indicated, needs to be done very carefully. Steroid dosing should be done with care and using guidance from your endocrinologist in order to avoid the adverse effects of excessive replacement, and the dangers of under replacement.

Part 2 – Treatment of adrenal insufficiency will be published in our next newsletter

If you have any questions on steroid therapy, please email it to catherine@acromegaly.org.nz and we will endeavour to have it published in our next newsletter (questions will remain anonymous)

Resources:
The NZ Acromegaly Society has produced some useful resources including:

- Information booklet on "Hydrocortisone advice for patients", including how to make up an emergency injection kit *www.acromegaly.org.nz/resources/information_booklet*
- Emergency Sheet (new) – ideal to have at home and in your car. Available to download as a Word document and fill in your own details including next of kin contact, medical history and medication list. *www.acromegaly.org.nz/resources/steroid-therapy*
- Wallet card – this is free for all members, please email catherine@acromegaly.org.nz if you would like one posted to you



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