Touchdown! Understanding corticosteroids like a pro

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The ins and outs of the endocrine system may seem as intimidating as a 350-pound linebacker running straight for you, let alone when corticosteroid medications are added to the mix. In this article, I'll help you understand how the endocrine system naturally produces corticosteroids in the body, how corticosteroid medications impact the body, why these drugs are used, and what dangerous adverse reactions you should watch for in your patients. You'll be ready for the pros in no time!

Meet the players

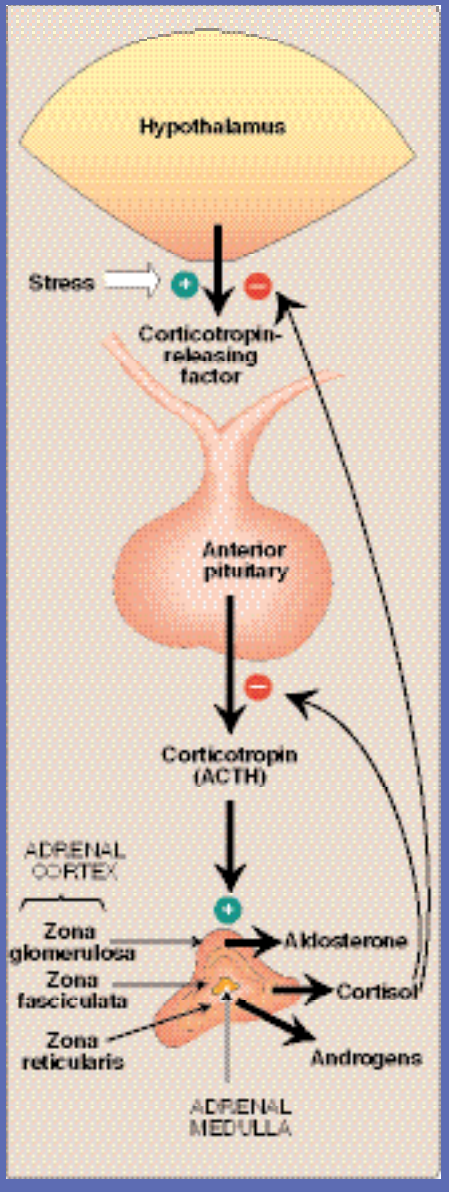
First, let's take a look at the endocrine system and its production of corticosteroids (see *Regulation of corticosteroid secretion*). The endocrine system follows rules just like the players in a football game:

• ***the coach—the hypothalamus.*** Leading the home team is the hypothalamus, which calls the plays between the nervous system and the endocrine system. The nerve cells in the hypothalamus control the pituitary gland by producing chemicals that stimulate or suppress hormone secretions from it. The hypothalamus constantly receives feedback from the central nervous system and responds by sending corticotropin-releasing hormone (CRH) to the anterior pituitary gland after receiving feedback from the brain.

• ***the quarterback—the anterior pituitary gland.*** The anterior pituitary gland is the quarterback for the home team. It's known as the master gland because it releases hormones that control many other glands, including the thyroid, reproductive, and adrenal glands. For this discussion, we'll focus on the interaction between the anterior pituitary gland and the adrenal cortex. When the anterior pituitary gland receives the play from the coach (the hypothalamus in the form of CRH), it releases adrenocorticotropic hormone (ACTH) to the receiver organ: the adrenal cortex.

• ***the receiver—the adrenal cortex.*** The adrenal cortex is part of the adrenal glands that sit on top of the kidneys. When it receives ACTH, it responds by releasing the natural corticosteroids cortisol, aldosterone, and androgens into the body. Cortisol, which is a glucocorticoid, influences stress response, immune response, carbohydrate metabolism, protein catabolism, blood electrolyte levels, and behavior. Aldosterone, which is a mineralocorticoid, encourages the

Regulation of corticosteroid secretion



body to conserve sodium and, consequently, water.

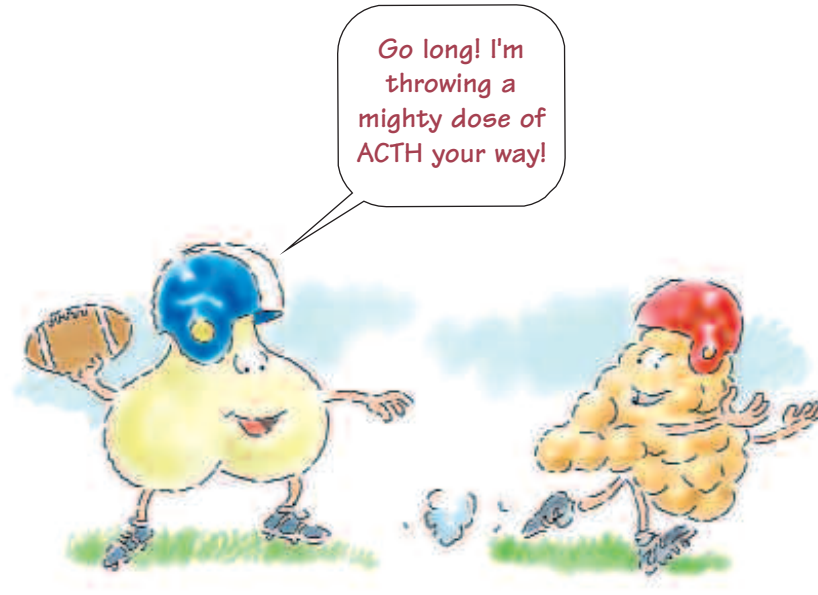
Instant replay

It's time to review what you just learned. The hypothalamus responds to information sensed by the brain and, in the case of corticosteroids, sends CRH to the anterior pituitary gland. The anterior pituitary gland receives CRH from the hypothalamus and sends ACTH to the adrenal cortex. When the adrenal cortex receives ACTH, it releases natural corticosteroids into the bloodstream.

A flag on the play

Now that you understand how natural corticosteroids are produced in the body, let's look at the impact for a patient who's taking a corticosteroid medication. Corticosteroids are given for many different reasons, but are primarily used to reduce the inflammatory response in patients with joint pain or inflammation, arthritis, dermatitis, allergic reactions, asthma, hepatitis, lupus, inflammatory bowel disease, or sarcoidosis (a multisystem disorder characterized by small, inflammatory nodules). They may also be used for glucocorticoid replacement in Addison's disease, adrenocorticol insufficiency, and adrenal hyperplasia; in the diagnosis of Cushing's disease; and to accelerate lung maturation in premature infants. See *Common corticosteroid medications* for information about some of the most common corticosteroid drugs.

When a patient receives corticosteroid medication, there isn't as much stimulus for



the hypothalamus to start the process of sending CRH to the anterior pituitary gland because there are plenty of steroids in the bloodstream from the medication dosage the patient is receiving. This causes the adrenal cortex to become "lazy" or suppressed. If a patient is receiving high doses of corticosteroids for even just a week, the adrenal glands can begin to be suppressed because of the decreased CRH and ACTH levels. This is the part of the game that can have significant risk for your patient. It can take months for your patient's adrenal glands to recover if the body has become used to higher levels of corticosteroids for an extended period of time.

Any time a patient has higher than normal levels of ACTH, cortisol, or aldosterone, the following adverse reactions

Common corticosteroid medications

Generic names	Trade names
Hydrocortisone	Cortisol, Cortef, Hydrocortone, Solu-Cortef
Cortisone	Cortone, Cortate, Cortogen
Dexamethasone	Decadron, Dexameth, Deronil, Delalone, Dexasone, Dexone, Hexadrol
Prednisone	Meticorten, Deltasone, Orasone, Panasol, Novo-Prednisone, Prednisolone, Meticortelone, Prelone, Predalone
Methylprednisolone	Medrol, Solu-Medrol, Meprolone
Triamcinolone	Aristocort, Kenacort, Kenalog, Cenocort, Azmacort, Aristospan
Beclomethasone	Beconase, Beclovent, Vanceril, Vancenase, Propaderm
Betamethasone	Celestone, Betameth, Betnesol, Betnelan

Adverse reactions to corticosteroid therapy

Adverse reactions	Nursing interventions
Cardiovascular effects	
Hypertension	Monitor for elevated BP.
Thrombophlebitis	Assess for signs and symptoms of deep vein thrombosis: redness, warmth, tenderness, and edema of an extremity.
Thromboembolism	Remind the patient to avoid positions and situations that restrict blood flow (crossing legs, prolonged sitting in the same position).
Accelerated atherosclerosis	Encourage foot and leg exercises when recumbent. Encourage low sodium intake. Encourage limited intake of fat.
Immunologic effects	
Increased risk of infection and masking of signs of infection	Assess for subtle signs of infection and inflammation. Encourage the patient to avoid exposure to others with upper respiratory infection. Monitor the patient for fungal infections. Encourage hand washing.
Ophthalmologic changes	
Glaucoma	Encourage frequent eye examinations.
Corneal lesions	Refer the patient to an ophthalmologist if changes in visual acuity are detected.
Musculoskeletal effects	
Muscle wasting	Encourage high protein intake.
Poor wound healing	Encourage high protein intake and vitamin C supplementation.
Osteoporosis with vertebral compression fractures, pathologic fractures of long bones, and aseptic necrosis of head of the femur	Encourage a diet high in calcium and vitamin D or calcium and vitamin D supplementation if indicated. Take measures to avoid falls and other trauma. Use caution in moving and turning the patient. Encourage postmenopausal women on corticosteroids to consider bone mineral density testing and treatment, if indicated. Instruct the patient to rise slowly from the bed or chair to avoid falling due to postural hypotension.
Metabolic effects	
Alterations in glucose metabolism	Monitor blood glucose levels at periodic intervals.
Steroid withdrawal syndrome	Instruct the patient about medications, diet, and exercise prescribed to control the blood glucose level. Report signs of adrenal insufficiency. Administer corticosteroids and mineralocorticoids as prescribed. Monitor fluid and electrolyte balance. Administer fluids and electrolytes as prescribed. Instruct the patient about the importance of taking corticosteroids as prescribed without abruptly stopping therapy. Encourage the patient to obtain and wear a medical identification bracelet. Advise the patient to notify all healthcare providers about the need for corticosteroid therapy.
Changes in appearance	
Moon face	Encourage a low-calorie, low-sodium diet.
Weight gain	
Acne	Assure the patient that most changes in appearance are temporary and will disappear if and when corticosteroid therapy is no longer necessary.

are likely to occur:
• mood swings (from depression to euphoria to rage)
• hypertension
• rapid weight gain in the trunk and face (not the limbs)
• insulin resistance and an increased serum glucose level
• increased serum sodium and decreased serum potassium levels
• decreased libido, impotence, amenorrhea (absence of menstrual periods), and infertility
• muscle wasting
• excessive sweating
• moon face
• hirsutism (excess body hair)
• skin problems, such acne, purple or red striae, and skin that bruises easily.

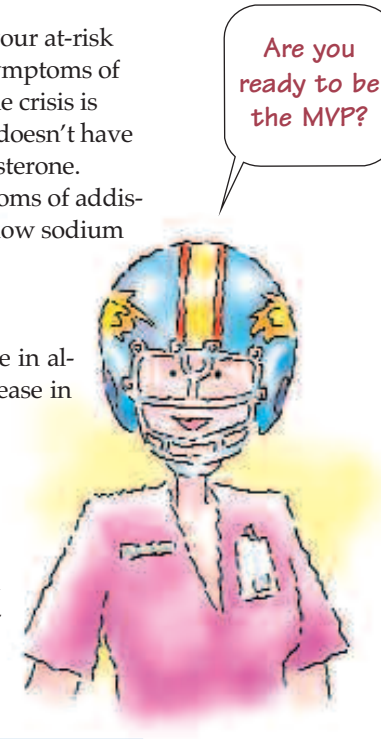
Do these signs and symptoms sound familiar? They should. The signs and symptoms of excess ACTH, which then causes increased cortisol and aldosterone levels, are also called Cushing's syndrome—most often caused by corticosteroid administration.

Sitting on the bench

If the adrenal glands become suppressed (due to the extra corticosteroids available in the bloodstream from receiving a corticosteroid medication), it takes a period of time for them to get back in the game. Remember, if all things were working normally, when the adrenal cortex received ACTH from the anterior pituitary gland, it would release natural corticosteroids into the bloodstream. But suppressed glands don't respond well to ACTH. Because of the suppression, the adrenal glands can't respond to stress and the needs of the body as they normally would by releasing the corticosteroids that help the body maintain homeostasis.

The adrenal glands need time to "wake up," so gradually decreasing the corticosteroid dosage is essential to allow them time to recover and get back in the game. If a patient with adrenal gland suppression from high-dose corticosteroid administration stops receiving the medication abruptly, he'll experience an adrenal crisis similar to an addisonian crisis, which can be life threatening. It's critical that you watch your at-risk patients for the key signs and symptoms of addisonian crisis. Remember, the crisis is occurring because your patient doesn't have enough ACTH, cortisol, or aldosterone.

Many of the signs and symptoms of addisonian crisis reflect the patient's low sodium level:
• extreme fatigue
• headache
• hypotension due to a decrease in aldosterone and consequent decrease in volume
• tachycardia
• nausea or vomiting
• diarrhea
• hypoglycemia
• decreased serum sodium and increased serum potassium levels
• muscle weakness
• decreased skin temperature.



Patient playbook

Teach your patients receiving corticosteroids the potential adverse reactions of corticosteroid medications, including the signs and symptoms of Cushing's syndrome and addisonian crisis, and what they can do to reduce the risks associated with corticosteroid therapy. See *Adverse reactions to corticosteroid therapy* for more information.

MVP of the game

Because corticosteroids are used to treat so many diseases, there's no question that you'll be involved in the care of patients receiving corticosteroid medications. As an MVP, you'll be on the lookout for, and be able to quickly recognize, the early signs and symptoms of a patient headed for trouble to ensure the safe and effective use of these drugs. ■

Learn more about it

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