

ACTH Stimulation Test

- ACTH (adrenocorticotrophic hormone) is a hormone produced by the brain that stimulates the adrenal glands to release cortisol and other hormones.
- Two medical conditions, Cushing's disease and Addison's disease, occur when the body's regulation of adrenal gland hormones is altered.
- The ACTH stimulation test can help your veterinarian diagnose Cushing's disease or Addison's disease.

What Is ACTH?

Glucocorticoids (primarily cortisol) and mineralocorticoids are two important types of hormones produced by the body's adrenal glands. Glucocorticoids and mineralocorticoids help regulate numerous complex processes in the body and participate in critically important functions, including the following:

- Maintaining fluid balance
- Maintaining sodium and potassium balance
- Maintaining the integrity and function of blood vessels
- Regulating blood pressure and blood flow to vital organs, like the kidneys
- Supporting cardiac function
- Controlling blood sugar levels and carbohydrate metabolism
- Helping to counteract the effects of stress
- Helping to maintain immune system function

Under normal conditions, the brain releases a hormone called *adrenocorticotrophic hormone (ACTH)* that stimulates the adrenal glands to release their hormones. The body has highly developed systems called *feedback mechanisms* that control, based on the body's needs, how much of these hormones the adrenal glands produce and release. For example, during times of physical or emotional stress, the body tends to increase the production and release of glucocorticoids (cortisol) to help it deal with the stressful episode. In contrast, when the body is receiving cortisol from an outside source (like a

cortisone pill or injection), it reduces the amount of cortisol that the adrenal glands produce.

Two medical conditions, Cushing's disease and Addison's disease, occur when the body's regulation of these hormones is altered; such alterations can cause significant illness in affected pets. Cushing's disease occurs when the body produces and releases excessive amounts of cortisol. The clinical term for Cushing's disease is *hyperadrenocorticism*. Addison's disease occurs when the brain doesn't release adequate amounts of ACTH, or the adrenal glands fail to release their hormones in response to ACTH. The medical term for Addison's disease is *hypoadrenocorticism*.

Two medical conditions, Cushing's disease and Addison's disease, occur when the body's regulation of adrenal gland hormones is altered.

Cushing's disease occurs when a change in the body causes the adrenal glands to ignore the normal feedback mechanisms that regulate cortisol, leading to excessive production and release of the hormone. Sometimes Cushing's disease is caused by a tumor on one of the adrenal glands, which continues to make cortisol despite signals from the body telling it to stop. Sometimes, the adrenal glands are "tricked" by the pituitary gland in the brain into continuing to produce too much cortisol. Either way, the sustained overproduction and release of cortisol eventually results in negative effects on the body.

In most cases, the cause of Addison's disease is not determined. Sometimes, the body's immune system can damage the adrenal glands' cells so extensively that they can't release hormones when necessary. In other cases, such as a brain tumor, the part of the brain that should release ACTH is unable to. However, Addison's disease can also occur

if a pet that is receiving cortisol medication suddenly stops getting it. In this case, the body has reduced its own cortisol production and can't increase it quickly enough to compensate when the medication is discontinued. This is why steroid medications, such as prednisone, should not be discontinued suddenly, but must instead be gradually reduced and then discontinued.

Cushing's disease and Addison's disease are most commonly diagnosed in dogs, although they occur rarely in cats.

What Is an ACTH Stimulation Test?

If your veterinarian suspects your pet may have Cushing's disease or Addison's disease, an ACTH stimulation test may be recommended. The ACTH stimulation test involves administering a small amount of ACTH by injection and then measuring the levels of cortisol produced over a period of a few hours. In dogs with Cushing's disease, the injection of ACTH causes the adrenal glands to release unusually high amounts of cortisol. In a dog with Addison's disease, the adrenal glands may be unable to respond adequately to ACTH, so the injection of ACTH does not result in a significant increase in cortisol levels. These responses can help your veterinarian diagnose Addison's disease or Cushing's disease in your pet. However, additional tests are recommended in many cases to confirm a diagnosis.

How Is an ACTH Stimulation Test Performed?

Your veterinarian will begin the test by drawing a small amount of blood from your pet to check the baseline ("starting") cortisol level. Afterward, a very small amount of ACTH is given by injection. A repeat blood sample is taken 1 to 2 hours after the injection to measure the cortisol level and determine if the body's response is appropriate. The blood samples are submitted to a diagnostic laboratory, and results are generally available within a few days.

Your veterinarian will likely recommend that your pet remain in the hospital for the few hours that are needed to complete the ACTH stimulation test. This is to avoid stress or excitement (for example,

from a car ride), which can affect your pet's cortisol level and reduce the accuracy of the final test result. Generally, pets undergoing an ACTH stimulation test are temporarily kept in a very quiet area of the hospital to reduce stress and excitement as the test is being performed. Your veterinarian may ask you to withhold food on the day of the test. You should mention any medications or supplements that your pet may be receiving, as some chemicals can affect the accuracy of the test. Be sure to address any questions or concerns with your veterinarian.

What Is an ACTH Stimulation Test Used For?

Cushing's disease and Addison's disease are complicated medical conditions, and confirming a diagnosis can be challenging. Your pet's response on this test can provide valuable information to help your veterinarian reach a diagnosis. In many cases, additional tests (including blood tests, x-rays, abdominal ultrasound examinations, and urine tests) are recommended to confirm a diagnosis.

Once a pet has been diagnosed with Cushing's disease and is undergoing treatment, many veterinarians periodically perform ACTH stimulation tests to assess how well the pet is responding to treatment.

Are There Risks Associated with Performing an ACTH Stimulation Test?

There are very few risks associated with ACTH stimulation testing. The ACTH injection is very safe and side effects are exceptionally rare. Drawing blood takes only a few seconds, and your veterinary team will take precautions to ensure that your pet is not injured during this procedure. Your veterinarian will also take steps to ensure that your pet is safe and comfortable while being hospitalized for the test. Once blood is obtained, all further processing is performed at your veterinarian's office or at a diagnostic laboratory, so there is no risk of harm to your pet.

Diagnosing Cushing's disease and Addison's disease can be complicated, but an early diagnosis can mean early treatment and a better chance at a normal life for your pet.