

TOPIC #1—HYPOTHYROIDISM

What is the thyroid gland / how does it work / what are the main components?

The thyroid gland is involved in the ‘hypothalamic-pituitary-adrenal axis’ which has a hand in pretty much every function of our dogs’ bodies. The thyroid gland is located in the neck below the voice box and is a butterfly-shaped lobe, one on each side. For the thyroid to work, the hypothalamus (located in the brain) will send a chemical called thyroid-releasing hormone to the pituitary gland. The pituitary gland will then produce a chemical called thyroid stimulating hormone (TSH) which it sends to the thyroid gland. The names are very similar because they both do almost the same thing: tell the thyroid gland to make and release more thyroxine (basically controls the rate at which the body burns calories).

Now here’s where it gets technical, so I will try to keep it simple, that way I don’t get confused myself when typing it. There are two forms of thyroxine: one is T3 (3,5,3’ triiodothyronine) and the other is T4. T3 is the ‘active’ form and is found inside various tissue cells and is what breaks down fats and cholesterol and other molecules for usage. T4 is the ‘inactive’ form and circulates in the bloodstream. Produced in the thyroid, most of the T4 is attached to proteins and will float around in the blood and not be absorbed by the body tissues. This forever free fella is called ‘bound T4’. The other small percent of T4 that is not bound to anything will enter the tissues and will be converted to T3. This one is called ‘free T4’. So, when the thyroid gland is being called upon by the body because of a change in metabolic rate (for example, if your dog as just eaten), more T4 is released (both free and bound), increasing the concentration in the blood—this will be related to the ‘how to test’ section below.

Adequate levels of thyroid hormone are necessary for hair to grow. The thyroid also controls the metabolic rates of hair and toenail growth, coat condition, appetite & metabolism, activity level, heart functions, bowel functions, brain functions, and reproductive functions (just to list a few!).

What is the disease?

Since the thyroid is present in the hypothalamic-pituitary-adrenal axis, you could see how a dysfunction in any of these three glands may result in thyroid hormone deficiency. But problems in the other 2 organs are rare, and more than 95% of the documented cases of hypothyroidism in dogs appear to result from the destruction of the thyroid gland. This damage is primarily from one of two sources: the dog’s own immune system attacking the thyroid gland tissue, or the gland is atrophied (size / shape is reduced) and cannot produce enough hormone (this either is genetic or a defect from birth). Most of the time the cause is from the immune system attack. This condition is called autoimmune thyroiditis. It can then be further broken down into two types, lymphocytic thyroiditis (immune system cells entering and attacking thyroid tissue cells) and idiopathic thyroid atrophy (idiopathic is generally used to describe any condition that has no definite origin or reason for happening, or no way to explain). In both cases, the gland fails to produce enough of thyroxine.

Humans vs dogs vs cats

Humans, dogs and cats all are affected by thyroid problems, but in different ways. From what I read, people seem to be affected by both hyper- and hypothyroidism. Cats more often than not (although not impossible to have hypo-) suffer from hyperthyroidism. In this case, the thyroid produces way too much T4 and they will traditionally eat like horses and still lose significant weight. Older cats will mainly be affected. Where dogs are sluggish and depressed and not eating as much, hyperthyroidism will cause cats to be almost opposites—increased energy, hyper, and increased food and water intake. In dogs, hypothyroidism most commonly occurs from 4 to 10 years of age. It usually affects mid- to large-size breeds and is rare in toy and miniature breeds. Many resources have differing opinions on which breeds are affected more. Greyhounds aren’t mentioned all the time, mainly because both they and Scottish Deerhounds have T4 concentrations considerably lower than the reference ranges commonly

used by most diagnostic laboratories. But those of us with greyhounds pretty much know that our breed is unique to begin with! I wanted to address this issue more, so I put it under 'ways to test' below.

Signs associated with hypothyroidism

Since thyroxine regulates the body's metabolic rate, and so many other functions, the signs that can be exhibited are varied and do not always initially indicate hypothyroidism. This makes hypothyroidism much more difficult to diagnose correctly the first time the dog is tested. The most common sign specific to thyroid is coat condition and



color. When hormone levels are low, hair will grow sparsely (and even stop growing) over the lumbar area equally on both sides (hair loss tends to be symmetrical). So, for dark coats, if you stand facing the dog, you can see a defined strip down along the backbone that is nice and shiny hair, and the sides from the neck down through to the thighs will be dull and lack shine. The hairs will seem to get shorter and will be thinning out because the undercoat is affected. The front and rear legs also seem to thin out and discolor. (see photo at left.) Most of the time, even in lighter coats, the overall hue of the hair takes on a reddish / brown color. The tail may become bald like a rat's tail. The hair loss associated with hypothyroidism is not itchy like if the dog had fleas or allergies or a skin infection. (see

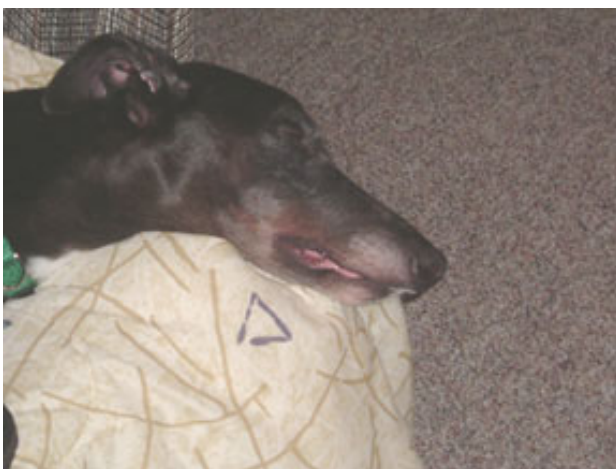
photo at left for red spots.)



Hypothyroid dogs commonly have black pigments in the skin of their groin and in the balding areas. This pigment can result in a condition called acanthosis nigricans, which can cause the skin to become oily and thickened.

Some of the below signs have been linked to thyroid problems:

- Lethargic behavior such as a lack of interest in play, frequent napping, tiring out on long walks
- Weight gain, sometimes without an apparent gain in appetite
- Bacterial infections of the skin and chronic ear infections
- Dry and flaky skin
- Cold intolerance/seeking out warm places to lie down
- Slow heart rate
- Severe behavioral changes such as unprovoked aggression, head tilt, seizures, anxiety and/or compulsivity
- Depression
- Broken toenails and infections
- Constipation
- Anemia
- Muscle weakness



- Excessive rubbing of nose and possible discoloration (reddish) around chin and mouth (see photo at left for red around the mouth)
- Ocular changes—since there are high levels of cholesterol and fats in the bloodstream, the eye can develop a whitish spot on the surface. Most times it does not interfere with vision, but bubbles can also erupt on the surface and will need surgery to remove (severe form)

Greyhounds are pretty prone to periodontal disease, and hypothyroidism can make this stinky condition even worse.

Ways to test

Blood testing for hypothyroidism is often performed as a panel of several tests in order to rule out any other disease or condition that might cause the T4 levels to be lower. Most vets will recommend a geriatric (or full) blood panel along with a CBC. CBC usually checks the level of cells in the blood, for example, like white blood cells, red blood cells, protein, serum, etc, and the panel will check all major organ functions. Dogs on certain drugs (most notably phenobarbital and prednisone) or other corticosteroids and sulfa drugs often have depressed T4 secretion, so this should be addressed before testing is done! Since greyhounds have lower levels of T4 in their bloodstream, some vets disagree as to when a greyhound is actually hyperthyroid, especially if he/she is not exhibiting many signs. A good thyroid test will check the total T4 (bound), free T4, and will check for certain antibodies. T3 levels are not normally used because they fluctuate widely in a 12 hour time span. Since some drugs and other diseases can influence the total T4 level, the free T4 is used more for diagnosis since it is less subject to fluctuate and give a false low value in response to these influences.

Below are two tests that are used along with the free and total T4 tests:

Anti-T3 and -T4 Antibodies: *These antibodies are directed against T3 and T4. As mentioned above about the two types of thyroid disease, this test addresses the autoimmune condition. A positive result for this test AND a low level of T4 are strong support for hypothyroidism. There is one **BIG** point to remember though! The presence of antibodies alone does not always mean hypothyroidism. It takes a long time for the antibodies to cause enough damage to cause hypothyroidism, and some dogs with antibodies will never develop the disease.*

Thyrotropin (TSH) Response Test: The TSH response test has long been recognized as an accurate measure of thyroid function and served as the “gold standard”, but recently has been very difficult to perform because bovine TSH (what is used) is not licensed for use in the dog. Measurement of total T4 is done before and six hours after intravenous administration of TSH. Unfortunately, another testing method has not been developed that is just as accurate to replace the TSH test yet.

If you are currently (or going in for the first time) getting your dog tested for T4 levels, a research paper was just published this month that found that the best time to test the total and free T4 levels was 3-6 hours after medication (or TSH injection). This might be something to bring up to your vet next time you schedule!!

How it's managed

Treatment of hypothyroidism is fairly easy compared to most diseases. Oral supplementation of the replacement hormone (normally the T4 version called levothyroxine) for the rest of the dog's life is all that is needed. Some dogs cannot maintain with just the T4 supplementation and will also need the T3 hormone. Initially, the thyroid hormone is usually given twice daily since the peak is generally between 4-6 hours after medication. Once the hair coat begins to improve and follow up tests are performed, some dogs can be maintained on once daily medication. If the dose is too high and given for too long a time, excessive water consumption, diarrhea, weight loss, and restlessness can result.

The most important indicator of the success of the pills is clinical improvement. The metabolic signs such as lethargy and mental dullness can be expected to disappear (at least improve) within two weeks of starting therapy, while other abnormalities, such as the hair loss and dry skin, may take up to three months to resolve.

I hope this was detailed enough but not too hard to follow and will help in diagnosing your canine friend. And don't forget, your vet is a wealth of information and most times an untapped source! Know what's normal for your dog every day, that way when these small changes happen, you will be more aware of them. The links below were used to aid my notes.

<http://www.veterinarypartner.com/Content.plx?P=A&A=461&S=1&SourceID=42>

<http://www.2ndchance.info/doghypothyroid.htm>

<http://www.vet.uga.edu/vpp/clerk/bell/>

<http://www.vetinfo4dogs.com/dthyroid.html>

<http://www.vetmed.wsu.edu/ClientED/hypothroidism.asp>