

HYPERTHYROIDISM

(Adapted from Veterinary Information Network www.vin.com)

Hyperthyroidism involves over-secretion of thyroid hormones and is the most common hormone imbalance in cats.

What is Thyroid Hormone?



Thyroid Gland Anatomy in Cats

Active thyroid hormone (nicknamed T3, short for triiodothyronine) sets the body's metabolic rate, sort of like a volume dial. One might say T3 determines how hard or how fast each cell works to do its job. Every cell of the body is affected by T3.

The thyroid glands (there's one gland on each side of the windpipe) do not produce T3. Instead, they produce an inactive form called T4. Tissues of the body absorb T4 and convert it to T3. Your vet will readily make references to T3 and T4. It is a good idea to know what they are referring to. While T3 is the active hormone, it turns out that more meaningful information is gained by measuring T4. Your veterinarian will probably mention monitoring your cat's T4 level.

Signs, Symptoms and Diagnosis of Hyperthyroidism

There are many clinical signs associated with feline hyperthyroidism. The hallmark sign is **weight loss despite excellent appetite**.

In the normal cat, the lobes of the thyroid gland cannot be felt with one's fingers. In the hyperthyroid cat at least one lobe is usually prominent and may be detected by your veterinarian during a physical exam.

Hyperthyroidism is generally a disease of older cats. The average age at diagnosis is about 13.

A blood panel is often ordered in the diagnostic work-up of any significant clinical signs. The blood panel surveys hepatic, renal, hematologic, and other body systems. Although there are multiple changes which fit hyperthyroidism, mild increases in liver enzymes are most commonly observed indicating mild (usually clinically insignificant) damage to the liver. The elevated T4 level forms the basis for diagnosis; there can be no other diagnosis in such a case.

If T4 is markedly elevated, the diagnosis is clear. Some cats have borderline results and require further testing.

In older cats, the normal range for T4 is much lower than it is for young adult cats and thus sometimes it is not obvious whether a cat is truly hyperthyroid. Further, T4 levels are readily reduced by other disease states and there is some normal (but unpredictable) fluctuation in T4 throughout the day.

The easiest tests for your veterinarian to perform are called the T3 SUPPRESSION TEST and the FREE T4. To do these some specific scheduling is necessary and the cat must be able to take pills.

Of course a nuclear medicine scan will also identify a hyperthyroid cat readily. The equipment necessary is only available in a limited group of radiotherapy facilities.

What Causes Hyperthyroidism?

Hyperthyroidism is caused by a benign growth in the thyroid gland that is over-producing T4. It is important to realize that these tumors are almost always benign and represent a form of goiter rather than a form of cancer. Less than 3% to 5% of hyperthyroid cats have a cancerous thyroid growth.

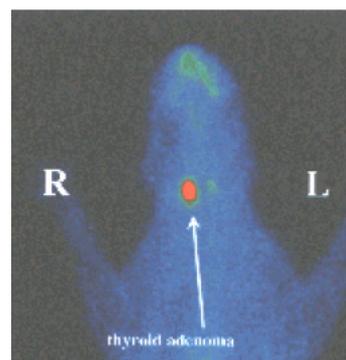
Purebred cats, especially the Siamese and Himalayan breeds, appear to have a decreased incidence of hyperthyroidism (meaning they are less likely to develop this condition). This implies that there are genetic factors at work as well.

Why treat?

Hyperthyroid cats frequently experience reduced quality of life through weight loss, muscle deterioration, chronic vomiting or chronic diarrhoea. Not all cats experience these signs at the time of diagnosis but there are less visible reasons to treat: heart disease and high blood pressure. These problems can result in heart failure, sudden blindness, or sudden death and all can be prevented with timely treatment for thyroid disease.

There are three methods of treatment for Hyperthyroidism outlined below:

Radiotherapy



This method of therapy is generally considered the safest and most effective method of treatment for feline hyperthyroidism. First, the procedure involves a nuclear medicine scan in which the cat receives an injection of the radioactive compound pertechnetate. The resulting scan shows the location and size of the cat's thyroid glands and confirms the disease.

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The scan also indicates whether one or both glands are involved and provides information needed to calculate the therapeutic dose of iodine 131 that will be used in treatment. An additional benefit of the scan is that it can identify the 3 to 5% of cats who have a malignant tumor and detects areas of tumor spread.

After the pertechnetate scan is complete, malignancy has been ruled out, and hyperthyroidism has been confirmed, a radioactive isotope of iodine called iodine 131 can be used to destroy the abnormal thyroid tissue. Normally, iodine is joined to the amino acid tyrosine in the thyroid gland to create T4. Iodine 131 is carried directly to the thyroid gland as though it were regular iodine. Iodine 131, being radioactive, emits high speed electrons that kill the surrounding abnormal thyroid tissue. Because these electrons penetrate only fractions of an inch, only the thyroid gland experiences the radiation and the rest of the body is spared.

This treatment need not be repeated and no additional therapy is required; however, while humans receiving similar treatment are promptly allowed to go home post-treatment, the process is different with cats. The Nuclear Regulatory Commission requires cats to remain hospitalized in a special isolation ward until the iodine 131 is at sufficiently low levels. This timeframe amounts to about three or four days of hospitalization depending on how quickly radiation levels drop. After the cat comes home, some restrictions must be imposed for another week and a half or so: the cat must use special flushable litter, the cat is not allowed outside, the cat's daily direct contact time with the owner is limited, children and pregnant women may not have contact with the cat during this time, etc.

Blood work is monitored following treatment to ensure return to normal thyroid status. Occasionally, a single course of radiotherapy is inadequate and a second course is needed.

Advantages:

- Treatment is a one-time event (only 2 to 4% of cats require a second treatment) and no on-going therapy is required.
- The disease is not simply managed but is actually cured!
- No anesthesia is required, indeed, treatment amounts to an injection followed by 3 to 7 days of boarding, very non-stressful for older cats with potential heart disease.
- If a cat is one of the unlucky 3 to 5% for which the thyroid tumor is malignant, the initial pertechnetate scan will indicate this right away.

Disadvantages:

- Owner and pet are separated during the quarantine.
- Some facilities require the cat to be confined indoors or have limited contact with owners for a period of time after discharge from the facility. Children and pregnant women can have no contact with the cat for a week or two after therapy. If this is too inconvenient to work out at home, the cat may be boarded until this period has passed.
- Facilities with capability of performing radiotherapy may not be conveniently located.

- This is a relatively expensive therapy e.g. upwards of \$1700
- Special flushable cat litter is required for 1 to 2 weeks after therapy.
- Some follow-up blood testing is generally recommended after treatment (typically 1 and 3 months after therapy).
- There is a chance (less than 5%) that the cat will become HYPOTHYROID after treatment, requiring daily oral thyroid hormone supplementation.
- Radiotherapy may not be a good idea for a cat with poor kidney function.

If kidney function is not thoroughly investigated prior to this therapy, latent kidney failure may be unmasked irreversibly by this therapy. This can be avoided simply by screening potential candidates for kidney failure prior to recommending radiotherapy. Those who have possible kidney insufficiency should be treated with medication to bring the thyroid levels under control. If kidney function begins to show deterioration on this therapy, medication is discontinued the need for treating thyroid disease must be reevaluated. If kidney function remains stable on treatment with anti-thyroid medications, then a more permanent therapy (such as radiotherapy) can proceed.

Surgical Treatment

The goal here is to remove the abnormal thyroid tissue, leaving the normal adjacent tissue alone. Considering that the average hyperthyroid cat is a geriatric patient with potential for high blood pressure and heart disease, quite a bit of patient preparation is necessary to reduce anesthetic risk. First, the patient's excess thyroid level is brought into the normal range with 2 to 4 weeks of oral medication. During the last 1 to 3 weeks of this period, heart medication (propranolol or other beta-blocker) is often used to compensate for the heart disease associated with hyperthyroidism, especially in cats with resting heart rates greater than 220 beats per minute. After thyroid levels have normalized, it is important to watch for an exacerbation of renal disease as it could be unmasked by the treatment of hyperthyroidism. Concurrent kidney problems complicates anesthesia and may even mean surgery is not an option.

Ideally a nuclear medicine scan is done prior to surgery to determine with certainty which thyroid lobe should be removed or if both should be. If this is not feasible, the surgeon will have to make a decision based on the visual appearance of the glands during surgery.

In 30% of cases, one gland is obviously abnormal and one gland is obviously normal (or even atrophied). The decision about what to remove is easy and the risk of calcium crisis (see below) is not significant.

In 70% of cases, both glands are abnormal and must be removed. In 15% of these cats, though, the enlargement is not symmetrical and, unless a nuclear medicine scan is done prior to surgery, the surgeon may be fooled into leaving an abnormal gland behind. Alternatively, if both glands are removed, there is potential to damage the tiny but very important parathyroid glands that sit atop the thyroid glands.

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Advantages:

- Treatment is generally permanent after recovery. Unless complications arise, no further treatment is needed.
- No special facilities are required for this treatment, unlike radiotherapy, so it is likely that someone who performs this surgery is located conveniently to any owner of a hyperthyroid cat.

Disadvantages:

- Performing surgery and general anaesthesia on a geriatric patient with potential heart disease has inherent risk.
- If abnormal thyroid tissue is left behind, hyperthyroidism is likely to recur within 6 to 24 months (note: even if normal thyroid tissue is left behind, it is possible for the normal tissue to develop abnormal changes and for the condition to begin afresh). Continued monitoring of T4, typically twice a year, is frequently recommended.
- The monitoring before and after surgery, plus the surgery itself, is relatively expensive.
- The laryngeal nerve is located near the thyroid gland. If it is damaged during surgery, the cat can experience a voice change. This change may be permanent.
- The sympathetic trunk (another neurologic tissue) is located near the thyroid gland. If it is damaged during surgery, the eye on that side may develop what is called Horner's syndrome. This eye will squint and draw back into the socket, the pupil will constrict and the third eyelid will come up. This syndrome may be permanent.
- Because this treatment represents a permanent cure, it is important that the patient's kidney function be thoroughly evaluated prior to therapy. The effect of restoring normal thyroid function on the patient's kidneys must be evaluated before beginning permanent resolution of the thyroid disease.
- It takes 1 to 3 months for thyroid blood levels to stabilize following surgery. Some cats become **hypo** thyroid after surgery and must take thyroid supplementation tablets either temporarily or permanently.
- Parathyroid gland damage causing calcium depletion. This can be discussed further with the surgeons.

Medication

The most common medication prescribed to treat feline hyperthyroidism is called methimazole. This medication has virtually replaced the older medication because methimazole is effective without as much tendency for side effects. In Australia, carbimazole is sometimes used (trade name Neomercazole). Because carbimazole is converted to methimazole in the body, the information here for methimazole also holds for carbimazole.

All these medications block the production of T4 and T3. Thyroid hormones that are already in the body when medication is started are still in play, so a good 2 to 4 weeks are needed before thyroid blood tests will show the effect of treatment.

It is important to understand what the potential side effects of methimazole and its relatives are, and the monitoring that is generally recommended. The thyroid nodule, which can be detected in a cat's throat, will not reduce in size with treatment and may in fact get larger.

Advantages:

- Medication is inexpensive relative to radiotherapy or surgery.
- Control of thyroid disease is achieved only while the pet is on medication so that if there is any problem with exacerbated poor kidney function, treatment can be discontinued.
- No hospitalization is required.
- Side effects are relatively uncommon.
- If an occasional dose is skipped, no harm is done.
- If no side effects are encountered after the first 3 months of therapy, the chance of side effects occurring thereafter is substantially reduced.

Disadvantages:

- Medication must be given at least daily (usually twice daily). Some cats simply will not take oral tablets at this frequency. Methimazole is readily made into a flavored liquid or transdermal paste for easier administration by a compounding pharmacy.
- Approximately 15% of cats will experience some kind of side effect. The usual side effects are: lethargy, loss of appetite, and vomiting. If one of these side effects occurs, medication is discontinued until the symptoms resolve. Medication is then restarted at a lower dose and gradually increased to the former dose. These side effects do not generally recur if medication is increased gradually in this way.
- Facial itching is a more serious side effect. This side effect also resolves with anti-itch medication and discontinuing methimazole. Cats who have this side effect can be expected to have it again if medication is restarted, so another form of treatment should be used. Facial itching occurs in less than 4% of cats on methimazole.
- Serious liver failure results in an extremely small number (less than 2%) of cats taking methimazole. This toxicity can be expected to resolve after discontinuation of the medication but, again, alternative therapy should be considered.
- Bone marrow changes can also result from methimazole administration. Blood tests evaluating white blood cell patterns should be periodically performed to monitor for these changes. This side effect occurs in less than 4% of cats on methimazole and necessitates a change in therapy.
- Pre-existing kidney insufficiency can be masked in hyperthyroidism because the heart disease and high blood pressure that go with hyperthyroidism increase blood flow through the kidneys, making the kidneys more efficient; this is virtually the only positive aspect of having hyperthyroidism). Once treatment is instituted for hyperthyroidism, the kidney disease is unmasked or made worse when kidney blood flow returns to normal. Sometimes it is necessary to choose between treating the kidneys and treating the thyroid, thus monitoring kidney function and thyroid levels is particularly important during methimazole therapy. Kidney problems can be minimized by starting with a lower dose of methimazole and working up over weeks or months so as not to cause as abrupt a change in kidney blood flow. If kidney problems become significantly worse on methimazole, medication can be discontinued. Approximately 15-22% of cats treated for hyperthyroidism will show kidney disease that was not evident prior to treatment.



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Most side effects occur during the first 3 months of Methimazole Therapy.

Periodic blood testing to examine T4 level, white blood cell patterns, kidney function, and liver enzymes should be periodically performed. Be sure to ask your veterinarian to review an appropriate schedule for your cat. Side effect potential can be reduced by beginning at a smaller dose and working up to the full therapeutic dose over the first couple of months of therapy.

Transdermal Methimazole

Many cats remain untreated for this ultimately debilitating disease because their owners cannot administer the medication. For many cats, even converting the medication into liquid does not yield a comfortable alternative. Yet another choice has become available to make methimazole a viable choice for fractious cats: a gel of methimazole administered to the hairless skin of the inner ear flap. The jury is still out on the effectiveness of transdermal methimazole though it looks like there is less potential for stomach upset with this route.

Diet

Hills have recently developed a hyperthyroidism diet that aims to reduce iodine in their diet which they need to produce thyroid hormones. Less iodine means their thyroid hormones drop and their thyroid acts normal again. The food also has appropriate sodium and phosphate levels for older cats that potentially have concurrent kidney issues. Feeding this food exclusively means no other treatment is required.