

# Feline hyperthyroidism: diagnosis and treatment

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## ABSTRACT

Hyperthyroidism is a common illness, especially in older cats. Typical clinical signs include weight loss in spite of a good or increased appetite. The majority of affected cats have a palpable goitre on physical examination. Most cases are straightforward to diagnose through measuring serum total thyroxine levels, but, occasionally, additional testing is required to confirm the diagnosis.

Four management options exist, including antithyroid medication, exclusive feeding of an iodine-restricted food, surgical thyroidectomy and radioiodine. All treatments have advantages and disadvantages and the treatment choice should be based on the individual cat and owner situation.

In the long term, check-ups are especially important in those cats receiving ongoing management for their thyroid disease.

The prognosis for cats with hyperthyroidism is often very good with appropriate management. Where possible, curative treatments are recommended.



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**Hyperthyroidism – the clinical syndrome resulting from excessive circulating levels of thyroid hormones – is a common disorder, primarily affecting older cats.**



**Figure 1.** Weight loss is the most common clinical sign in affected cats. This cat also has a poor coat, which can be associated with hyperthyroidism.

The median age at diagnosis is around 12 to 13 years. In most cases, the condition is caused by benign hyperplasia of thyroid tissue and is typically bilateral (involving both thyroid glands).

The clinical signs of hyperthyroidism vary in severity and are generally most severe in cats suffering with the illness for longer and those with concurrent illnesses. Chronic kidney disease (CKD) is one of the most common concurrent illnesses and results in a worsening of many of the clinical signs.

**Table 1** lists the common clinical signs and physical examination findings in cats suffering from hyperthyroidism. Hyperthyroid cats can be difficult to examine through being more anxious as a result of their hyperthyroidism.

The overwhelming majority of hyperthyroid cats have a palpable goitre and are suffering from weight loss (**Figure 1**). The goitre is usually palpated in the neck, just below the larynx, on one or both sides of the trachea (**Figure 2**). The size of the goitre can vary enormously. In most cases, the goitre is not visible by eye and is the size of a garden pea.

In rare cases, the goitre can be as large as a golf ball. In a small number of hyperthyroid cats, the enlarged thyroid cannot be felt. This may be for several reasons (**Table 2**). In the very small number of cats with thyroid adenocarcinomas, the thyroid may feel adherent to underlying tissues and/or the skin.

## Diagnosis

Clinical sign	Approximate frequency - percentage of cats (Basal and Peterson, 2012)
Weight loss	88
Polyphagia	49
Vomiting	44
Polyuria/polydipsia	36
Increased activity	31
Decreased appetite	16
Diarrhoea	15
Decreased activity	12
Weakness	12
Dyspnoea	10
Panting	9
Large faecal volume	8
Anorexia	7
<b>Physical examination findings</b>	
Large thyroid gland	83
Thin	65
Heart murmur	54
Tachycardia	42
Gallop rhythm	15
Hypertension	15
Aggressiveness	10
Unkempt hair coat	9
Increased nail growth	6
Alopecia	3
Congestive heart failure	2
Ventral neck flexion	1

**Table 1.** Clinical findings in hyperthyroid cats, listed in approximate order of decreasing frequency.

Hyperthyroidism may be suspected on the basis of historical and clinical findings, as already outlined. The most common changes found on routine blood profiles include elevated levels of liver enzymes (alanine aminotransferase; ALT, and alkaline phosphatase; ALP), leukocytosis, eosinopenia and erythrocytosis.

The diagnosis of hyperthyroidism is usually straightforward to confirm through measuring serum total thyroxine levels ( $T_4$ ). In cats with mild/early disease, levels may be more equivocal due to fluctuating levels of thyroid hormones. Presence of concurrent illnesses can also make diagnosis more difficult since total  $T_4$  levels can be suppressed by other illnesses – what is referred to as the sick euthyroid syndrome.

If the total  $T_4$  result is in the lower half of the reference range, hyperthyroidism is unlikely. However, if the total  $T_4$  result is in the upper half of the reference range, hyperthyroidism remains a potential differential diagnosis. In these patients, a simple and often effective method of confirming the hyperthyroidism is to repeat the total  $T_4$  measurement after a few weeks.

Free  $T_4$  measured by equilibrium dialysis can be another useful diagnostic tool. This test is highly sensitive in diagnosing hyperthyroidism (Peterson et al, 2001), although a small number of false-positive results can occur, meaning the free  $T_4$  test should not be used as a screening test for diagnosis of hyperthyroidism.

An elevated free  $T_4$  (>40pmol/l), in addition to total  $T_4$  in the upper half of the reference range (>30nmol/l), is consistent with a diagnosis of hyperthyroidism, especially if the cat is known to be suffering from concurrent disease (Wakeling et al, 2008).

## Treatment options

Untreated hyperthyroidism is associated with progressively worsening clinical signs. Delaying treatment increases the risk of complications, such as cardiovascular disease.

Treatment often produces a rapid improvement in quality of life with many patients having an excellent quality of life for years following diagnosis. There are four options for management of hyperthyroidism:

- Reversible options (lifelong treatment needed):
  - antithyroid medication
  - exclusive feeding of an iodine-restricted food
- Potentially curative options:
  - surgical thyroidectomy
  - radioiodine



**Figure 2.** Most cats suffering from hyperthyroidism have a palpable goitre (enlarged thyroid gland/s). It can help to turn the head to each side when palpating small nodules.

**Table 3** summarises the advantages and disadvantages of treatment options.

Curative options are favoured by the author, where possible, especially when hyperthyroidism is diagnosed in a relatively young and, otherwise, healthy cat.

Patients should be screened for presence of systemic hypertension, which is estimated to be present in around 15% of cats suffering from hyperthyroidism.

## **Antithyroid medications**

Veterinary licensed antithyroid medications include tablet forms of thiamazole and carbimazole, and, more recently, an oral liquid methimazole.

Thioureylenes block production of the thyroid hormones and, therefore, symptomatically manage the hyperthyroidism. Lifelong treatment is required unless a curative treatment, such as surgery or radioiodine, is subsequently pursued. In the long term, difficulties with owner and patient compliance may reduce the overall success of this treatment modality.

Nevertheless, medical treatment is popular – not least since it is a reversible treatment of particular benefit when stabilising patients with concurrent CKD. The dose of medication can be “fine tuned” to suit the individual patient and withdrawn completely, if necessary. Ideally, a dose resulting in reduction of total  $T_4$  levels to the lower half of the reference range is aimed for and total  $T_4$  levels should be checked two to three weeks after treatment starts or the dose changes (Daminet et al,

2014).

Reason	Possible solution
The cat may be tense and difficult to examine.	It is easiest to feel a thyroid nodule when the cat is relaxed. Sedation or anaesthesia may be required to palpate the goitre in some cats.
The thyroid is so enlarged and heavy that it has descended, with gravity, into the chest cavity.	Sometimes, "tipping" the cat gently (holding the back legs up while the cat stands with their forelimb paws on the examination table) can allow the goitre to be felt at the bottom of the neck.
The goitre is not very large and difficult to feel.	Try turning the cat's head to either side when palpating the neck.
The diseased thyroid tissue is ectopic.	Most commonly, ectopic thyroid tissue is located in the chest cavity and hence cannot be palpated. Published reports suggest up to 20 per cent of hyperthyroid cats may have this condition (Harvey et al, 2009). Many cats with ectopic hyperthyroid tissue also have a palpable goitre.

**Table 2.** Reasons for not being able to palpate a goitre in a hyperthyroid cat.

Transdermal thiamazole gel is not a veterinary licensed preparation (however, it can be used under cascade regulations, where appropriate). Dosing is as for oral preparations with the same range of potential adverse effects. Cats receiving this therapy may be at a lower risk of gastrointestinal side effects compared to those treated with oral preparations.

The gel is usually applied to the inside of the pinna (a hairless area); carers should wear gloves and avoid direct contact with the gel. The medication is absorbed through the skin and into the blood stream. Transdermal antithyroid medications can take longer to be effective than oral forms.

Side effects have been reported with oral and transdermal administration of thioureylenes. Around 10% to 20% of patients may suffer from temporary and manageable side effects, including lethargy, inappetence, diarrhoea, nausea and vomiting.

In most cats with these side effects, the clinical signs are mild and only last a few days. In others, they are more severe and may necessitate stopping treatment or a treatment "holiday". Starting treatment at a low dose before gradually increasing it, as needed, helps minimise their occurrence and severity.

Severe side effects may be seen in up to 5% of treated cats and necessitate withdrawal of therapy before an alternative treatment is started.

Side effects that most commonly develop in the first few months of therapy include:

- Persistent and more severe gastrointestinal signs, such as nausea, vomiting and anorexia.
- Pruritic dermatitis often affecting the head and neck area.
- Serious haematological problems including thrombocytopenia, leukopenia and immune-mediated haemolytic anaemia.
- Hepatopathy.
- Myasthenia gravis.

## Feeding an iodine-restricted food



**Figure 3.** Surgical thyroidectomy is often a straightforward procedure and offers the possibility of a cure from hyperthyroidism.

Production of thyroid hormone requires iodine molecules; therefore, limiting the amount of iodine fed reduces the amount of thyroid hormone produced and released by the thyroid gland.

As with medical management, lifelong treatment (with 100% compliance) is required unless a curative treatment is subsequently pursued. Patient and owner compliance is essential to the success of this approach – even small deviations from the prescribed feeding can allow “escape” of thyroid control.

Unlike medical treatment there are no “drug-related” side effects to worry about, but compliance to the food may be an issue, especially if using this treatment long term. The food is phosphate restricted and moderate in protein, making it an acceptable nutrition for cats with mild to moderate CKD, but not recommended for cats in IRIS stages three and four CKD.

## Surgical thyroidectomy

This potentially curative treatment has disadvantages of requiring general anaesthesia (which may be contraindicated in some patients) and is only suitable for those cases with easily accessible hyperfunctional thyroid tissue.

Up to 20% of patients may have ectopic hyperfunctional thyroid tissue and this is commonly located in the anterior thorax, not an area suited to straightforward thyroidectomy (Harvey et al, 2009; **Figure 3**).

Pre-surgical stabilisation with antithyroid medication or an iodine-restricted food is recommended. In routine cases, side effects of thyroidectomy, such as damage to the parathyroid glands resulting

in hypocalcaemia, are possible.

## Radioiodine

This treatment is usually administered by subcutaneous injection. The radioactive iodine targets the abnormal thyroid tissue resulting typically in a 95% success rate. Published studies have so far shown the best long-term prognosis for treatment of hyperthyroidism is achieved with radioiodine.

## Renal function decline with treatment of hyperthyroidism

Advantages	Disadvantages	Medical management (antithyroid drugs)	Neonatal management (radioiodine)	Surgical (thyroidectomy)	Radioiodine
<ul style="list-style-type: none"> <li>Readily available</li> <li>Usually less expensive than surgical treatment options</li> <li>Early clinical onset of action – most patients euthyroid within few weeks</li> <li>Most cats suffer no side effects of treatment, even with long-term therapy</li> <li>Can be treated “out-patient” especially helpful in cats with concurrent chronic kidney disease</li> <li>Reversible especially an advantage in cats with concurrent kidney disease where any treatment for hyperthyroidism can cause a worsening in their kidney function</li> <li>Very helpful in stabilising a patient’s preparation for surgical treatment of underlying underlying disease</li> <li>Not contraindicated in cats with concurrent renal disease</li> <li>Reversible especially an advantage in cats with concurrent kidney disease where any treatment for hyperthyroidism can cause a worsening in their kidney function</li> <li>Very helpful in stabilising a patient’s preparation for surgical treatment of underlying underlying disease</li> <li>Not contraindicated in cats with concurrent renal disease</li> </ul>	<ul style="list-style-type: none"> <li>Side effects occur because in some patients continue require antithyroid medication</li> <li>Regular monitoring, including bloodwork, is recommended every 6-8 weeks to ensure the treatment is safe and effective</li> <li>The medication does not cure the condition, so long-term treatment is required to ensure the control of hyperthyroidism – long term, the required dose of medication may change</li> <li>Some patients may experience side effects with long-term treatment (e.g. weight loss, vomiting, diarrhoea)</li> <li>Management of hyperthyroidism can be difficult in cats with concurrent chronic kidney disease</li> <li>Some cats may experience side effects with long-term treatment (e.g. weight loss, vomiting, diarrhoea)</li> <li>Management of hyperthyroidism can be difficult in cats with concurrent chronic kidney disease</li> <li>Some cats may experience side effects with long-term treatment (e.g. weight loss, vomiting, diarrhoea)</li> <li>Management of hyperthyroidism can be difficult in cats with concurrent chronic kidney disease</li> <li>Some cats may experience side effects with long-term treatment (e.g. weight loss, vomiting, diarrhoea)</li> </ul>	<ul style="list-style-type: none"> <li>Readily available</li> <li>Usually less expensive than surgical treatment options</li> <li>No side effects reported other than sedation/anaesthesia that can occur with any treatment for hyperthyroidism</li> <li>No need for antithyroid medication unless cat that accept the food</li> <li>Reversible especially an advantage in cats with concurrent kidney disease where any treatment for hyperthyroidism can cause a worsening in their kidney function</li> <li>Very helpful in stabilising a patient’s preparation for surgical treatment of underlying underlying disease</li> <li>Not contraindicated in cats with concurrent renal disease</li> <li>Easier to administer than surgery</li> </ul>	<ul style="list-style-type: none"> <li>Readily available</li> <li>Usually less expensive than surgical treatment options</li> <li>No side effects reported other than sedation/anaesthesia that can occur with any treatment for hyperthyroidism</li> <li>No need for antithyroid medication unless cat that accept the food</li> <li>Reversible especially an advantage in cats with concurrent kidney disease where any treatment for hyperthyroidism can cause a worsening in their kidney function</li> <li>Very helpful in stabilising a patient’s preparation for surgical treatment of underlying underlying disease</li> <li>Not contraindicated in cats with concurrent renal disease</li> <li>Easier to administer than surgery</li> </ul>	<ul style="list-style-type: none"> <li>Available in most practices</li> <li>Effectively curative with no further medication for antithyroid medication</li> <li>Single treatment (single injection)</li> <li>Short hospitalisation (usually 1-2 days)</li> </ul>	<ul style="list-style-type: none"> <li>High cure rate (95% cure rate) on further treatment for antithyroid medication</li> <li>No antithyroid medication required</li> <li>All abnormal thyroid tissue is targeted (regardless of its location in the body, the example of a thyroid adenoma)</li> <li>Safe to adjust diet, but not antithyroid medication</li> <li>Recovery of disease is very slow</li> <li>Not effective in cats with concurrent chronic kidney disease</li> </ul>

**Table 3.** Advantages and disadvantages of each of the management options.

All treatments for hyperthyroidism have the potential to worsen kidney function. This is because the hyperthyroid condition increases renal blood flow and glomerular filtration rate.

When the hyperthyroidism is treated, the increased blood flow to the kidneys decreases. For many hyperthyroid cats, this return to normality is not associated with kidney problems. However, in a proportion of patients, this reduction in blood flow has the potential to “unmask” kidney disease previously unknown and worsen pre-existing kidney disease.

Unfortunately, there is no way to predict which cats will suffer renal problems following treatment of their thyroid disease. For this reason, medical treatment of hyperthyroidism is often recommended initially since this is a reversible treatment that can be reduced or stopped if problems are seen.

Hyperthyroidism is damaging to the kidneys, so optimal management of the hyperthyroidism is desirable, where possible. Typically, it is only cats with very serious CKD (such as IRIS stage four, creatinine >440mol/L) where optimal management of hyperthyroidism proves difficult/impossible without inducing a clinical and laboratory deterioration in renal function.

## Long-term monitoring

Regular check-ups are important, especially in cats managed with reversible options. The aim of



check-ups is to ensure therapy is optimal without any significant side effects. Suitable protocols for check-ups are covered elsewhere (Daminet et al, 2014).

Iatrogenic hypothyroidism (IH) is an important adverse effect to monitor for in all cats receiving treatment for their hyperthyroidism, since it is associated with a worse prognosis. Diagnosis, prevention and management of IH is discussed in more detail in another article by the author (Caney, 2014).

In general the prognosis for management of hyperthyroidism is very good, depending on the severity of the disease and presence of other concurrent illnesses, such as CKD.

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