

Diagnosing Feline Hyperthyroidism

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YOU HAVE ASKED ...

What tests should I use, and in what order, to diagnose a cat with suspected hyperthyroidism?

THE EXPERTS SAY ...

Hyperthyroidism is the most common endocrine disease affecting cats, particularly cats >8 years of age. Hyperthyroidism should be suspected in cats of this age presented for weight loss with normal-to-increased appetite, polyuria/polydipsia, hyperactivity, poor hair coat (**Figure 1**, next page), or GI signs (eg, vomiting, diarrhea).¹⁻³ Up to 26% of hyperthyroid cats have an apathetic presentation that includes anorexia and lethargy.^{4,5}

On examination, up to 90% of hyperthy-

roid cats have a palpable thyroid goiter (**Figure 2**, next page).² These cats should be closely monitored for development of hyperthyroidism.^{1,3,6-10} A minimum database (ie, CBC, serum chemistry profile, urinalysis, blood pressure, total thyroxine [tT₄]) is recommended. The most common laboratory abnormalities in cats with hyperthyroidism include mildly-to-moderately increased alkaline phosphatase and/or alanine transferase activity, mild polycythemia, and proteinuria (**Figure 3**, page 63).^{2,11}

Initial Hormone Testing

If hyperthyroidism is suspected, a serum tT₄ assay is recommended as the first-line diagnostic test.⁸ Increased tT₄ is diagnostic for hyperthyroidism in cats with consistent clinical signs.^{2,3,6-10,12-16} Various assays can be used to measure tT₄, but radioimmunoassay is considered the best. In one study of 50 cats, the

tT₄ = total thyroxine

point-of-care enzyme-linked immunosorbent assay (ELISA) consistently overestimated tT_4 as compared with radioimmunoassay.¹³ Thus, ELISA results should be interpreted with caution and confirmed via another method.^{8,12-14}

For most hyperthyroid cats, tT_4 measurement is sufficient for diagnosis. Difficulty can arise when a cat has clinical signs consistent with hyperthyroidism but tT_4

is in the upper one-third of the reference range. About 10% of hyperthyroid cats have tT_4 within the normal reference interval at the time of testing. This can occur in cats with early or mild disease or with a nonthyroidal illness that causes a decrease in serum tT_4 .^{1,2,7-10,13-19} Additionally, certain drugs (eg, thioureylenes, iodinated contrast agents, glucocorticoids¹⁹) can cause tT_4 to be falsely lowered into the normal range.

Limited information exists about what other drugs affect thyroid function in cats. Most medications affecting the thyroid axis in dogs are assumed to have similar effects in cats.^{11,20} If hyperthyroidism is suspected despite normal tT_4 , tT_4 can be reassessed 2 weeks later. If possible, nonthyroidal illnesses should be treated during this time. In many hyperthyroid cats, the second test will detect increased tT_4 .⁸⁻¹⁰

Other diagnostic options include measurement of free thyroxine (fT_4) or thyroid-stimulating hormone (TSH), a triiodothyronine (T_3 ; liothyronine) suppression test, or thyroid scintigraphy.^{2,13,16,19} Other possible tests include thyrotropin-releasing hormone or a TSH-stimulation test; however, no feline-specific thyrotropin-releasing hormone or TSH assay is available.^{8,10,15,16,18}

Additional Hormone Testing

Because fT_4 is more sensitive and less specific than tT_4 for diagnosing feline hyperthyroidism,^{8,17} more results may be false-positive when screening for fT_4 alone.^{15,17} Therefore, fT_4 measurement should be performed only in cats with clinical signs of hyperthyroidism and an inconclusive tT_4 measurement.^{8,15-17} fT_4 should not be used alone as a screening test. The combination of increased fT_4



▲ **FIGURE 1** Unkempt hair coat of a hyperthyroid cat. Photo courtesy of Jacqueline Whittemore, DVM, PhD, DACVIM, University of Tennessee



▲ **FIGURE 2** Palpation of a thyroid slip. Photo courtesy of Greg Hirshoren, University of Tennessee

and tT_4 in the upper one-third of the reference range with compatible clinical signs suggests hyperthyroidism. However, a recent study found that 20% of cats with increased fT_4 were euthyroid as determined by thyroid scintigraphy.¹⁵

Concurrent measurement of fT_4 and TSH is helpful, especially in cats with equivocal tT_4 ; to date, however, only a canine TSH assay has been evaluated in cats, and most hyperthyroid cats have TSH levels below the assay detection threshold.¹⁵ Findings of suppressed TSH in combination with increased fT_4 and tT_4 in the upper one-third of the reference range are consistent with early hyperthyroidism. Of note, up to 2% of hyperthyroid cats may have normal TSH from incomplete suppression, and $\approx 30\%$ of elderly euthyroid cats have undetectable TSH.^{8,15,21} Consequently, the canine TSH assay cannot distinguish low-normal TSH in euthyroid cats from truly low TSH in hyperthyroid cats. Like fT_4 , TSH test results should be interpreted in combination with other test results, and the TSH tests should not be the sole screening test used.

The T_3 suppression test can be expensive and may have limited availability in some countries.^{2,7-9,15,16} To conduct this test, T_3 is given orally q8h for 3 days, then both T_3 and tT_4 are measured. In a euthyroid cat, tT_4 will decrease as a consequence of negative feedback from T_3 administration, whereas a hyperthyroid cat's tT_4 will not.^{9,15,16} This test is generally reliable if T_3 is administered properly, but practical difficulties can arise when owners attempt to give multiple oral doses over several days. Poor compliance with T_3 dosing can lead to euthyroid cats with tT_4 results similar to those of hyperthyroid cats and an incorrect

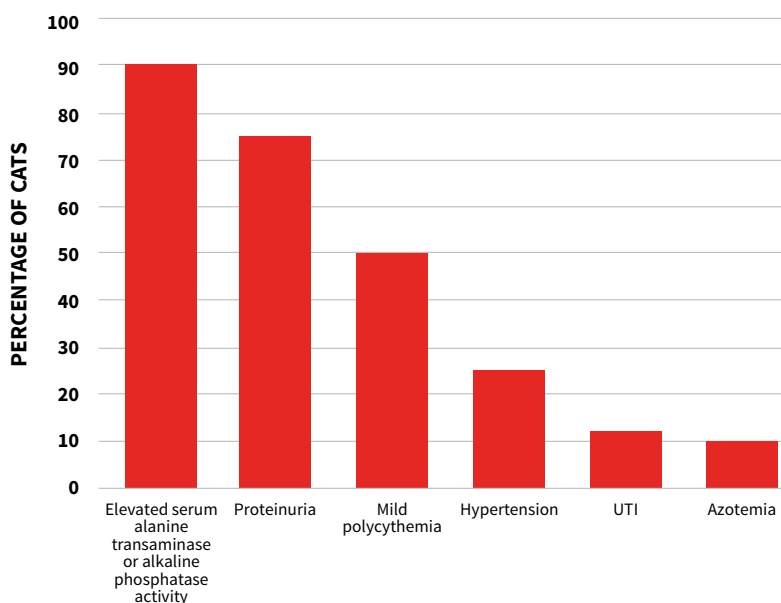
diagnosis. Therefore, it is important to assess owner compliance by measuring T_3 along with tT_4 .^{9,15,16}

Thyroid Scintigraphy

In patients in which hyperthyroidism is suspected but hormone testing is inconclusive, thyroid scintigraphy, the standard for diagnosing hyperthyroidism, should be considered.^{6-8,15,22-24} In scintigraphy, the thyroid gland takes up the radioactive marker technetium 99m pertechnetate, just as it would iodine, and allows for imaging of active thyroid tissue. Results are assessed by comparing the uptake of pertechnetate between the thyroid and salivary glands. In a hyperthyroid animal, uptake by the thyroid glands is noticeably higher than uptake by the salivary glands.^{6,21,25}

Thyroid neoplasia and ectopic thyroid tissue may also be identified via scintigraphy. Although technetium 99 is a safe isotope by the standards of radioactive substances, it requires special facilities

ELISA = enzyme-linked immunosorbent assay
 fT_4 = free thyroxine
 T_3 = triiodothyronine (liothyronine)
 TSH = thyroid-stimulating hormone
 tT_4 = total thyroxine



▲ **FIGURE 3** Percentage of hyperthyroid cats with abnormal minimum database findings at the time of diagnosis¹¹

fT₄ = free thyroxine
 T₃ = triiodothyronine
 (liothyronine)
 TSH = thyroid-stimulating
 hormone
 tT₄ = total thyroxine

and licensing.^{8,15} Therefore, thyroid scintigraphy is only available at some referral practices.

Conclusion

Feline hyperthyroidism should be suspected based on history, clinical signs, and physical examination findings. The initial diagnostic plan calls for a minimum database (ie, CBC, serum chemistry

profile, urinalysis, blood pressure, tT₄). Increased tT₄ in combination with clinical signs is diagnostic for hyperthyroidism. If hyperthyroidism is suspected but tT₄ is in the upper one-third of the reference range, options include repeating tT₄ in several weeks, measuring fT₄ and TSH, performing a T₃ suppression test, or referring for thyroid scintigraphy. ■

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