Thyroid disorders are commonly encountered by small animal clinicians. As thyroid screening has become more frequently utilized, practitioners have become more aware of the frequency with which these disorders occur. Because thyroid disorders typically respond well to treatment and carry a good prognosis, it is important for the clinician to be aware of the common clinical signs as well as the unusual manifestations of canine hypothyroidism and to routinely screen patients with suspected or potential thyroid disease.

Testing for canine hypothyroidism is indicated in dogs with historical and clinical signs consistent with hypothyroidism; potential candidates for thyroid screening include dogs with unexplained lethargy or weight gain, poor haircoat, recurrent skin or ear infections, chronic seborrheic dermatitis, elevated cholesterol, cold intolerance, neuromuscular disorders or behavioral changes. In addition, the overall incidence of canine hypothyroidism is such that T4 determination may be included as part of a routine canine geriatric screening panel. In-house T4 testing can offer a convenient alternative for the determination of T4 levels for the diagnosis of canine hypothyroidism and for monitoring T4 levels during therapy. In addition, there have been recent improvements in in-clinic TT4 tests.

The recommended initial data base for the dog with suspected hypothyroidism consists of a serum T4 level and a CBC, chemistry profile and urinalysis. Results of the CBC and chemistry profile can be extremely helpful in evaluating the dog with suspected hypothyroidism. Findings such as hypercholesterolemia and mild anemia will increase the index of suspicion for the disorder. In addition, the tests are useful in excluding nonthyroidal illness (NTI). Moderate to severe NTI can lower the T4 level well below the normal range, and can affect other tests of thyroid function as well. No test of thyroid function is perfect and NTI can adversely affect all of them, making interpretation of results difficult. Care must be taken to exclude NTI and thyroid testing of sick dogs should be avoided if possible. The results of thyroid function tests, including T4 levels, must be interpreted in light of the patient's history and physical examination and the results of the minimum data base. For example, a borderline low T4 in a dog with a classical presentation, hypercholesterolemia and mild anemia is more significant than the same result in a dog with atypical clinical findings, a normal cholesterol and evidence of NTI on the accompanying tests. It should also be remembered that older dogs and sight hounds of any age tend to have lower T4 concentrations. Rarely, dogs with hypothyroidism have circulating anti-T4 antibodies that are measured as T4 by many assays resulting in falsely elevated T4 levels (but usually above the reference range).

A T4 >27 nmol/L and within the reference range, with few exceptions, excludes hypothyroidism. This means that a T4 level of this magnitude is very useful in excluding the diagnosis of hypothyroidism. Dogs with low T4 levels or dogs with low-normal T4 levels in which the disease is still suspected will require additional testing to confirm the diagnosis. The tests of choice to confirm hypothyroidism are determination of serum TSH and free T4 (fT4) levels. An elevated TSH level and a decreased fT4 level are consistent with hypothyroidism. Approximately 25 per cent of dogs with confirmed hypothyroidism will have a normal serum TSH level. Therefore, the current recommendation is to run a serum TSH level and a fT4 level in tandem to confirm the diagnosis of hypothyroidism. Based on a multicenter clinical study, a new veterinary specific fT4 test with comparable accuracy to the fT4 equilibrium dialysis test, but superior precision and faster turnaround time, was introduced by IDEXX Laboratories.

Several commonly administered drugs can alter T4 levels, often into the hypothyroid range, and the results of other thyroid tests as well, including fT4 levels. Glucocorticoids will usually lower T4 concentrations especially if high doses have been given, but may also do so in some patients receiving modest dosages. Phenobarbital has also been shown to significantly lower T4 levels and potentially fT4 as well. Trimethoprim/sulfa antibiotics have also been shown to interfere with thyroid hormone metabolism and lower thyroid levels. Many other drugs have been shown to alter thyroid hormone parameters in humans. Until data is available to demonstrate similar effects in veterinary patients, thyroid
hormone levels in patients receiving these medications should be interpreted cautiously. Thyroid testing in animals being administered drugs that alter or have the potential to alter thyroid hormone levels should be delayed until a few to several weeks after discontinuing the medication. In those patients in which the potentially interfering drug cannot be discontinued, the thyroid test results must be evaluated with the possible effects of the concurrent medication in mind.

The most important parameter in assessing response to thyroid replacement therapy is resolution of clinical signs. Name-brand preparations are recommended. Therapeutic monitoring of thyroid hormone levels is extremely helpful in assuring appropriate dosing and a prompt response to treatment and is strongly recommended. Ideally, both peak and trough levels of T4 would be determined. Practically, however, one usually determines the peak or trough T4 level during therapeutic monitoring of hypothyroidism. One must remember that T4 results can vary between testing methodologies and even from laboratory to laboratory using the same assay. Ideally, the same methodology and/or laboratory should be used for all followup monitoring unless unexpected or confusing results are being obtained. All dogs are initially given thyroxine twice daily. In some dogs, only once daily thyroxine is needed during long-term therapy while others continue to need twice daily administration. Four to six weeks after initiating treatment, either the peak or trough T4 level (or both) is determined. The choice of peak or trough sampling is dependent on the client’s and veterinarian’s schedule. The desired post-pill thyroid hormone level(s) will depend on the timing of the blood sample. Serum for peak levels is drawn 4 to 6 hours after thyroxine administration, whereas serum for trough levels is drawn immediately prior to the next dose. Peak levels should be high-normal to slightly increased and trough levels should be low-normal. Thyroid hormone levels should be determined 4-6 weeks after any change in dosage, administration frequency or brand of thyroxine supplementation. Thyroid hormone levels are determined at 3 and 6 months of therapy and ideally every 6 months thereafter to assure proper dosing and to allow for early detection of under treatment or iatrogenic hyperthyroidism.

Feline hyperthyroidism is the most common endocrine disorder of older cats. Thyroid hormone excess effects multiple organ systems and the associated clinical signs range in severity from mild to severe and are quite variable from cat to cat. As a result of the increased incidence of the disease, the increased index of suspicion among practicing veterinarians and the increased screening of geriatric cats for hyperthyroidism, the average hyperthyroid cat is now evaluated earlier in the course of disease than when the disorder was first recognized. These cats often have relatively mild hyperthyroidism, lack some to many of the classical signs of hyperthyroidism and present a diagnostic challenge for the clinician. Given the prevalence of the disease it is recommended that a T4 level be included in the annual geriatric screening for all cats 7 years of age and older. Thyroid screening can also be recommended for cats 3 years of age and older that are hyperactive, are polyuric and polydipsic, have lost weight, have a heart murmur, tachycardia or gallop rhythm, have an enlarged thyroid on palpation, and in those with an elevation in liver enzyme levels. In most cases the diagnosis of feline hyperthyroidism is straightforward and can be confirmed by demonstrating an elevated serum T4 level. Determination of T3 levels does not add substantial information and is not necessary. Some cases, particularly early hyperthyroidism, can be challenging and require additional testing. In cats with mild or occult hyperthyroidism, T4 levels can fluctuate into and out of the normal range. Furthermore, concurrent moderate to severe NTI can lower an increased T4 into the normal range. Therefore, a normal T4 does not necessarily exclude hyperthyroidism in a cat with compatible clinical findings. What is recommended in these cases? If NTI is present, the T4 is repeated after the condition has improved or resolved. If NTI is absent, additional testing for hyperthyroidism can be performed or one or more T4 levels can be repeated over the next few weeks.

Tests to diagnose occult or mild hyperthyroidism include determination of fT4, TSH, the T3 suppression test and quantitative technicium uptake scans. Practically, determination of fT4 is generally next the diagnostic test in cats with occult or early hyperthyroidism in which a screening total T4 level was
inconclusive. Free T4 levels are usually elevated in cats with occult hyperthyroidism. NTI can occasionally elevate ft4 and must be excluded beforehand. However, in most cats with NTI the accompanying total T4 is low-normal or low. The T3 suppression test is performed by determining T4 (and T3 as well) levels before and after administering of T3 per os three times daily for 7 doses. Lack of suppression of T4 levels is supportive of hyperthyroidism.

The treatment options for feline hyperthyroidism include long-term antithyroid drug administration, therapeutic diet, surgical thyroidectomy and radioactive iodine therapy (131I), with each of these treatment options having advantages as well as disadvantages. Several factors must be taken into consideration in order to determine the best treatment option for an individual hyperthyroid patient. These include the age of the cat, concurrent medical problems (e.g., cardiovascular disease or renal disease), availability of each therapy, economic factors and the client's opinions regarding each form of therapy. Regardless of the treatment chosen, regularly scheduled follow-up care including monitoring T4 levels is very important in assuring the best possible therapeutic outcome. The advent of in-house T4 testing can offer a convenient alternative for determination of T4 levels during long-term therapy. In addition, the potential interaction of chronic renal disease (which may initially be subclinical) and hyperthyroidism must be taken into account as both disorders can be seen in the geriatric feline patient. The unmasking of renal disease or the negative impact on renal function resulting from the treatment of hyperthyroidism can influence the type of therapy chosen or necessitate alterations in therapy. Blood pressures should also be monitored before and during therapy.

During therapy with an antithyroid drug, a T4 level, CBC, platelet count and chemistry profile are evaluated every 2 to 3 weeks during the initial 3 months of treatment to monitor for any needed dosage adjustments and for the occurrence of adverse effects (thrombocytopenia, anemia, agranulocytosis, hepatopathy). After this a T4 is determined at 6 months of therapy and every 6 months thereafter. The dosage is adjusted to the lowest effective dose. In cats treated for long periods of time the dose required to maintain control of the hyperthyroid state may increase. Hill's y/d diet is a new treatment option for feline hyperthyroidism that has recently been described. Preliminary results demonstrate that this restricted iodine diet reduced total T4 concentrations into the normal range by 8-12 weeks in most hyperthyroid cats fed the diet and maintained them there, however, T4 levels are not lowered enough in some cases. Prior to thyroidectomy, an antithyroid drug is administered for 3 to 4 weeks to establish a euthyroid state. A T4, CBC, profile and UA are checked before surgery. Following surgery the T4 level should be determined before discharge to assure that hyperthyroidism is no longer present. After unilateral thyroidectomy thyroid replacement is rarely given and T4 levels usually normalize in 2 to 4 months (therefore, T4 can be determined at 2 month intervals until normal). Daily thyroxine supplementation is indicated after bilateral thyroidectomy. Thyroid hormone production usually normalizes, however, weeks to months after surgery and replacement therapy can be discontinued. This is monitored by periodic T4 determinations. The most serious postoperative complication that can occur following bilateral thyroidectomy is hypocalcemia secondary to iatrogenic hypoparathyroidism (usually 1 to 4 days postop). Following bilateral thyroidectomy, daily serum calcium levels should be measured until calcium stabilizes in the normal range. During long-term follow-up after thyroidectomy, T4 levels should be determined every 6 months to monitor for recurrence of hyperthyroidism. Radioactive iodine is a safe and effective treatment alternative for feline hyperthyroidism, and can be considered the treatment of choice in cats with uncomplicated hyperthyroidism. A single treatment is effective in 90 to 95 % of cats and the 5 to 10% that remain hyperthyroid can successfully be retreated in most instances. Overt hypothyroidism is uncommon. After administration of radioactive iodine, a T4 level should be measured at the time of discharge from the treatment facility and at 2 to 3 months posttreatment. During long-term follow-up a T4 level is determined at 6 months posttreatment and every 6 months thereafter.
Treatment of feline hyperthyroidism can unmask chronic renal failure as a result of decreased GFR and RBF associated with the establishment of euthyroidism. A recent study demonstrated that the appearance of mild stable renal azotemia following treatment for hyperthyroidism did not negatively impact survival time as compared to cats that remained nonazotemic. In cats that develop mild stable CRF after treatment for hyperthyroidism, it may not be necessary to withdraw treatment for hyperthyroidism in order to normalize serum creatinine concentrations. Nonetheless, the T4 levels should be regularly checked to avoid over-treatment of hyperthyroidism.