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POINT-OF-CARE IN-HOUSE THYROID TESTING

COMPARISON OF LABORATORY AND IN-HOUSE TESTS

climician’s brief®

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T4 thyroid disease is relatively common in dogs and cats; however, dogs are most commonly hypothyroid while cats are most commonly hyperthyroid. The measurement of total thyroxine (T₄) is the mainstay for diagnosing thyroid disease in both species and for evaluating therapeutic success. Dogs suspected of being hypothyroid (borderline or low concentrations of T₄) usually also have confirmation tests to determine free T₄ and/or thyroid stimulating hormone (TSH or thyrotropin) concentrations. In cats suspected of being hyperthyroid (increased concentration of T₄), the total T₄ is usually sufficient to diagnose the disease, while levels in the mid to upper portion of the reference range are considered suspicious and warrant further testing (such as measurement of free T₄).

Historically, radioimmunoassay (RIA) in the laboratory has been considered the gold standard of T₄ testing, but new methods and technology advancements have made other affordable, convenient, and time-sensitive methods available. Most RIA procedures have been designed for people but have been validated for use in domestic animals, and a total T₄ RIA test kit is marketed specifically for dogs. ELISA-based and chemiluminescent systems processed in commercial laboratories also have been validated for total T₄ concentration testing in dogs and cats. A point-of-care in-house ELISA system (IDEXX SNAP® T₄ Test) for use by veterinarians in a practice setting is also commercially available. The study presented on the opposite page compared results from these 4 methods of analysis and demonstrated a good correlation among them. The data give the practitioner a good basis for selecting among currently available T₄ testing methods, providing a greater range of solutions than has been available in the past.
STUDY – Comparing various methods of T₄ testing

- Serum samples obtained from 98 dogs and 100 cats
- Samples were submitted to diagnostic lab to test the following:

  **Dogs**
  - Screening for hypothyroidism: 41
  - Assessing adequacy of treatment: 39
  - Reason for request unknown: 18

  **Cats**
  - Screening for hyperthyroidism: 64
  - Assess treatment with methimazole: 17
  - Reason for request unknown: 19

- 12 pairs (24 animals) for comparison of the 4 assay methods for 2 species
- Precision estimates were determined for each assay using serially diluted dog and cat serum
- Samples submitted to a veterinary university endocrinology lab
- T₄ concentration determined by RIA T₄ assay within 1 of 4 ranges
  - 0.5 to 1.5 µg/dl
  - 1.6 to 3.0 µg/dl
  - 3.1 to 4.9 µg/dl
  - 5.0 to 7.0 µg/dl

<table>
<thead>
<tr>
<th>T₄ Assay Methods**</th>
<th>Method</th>
<th>Test</th>
<th>Performed by</th>
<th>Product maker</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
<td>Canine total T₄ coated-tube RIA</td>
<td>Diagnostic laboratory</td>
<td>Coat-A-Count Canine Total T₄, Diagnostic Products Corp, Los Angeles, CA</td>
</tr>
<tr>
<td>B</td>
<td></td>
<td>In-house enzyme-linked immunosorbent assay (ELISA) kit</td>
<td>In-house (simulated)*</td>
<td>SNAP® T₄, IDEXX Laboratories, Westbrook, ME</td>
</tr>
<tr>
<td>C**</td>
<td>RIA total T₄ kit</td>
<td>Mailed to company</td>
<td>Coat-A-Count Total T₄, Diagnostic Products Corp, Los Angeles, CA</td>
<td></td>
</tr>
<tr>
<td>D**</td>
<td>CEIA kit</td>
<td>Mailed to company</td>
<td>Immulite Total T₄, Diagnostic Products Corp, Los Angeles, CA</td>
<td></td>
</tr>
</tbody>
</table>

* Performed by a veterinary student.
† Sensitivity was 0.15, 0.5, 0.25, and 0.4 µg/dl for assays A, B, C, and D respectively.
** Marketed for human, validated for use in dogs and cats.

RESULTS

- Statistical comparisons of T₄ test method results revealed, in general, good correlation between T₄ concentrations.
- Agreement was generally excellent for T₄ concentrations in low to middle portion of clinically normal ranges.
- Divergent results were seen for all methods at higher T₄ concentrations, but it is possible that factors such as lipemia, hemolysis, or method of serum collection contributed to these differences.
- In general, the T₄ concentrations obtained by assay method A were lower than those of the other methods. These differences were more profound at higher concentrations, and in cats.

Discussion

For hypothyroidism in dogs, most veterinarians use total T₄ concentrations as screening tests. Because factors other than hypothyroidism can cause low total T₄ concentrations, confirmation tests are needed to make a diagnosis. This study showed that a point-of-care system (method B) provided reliable and consistent results for screening and for assessing adequacy of T₄ replacement treatment.

For hyperthyroidism in cats, there was good agreement between methods for total T₄ concentrations above the reference range. Because some cats with hyperthyroidism have total T₄ concentrations within reference ranges, other testing may be indicated when thyroid disease is suspected but total T₄ is within the reference range.

Commentary

Canine hypothyroidism and feline hyperthyroidism are two of the most common endocrine disorders seen in small animal practice. Because thyroid disorders typically respond well to therapy and have a good prognosis, it is important for the practitioner to be aware of both common and uncommon clinical signs and to routinely screen patients with suspected or potential disease.

Serum total thyroxine (T4) concentrations commonly used for screening and therapeutic monitoring are routinely offered by diagnostic laboratories using a radioimmunoassay or chemiluminescence test. The availability of an in-house T4 testing system can offer a convenient, cost-effective alternative. This study showed generally good correlation between the various methodologies and it appears that any of them, including the IDEXX SNAP® T4 in-house test, is appropriate, dependable, and indicated. It must be remembered that with any test, false negative and false positive results can occur for any number of reasons, and that results must be interpreted in light of the patient’s history, clinical signs, and other laboratory findings. — Peter P. Kintzer, DVM, DACVIM, Staff Internist, Boston Road Animal Hospital, Springfield, Massachusetts

SUGGESTED READING


