

Fig. 17.1. Hormonal control of thyroid glands. TRH released from the hypothalamus stimulates the release of TSH from the pituitary. TSH stimulates the production and release of T_4 and T_3 in pathways involving thyroglobulin in the thyroid glands. In blood, most T_4 and T_3 molecules are protein bound. fT_4 and fT_3 may enter peripheral cells in which some of the T_4 is converted to T_3 . T_3 has more activity than T_4 . In the negative-feedback system (dashed lines), fT_4 and fT_3 (produced locally) inhibit the secretion of TSH and possibly TRH.

Fig. 17.2. Effects of T_4 AA on measured $[tT_4]$ in a solid-phase RIA. RIAs are competitive-binding assays in which the patient's T_4 competes with a known amount of radioactive T_4 ($*T_4$) for a limited number of antibody-binding sites (e.g., in a tube coated with anti- T_4 antibodies). Thus, a greater concentration of patient T_4 results in less bound $*T_4$.

- In the analysis of dog 1's serum, its serum (containing T_4) and a $*T_4$ reagent are added to an antibody-coated tube (step a). During incubation (step b), some of the patient T_4 and $*T_4$ bind competitively to anti- T_4 antibodies on the tubes; other T_4 molecules remain unbound. After incubation, the unbound T_4 is rinsed from the tube, and the bound T_4 stays in the tube (step c). The tube's radioactivity is then measured, and the percentage of added $*T_4$ that remained bound is determined (in this simplified version, 6 of 12 added $*T_4$ were bound, or 50 % bound). Using a standard dose-response curve, dog 1's $[tT_4]$ is determined (see the graph).
- In the analysis of dog 2's serum, its serum (containing T_4 and T_4 AA) and $*T_4$ reagent are added to an antibody-coated tube (step d). During incubation, $*T_4$ binds to the anti- T_4 antibodies coating the tube and to the T_4 AA, and thus less $*T_4$ is bound to the tube (step e). After rinsing out T_4 not bound to the tube (step f), the tube's radioactivity is measured, and the percentage of added $*T_4$ that remained bound to the tube is determined (in this simplified version, 4 of 12 added $*T_4$ were bound, or 33 % bound). Using a standard dose-response curve, dog 2's $[tT_4]$ is determined (see the graph). The lower % $*T_4$ bound translates to a greater $[tT_4]$ on the standard dose-response curve.

In this schematic assay, the $[T_4]$ in the sera of dogs 1 and 2 were the same (each had 12). However, the T_4 AA in dog 2's serum interfered with binding of $*T_4$ to the tube and resulted in a falsely increased measured $[tT_4]$.

Fig. 17.3. T_3 suppression test results in cats; liothyronine, 25 μg per os, q8h for seven doses. In cats with hyperthyroidism, there was a failure to suppress $[tT_4]$ below 20 nmol/L. In cats with other disorders, the $[tT_4]$ in post- T_3 samples was < 20 nmol/L. Hyperthyroidism was diagnosed in 77 cats, based on clinical signs, palpable thyroid nodules, high-normal to increased $[tT_4]$, and response to treatment for hyperthyroidism. Cats ($n = 22$) with other disorders had clinical signs suggestive of hyperthyroidism. Their disorders included gastrointestinal diseases, chronic renal disease, cardiomyopathy, and behavioral disorders. The *grey-shaded area* represents the $[tT_4]$ found in 44 clinically healthy cats. The graph was constructed from published data.⁸⁰