Hyperthyroidism and Hyperparathyroidism in Guinea Pigs (*Cavia porcellus*)

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KEYWORDS

• Guinea pig • Cavia porcellus • Thyroid • Parathyroid • Pathology
• Diagnostic testing • Treatment

KEY POINTS

- Diseases of the cavian thyroid and parathyroid have been documented in the scientific literature.
- Clinical signs of a thyroid or parathyroid disorder can be subtle and varied.
- The diagnosis of a true or primary thyroid or parathyroid malfunction can be challenging but should be done in a systematic fashion, as is done with other mammals.
- Treatment of the diagnosed condition can vary and ranges from medical management instead of surgery or radioactive therapy.
- Currently, thyroid and/or parathyroid disease might be a clinically underdiagnosed condition due to inadequate representation in the literature.

HYPERTHYROIDISM

Hyperthyroidism or thyrotoxicosis is a disease process with multiple causes and manifestations characterized by elevated thyroxine (T4) and/or triiodothyronine (T3) serum levels with reduced thyrotropin (TSH) concentrations.[1–4] In humans, the most common cause of thyrotoxicosis is Graves disease, an autoimmune condition in which autoantibodies stimulate the thyrotropin receptors leading to overproduction of T4 and T3.[1]

The thyroid gland activity is controlled by the hypothalamus-pituitary-thyroid axis. The hypothalamus produces thyroid-releasing hormone that stimulates the pituitary to produce TSH that, in turn, stimulates the thyroid gland to produce thyroid hormones, mainly T3 and T4. The stimulation or suppression of this pathway is

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controlled by a negative feedback mechanism. Secondary hyperthyroidism, also called thyrotropin-induced hyperthyroidism or central hyperthyroidism, has been described in great detail in human medical literature.[5–8] This condition is caused by a primary TSH-secreting pituitary tumor, which leads to an elevation of thyroid hormone secretion; although in some cases it may cause hypothyroidism.[7–9] Although TSH-secreting pituitary tumors are rare, adenomas are the most commonly reported pituitary neoplasias, whereas carcinomas are unusual.[6,10–12] If the abnormal production of T3 and T4 occurs due an abnormal behavior of the thyroid alone, this is diagnosed as primary hyperthyroidism or simply hyperthyroidism.

Hyperthyroidism has been described in several animal species; it is the most common endocrine disease in cats.[13] Feline hyperthyroidism was first reported in the 1970s and the condition seems to mainly affect middle-aged to older cats without breed and sex predisposition.[13–15] Only one case of juvenile hyperthyroidism in an 8-month old domestic shorthaired cat can be found in the scientific literature to date.[10] In this case, a diffuse thyroid hyperplasia was detected on histopathology.[10] In general, hyperthyroidism in cats is usually caused by a benign thyroid adenoma or a diffuse adenomatous hyperplasia.[16] In most cases of hyperthyroidism in cats, a goiter or a thyroid gland hyperplasia can be detected.[13] Hyperthyroidism has been described in dogs but it is rare.[17]

Among exotic species, hyperthyroidism has been rarely described. In avian species, only one case of naturally occurring hyperthyroidism has been reported in a wild barred owl (*Strix varia*) due to a productive thyroid follicular carcinoma.[18] In reptiles, hyperthyroidism has been described in a green iguana (*Iguana iguana*) and in a leopard gecko (*Eublepharis macularius*).[19,20]

Primary hyperthyroidism has been described in guinea pigs for several decades but this disease is not commonly reported in most textbooks; therefore, clinicians may not be aware of this condition leading to a potential underdiagnosis of this condition in the English-speaking community.[21] Furthermore, if incomplete necropsies are performed in which the thyroid gland is not collected, the diagnosis of primary thyroid disease will not occur. Recently, thyroid neoplasias have been reported to be one of the most common neoplasias (3.6%) detected in guinea pigs by one laboratory service.[22] Of the 19 cases reported, 8 were macrofollicular thyroid adenoma, 5 follicular thyroid carcinoma, 3 papillary thyroid adenoma, 1 thyroid cystadenoma, 1 follicular-compact thyroid carcinoma, and 1 small cell thyroid carcinoma.[22] No scientific data exists to assess age predisposition of the condition; however, it seems that mainly animals more than 3 years of age are affected with a possible predisposition toward female guinea pigs.[23]

The clinical signs in the guinea pigs affected by thyroid disease causing hyperthyroidism seem to be similar to other species. The most common clinical signs are hyperesthesia, hyperactivity, and polyphagia with paradoxic poor body condition or progressive weight loss.[23] In the case of a goiter formation, a palpable mass at the ventral cervical area may be noticed on palpation. Diarrhea or soft feces, polyuria and/or polydipsia, progressive alopecia, and tachycardia are inconsistently reported.[23]

Reference intervals of thyroid hormones have been reported in guinea pigs in the scientific literature.[24,25] In one study, significant differences were detected between females and castrated males, but no significant differences were detected between intact and castrated males or females and intact males.[24] In another study in which total T4 reference intervals were determined using a point-of-care T4 enzyme immunoassay (T4 and Cholesterol Reagent Disk; Abaxis Inc, Union City, CA, USA), no significant differences were detected between age (2 vs 8 months), sex, housing type, and sampling protocol.[25] Although this study demonstrated repeatability, results