Ferret adrenal-associated endocrinopathy

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A 4-year-old, spayed, female ferret was referred with a 5-month history of pruritic alopecia and a previous episode of alopecia that had resolved. A skin scraping had been negative for parasites, and no improvement had occurred on a trial course of thyroid hormone.

Physical examination revealed complete alopecia over most of the dorsum and tail, and a slightly enlarged vulva, but the ferret was bright and active. Differential diagnoses included hyperadrenocorticism, hyperestrogenism due to remnant or ectopic ovarian tissue, and hypothyroidism. Results from a complete blood cell count (CBC), serum biochemistry panel, and thyroxine (T4) assessment were within normal limits. Radiographically, no abnormalities were identified. Abdominal ultrasonography revealed a mass, cranial to the left kidney. An enlarged left adrenal gland, measuring 1 × 1 cm, was removed during exploratory laparotomy. Histopathologic diagnosis was consistent with adrenocortical carcinoma. The ferret was discharged 2 d postoperatively. In 4 wk, complete hair regrowth had occurred. The ferret was alive and normal, except for mild tail alopecia, 2 y later.

Adrenal gland neoplasia in ferrets is often referred to as hyperadrenocorticism or Cushing's syndrome; however, excess cortisol production rarely occurs (1–3). "Adrenal-associated endocrinopathy" (AAE) may be a more descriptive term, since elevated levels of sex hormones have been shown to be responsible for the clinical signs (3). Increased levels of circulating estrogens can suppress the anagen phase of the hair cycle, resulting in telogenic hair follicles and alopecia (2). In spayed females, estrus-like effects, including vulvar enlargement, mucoid vulvar discharge, and attraction to male ferrets, are seen (2). In males, hyperestrogenism can cause a cystic prostate, which can compress and partially obstruct the urethra, resulting in dysuria (4). Clinical signs often appear in the spring and regress in the fall, following the breeding seasons (3). Signs will then recur with increasing severity each year until they appear year-round (3).

Diagnosis is usually based on clinical signs, ultrasonography, exploratory laparotomy, and histopathology

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(1–3). Adrenocorticotrophic hormone stimulation and dexamethasone suppression tests are unrewarding in ferrets (1,5). Atrophy of the unaffected adrenal gland and hypoadrenocorticism after adrenalectomy rarely occur (1).

In a survey of 50 cases, 70% were spayed females, and the age range was between 1 and 7 y, with a mean of 3.4 y (1). Approximately 84% of cases were unilateral, with approximately 76% of them involving the left adrenal gland (1).

The enlarged adrenal gland can be palpated in about one-third of cases (1). The left gland is more amenable to palpation than the right, which is covered by a lobe of liver (4). The adrenal glands are surrounded by abundant fat and can usually be located with ultrasound (6). If the right adrenal gland is affected, the caudal vena cava should be examined for evidence of infiltration (7). Approximately half the cases of AAE can be diagnosed through ultrasound (1).

A CBC and serum biochemistry panel are useful to look for concurrent disease but usually show no abnormalities attributable to AAE (4). A few cases of AAE have shown evidence of estrogenic bone marrow suppression, such as normocytic, normochromic anemia; leukopenia; or thrombocytopenia (1,7). Usually these parameters return to normal once treatment has been completed (8).

A new blood chemistry panel designed to diagnose AAE in ferrets is available at the University of Tennessee College of Veterinary Medicine (4). The panel assays 4 hormones: dihydroepiandrosterone sulfate, estradiol, androstenedione, and 17-hydroxyprogesterone (4). Elevated levels of at least 1 of 3 of these hormones, estradiol, 17-hydroxyprogesterone, and androstenedione, are present in 96% of affected ferrets (2).

Treatment of choice is surgical removal of the affected adrenal gland (1,9). Removal of the left adrenal gland is straightforward, but removal of the right adrenal gland is difficult because of its close association with the caudal vena cava (9). Histopathologic diagnosis can include adrenal adenoma (64%), adrenocortical hyperplasia (26%), and adrenocortical adenocarcinoma (10%) (1). Because metastasis and recurrence of adrenal gland neoplasms are rare and clinical signs resolve soon after adrenalectomy, prognosis is very good (4).

The etiology of AAE is unknown. One hypothesis has linked early gonadectomy with AAE (1,3); another hypothesis involves conversion of excess androgens to testosterone and then estrogens within the adrenal gland (2).

Regardless of etiology, ferret adrenal gland neoplasia differs greatly from hyperadrenocorticism, or Cushing's

disease, seen in other species. Because elevated levels of sex hormones rather than cortisol are responsible for this disease, AAE may be a more correct term. Further studies are needed to clarify the etiology of this disease in ferrets.

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