

EPIDEMIOLOGICAL ASPECTS OF FELINE HYPERTHYROIDISM IN NEW ZEALAND

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Feline hyperthyroidism is a multisystemic disease resulting from excessive secretion of thyroid hormones, L-thyroxine (T₄) and/or L-triiodothyronine (T₃). This disorder is now the most common endocrine disease of middle-aged to older domestic cats (average age at diagnosis = 12-14 years, range 4-22) diagnosed at veterinary clinics in New Zealand and many other countries. The most common clinical signs are weight loss, polyphagia and hyperexcitability. Functional thyroid adenoma (multinodular adenomatous hyperplasia), involves either one lobe in about 25% or both thyroid lobes in about 75% of cases and accounts for at least 97% of diagnosed cats with hyperthyroidism.¹ A number of suspected cases were reported in the veterinary literature from 1955 onwards but the first confirmed cases were in 1979. Despite progress in improving the diagnosis and treatment of feline hyperthyroidism, it has been observed that over time there has been an increase in the incidence of this disease.^{1 2 3}

The factors initiating and sustaining the transformation of a normal feline thyroid into a nodular hyperfunctioning goitre remain unknown. Genetic predisposition, environmental exposure to chemicals, immunological factors, nutrition and perhaps infectious agents may all influence the development of the disease.^{2 3 4 5}

Cats in New Zealand provide a unique population to investigate the epidemiology of hyperthyroidism. The lifestyle and feeding practices of cats in New Zealand have similarities to cats in other countries, but also differ in many important aspects especially with respect to outdoor activity. New Zealand has a high proportion of cat-owning households (47%) and the movement of cats into and out of the country is minimal. For the last 10 years the cat population in New Zealand has remained unchanged at around 0.9 million with 1.55 cats per cat owning household. Most cats are indoor/outdoor or outdoor cats and commercial foods did not constitute a high proportion of cat diets prior to 1990.

Materials & Methods

A questionnaire-based case-control study involving 125 hyperthyroid, 125 sex- and age-matched (± 1.5 years) and 125 random control New Zealand cats was conducted over a 14-month period. The survey required the questionnaire (which was pilot tested and revised for the main study) to be completed by the primary care veterinarian and the owner of the cat for which a diagnosis of hyperthyroidism had been made (based on history, clinical signs and elevated concentration of thyroid hormones). Retrospective and recent cases were sourced from 25 veterinary practices scattered throughout New Zealand. The owners of cases and controls were questioned about their cats' exposure to potential risk factors including: cat and owner demographics, each cat's medical history, the indoor and outdoor environment, the cat's diet and feeding practices. The random controls were selected from practice records using a selection table of random numbers. A range of statistical techniques was employed to analyse the data, including descriptive analyses, univariate logistic regression for each variable and multivariate stepwise forward logistic regression.

Results

The multivariate unconditional logistic regression procedure for comparison of cases with random controls indicated that cats whose bedding was regularly treated with anti-flea products were at higher risk (OR=57.6 (3.79–>200))=(Odds Ratio (95% confidence intervals)). A 6.6-fold (1.84–23.89) increase in risk was found for cats predominantly sleeping on the floor. Dental disorders were 5.5 times (1.73–17.49) more likely in diseased cats and this finding was independent of age. Cats whose history indicated they had a previous owner or were of unknown origin were at higher risk (OR=4.1 (0.96–17.89)) than cats reared from an early age by their owners. Female cats were more likely to be affected than males (OR=3.3 (1.18–9.02)) and the risk of developing hyperthyroidism increased with age for both genders. Cats eating half or more of their daily food requirement in the form of canned commercial cat food appeared to be at higher risk (OR=2.1 (0.33–12.93)) of developing hyperthyroidism than cats not fed canned food. Siamese cats were at lower risk of having hyperthyroidism than other breeds (OR=0.01 (0.001–0.2)).

The multivariate conditional logistic regression procedure for comparison of cases with matched controls suggested that cats with episodes of diarrhoea were 7.4 times (2.4–22.5) as likely to have hyperthyroidism. The interaction between drinking water from puddles and the regular use of organic fertilisers, such as compost or animal manure, in the cat's outdoor territory was a risk factor associated with a 5.3-fold (1.08–25.61) increase in the risk of developing disease. Disease risk was higher in cats exposed to a variety of flavours of commercial canned cat food compared to those fed only one flavour (OR=3.8 (1.5–9.61)). Regular use of fly sprays in the cat's indoor territory appeared to be associated with higher risk of disease (OR=3.3 (1.19–9.29)) while cats in multi-cat households were at lower risk (OR=0.15 (0.05–0.44)).

Discussion

The results are in general agreement with findings from previously published work^{2,5} and have drawn attention to some factors worthy of further investigations. The common contributing factors in all three epidemiological studies were related to cat age and breed, the type of diet and feeding practices, the pattern of use of insecticides (anti-flea treatment of cat's bed/bedding and frequent use of anti-fly sprays at home) and regular application of fertilisers on the cat's outdoor territory. However, as with previous reports, this study did not isolate any single dominant factor which could be incriminated in the development of feline hyperthyroidism, strengthening the view that this is a multifactorial disease.

Unlike two previous studies conducted in the United States, in which only case-matched controls were researched (matched by sex and age [± 1 year² and ± 3 years⁵]), in the New Zealand study two control populations were used. The conclusion was made that variables which were significantly associated with hyperthyroidism in both comparisons without any confounding effect were particularly good candidates for the most influential causes of the disease.

Only two variables were common to both models. The first variable was linked by two kinds of environmental exposures involving the use of insecticides: "anti-flea products used regularly on cat's bed/bedding" and "regular use of fly sprays on cat's indoor territory". The second variable was combined from two closely related dietary factors: "daily proportion of commercial canned food" and "feeding the cat with a variety of flavours of commercial canned food". The incomplete agreement between the two analytical approaches may have been due to: a) the matched analysis focused on external influences, whereas the random analysis focused more on internal ones; b) the number of animals in the study did not provide sufficient statistical power to ensure that all relevant variables were in the final model; c) only crude measures could be made for several variables. It is recognised that some of these findings may not be causal and further studies are warranted to clarify these aspects and investigate the molecular basis of the disease, the role of breed, sex, diet and exposure to other potentially important environmental factors, e.g. insecticides.

Reference

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