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ELUCIDATING THE RISK FACTORS OF FELINE UROLOGICAL SYNDROME

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Lower urinary tract disease, also referred to as feline urological syndrome (FUS), is an important clinical condition in cats. The disorder is characterised by inflammation with or without obstruction of the lower urinary tract and clinical signs of dysuria, polakiuria and haematuria. There is no single diagnostic criterion which identifies and distinguishes FUS, and the diagnosis is often based on the clinical signs and elimination of identifiable causes of lower urinary tract disease, eg. bacterial infection, neoplasia etc. Clearly, FUS is a complex disease of multifactorial aetiology. A number of significant risk factors have been identified by researchers in other countries (Willeberg, 1977). This study was designed to investigate some of the risk factors for this disease in cats in New Zealand.

METHODS

A case-control study based on a questionnaire was conducted over a two year period from 1991 to 1993. Cases were all those cats presented for treatment of FUS at participating veterinary practices during the study period. For each case, two control cats were selected from the same practice. One of the control cats was case-matched on sex and age and the other was randomly selected from practice records. Weather records for the Auckland area, from which the majority of the cases came, were obtained for the study period to investigate the influence of weather variables on the monthly incidence of reported FUS cases. At the completion of the survey period, a supplementary questionnaire was sent to those owners of cases and controls who had indicated that litter trays were utilised, to probe issues related to the use of litter trays not covered by the original questionnaire.

All data were entered into the EpiInfo system, and initial univariate analysis conducted using this program. Multivariate analyses, including Poisson regression, logistic regression and classification and regression trees were conducted in S-Plus.

RESULTS

One hundred and ninety-three cases, 189 case-matched controls and 189 random controls were involved in the study. Univariate analysis of the random control data showed that having more than one cat in the household was a risk factor (OR = 1.55, $P < 0.05$). Weight category of cat appeared to be important ($c^2 = 5.49$, $P < 0.1$). Likewise, lazy cats tended to have a higher proportion of FUS (OR = 2, $P < 0.05$). The use of a litter tray (OR = 2.34, $P < 0.001$), spending less than 3 hours per day outside (OR = 2.01, $P < 0.05$) and sleeping inside (OR = 2.04, $P < 0.001$) were all significant variables. A house move within the last three months was significant (OR = 3.94, $P < 0.001$), and interestingly, a veterinarian check during the last 12 months was protective (OR = 0.54, $P < 0.05$). Low fluid consumption appeared to be a risk factor (OR = 1.96, $P < 0.01$), as did the intensity of dry cat food feeding (proportion of diet and frequency of feeding) (OR = 2.03, $P < 0.001$). When a high level of dry cat food feeding was combined with a low fluid intake, the strength of association with FUS increased (OR = 2.98, $P < 0.05$). However, high fluid consumption, combined with high intensity dry cat food feeding, reduced the association (OR = 1.04, $P = 0.9$). Different sources of food, such as birds and rodents, were protective (OR = 0.47, $P < 0.001$). There was no

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association between FUS and the age, sex or age of neutering of cats.

The matched analysis indicated that FUS is more common in purebred cats than cross-bred cats (OR = 2.14, P < 0.01), with a greater proportion of diseased cats having long hair (OR = 1.99, P < 0.01). Age of neutering did not appear to be important in the aetiology of FUS. The amount of time cats spent indoors appeared to be important, with an association between FUS and the use of litter trays (OR = 2.36, P < 0.001), spending less than 3 hours per day outside. (OR = 1.83, P < 0.05) and whether cats sleep indoors or outdoors (OR = 2.03, P < 0.001). Where owners had moved house within the last three months, there was a higher proportion of cats with FUS (OR = 2.2, P < 0.05). There was no significant association with viral conditions. Although the feeding of dry cat food as a component of a cat's diet did not appear to be a risk factor, the intensity of dry cat food feeding was important (OR = 1.83, P < 0.01). When high intensity of dry cat food feeding and low water consumption were combined, the association with FUS strengthened (OR = 2.5, P < 0.01), but when high intensity of dry cat food feeding was combined with high water intake, the association disappeared (OR = 1.31, P > 0.1). Different sources of food had a protective effect (OR = 0.45, P < 0.001).

The supplementary litter tray questionnaire indicated that regular usage of a litter tray, as opposed to occasional or seasonal, use was important in both the random control (OR = 3.41, P < 0.05) and the matched control data (OR = 3.26, P < 0.05). Type of litter used was marginally significant in both sets of data (random c^2 = 9.09, P = 0.105; matched c^2 = 9.7, P = 0.084).

Poisson regression of the Auckland weather data showed that the number of rain days in the month prior to the reporting of a case was the main contributing variable (RR = 1.1 per day, P < 0.001; deviance = 32.34 on 23 degrees of freedom, P > 0.05) (see Table 1).

Table 1. Poisson regression model for influence of weather variables on Auckland cases.

Variables	b coef.	S.E.	Coef./SE	P
(Intercept)	0.3753	0.3615	1.04	0.2993
Rain days in preceding month	0.0636	0.0181	3.52	0.0004

Deviance: 32.34 on 23 degrees of freedom (P = 0.0932)

The results of backwards stepwise unconditional regression using significant variables from the univariate analysis of random control data are presented in Table 2.

Classification and regression tree analysis consistently selected intensity of dry cat food feeding for the primary binary split of the data.

DISCUSSION

The results have confirmed many of the findings of previously published results (Willeberg, 1977). For example, there does seem to be a link between apparent feline inactivity and the development of FUS. Factors such as laziness, sleeping inside, and a high number of rainfall days in the previous month are all significant. The finding that the use of litter trays is associated with FUS is interesting. There may be a biological explanation related to urine retention, with cats being reluctant to urinate in soiled litter somehow contributing to the conditions necessary for development of FUS within the lower urinary tract. The intensity of dry cat food feeding appears to be a significant risk factor. However, it appears that high fluid consumption can compensate for high feeding levels of dry cat food.

Table 2. Final logistic regression model of random control data.

Variables	b coef.	S. E.	Coef./SE	P	OR
(Intercept)	1.3529	0.3134	4.3187	–	–
More than one cat	0.3007	0.1161	2.5898	0.0096	1.35
Behaviour (lazy vs. active)	0.341	0.1553	2.1962	0.028	1.41
Litter tray	0.6314	0.1697	3.7218	0.0002	1.88
Sleeps (in vs. out/variable)	0.3197	0.1286	2.4864	0.013	1.38
Moved house last 3 months	0.7785	0.2338	3.3291	0.0009	2.18
Vet check last 3 months	-0.3984	0.1606	-2.4802	0.013	0.67
Fluid intake (low vs. high)	0.3046	0.1314	2.3181	0.02	1.36
Intensity dry cat food	0.3213	0.1162	2.7647	0.0057	1.38
No tray * can't leave house	-0.4778	0.2158	-2.2137	0.027	0.62
Use tray * can't leave house	0.3108	0.2347	1.3241	0.185	1.36

Null deviance: 519.8364 on 374 degrees of freedom
Residual deviance: 448.0874 on 364 degrees of freedom (P = 0.0017)

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