



Final grant report form: Norman Hayward Fund

The terms and conditions of Animal Welfare Foundation Grants require recipients to complete a final report giving a summary of the work undertaken, including a layman's version which AWF can use in its own publications and in disseminating research results to the general public.

The final report is an opportunity for you to share details of the achievements and implications of the project that AWF has supported. The information is valuable as it allows AWF to assess and review the outputs and outcomes of the projects that we fund and enables the trustees to ensure that research has been carried out in accordance with AWF's charitable objectives.

Please complete and save this form electronically in Word and return it as an e-mail attachment to Erika Singh at erika@animalwelfarefoundation.org.uk. This is also the person you should contact if you have any queries about completing the report.

PROJECT/STUDY TITLE:	Risk factors associated with feline pruritus unrelated to ectoparasites (PUE)
PRINCIPAL APPLICANT(S)	Dr Emily Blackwell Dr Natalie Barnard Aiden Foster
GRANT AWARDED (DATE):	14/08/17

Lay summary of project outcomes, achievements and potential impact on animal welfare: Max 300 words

This study investigated stress as a risk factor for feline (presumed allergic) skin disease where parasites were not involved. The headline findings from this research were;

- Female cats were 2.5 times more likely to suffer from allergic skin disease than male cats.
- Cats in multicat households were less likely to have allergic skin disease, unless there were signs of inter-cat conflict, where they were 2.3 times more likely.

Allergic skin disease is a common, hard to manage condition in cats, which can cause considerable distress to the cat's owner, as well as having a significant impact upon the quality of life of the cat. The findings from this study indicate that environmental stressors can influence the clinical signs of allergic skin disease in cats, over and above the particular allergens that may be driving the condition.

Consideration of potential stressors should therefore form an integral part of the treatment of allergic skin disease, with stress recognition and management techniques implemented alongside systemic and where feasible topical therapies; together with prophylactic parasite control in treatment regimens for allergic cats. In particular, where it exists, efforts should be made to try to reduce conflict between cats in a household.

These findings have informed the content of advice sheets for cat owners on the risk factors for pruritus, including guidance on how to recognize stress in their pet and in cases where more support is required, where to obtain appropriate behavioural advice. Implementing relatively simple practical interventions to decrease the risk of exposure to inter-cat conflict can reduce stress and thus decrease the number of cats requiring

therapeutic intervention, thereby benefiting the welfare of cats, their owners and veterinary practitioners. Given that behavioural interventions are not going to harm the cat and may benefit the whole group, it may be prudent to apply such interventions for all cats with allergic skin diseases including those where parasites (fleas) are likely to be playing a role.

Detailed progress against original objectives: List outcomes against original objectives. Discuss what has been achieved, including any statistical analysis completed as part of the project.

The main objective for this study was to evaluate the risk factors associated with the occurrence of feline pruritus unrelated to ectoparasites (PUE), with an emphasis on stressors in the feline environment.

A questionnaire containing 43 questions was created using Online Surveys[®]. The survey took owners around 30 minutes to complete. The questionnaire was based on one previously used to investigate the role of stress as a flare factor for cats with feline idiopathic cystitis (FIC), modified to include questions relating to allergic skin disease. The questionnaire was distributed over a five-month period, from April to September 2018. It was initially sent to 60 clients who had had cats referred to the dermatology service at Langford Vets that complied with the 'case cat' recruitment criteria and had given consent to be contacted. An option of a paper or online version of the questionnaire was provided. As only 28 complete responses were received from these 60 owners, recruitment was widened to other dermatology referral services and advertisements were placed on social media (Facebook[™] and Twitter[™]) and in veterinary literature. Over the same time period, healthy 'control cats' were recruited for comparison. The healthy (control) cat questionnaire was similar to the 'case-cat' questionnaire, but without the questions that specifically asked about the cat's skin disease.

The questionnaires comprised five sections, covering signalment, early life, health, other animals and people in the household, and lifestyle and husbandry factors. The aim of the questionnaire was to determine if any aspects of the cats' home life, health, husbandry or reactions to potential stressors were predictive for allergic skin disease. Rather than making subjective assessments about their cat's 'stress' levels in different contexts, owners were asked to report behavioural signs associated with distress, making this a more objective measure. The questions were mostly formatted as either tick boxes or likert-type scales to try and standardise the answers for ease of analysis. Some questions required free text answers when an 'other' option was necessary or to provide information about ectoparasite control product and frequency of application.

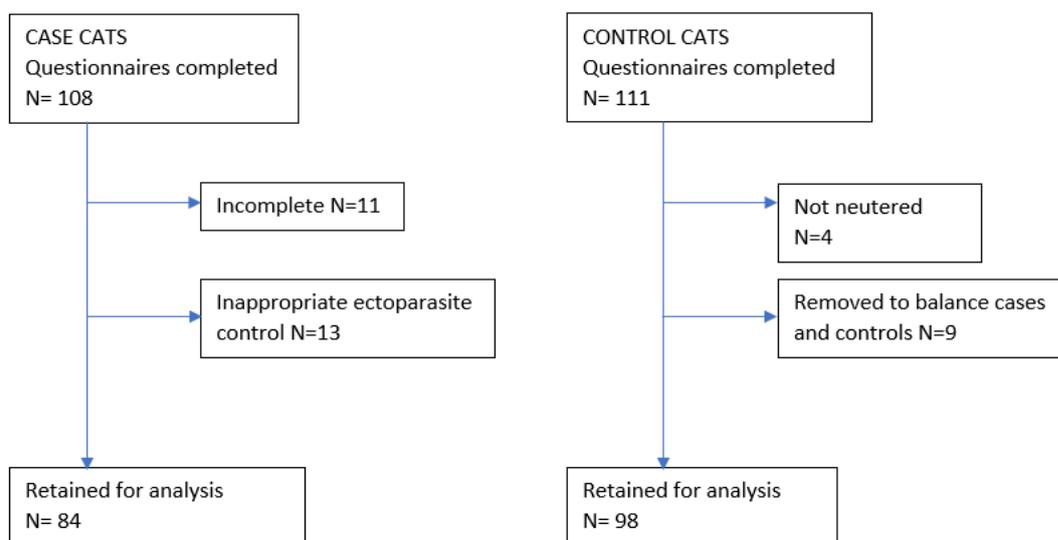
Cats over six months of age, of any sex or breed were included in the study. Cases were defined as those who had been diagnosed with cutaneous adverse food reaction or non-flea, non-food-induced hypersensitivity dermatitis, or with an undetermined diagnosis of allergic skin disease, at least six months prior to completing the questionnaire. To rule out ectoparasites, cats must have been receiving veterinary prescribed ectoparasitic treatment for at least six months, at the manufacturer-recommended frequency. Control cats were age-matched cats who had not shown signs of skin disease in the last year, as reported by the owners.

Univariable logistic regression analysis was used to examine the association between case-control status and individual potential risk factors. Variables that were significant in

the univariable analysis ($p < 0.2$) were used to construct a multivariable logistic regression model using the forward stepwise method, to identify potential risk factors for PUE.

Questionnaires were completed by 219 cat owners, of which 108 were case cats and 111 were controls. Twenty-four case cats were deemed ineligible either because the questionnaires were filled in incompletely ($n=11$) or they were not receiving adequate ectoparasite control ($n=13$). Four cats in the control group were not neutered, while all case cats were neutered so the entire cats were removed from the data set to make the case and control cats more comparable. Control cat numbers were reduced in accordance with these ineligible cats, leaving 98 control cats and 84 case cats.

Figure 1: Flow chart showing case and control cats retained for analysis



The cats' ages ranged from 11 months to 18 years.

The control group comprised 57 males (58.2%) and 41 females (41.8%) and there were 34 males (40.5%) and 50 females (59.5%) in the case group. There was a significant difference in the male to female split between the two groups ($\chi^2=5.66$, $P=0.01$). All cats included in the analysis were neutered. There was no significant difference between the groups in terms of the source of the cats ($\chi^2=0.278$, $P=0.598$), in terms of whether they were a stray, rescue or farm cat, or were obtained from the breeder or bred by the owner. The number of cats in the household ranged from one to ten, with most owners having one or two cats (41.8% and 36.6% respectively) in both groups. Of the cats in multicat households (2 or more cats), 38.6% of cats share one or more resources, including food bowls, water and litter trays. In 48.1% of cats, behavioural signs of having conflict with cats outside the house in the previous 12 months were reported by the owner. Owners described how busy their households were, with 63.5% of households being described as slightly to extremely busy. One aspect of having a busy household was the presence of children, with 36% of households having children or babies. Owners reported 36% of cats had spent one or more nights in a boarding cattery in the prior 12 months before completing the questionnaire. Within the past twelve months, more cats in both groups had suffered from either an illness or an injury than didn't. The most common illness (aside from skin and ear issues in case cats) was vomiting (17.6%) and

the most common injuries were sustained as a result of fights with another cat (50% of reported in injuries in case cats and 36% in control cats). Of cats that were receiving medications, either for their skin disease or another illness, 44% of cats were successfully medicated less than 100% of the time; 12% of cats were not receiving any medication.

Univariable logistic regression analysis was used to examine the association between case-control status and individual potential risk factors, and all variables that were significant in the univariable analysis were taken forward to be included in the multivariable analysis. The final multivariable model contained seven independent variables (sex of cat, illness or injury, presence of children, decrease in outside access, living in a multicat household, signs of conflict with other cats and fear of loud noises). Five of the independent variables made a statistically significant contribution to the model; the cat's sex, whether there was conflict with other cats in the household, whether it was a multicat household, fear of loud noises and presence of illness or injury in the previous 12 months.

The strongest predictor was sex, with female cats being 2.5 times more likely to have skin disease than male cats. Another strong predictor was cats that exhibited negative behavioural signs with other cats in the household. These cats being 2.3 times more likely to have skin disease than those whose owners did not report behavioural signs of conflict between the cats i.e. the cats appeared to be part of the same social group as other cats in the household. Because of this distinction, simply being part of a multicat household was not a significant predictor for skin disease, with the odds of being in a multicat household being 56.4% lower in cases than controls.

The odds of having an illness or injury in the last 12 months was 54.4% lower in cases than controls. The odds of cats showing signs of a fear of loud noises were 57.5% lower in cases than controls. The presence of children or babies in the house and a decrease in outside access did not significantly affect the model.

Were there any challenges or barriers/modifications to the project? Explain the nature of and reasons for any changes in project focus, scope, delivery, schedule or evaluation.

The main challenge to completing this project was the recruitment of case cats. During the planning stages, a preliminary examination of the caseload at Bristol Vet School dermatology referral service suggested that it would be possible to recruit the required number of eligible cats, given an estimated completion rate of 55%, however it became apparent that owners of a significant number of the 102 cats that fulfilled the study criteria were either not willing to complete questionnaires, had lost the cat or had moved from the address held by the hospital and the actual completion rate was 27.5%.

Our contingency plan in the event of not being able to recruit sufficient cats from the Bristol hospital was to extend recruitment to additional referral centres, which we did.

Provide details of knowledge transfer activities to date and any future plans/actions.

The main study was presented at the BVA AWF Discussion Forum June 2019
<https://www.animalwelfarefoundation.org.uk/education-and-debate/2019-discussion-forum/>
Accessed 27/10/2019

The preliminary study was presented at the ECVD-ESVD Annual Congress in 2018
<https://onlinelibrary.wiley.com/doi/full/10.1111/vde.12678>
See page 373 of VDE12678 for details of the abstract.

<p>A letter was published in the Veterinary Record as part of the recruitment of cases for the study. Swales N, Foster A, Blackwell E, Barnard N. (2018) Contributing to study of cats with allergic skin disease. Veterinary Record 183, 165.</p> <p>Nicola Swales has been invited to present the research at a UK dermatology meeting in 2020.</p>
<p>Provide details of any original peer-reviewed research papers, book chapters and books/monographs that have resulted directly from your work supported by this grant.</p>
<p>Swales, N., Foster, A.P., Barnard, N. and Blackwell, E. (In prep). Risk factors associated with feline allergic skin disease unrelated to ectoparasites.</p>
<p>Have any other funding bodies been involved in supporting the development of the work supported by this grant?</p>
<p>No</p>
<p>Has any intellectual property activity has resulted directly from the research funded through this grant to date?</p>
<p>No</p>
<p>Have you, or any of the staff included above, received any prizes, awards or commendations as a direct result of the research supported by this grant to date? If yes please give details, including the name of the recipient.</p>
<p>N/A</p>
<p>If any clinical trials have been supported by the funding of this grant, please enter the title of the trial and briefly describe any key developments or outcomes (Max 300 words)</p>
<p>N/A</p>
<p>Have the results been published? If yes please state when:</p>
<p>Results have been submitted to PLOS ONE for publication</p>
<p>Use the space below for any other relevant information you wish to report on.</p>
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