

An open prospective investigation into aetiology in a group of cats with suspected allergic skin disease

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Abstract This prospective study evaluated the cause(s) of dermatitis in a series of cats with signs suggestive of allergic skin disease. Twenty cases completed the diagnostic evaluation, which included intradermal skin testing, a rigorous flea-control programme, and a 4-month stabilization period on a restricted protein source commercial diet, followed by rechallenge with the cat's original diet. The most common final diagnoses included flea allergic dermatitis (seven cases), and flea allergic dermatitis together with atopy (seven cases). Three additional cases which did not complete the study were also considered to be atopic. No cases were considered to be primarily associated with food hypersensitivity, an observation supporting previous data indicating this to be a rare cause of allergic skin disease in the cat. These observations emphasize the value of a rigorous flea-control programme as part of the management of many cases of feline allergic dermatitis.

Keywords: allergic dermatitis, cat, fleas, atopy, food sensitivity.

INTRODUCTION

Feline allergic dermatitis may result from a number of causes, of which flea hypersensitivity is thought to be the most important.¹ The relative importance of other hypersensitivities, such as to inhaled or dietary allergens, and elucidation of the role they may play singly, or in combination, still require further study in the cat.

The term 'food hypersensitivity' has been applied very loosely in veterinary medicine to describe any adverse reaction to ingested food. True food hypersensitivity is an immunologically mediated phenomenon. To confirm a diagnosis the antigen should be identified, a relationship between antigen exposure and reaction should be shown, and the involvement of a known immunopathogenic pathway demonstrated.² In practical terms these conditions are rarely fulfilled, and presumptive diagnoses tend to be made on the basis of clinical responses to an exclusion diet followed by rechallenge with the patient's original diet. The reported prevalence of food hypersensitivity varies from 1%³ to 11%⁴ of all feline dermatoses. No age, breed or sex predilections have been noted. The clinical manifestations of food hypersensitivity reported are mainly dermatological, namely pruritus, miliary dermatitis, facial dermatitis, erythema and eosinophilic lesions.^{5, 6} Gastrointestinal disease has

also occasionally been reported^{7–9}, and rarely, signs of respiratory and neurological involvement.¹⁰

The aim of this study was to investigate the relative prevalence of causes of feline allergic dermatitis, and in particular food hypersensitivity, within a clinical population in the catchment area of Bristol University School of Veterinary Science.

MATERIALS AND METHODS

Cases were recruited to this study over a period of 18 months, following requests to local practices to refer cats with clinical signs suggestive of food hypersensitivity. Referral of cats with recurrent pruritus, miliary dermatitis, bilateral symmetrical alopecia, or eosinophilic plaque or granuloma was requested. Referring veterinarians were asked to discontinue all medical therapy at least 4 weeks prior to referral. Following referral, cases underwent a diagnostic protocol which included thorough clinical examination, microscopy of coat brushings and skin scrapes, fungal culture, haematology and biochemistry profiles, serology (for feline leukaemia [FeLV] and immunodeficiency [FIV] viruses), skin biopsy, intradermal skin testing, and assessment of intestinal permeability ratio (lactulose : mannitol).

Coat brushings were examined under a light microscope, Wood's lamp, and sent for fungal culture on Sabouraud's Dextrose Agar (Oxoid). Skin scrapes were taken using liquid paraffin as a suspension agent and examined by light microscopy. Blood samples (fasted) were taken by cephalic venepuncture, under manual restraint with no sedation.

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Intradermal skin tests were conducted under sedation with medetomidine (Domitor; Smithkline Beecham) at a dosage of $40 \mu\text{g kg}^{-1}$ intramuscularly (i.m.), following pre-medication with atropine at a dosage of $50 \mu\text{g kg}^{-1}$ i.m. The skin test was performed with the cat in right lateral recumbency, the coat being clipped away from an area on the left thorax measuring $\approx 8 \times 6$ cm. An identical test kit of 40 allergens (Greer Labs) was used on each cat, which included *Ctenocephalides felis*, house dust mites, grass and tree pollens, weed pollens, and moulds, at the suppliers recommended dilutions in protein nitrogen units. A volume of 0.05 mL of each allergen was injected intradermally, using 0.5-mL insulin syringes and 29-gauge needles, and the test was read at 10 and 30 min post-injection. Furthermore, owners were asked to watch for delayed reactions at 12, 24 and 48 h. Skin biopsies were taken under the same sedation using a 6-mm punch biopsy at three separate sites. Biopsies were placed in 10% formalin for histopathology.

Intestinal permeability was assessed using the method described in ref 11. Briefly, following a 12-h fast the bladder was emptied by cystocentesis. A solution of 1.8 g lactulose and 1.7 g mannitol in 50 mL distilled water was then delivered by naso-oesophageal tube to the stomach. Urine was collected by cystocentesis after 6 h and lactulose and mannitol assayed.

During this diagnostic protocol a rigorous flea-control programme was instituted. This programme comprised weekly spraying of all animals in the household with a licensed organophosphate (Nuvan Top; Ciba Geigy), monthly spraying of the indoor environment with a licensed synthetic pyrethroid and insect growth regulator (Acclaim Plus; Ceva). All animals in the household were treated every 3 months for *Dipylidium caninum* infestation with praziquantel (Droncit, Bayer) to eliminate the possibility of pruritus induced by intestinal parasitism.⁴ Following the diagnostic protocol cats were placed on a commercial canned diet with protein sources restricted to chicken and rice (Waltham Veterinary Diet Feline Selected Protein, Masterfoods Austria) for a 4-month stabilization period. Cats were allowed their usual access to the outdoor environment, and the flea-control programme was continued throughout this period. Following the 4-month period the cats were rechallenged with their original diet, and responses assessed.

Cats were evaluated at initial presentation, monthly during the stabilization period, and following rechallenge with their original diet, for body-weight, and 11 parameters assessing clinical condition (Table 1). Assessment was always made by the same veterinary surgeon (H.O'D.), and the scores for each parameter recorded on visual analogue scales.¹² Pruritus was assessed from licking and overgrooming reported by the owners and observed during consultations. In addition, each owner was asked to

Table 1. Clinical parameters assessed during study of cats suspected of having allergic skin disease

Parameter	Extremes of visual analogue scale*	
	Lower	Upper
Generalized pruritus	Normal	Extreme
Dorsal pruritus	Normal	Extreme
Head/neck pruritus	Normal	Extreme
Ventral/abdominal pruritus	Normal	Extreme
Erythema	None	Very red
Scale/seborrhoea	None	Widespread
Excoriations	None	Widespread
Alopecia	None	Entire
Papules/crusts	None	Widespread
EGC—size	None	Very large
EGC—depth	None	Very deep

EGC, eosinophilic granuloma complex.

*Visual analogue scale is represented by a 10-cm line. Line is marked between the extremes according to the clinician's impression of the severity of the sign. A numerical score is subsequently transcribed by measurement.

complete a daily record sheet to help assess compliance to the dietary regimen.

Data from cats with similar diagnoses were generally grouped (as were the four cases classified as idiopathic) for statistical analysis. Exceptions to this were body-weight, and for assessment of the results of re-challenge, where data from all cats completing the feeding study, but not suspected of having gastrointestinal complications, were treated as one group. Data for each clinical parameter were summarized as means and standard deviations. Presenting scores of the groups were compared by analysis of variance. For each of the clinical parameters, scores of the flea allergic dermatitis (FAD) and FAD concurrent with atopy groups were compared through to the end of the management phase using analysis of variance and a repeated measures design.¹³ This provided tests for differences between the groups, and interactions between the groups and time. Paired *t*-tests were used to test for differences in body-weight at each of the management time points compared with initial values, to compare the scores for each of the clinical parameters before and after rechallenge with the cats' original diets, and to compare initial scores for each parameter with those at the end of the stabilization phase within the two main diagnosis groups. These analyses were undertaken using the general linear model algorithm in the software package GLIM 3.77 (Royal Statistical Society, Oxford), or on a PC-based statistical package (Statgraphics, Manugistics, Rockville, Maryland, USA).

RESULTS

Twenty-five cats started the trial; 13 were neutered females, 11 were neutered males, and one was an entire male. Nineteen of the cats were domestic shorthairs, three were domestic longhairs, two were

Abyssinian and one was Persian. The age at presentation ranged from 2 to 13 years, with a mean age of 5 years. The age at onset of clinical signs ranged from 4 months to 11 years, with a mean of 3.5 years. The major presenting signs are summarized together with the final diagnoses in Table 2.

Previous therapy had been varied, including combinations of glucocorticoids, progestagens, anti-parasitic agents, antibiotics, thyroid hormone, and homeopathic preparations. No cat had received treatment within the month prior to entering the trial. Previous diet was mainly based on a variety of canned foods.

Skin scrapes from all cases were negative for ectoparasites. Coat brushings were negative for dermatophytes from all cats, although two cats showed evidence of fleas or flea excreta. Intradermal

skin tests were performed in 23 cats, the results of which are summarized in Table 3. Skin biopsies were taken from 11 cats. Five showed non-specific mild mixed inflammatory cell infiltrate, suggestive of a hypersensitivity response. Three had eosinophilic infiltrates and other histological features compatible with a diagnosis of eosinophilic granuloma/plaque. Two cats with generalized papulocrustaceous dermatitis showed a deeper and more severe mixed inflammatory cell component and more prominent epidermal hyperplasia. One cat, with facial excoriation, showed only epidermal ulceration.

Routine blood biochemistry and haematology were generally unremarkable. Five cats had eosinophil counts above the normal range, although only one showed marked eosinophilia ($15\text{--}20 \times 10^9 \text{ L}^{-1}$, compared with a mean from the other cats of

Table 2. Predominant clinical presentations and final diagnoses in cats suspected of having allergic skin disease

Clinical presentation	Final diagnosis					
	FAD	Atopy	FAD & atopy	IBD	HPES	Idiopathic
Symmetrical alopecia	6		1			1
Dorsal papulocrustaceous lesions	1		4			1
Facial dermatitis			1			4*
Eosinophilic granuloma complex	3					
Generalized papulocrustaceous lesions				1	1	
Seborrhoea sicca			1			
Cats completing trial ($n=20$)	7	0	7	1	1	4
Cats not completing trial ($n=5$)	0	3	0	0	0	2

FAD, flea allergic dermatitis; IBD, inflammatory bowel disease (with dermatological signs); HPES, hypereosinophilic syndrome.

*One of these cats also showed mild lesions of eosinophilic granuloma complex.

Table 3. Selected results of intradermal skin testing in cats suspected of having allergic skin disease

Cat no.	Test substance					Final diagnosis
	Histamine (positive control)	Flea allergen	House dust allergens	Pollen allergens	Mixed insect	
2	+	+	+	+	+	EGC (atopy?)
4	+	+	—	—	+	FAD
5	+	—	—	—	—	Idiopathic
6	+	—	+	—	—	EGC (atopy?)
7	+	+	—	—	+	FAD
8	+	+	+	—	+	FAD & atopy
9	+	+	—	—	+	FAD
10	+	—	—	—	—	Idiopathic
11	+	+	—	—	—	FAD
12	+	—	+	+	—	EGC (atopy?)
13	No skin tests performed due to generalised lesions					IBD
14	+	—	+	—	+	FAD and atopy
15	+	+	+	—	+	FAD and atopy
16	+	+	—	—	—	FAD
17	+	+	—	—	+	FAD and atopy
18	+	+	+	—	—	FAD and atopy
20	+	+	—	—	+	FAD
22	+	—	—	—	—	Idiopathic
23	+	—	—	—	—	Idiopathic
25	No skin tests performed due to generalised lesions					HPES
26	+	—	+	—	—	FAD and atopy
27	+	+	+	—	+	FAD and atopy
28	+	—	—	—	—	Idiopathic
29	+	+	+	+	+	FAD
31	+	—	—	—	—	Idiopathic

+ = positive reaction, — = negative reaction.

HPES, hypereosinophilic syndrome; IBD, inflammatory bowel disease; FAD, flea allergic dermatitis; EGC, eosinophilic granuloma complex.

$1.53 \times 10^9 \text{ L}^{-1}$ and a laboratory normal range of $1.2 \pm 1.0 \times 10^9 \text{ L}^{-1}$). All cats were FeLV antigen negative, and only one tested FIV antibody positive.

Fourteen cats were evaluated for intestinal permeability at the start of the trial. Thirteen had intestinal permeability ratios within the normal range.¹¹ One cat with severe generalized dermatitis and concurrent weight loss had an elevated ratio, suggestive of increased intestinal permeability.

Compliance with the 4-month dietary regimen was good, with 20 of the cats completing the stabilization period and dietary rechallenge. Of the other five cats, only two were withdrawn because of refusal to eat the diet, one other cat was withdrawn because of poor owner compliance, and two (both with eosinophilic granuloma complex [EGC]) because of deterioration in their clinical condition when weaned off medication. There was no significant change in mean body-weight of cats completing the study (mean and standard deviation of initial and end of stabilization period body-weights were 4.44 ± 1.13 and 4.5 ± 0.91 kg, respectively). Clinically, the most important observation with regard to feeding was that there were no significant changes in the scores for any of the parameters when the cats were rechallenged with their original diets. Evaluation of individual scores revealed that only one of the 20 cats showed deterioration in clinical signs when rechallenged. However, the severity of clinical signs in this cat, which was in the FAD group, had already begun to worsen in the latter part of the stabilization period.

At presentation the severity of clinical signs was not significantly different in the cats with FAD (Table 4) and those with FAD and atopy (Table 5), with the exception of a higher score ($P < 0.05$) for papules/crusts in the latter group. However, the idiopathic group showed significantly ($P < 0.05$) more severe head/neck pruritus and excoriations (Table 6). In addition, lesions of EGC were also present in one cat in this latter group, but not in any of the cats in the other two groups. Results from this idiopathic group

were not included in the analysis of changes during the stabilization period, because of these differences with the other groups, the small size of this group, and the possibility that this was not an homogenous group from the point of view of the underlying aetiology of disease.

Comparison of the initial and end of stabilization clinical scores for the FAD group showed significant reductions in generalized, dorsal, and ventral/abdominal pruritus, and alopecia. A similar comparison in the group with FAD and atopy showed a significant reduction only in erythema. Clinical evaluation suggested improvement in some other parameters, although changes were not statistically significant (e.g. alopecia $P = 0.057$; papules and crusts $P = 0.051$). Repeated measures analysis revealed significant group $\times$ time interactions for generalized and ventral/abdominal pruritus, alopecia and papules/crusts, suggesting that the groups had different response patterns over time. In addition, over the course of the study, the FAD and atopy group had significantly more severe head/neck pruritus.

Individual animals showed marked clinical improvements. This was particularly true of the FAD group. All except the one cat mentioned above showed considerable reductions in scores for generalized, dorsal and ventral/abdominal pruritus during the study. Improvements were also noted in scale/seborrhoea, excoriations, alopecia, papules/crusts, and erythema in most of the animals in this group showing these signs (Table 4). Individual responses were more variable in the group diagnosed as having FAD and atopy (Table 5), and in the idiopathic group (Table 6). Within both groups, however, more cats showed improvements in most signs, than deteriorations.

The two cats with widespread papulocrustaceous dermatitis had concurrent weight loss (cases 13 and 25). One of these had elevated intestinal permeability (case 13), and both showed abnormal breath hydrogen patterns suggestive of gastrointestinal dysfunction.

Table 4. Clinical signs of cats with flea allergic dermatitis ($n = 7$)

		Score at trial phase (mean and standard deviation) ¹				
		Stabilization period				
Clinical sign	Initial visit	After 1 month	After 2 months	After 3 months	After 4 months	After rechallenge with original diet
Generalized pruritus	2.87 (0.74)	1.91 (1.00)	1.23 (0.70)	0.77 (0.52)	0.74 (0.60)*	0.84 (1.17)
Dorsal pruritus	1.79 (1.58)	1.06 (1.16)	0.76 (0.74)	0.37 (0.44)	0.37 (0.54)*	0.74 (1.70)
Head/neck pruritus	0.09 (0.15)***	0.03 (0.08)	0	0	0	0.09 (0.23)
Ventral pruritus	3.67 (1.64)	2.10 (1.31)	0.97 (1.31)	0.60 (0.55)	0.94 (1.14)*	0.94 (1.31)
Scale/seborrhoea	0.29 (0.63)	0.11 (0.23)	0.10 (0.13)	0.04 (0.11)	0	0
Excoriations	0.06 (0.10)***	0.04 (0.11)	0	0	0	0
Alopecia	4.04 (1.85)	2.36 (1.73)	1.70 (1.18)	0.79 (0.46)	0.59 (0.49)*	0.80 (1.52)
Papules/crusts	0.26 (0.41)***	0.03 (0.08)	0.23 (0.43)	0	0.21 (0.39)	0.70 (1.64)
Erythema	0.53 (0.82)	0.10 (0.15)	0.07 (0.19)	0	0.11 (0.30)	0.16 (0.42)
Depth of EGC ²				Not present		
Size of EGC ²				Not present		

¹Transcribed from recordings on visual analogue scales; ²eosinophilic granuloma complex.

*Significantly different ($P < 0.05$) from score at initial visit.

**Significantly different ($P < 0.05$) from initial score of idiopathic group (Table 6).

***Significantly different ($P < 0.05$) from initial score of FAD and atopy group (Table 5).

Table 5. Clinical signs of cats with flea allergic dermatitis and atopy ($n = 7$)

		Score at trial phase (mean and standard deviation) ¹				
		Stabilization period				
Clinical sign	Initial visit	After 1 month	After 2 months	After 3 months	After 4 months	After rechallenge with original diet
Generalized pruritus	2.37 (2.41)	2.23 (1.74)	2.49 (2.51)	2.80 (2.30)	2.08 (1.95)	2.26 (2.04)
Dorsal pruritus	3.03 (2.68)	2.56 (2.81)	2.57 (3.08)	2.57 (3.08)	1.18 (1.35)	1.70 (2.30)
Head/neck pruritus	0.97 (1.31)***	0.69 (0.67)	0.73 (0.73)	0.70 (0.90)	0.67 (0.85)	0.54 (1.01)
Ventral pruritus	1.59 (2.31)	1.26 (1.75)	1.14 (2.13)	1.14 (1.44)	0.88 (1.29)	0.84 (0.83)
Scale/seborrhoea	1.14 (1.30)	0.53 (0.60)	0.91 (1.08)	1.37 (1.81)	1.25 (1.62)	1.19 (1.97)
Excoriations	0.29 (0.38)***	0.14 (0.27)	0.10 (0.19)	0.06 (0.15)	0.05 (0.12)	0
Alopecia	2.89 (2.03)	2.20 (1.42)	2.06 (1.70)	2.19 (2.00)	1.45 (1.24)	1.83 (2.16)
Papules/crusts	1.51 (1.45)***	1.03 (0.94)	0.51 (0.66)	0.39 (0.30)	0.38 (0.50)	0.16 (0.15)
Erythema	0.81 (0.68)	0.34 (0.28)	0.34 (0.42)	0.21 (0.25)	0.17 (0.36)*	0.03 (0.08)
Depth of EGC ²		Not present				
Size of EGC ²		Not present				

¹Transcribed from recordings on visual analogue scales; ²eosinophilic granuloma complex.*Significantly different ($P < 0.05$) from score at initial visit.**Significantly different ($P < 0.05$) from initial score of idiopathic group (Table 6).***Significantly different ($P < 0.05$) from initial score of FAD and atopy group (Table 4).**Table 6.** Clinical signs of cats with idiopathic skin disease ($n = 4$)

		Score at trial phase (mean and standard deviation) ¹				
		Stabilization period				
Clinical sign	Initial visit	After 1 month	After 2 months	After 3 months	After 4 months	After rechallenge with original diet
Generalized pruritus	2.55 (2.03)	1.13 (1.08)	2.58 (2.73)	3.10 (3.5)	2.20 (2.41)	1.90 (2.11)
Dorsal pruritus	0.45 (0.21)	0.28 (0.66)	0.75 (0.66)	1.00 (1.51)	0.63 (0.85)	0.43 (0.57)
Head/neck pruritus	3.73 (3.09)*	2.38 (3.37)	3.03 (3.34)	1.70 (1.18)	1.70 (1.15)	1.25 (1.06)
Ventral pruritus	0.78 (1.36)	0.70 (0.95)	1.00 (1.42)	1.08 (2.00)	0.70 (1.09)	0.50 (0.76)
Scale/seborrhoea	1.40 (2.67)	1.63 (3.25)	1.73 (3.45)	0.33 (0.65)	0.50 (0.53)	0.45 (0.58)
Excoriations	1.40 (1.58)*	0.68 (0.94)	0.80 (1.18)	0.70 (1.27)	1.03 (1.37)	0.33 (0.34)
Alopecia	1.80 (1.81)	1.56 (1.33)	2.10 (1.76)	2.45 (2.42)	1.85 (1.94)	1.28 (1.49)
Papules/crusts	1.10 (1.11)	0.58 (0.69)	0.88 (0.91)	0.68 (0.78)	0.50 (0.44)	0.35 (0.30)
Erythema	2.58 (2.85)	1.95 (3.18)	2.28 (3.50)	0.88 (0.71)	0.60 (0.55)	0.25 (0.17)
Depth of EGC ²	0.28 (0.55)	0.10 (0.20)	0.15 (0.30)	0.08 (0.15)	0.08 (0.15)	0.08 (0.15)
Size of EGC ²	0.33 (0.65)	0.13 (0.25)	0.13 (0.25)	0.10 (0.20)	0.10 (0.20)	0.18 (0.35)

¹Transcribed from recordings on visual analogue scales; ²eosinophilic granuloma complex.*Significantly different ($P < 0.05$) from initial scores of other groups.

tion. Due to the severity of clinical signs both cats received concurrent medical therapy (oral prednisolone) with the diet trial. Attempts to reduce the dosage were not successful, and neither cat deteriorated on rechallenge with its original diet.

DISCUSSION

The variation in reported prevalence of adverse reactions to diet and dietary hypersensitivity in the cat^{5,6,14,15} serves to underline the difficulties encountered in substantiating a diagnosis. The main allergic factors investigated in this study were flea extract, dietary proteins and inhaled allergens. Of the cats completing the trial 35% were judged to have flea bite hypersensitivity alone, and a further 35% concurrent flea bite and atopy. Three additional cases which did not complete the trial were also considered to have atopy on the basis of intradermal skin testing and clinical presentation. In previous studies of food hypersensitivity in the cat, 21%⁶ and 31%¹⁵ of the cats were reported to have flea bite and/or inhalant allergy

concurrently. In one further study, no investigation was made of concurrent hypersensitivities.⁵

In the previous studies of food hypersensitivity in the cat little reference is made to indicate whether or not there was concurrent flea control. Flea-bite hypersensitivity is recognized as the primary cause of allergic dermatitis in the cat,¹⁶ based on the demonstration of fleas or flea excreta in coat brushings, a positive intradermal response to flea allergen, and clinical improvement following a rigorous flea-control programme. In this study, none of the cats that were positive to intradermal *C. felis* allergen and subsequently responsive to a flea-control programme showed any evidence of flea debris in coat brushings. Two other cats in the trial, on whom flea debris could be demonstrated, subsequently proved negative to *C. felis* allergen and unresponsive to flea-control measures. These findings tend to suggest that evidence of flea debris in the coat is not a reliable indicator of a potential diagnosis of flea-bite hypersensitivity. Indeed, it seems likely that hypersensitive cats will rapidly remove fleas from their coats by grooming or scratching.

The results of the intradermal skin test with *C. felis* allergen correlated well with the response to flea-control measures in this study, suggesting good sensitivity and specificity. However, in practical terms, intradermal skin testing may not be readily available, so response to good flea-control measures appears to be the best method of assessing flea-bite hypersensitivity. In the majority of cases it took 4 or more weeks after rigorous flea control was initiated for visible hair regrowth and/or reduction in papular lesions to occur. Most owners had undertaken some form of antiparasitic therapy prior to the trial, but had failed to include environmental control, endoparasitic agents, or to persevere with regular application. The environmental agent (Acclaim Plus, Ciba Geigy) was used at an 'off label' advice frequency of monthly during the trial, with owners subsequently reverting to an on-label usage of 3-monthly applications. Owner compliance to flea control during the trial was very good in 85% of cases, although this group of owners may have represented a more motivated group than average first-opinion clients. It is likely that the poor response of one of the cats in the FAD group in the latter part of the stabilization period reflected poor owner compliance to the flea-control programme, although the presence of an additional unidentified complicating factor in this individual's disease process is a further possibility. The clinical responses of the FAD and atopy group to the treatment regimen were also generally positive, although as shown by the data analysis, improvements in some parameters were less marked than those of the FAD group. These varied responses were not unexpected, given the different underlying causes of disease.

The prevalence of positive intradermal skin tests to inhalant allergens in 10/20 (50%) (Table 3) of cases in this trial is much higher than the prevalence of 8–10% of feline skin disorders attributed to atopy previously.¹⁷ In 9/20 cases (45%) it appeared to be a clinically significant component of the allergic challenge. In the one remaining case, the control of concurrent flea bite hypersensitivity removed the clinical signs. Three of the nine cats (33%) with positive intradermal skin tests had lesions of the EGC. Previous studies have suggested that between 12.5¹⁶ and 39% (A. Prost pers. comm.) of atopic cats exhibit EGC lesions. Five of the cats with positive intradermal skin test results underwent subsequent hyposensitization. The response after 18 months was judged as good in two, moderate in one, and poor or none in two cases. Prost suggests a success rate of 73% following hyposensitization of atopic cats (A. Prost pers. comm.), but results in the UK have been less promising (unpublished observations). The limited success of hyposensitization therapy in some of the cats in this trial was supportive of the use of intradermal skin tests in selecting cases in which inhaled allergens may have been involved. However, with such a small number of cases no strong conclusions can be drawn.

The optimum duration of a diet trial for cats suspected of food hypersensitivity is debatable. Empirical recommendations in the past suggested a 3-week duration, but more recent studies indicated that in a small percentage of cases up to 10 weeks' duration may be necessary.¹⁵ This study included a diet trial period in excess of this latter recommendation, making it extremely unlikely that any cases of food hypersensitivity were unrecognized due to insufficient length of the dietary trial. Rechallenge with the original diet is essential to substantiate a diagnosis of food hypersensitivity, but problems can be encountered with owner compliance, particularly if there has been an improvement in the animal's clinical condition during the dietary trial. In previous studies of cats judged to be food allergic, rechallenge was achieved in 100,¹⁵ 79,⁶ and 0%,^{5,14} respectively. The time elapsed before the return of clinical signs is only reported in one study and varied from 15 min to 10 days.¹⁵ All the cats in the current study were rechallenged, and none, based on their responses, was considered to have dietary hypersensitivity as a primary cause of their clinical signs. This was considered to be the case even in the cat which showed worsening of some signs after rechallenge, as deterioration had begun earlier in the trial.

The clinical signs in four cats remained static throughout the trial and rechallenge. The possibility of food sensitivity was further investigated in these cats by feeding two additional diets. These investigations were conducted because of the possibility that the cats may have been intolerant of chicken, and secondly, because of concerns regarding the suitability of using commercial foods as exclusion diets for diagnosis. This latter concern arises from observations of exacerbation of clinical signs in some dogs when fed commercial exclusion diets, compared with feeding an equivalent home-prepared diet.¹⁸ This occurrence has also been recorded in one cat.⁶ A commercial canned diet with protein sources limited to venison and rice (Waltham Veterinary Diet Feline Selected Protein, Masterfoods Austria), was followed by a home-prepared diet of rabbit and rice. Each diet was fed for a 6-week period, during which cats were confined indoors. None of the cats showed any clinical improvement on either diet. This made a diagnosis of food hypersensitivity very unlikely. The number of cases showing facial pruritus in which an underlying aetiology could not be identified was an interesting observation. It is speculative whether these were cases of irritant or allergic contact dermatitis, or possibly insect bite hypersensitivity? This is a group of cats which can be very frustrating for the clinician to manage.

This lack of cases of dietary hypersensitivity was surprising. Previous studies have reported prevalence of the condition in the USA and continental Europe, and it is possible that there may be true geographical differences, although this seems improbable. However, close evaluation of the figures from the

American studies that incorporated rechallenge reveals only 14 cases in 5 years drawn from three referral populations,⁶ and 13 cases in 4 years from a referral hospital;¹⁵ an average of about three cases per year. Thus it seems that dietary hypersensitivity may be a rare condition in the cat. The data from the current study support this low prevalence, and whilst this is considered to be a genuine finding, it is also possible that the explanation is more complex. It could be argued that dietary management may have reduced one aspect of allergenic challenge, allowing better control of other factors, e.g. flea saliva hypersensitivity. On this basis it would have to be assumed that control of these other factors was so good by the time of reintroduction of the original diet (after approximately 4 months), that the renewed dietary challenge was not of clinical significance.

Histopathological findings in these cases appeared to be non-specific and of little diagnostic value. The aetiology and pathogenesis of lesions of the eosinophilic granuloma complex are still undetermined, although it is a recognizable pathological entity. In this study there appeared to be a strong association between positive intradermal skin test results and the presence of eosinophilic granuloma.

The presence of a mild peripheral eosinophilia has been reported to be 91% predictive of cats with underlying allergic or parasitic skin disease.¹⁹ In this study only 5/25 (20%) of the cats had elevated eosinophil counts, of which definitive diagnoses were made in four out of five cases (atopy, FAD, hypereosinophilic syndrome). In the remaining 20/25 (80%) of the cats, where eosinophil counts were within the normal range, 15/25 were definitively diagnosed as having allergic or parasitic skin disease. These findings support the view that a normal eosinophil count may be found frequently in cats with underlying allergic or parasitic skin disease, and is of poor predictive value in evaluating idiopathic feline symmetric alopecia (IFSA).

One cat with severe papulocrustaceous dermatitis was given a tentative diagnosis of hypereosinophilic syndrome on the basis of clinical and pathological findings.^{16, 20, 21}

Intestinal permeability ratios have been studied in humans in relation to food allergy. Abnormal permeability following antigen challenge in children with eczematous skin disease supports the hypothesis that once sensitized the physiological absorption of dietary antigen may be sufficient to maintain an allergic response in the skin.²² Thirteen of 14 cats evaluated in this trial showed intestinal permeability ratios within the normal range,¹¹ and none of these cases was subsequently judged to have a food allergic component. The one cat with an elevated permeability ratio showed obvious clinical signs of concurrent gastrointestinal disease.

Food hypersensitivity may be involved in some cases of gastrointestinal disease. Previous reports of cats with food hypersensitivity suggest that 10–15%

of cases show concurrent skin and gut involvement²³ and food hypersensitivity has been implicated as a cause of lymphocytic-plasmacytic gastroenteritis.²⁴ Thus, diets of the type used in this study (i.e. limited protein source) may prove to be a useful adjunct to therapy of some types of gastrointestinal disease. It has recently been reported that a commercial chicken and rice based diet was a useful component of management of chronic idiopathic colitis in dogs,²⁵ and anecdotally, it appears that similar diets are used quite widely in gastrointestinal problems in cats in veterinary practice. Two of the cats in this study had concurrent gastrointestinal disease. Both exhibited generalized papulocrustaceous dermatitis, moderate pruritus and weight loss despite polyphagia. In these cases, neither cat responded to dietary therapy alone, but both responded well to a combination of the diet with high levels of oral prednisolone (2 mg kg⁻² day⁻¹). Further studies are required to elucidate the role of food antigens in feline gastrointestinal disease.

The low level of concurrent infection with either FeLV or FIV suggests that neither virus plays a significant role in the pathogenesis of allergic dermatitis in the feline. Several reports of clinical signs in FIV-infected cats describe chronic skin disease,²⁶ but there are no further details. It seems likely that such skin disease is related to secondary opportunist infections, e.g. dermatophyte, bacterial, viral; combined with the immunosuppressive and debilitant effects of FIV, rather than allergic disorders *per se*.

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Résumé Une étude étiologique prospective a été réalisée dans une population de chats suspects de dermites allergiques. Des tests cutanés intradermiques ont été réalisés ainsi qu'un contrôle antipuce rigoureux et un régime d'élimination, faisant appel à une alimentation du commerce restreinte en protéines pendant 4 mois, suivi par une réintroduction de l'alimentation initiale du chat. Le diagnostic le plus fréquent est la Dermite par Allergie à la Piqûres de Puce (DAPP) (7 cas), une DAPP associée à une atopie (7 cas). Trois cas supplémentaires sont atopiques. Aucun cas n'est en rapport avec seulement une allergie alimentaire. Cette observation montre que l'allergie alimentaire est une cause rare de dermite allergique chez le chat. Ces observations confirment par ailleurs l'intérêt d'un contrôle antipuce rigoureux dans la gestion thérapeutique des dermites allergiques du chat. [O'Dair, H.A., Markwell, P.J., Maskell, I.E. An open prospective investigation into aetiology in a group of cats with suspected allergic skin disease (Etude étiologique prospective ouverte dans une population de chats suspects de dermite allergiques). *Veterinary Dermatology* 1996; **7**: 193-202.]

Resumen Este estudio prospectivo evalúa la(s) causa(s) de dermatitis en un grupo de gatos con síntomas sugestivos de dermatosis alérgica. Se evaluó el diagnóstico de veinte casos, incluyendo pruebas cutáneas intradérmicas, programa riguroso de control de pulgas y un periodo de cuatro meses de estabilización con una dieta comercial con fuente de proteína restringida, seguido de una re-exposición a la dieta original del gato. El diagnóstico final más frecuente fue de dermatitis alérgica a las pulgas (siete casos) y dermatitis alérgica a las pulgas con atopia (siete casos). Tres casos más que no completaron el estudio fueron también considerados atópicos. Ninguno de los casos fue considerado estar principalmente asociado a una hipersensibilidad alimentaria, lo que apoya hallazgos previos indicativos de que este tipo de hipersensibilidad es poco frecuente en el gato. Estos hallazgos resaltan la importancia de un programa rigurosos de control de pulgas en el protocolo de manejo de muchos casos de dermatitis alérgica felina. [O'Dair, H.A., Markwell, P.J., Maskell, I.E. An open prospective investigation into aetiology in a group of cats with suspected allergic skin disease (Investigación prospectiva abierta de la etiología en un grupo de gatos sospechosos de dermatosis alérgica). *Veterinary Dermatology* 1996; **7**: 193-202.]

Zusammenfassung Diese prospektive Untersuchung wertete die Fälle von Dermatitis bei einer Reihe von Katzen aus, die Symptome aufwiesen, welche auf eine allergische Hautkrankheit deuteten. Zwanzig Fälle wiesen eine vollständige diagnostische Untersuchung auf, die intradermale Hauttests, striktes Flohbekämpfungsprogramm und eine viermonatige Stabilisierungsphase mit einer kommerziellen Diät mit begrenzten Eiweißquellen, gefolgt von einer Provokation mit dem bisher üblichen Katzenfutter, beinhaltete. Die häufigste endgültige Diagnose bestand in Flohbißdermatitis (sieben Fälle) und Flohbißdermatitis zusammen mit Atopie (sieben Fälle). Drei weitere Fälle durchliefen die Studie nicht vollständig, wurden aber als atopisch angesehen. Kein Fall wurde primär in Verbindung mit Futtermittelhypersensibilität gesehen, eine Beobachtung, die frühere Daten unterstützt, die dies als seltene Ursache bei allergischen Hautkrankheiten der Katze nennt. Diese Beobachtungen betonen die Bedeutung des genauen Flohbekämpfungsprogramms als Teil des Management vieler Fälle von allergischen Hautkrankheiten bei der Katze. [O'Dair, H.A., Markwell, P.J., Maskell, I.E. An open prospective investigation into aetiology in a group of cats with suspected allergic skin disease (Offene prospektive Untersuchung über die Ätiologie bei einer Gruppe von Katzen mit Verdacht auf allergische Hautkrankheiten). *Veterinary Dermatology* 1996; 7: 193–202.]