

# Pilot study: prevalence of positive aeroallergen reactions in 10 cats with small-airway disease without concurrent skin disease

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## What is known about the topic of this paper

- Feline obstructive lung disease is common in cats and there are many possible causes.
- There exists experimental and clinical work to suggest that some cats with feline obstructive lung disease may benefit from immunotherapy.
- In order to further identify and define the population of cats with feline obstructive lung disease that have an underlying allergic aetiology, it is necessary to know whether or not currently available diagnostic tests can be used to detect allergy reactions.

## What this paper adds to the field of veterinary dermatology

- Compared to normal cats, cats with idiopathic small-airway disease have more positive allergy reactions on intradermal skin test and serum immunoglobulin E tests. In other words, positive reactions were more common in cats affected with small-airway disease than normal cats. To date, these two populations have not been compared.
  - The findings from this pilot study indicate that currently available allergy testing modalities could be used as part of the methodology to help identify what role, if any, allergy has in the pathogenesis of cats with idiopathic small-airway disease.
  - Study criteria required that cats be free of skin disease to minimize the possibility that positive reactions were due to another known hypersensitivity reaction.
  - Interestingly and unexpectedly this became an obstacle to recruit cats.
  - Prior case reports on cats with idiopathic small-airway disease did not report that these cats had skin disease.
  - This may be unique to this study or there may be an overlap in population of cats with airway and skin disease. This needs further study.
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## Abstract

**The purpose of this study was to determine the prevalence of positive allergen reactions in cats with small-airway disease (i.e. 'feline asthma', 'feline**

**allergic bronchitis', 'feline bronchial disease'). Intradermal skin tests (IDT) and serum immunoglobulin E (IgE) tests were performed in 10 cats with idiopathic small-airway disease and in 10 normal cats without a history of respiratory disease. None of the cats had a history of skin disease or clinical signs of skin disease at the time of testing. Significantly more individual positive allergen reactions were found on serum IgE tests than on IDT in both groups of cats. Affected cats had significantly more individual positive allergen reactions on both tests than unaffected cats. Both IDT and serum IgE tests resulted in more individual positive allergen reactions to weeds, trees, grasses, and/or moulds in affected cats than in normal cats. Significantly more positive allergen reactions to house dust mites were found in affected compared to non-affected cats by IDT but not by serum IgE testing. One unexpected obstacle to inclusion of more affected cats in the study was the concurrent presence or history of suspect or known allergic skin disease. Concurrent allergic skin disease has not been reported in association with small-airway disease in cats. The increased prevalence of individual positive allergen reactions in affected cats may be due to increased immunological reactivity in these cats. Further studies are needed to answer this question and to determine what role, if any, aeroallergens have in the pathogenesis of this complex feline disease.**

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Small-airway inflammatory disease affects many cats and is caused by persistent airway inflammation.<sup>1-8</sup> Although the role of allergic response as the initiator or mediator of small-airway inflammation in affected cats is controversial, experimental studies have shown that airway inflammation and reproduction of clinical signs can be simulated by antigenic or allergenic stimulation leading to activation of CD4+ lymphocytes and initiation of a Th2 immune response.<sup>1,9-11</sup> The most common clinical signs of small-airway disease in the cat include chronic cough, loud breathing, rapid or laboured breathing, lethargy, exercise intolerance and acute respiratory distress.<sup>1</sup> Clinical signs can be acute or chronic and most often are first reported in young to middle-aged cats.<sup>1-8</sup> The same clinical signs can be caused by any number of diseases including, but not limited to, parasitic, infectious, cardiac, or neoplastic causes. Because idiopathic small-airway disease requires lifelong management, every effort is made to identify a

treatable and curable disease. If no underlying cause is found, a clinical diagnosis of 'idiopathic inflammatory lung disease', 'idiopathic feline bronchial disease or complex' or 'idiopathic feline asthma' is made and the focus turns to treatment options. From a treatment perspective, what is common among these cats is that they have a hyper-responsive airway and their clinical signs are usually glucocorticoid responsive. The observation that clinical signs are suggestive of a hypersensitivity reaction and that the signs are glucocorticoid responsive suggests that in some cats allergens may be one of many underlying triggers. It is important to note that the role of allergens in naturally occurring disease is unproven. Cats have been used as an animal model for the study of human asthma, although it is still unclear how useful animal models of disease are with respect to this complex disease in people.<sup>9–11</sup> The development of an experimental model of feline asthma for the study of human disease has led to the use of this model to study not only the pathophysiology, but also the impact of various treatment options on experimentally induced feline asthma. Evidence exists, including studies involving experimentally induced feline asthma, that immunotherapy may be a treatment option for some cats.<sup>12–16</sup> It is unlikely that all cats with idiopathic small-airway disease have allergic lung disease, but experimental studies suggest that a subset of cats have an underlying allergic trigger for their signs.<sup>9,10,16</sup>

Intradermal testing (IDT) and/or *in vitro* serum immunoglobulin E (IgE) tests are routinely used for the identification of important allergens for immunotherapy in cats with a clinical diagnosis of feline atopy. The goal of the pilot study reported here was to determine the prevalence of positive allergen reactions in cats with a diagnosis of naturally occurring idiopathic small-airway disease. We hypothesized that positive allergen reactions are more common in cats with idiopathic small-airway disease than in cats with no history of inflammatory small-airway disease.

## Materials and methods

This was an open prospective clinical study. The study protocol was reviewed and approved by the University of Wisconsin Animal Care and Use Committee.

### Inclusion and exclusion criteria

For the purposes of this study, cats with skin disease were excluded to minimize the possibility that positive reactions found on allergen testing were due to other known type I hypersensitivity reactions and to ensure that the study population closely matched that of other published studies. Previous studies on cats with idiopathic airway disease did not report skin disease as a finding.<sup>4–8</sup>

### Study cats

The unaffected or normal group consisted of 10 cats that were either housemates of affected cats or cats belonging to faculty or students at the School of Veterinary Medicine, University of Wisconsin. No abnormalities were found upon physical examination and these cats had no history of coughing. The 10 affected cats were recruited from the patient pool presented or referred for the complaint of coughing. Both groups contained nine domestic short-haired cats and one Siamese breed cat and six neutered males and four neutered females. The age of unaffected cats ranged from 1 to 15 years and 3 to 15 years for affected cats. Cats were referred to the dermatology service for

testing only after being diagnosed with idiopathic small-airway disease by the cardiology-respiratory service at the Veterinary Medical Teaching Hospital (VMTH). This diagnosis was based on established and accepted criteria including (i) cats having a compatible history of small-airway disease (i.e. coughing, wheezing, and/or dyspnoea), (ii) cats having compatible clinical findings (pulmonary wheezing, crackles), (iii) lack of identification of a treatable or curable disease via thoracic radiographs, a complete blood count, occult heartworm testing, faecal flotation, cytological examination of tracheal-bronchial fluid, aerobic bacterial culture and *Mycoplasma* spp. culture of tracheal-bronchia lavage fluid (results of diagnostic testing was negative or normal; data not shown), and (iv) lack of resolution of clinical signs after a 21-day trial of doxycycline at 5 mg kg<sup>-1</sup> orally every 12 h. In the clinical experience of the two internists-cardiologists (RH and RS), negative *Mycoplasma* spp. cultures do not consistently rule out this pathogen; therefore, a negative response to therapy is part of the routine evaluation in the VMTH. Antibiotics were discontinued at least 1 week prior to enrolment. No treatments were allowed during the initial investigation, and allergen testing (IDT and serum IgE testing) was completed within 48 h of presentation.

### Allergen testing

After a diagnosis of idiopathic inflammatory lung disease was made, cats were referred to the dermatology service for IDT. Complete dermatological examinations were performed on the cats prior to testing to look for signs of pre-existing skin disease. Owners were questioned and medical records were examined to ensure that none of the cats had received glucocorticoid therapy for at least 12 weeks prior to allergy testing. Serum was collected for allergen-specific IgE testing by the commercial laboratory (HESKA Corporation, Fort Collins, CO, USA) used routinely by the dermatology service for testing patients with atopic dermatitis. The laboratory was unaware of the sample's origin (i.e. normal or affected cats). Results of the ELISA test were reported as EA units (ELISA Absorbance units); EA units for the cat range from 0 to 5000. According to the laboratory's recommendations, EA units of 150 or greater are considered significant provided that they correlate with clinical signs. IDT was performed by a single investigator (KM) using previously described protocols.<sup>17</sup> Referral of cases from the respiratory/cardiology service to the dermatology service made it impossible to ensure that KM was blinded to the identity of the cats. IDT was performed under sedation using published protocols known not to interfere with IDT reactions.<sup>17</sup> Phosphate-buffered saline was used as a negative control and histamine (1 : 100 000) was used as a positive control. Thirty-nine test allergens were used in this study (Table 1); testing allergens were used at the same dilution as those used for patients with allergic skin disease. Injection site reactions were scored according to a conventional 0–4 scale using erythema, turgidity, wheal diameter and wheal depth as parameters; saline was considered a '0' and histamine '4'. Sites were assessed objectively by measuring the horizontal and vertical diameters of the injection site reactions. Reactions with diameters equal to or greater than the mean diameter of the positive and negative controls were considered positive. In addition, erythema and/or turgidity and/or induration had to be present for reactions to be scored as 'positive'.

### Data analysis

The median age of cats in the control and affected groups was compared using the Mann–Whitney *U*-test. Fisher's exact test was used for all other comparisons. Nonparametric testing was used because normal distribution of the population for the parameters analysed could not be assumed. The total number of positive allergen reactions by IDT was compared to the total number of positive allergen reactions by serum IgE test within each group. The total number of positive reactions and the proportion of positive allergen reactions in each allergen group (grass, weed, tree, and mould) by IDT and serum IgE tests, were compared between normal and affected cats. Similarly, the proportion of positive allergen reactions to *Dermatophagoides farinae*, *Dermatophagoides pteronyssinus* and cockroach allergens using both detection methods were compared between normal and affected cats. For all tests, a *P*-value < 0.05 was considered significant.

**Table 1.** Test allergens used in 10 normal cats and in 10 cats with idiopathic small-airway disease

|                                |                                                                                                                                                                                                                                                                                                                                    |
|--------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Grasses                        |                                                                                                                                                                                                                                                                                                                                    |
| IDT (n = 7):                   | Meadow fescue, Johnson, timothy/orchard, perennial rye, brome, red top, June bluegrass                                                                                                                                                                                                                                             |
| Serum IgE test (n = 10)        | Meadow fescue, Johnson, sweet vernal, timothy, perennial rye, smooth brome, red top, Bermuda, orchard, June blue grass                                                                                                                                                                                                             |
| Weeds                          |                                                                                                                                                                                                                                                                                                                                    |
| IDT (n = 12)                   | Common cocklebur, lamb's quarter, marsh elder, common mugwort, pigweed mix, English plantain, ragweed mix, red/sheep sorrel, yellow dock, Russian thistle, dandelion, red clover                                                                                                                                                   |
| Serum IgE test (n = 12)        | Common cocklebur, lamb's quarter, marsh elder rough, marsh elder burweed, mugwort, rough pigweed, English plantain, tall ragweed, short ragweed, yellow dock, Russian thistle, kochia                                                                                                                                              |
| Trees                          |                                                                                                                                                                                                                                                                                                                                    |
| IDT (n = 14)                   | Ash mix, aspen, birch mix, box elder, elm mix, maple mix, eastern mix oak, eastern cottonwood, black willow, pine mix, red mulberry, shagbark hickory, black walnut, red cedar                                                                                                                                                     |
| Serum IgE test (n = 15)        | White ash, quaking aspen, black birch, box elder, American elm, sugar maple, white oak, eastern cottonwood, black willow, yellow pine, red mulberry, shagbark hickory, black walnut, red cedar, bayberry wax myrtle                                                                                                                |
| Moulds                         |                                                                                                                                                                                                                                                                                                                                    |
| IDT (n = 3)                    | Grass smut mix (Bermuda grass smut, Johnson grass smut), mould mix 1 ( <i>Alternaria</i> spp., <i>Aspergillus</i> spp., <i>Cladosporium</i> spp., <i>Bipolaris</i> spp., <i>Penicillium</i> spp.), mould mix 2 ( <i>Aureobasidium</i> spp., <i>Drechslera</i> spp., <i>Fusarium</i> spp., <i>Mucor</i> spp., <i>Rhizopus</i> spp.) |
| Serum IgE test (n = 5)         | <i>Penicillium</i> mix, <i>Aspergillus</i> spp., <i>Cladosporium</i> spp., <i>Fusarium</i> spp., <i>Alternaria</i> spp.                                                                                                                                                                                                            |
| Insects and mites              |                                                                                                                                                                                                                                                                                                                                    |
| IDT and serum IgE test (n = 3) | <i>Dermatophagoides farinae</i> , <i>Dermatophagoides pteronyssinus</i> , and cockroach                                                                                                                                                                                                                                            |

IDT, intradermal test; IDT allergens were obtained from Greer Laboratories, Lenoir, NC, USA. Test concentrations were 1000 PNU per ml. Insect allergens were used at a test dilution of 1 : 5000 w/v.

## Results

The median age of normal cats (4.5 years) did not differ significantly from that of affected cats (5.5 years,  $P = 0.39$ ).

Test allergens are summarized in Table 1 and serum IgE and IDT test results are summarized in Tables 2 and 3. The total number of possible individual positive allergen reactions for all 10 cats in each group was 390 and 450 for IDT and serum IgE tests, respectively. In both groups, serum IgE testing detected significantly more positive allergen reactions than IDT. Unaffected cats had 51/390 (13%) positive IDT allergen reactions and 92/450 (20%) positive serum IgE allergen reactions ( $P = 0.0006$ ). Affected cats had 85/390 (21%) positive IDT allergen reactions and 151/450 (34%) positive reactions by serum IgE testing ( $P < 0.001$ ).

Cats with inflammatory lung disease had significantly more positive reactions to all tested allergens than unaffected cats by both IDT (85 vs. 51,  $P = 0.0018$ ) and serum IgE testing (151 vs. 92,  $P < 0.001$ ). As a group, affected cats had significantly more positive allergen reactions than unaffected cats to grasses, weeds, moulds, and/or trees by both allergen tests ( $P = 0.001$ ). Significantly more positive allergen reactions to trees, but not to grasses, weeds or mould allergens were found in affected compared to normal cats when the IDT test was performed ( $P = 0.004$ ). Serum IgE testing resulted in significantly more positive allergen reactions to grasses ( $P = 0.004$ ) and weeds ( $P = 0.0244$ ), but not to trees or mould allergens in affected cats compared to normal cats. IDT detected more positive allergen reactions to house dust mites (*D. farinae* and *D. pteronyssinus*) in affected compared to normal cats ( $P = 0.0095$ ). However, no significant difference was found between the two groups regarding the results of serum IgE testing to house dust mite allergens ( $P > 0.05$ ). No significant difference in the number of positive allergen reactions to cockroach antigen was found between affected and unaffected cats by IDT or serum IgE test ( $P > 0.05$ ).

## Discussion

The investigators recruited an affected study population that most closely represented the clinical population that might be targeted for allergen testing. All of the affected cats in this study had similar clinical presentations including hyperreactive airways, glucocorticoid responsive signs, chronic cough, and respiratory distress. Diagnostic testing failed to identify an underlying cause. Depending on the criteria used in retrospective studies<sup>4–8</sup> or current text books and clinical reviews,<sup>1–3</sup> these same cats might be described as having idiopathic feline asthma, feline asthma syndrome, feline bronchitis, allergic bronchitis, and most recently feline bronchial disease (FBD). For the purposes of this study, the investigators felt the term 'idiopathic small-airway disease' or 'inflammatory lung disease' the most appropriate diagnosis because we could identify the location of the inflammation but not the cause. The role of allergens as a trigger cause of naturally occurring feline inflammatory lung disease is controversial. One of the goals of this study was to determine whether IDT or serum IgE tests could be used to identify triggers that may contribute to the cause of the inflammation associated with idiopathic airway disease.

In this study, we found that affected cats had significantly more individual positive allergen reactions on both IDT and serum IgE testing than did unaffected cats. Affected cats had significantly more positive allergen reactions to grasses, weeds, moulds and trees than unaffected cats by both allergen tests.

It was interesting to note that more positive allergen reactions to house dust mites (*D. farinae* and *D. pteronyssinus*) were found with IDT, but not with IgE testing in affected cats (13/20) than in unaffected cats (4/20). It was recently reported that the irritancy thresholds for IDT allergens in cats may need to be changed and that many 'positive allergen reactions' may in fact be due to irritant reactions.<sup>18</sup> However, in another study, no evidence of

**Table 2.** Number of positive serum IgE test results in normal cats and in cats with idiopathic small-airway disease

| Normal cats | Number of positive serum IgE test* reactions per allergen category and per individual cat |     |       |      |       |      |                   |              |           | Total no. of positives/cat |
|-------------|-------------------------------------------------------------------------------------------|-----|-------|------|-------|------|-------------------|--------------|-----------|----------------------------|
|             | Sex                                                                                       | Age | Grass | Weed | Mould | Tree | <i>D. farinae</i> | <i>D. pt</i> | Cockroach |                            |
| N1          | FS                                                                                        | 7   | 0     | 1    | 0     | 0    | 1                 | 1            | 1         | 4                          |
| N2          | MN                                                                                        | 15  | 10    | 12   | 0     | 11   | 0                 | 0            | 0         | 33                         |
| N3          | MN                                                                                        | 7   | 0     | 0    | 0     | 0    | 0                 | 1            | 0         | 1                          |
| N4          | MN                                                                                        | 4   | 0     | 0    | 1     | 0    | 0                 | 0            | 0         | 1                          |
| N5          | MN                                                                                        | 5   | 2     | 0    | 0     | 1    | 1                 | 0            | 0         | 4                          |
| N6          | MN                                                                                        | 1   | 2     | 2    | 0     | 0    | 1                 | 1            | 0         | 6                          |
| N7          | MN                                                                                        | 4   | 0     | 0    | 0     | 0    | 0                 | 0            | 0         | 0                          |
| N8          | FS                                                                                        | 4   | 0     | 0    | 0     | 0    | 0                 | 0            | 0         | 0                          |
| N9          | FS                                                                                        | 3   | 10    | 12   | 1     | 15   | 1                 | 0            | 1         | 40                         |
| N10         | FS                                                                                        | 5   | 0     | 1    | 1     | 0    | 0                 | 0            | 1         | 3                          |
| Total       |                                                                                           |     | 24    | 28   | 3     | 27   | 4                 | 3            | 3         | 92                         |
| Mean        |                                                                                           |     | 5.5   | 2.4  | 0.3   | 2.7  | 0.4               | 0.3          | 0.3       | 9.2                        |
| Median      |                                                                                           |     | 4.5   | 0    | 0.5   | 0    | 0                 | 0            | 0         | 3.5                        |

  

| Affected cats | Number of positive serum IgE test* reactions per allergen category and per individual cat |     |       |      |       |      |                   |              |           | Total no. of positives/cat |
|---------------|-------------------------------------------------------------------------------------------|-----|-------|------|-------|------|-------------------|--------------|-----------|----------------------------|
|               | Sex                                                                                       | Age | Grass | Weed | Mould | Tree | <i>D. farinae</i> | <i>D. pt</i> | Cockroach |                            |
| A1            | MN                                                                                        | 3   | 10    | 12   | 0     | 13   | 1                 | 0            | 0         | 36                         |
| A2            | MN                                                                                        | 13  | 9     | 2    | 0     | 0    | 1                 | 1            | 0         | 13                         |
| A3            | MN                                                                                        | 5   | 0     | 0    | 0     | 0    | 1                 | 1            | 0         | 2                          |
| A4            | FS                                                                                        | 6   | 0     | 0    | 0     | 0    | 1                 | 1            | 1         | 3                          |
| A5            | FS                                                                                        | 15  | 10    | 12   | 2     | 15   | 1                 | 1            | 1         | 42                         |
| A6            | MN                                                                                        | 15  | 10    | 12   | 0     | 8    | 1                 | 1            | 0         | 32                         |
| A7            | MN                                                                                        | 4   | 10    | 7    | 0     | 6    | 0                 | 0            | 0         | 23                         |
| A8            | FS                                                                                        | 13  | 0     | 0    | 0     | 0    | 0                 | 0            | 0         | 0                          |
| A9            | FS                                                                                        | 4   | 0     | 0    | 0     | 0    | 0                 | 0            | 0         | 0                          |
| A10           | MN                                                                                        | 4   | 0     | 0    | 0     | 0    | 0                 | 0            | 0         | 0                          |
| Total         |                                                                                           |     | 49    | 45   | 2     | 42   | 6                 | 5            | 2         | 151                        |
| Mean          |                                                                                           |     | 8.2   | 4.9  | 0.2   | 4.2  | 0.6               | 0.5          | 0.2       | 15.1                       |
| Median        |                                                                                           |     | 5.5   | 4.5  | 1     | 0    | 1                 | 0.5          | 0         | 8                          |

\*HESKA test: EA units (ELISA Absorbance units) of 150 or greater are significant.

N, normal; A, affected; MN, male neutered; FS, female spayed; *D.*, *Dermatophagoides*; *pt*, *pteronysinus*.

irritancy was found.<sup>19</sup> In the study reported here, if the positive reactions were caused by irritancy, it seems reasonable that a similar proportion of normal cats would have had false-positive allergen reactions, but this was not the case. In Austel *et al.* study, the concentration of house dust mites was reported in PNU and, in this study we used a 1 : 5000 w/v concentration, making it difficult to compare results.<sup>18</sup> It is possible that for this population of cats, IDT may be the preferred test for detecting reactivity to house dust mites.

Although inflammatory lung disease is reported to be common in cats, it was difficult to recruit cats for this study.<sup>1-8</sup> Many cats meeting study criteria could not be withdrawn from glucocorticoid therapy to allow for IDT. Other cats presented in respiratory crisis, making participation difficult as emergency therapy took priority over study participation. Both of these complications were expected. What was unexpected was the number of cats that could not be enrolled because of pre-existing and/or concurrent skin disease (i.e. signs compatible with allergic skin disease). Published cases on cats with feline asthma or feline bronchial disease do not report skin disease to be a concurrent clinical finding. Veterinary dermatologists do not commonly report respiratory disease as a concurrent finding in cats with allergic skin disease. It may be that some atopic cats have concurrent respiratory disease that is inapparent to

owners or that any respiratory signs are attributed to expectoration of groomed hair and not to lung disease. Cats with severe inflammatory respiratory disease and mild skin disease would most likely not be evaluated by a dermatologist because glucocorticoid therapy would also alleviate signs of allergic skin disease. Finally, skin disease in cats with severe respiratory disease may simply be overlooked because of the seriousness of the respiratory distress.

Several important points need to be made regarding the use of allergen tests. First, positive allergen reactions reflect exposure and may not be clinically relevant. Second, it is well known that IDT in cats is problematic to interpret because of subtle positive reactions in this species and that repeatability of both serum IgE and IDT testing is always a concern. Third, the performance characteristics of the serum IgE test used in this study has not been completely described in the literature. There is one published study supporting the use of the key reagent in this commercial test in the cat.<sup>20</sup> Studies on the sensitivity, specificity, and repeatability of both IDT and serum IgE testing in cats have recently been reviewed by Foster and Rooze and it is clear that, at least for cats with allergic skin disease, IDT and serum IgE tests can be problematic.<sup>21</sup> Clinicians unfamiliar with allergen testing are referred to this reference for more information.

**Table 3.** Number of positive IDT results in normal cats and in cats with idiopathic small-airway disease

| Normal cats | Number of positive IDT reactions per allergen category and per individual cat |     |       |      |       |      |                   |              |           | Total no. of positives/cat |
|-------------|-------------------------------------------------------------------------------|-----|-------|------|-------|------|-------------------|--------------|-----------|----------------------------|
|             | Sex                                                                           | Age | Grass | Weed | Mould | Tree | <i>D. farinae</i> | <i>D. pt</i> | Cockroach |                            |
| N1          | FS                                                                            | 7   | 1     | 1    | 0     | 1    | 1                 | 1            | 0         | 5                          |
| N2          | MN                                                                            | 15  | 0     | 4    | 0     | 3    | 0                 | 0            | 0         | 7                          |
| N3          | MN                                                                            | 7   | 1     | 4    | 1     | 3    | 0                 | 1            | 1         | 11                         |
| N4          | MN                                                                            | 4   | 0     | 2    | 0     | 0    | 0                 | 0            | 0         | 2                          |
| N5          | MN                                                                            | 5   | 0     | 0    | 0     | 0    | 0                 | 0            | 0         | 0                          |
| N6          | MN                                                                            | 1   | 1     | 3    | 0     | 1    | 0                 | 0            | 0         | 5                          |
| N7          | MN                                                                            | 4   | 0     | 2    | 0     | 0    | 1                 | 0            | 0         | 3                          |
| N8          | FS                                                                            | 4   | 0     | 0    | 0     | 2    | 0                 | 0            | 0         | 2                          |
| N9          | FS                                                                            | 3   | 5     | 5    | 0     | 5    | 0                 | 0            | 0         | 15                         |
| N10         | FS                                                                            | 5   | 0     | 1    | 0     | 0    | 0                 | 0            | 0         | 1                          |
| Total       |                                                                               |     | 8     | 22   | 1     | 15   | 2                 | 2            | 1         | 51                         |
| Mean        |                                                                               |     | 5.5   | 0.8  | 2.2   | 0.1  | 1.5               | 0.2          | 0.2       | 5.1                        |
| Median      |                                                                               |     | 4.5   | 0    | 2     | 0    | 1                 | 0            | 0         | 4                          |

  

| Affected cats | Number of positive IDT reactions per allergen category and per individual cat |     |       |      |       |      |                   |              |           | Total no. of positives/cat |
|---------------|-------------------------------------------------------------------------------|-----|-------|------|-------|------|-------------------|--------------|-----------|----------------------------|
|               | Sex                                                                           | Age | Grass | Weed | Mould | Tree | <i>D. farinae</i> | <i>D. pt</i> | Cockroach |                            |
| A1            | MN                                                                            | 3   | 1     | 4    | 0     | 3    | 1                 | 1            | 0         | 10                         |
| A2            | MN                                                                            | 13  | 0     | 0    | 0     | 0    | 0                 | 0            | 0         | 0                          |
| A3            | MN                                                                            | 5   | 1     | 3    | 0     | 3    | 1                 | 1            | 1         | 10                         |
| A4            | FS                                                                            | 6   | 0     | 1    | 2     | 9    | 0                 | 1            | 0         | 13                         |
| A5            | FS                                                                            | 15  | 0     | 0    | 0     | 1    | 1                 | 1            | 1         | 4                          |
| A6            | MN                                                                            | 15  | 0     | 1    | 0     | 4    | 1                 | 1            | 1         | 8                          |
| A7            | MN                                                                            | 4   | 3     | 1    | 1     | 6    | 0                 | 1            | 0         | 12                         |
| A8            | FS                                                                            | 13  | 0     | 0    | 0     | 0    | 0                 | 0            | 0         | 0                          |
| A9            | FS                                                                            | 4   | 1     | 5    | 2     | 10   | 1                 | 1            | 0         | 20                         |
| A10           | MN                                                                            | 4   | 0     | 4    | 0     | 3    | 0                 | 1            | 0         | 8                          |
| Total         |                                                                               |     | 6     | 19   | 5     | 39   | 5                 | 8            | 3         | 85                         |
| Mean          |                                                                               |     | 8.2   | 0.6  | 1.9   | 0.5  | 3.9               | 0.5          | 0.8       | 16.7                       |
| Median        |                                                                               |     | 5.5   | 0    | 1     | 0    | 3                 | 0.5          | 1         | 9                          |

IDT, intradermal test; N, normal; A, affected; MN, male neutered; FS, female spayed; *D*, *Dermatophagoides*; *pt*, *pteronysinus*.

The finding of a significantly increased prevalence of positive allergen reactions in cats with inflammatory lung disease does not prove that a hypersensitivity reaction is the underlying trigger of the clinical signs. Another possible explanation for the increased prevalence of positive allergen reactions is that the pre-existing pulmonary disease somehow increased immunological reactivity. However, immunological studies are needed to determine whether activation of CD4+ lymphocytes and initiation of a Th2 immune response occur in cats with naturally occurring disease as has been shown in experimental disease.<sup>1,9-11</sup> It is also possible that skin reactivity does not reflect what is happening in the lung. Thus, the finding of increased prevalence of positive aeroallergens in affected cats in this study warrants further study on the role of allergens in this complex feline respiratory disease.

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**Résumé** Le but de cette étude était de déterminer la prévalence de réactions positives à des allergènes chez des chats atteints de maladies respiratoire (i.e. "asthme félin", "bronchite allergique féline", "maladie bronchique féline"). Des tests intradermiques (IDT) et des dosages d'IgE sériques ont été réalisés chez 10 chats présentant une atteinte respiratoire idiopathique et chez 10 chats normaux sans histoire de trouble respiratoire. Aucun des chats n'avaient d'histoire de trouble cutané ou de signe dermatologique au moment des tests. Des positivités significativement plus importantes ont été observées avec les dosages sérologiques qu'avec les tests cutanés dans les deux groupes de chat.

Les chats malades présentaient significativement plus de réactions positives avec les deux tests que les chats sains. A la fois les IDT et les dosages sérologiques ont montré des réactions positives plus fréquentes aux arbres, herbacées, graminées et/ou moisissures chez le chats malades que chez les chats sains. Des réactions significativement plus importantes ont été notées aux acariens des poussières pour les chats malades par IDT mais pas par dosage IgE. Une difficulté à l'inclusion a été la présence concomitante d'une anamnèse ou de symptômes compatibles avec une maladie allergique. L'existence de troubles cutanés d'origine allergique n'a pas été rapportée en association avec des troubles respiratoires chez le chat. La prévalence augmentée des réactions positives chez le chats atteints pourrait être due à une réactivité immunologique augmentée chez ces chats. Des études supplémentaires sont nécessaires pour répondre à cette question et pour déterminer quel est le rôle des aéroallergènes dans cette maladie complexe. what role, if any, aeroallergens have in the pathogenesis of this complex feline disease.

**Resumen** El propósito de este estudio fue determinar la prevalencia de reacciones positivas a alérgenos en gatos con enfermedad de las vías respiratorias bajas (asma felino, bronquitis alérgica felina, enfermedad bronquial felina). Se efectuaron pruebas intradérmicas y análisis de IgE en diez gatos con enfermedad respiratoria idiopática de las vías bajas y en diez gatos normales sin historia de enfermedad respiratoria. Ninguno de los gatos tenía una historia de enfermedades de la piel o signos clínicos de las mismas en el momento de las pruebas. Se encontró un número significativamente mayor de reacciones alérgicas positivas para IgE que para las pruebas intradérmicas en ambos grupos de gatos. Los gatos afectados tenían un número significativamente más elevado de reacciones individuales positivas a alérgenos en ambas pruebas comparados con gatos no afectados. Tanto la prueba intradérmica como los niveles de IgE en suero dieron mayor número de positivos individuales a malas hierbas, árboles, gramíneas y/o mohos en gatos afectados que en gatos normales. Hubo un número significativamente mayor de reacciones positivas a ácaros del polvo en gatos afectados comparados con sanos en la reacción intradérmica, pero no en el nivel de IgE. Una dificultad inesperada para la inclusión de más gatos afectados en el estudio fue la presencia o historia clínica de dermatitis alérgica o sospecha de la misma. La enfermedad alérgica de la piel no ha sido documentada en la literatura conjuntamente con enfermedad alérgica de las vías respiratorias bajas. La mayor prevalencia de reacciones positivas a alérgenos individuales en gatos afectados puede ser debida a una mayor reactividad inmunológica en estos gatos. Más estudios serían necesarios para responder a esta pregunta y para determinar si los aeroalérgenos juegan algún papel en la patogenia de este complicado proceso felino.

**Zusammenfassung** Das Ziel dieser Studie bestand darin, das Vorkommen von positiven allergischen Reaktionen bei Katzen mit einer Erkrankung der kleinen Luftwege (i. e. „felines Asthma“, „feline allergische Bronchitis“, „feline Erkrankung der Bronchien“) zu bestimmen. Intradermaltests (IDT) und Serum IgE Analysen wurden bei 10 Katzen mit idiopathischer Erkrankung der kleinen Luftwege und bei 10 normalen Katzen ohne Anamnese einer respiratorischen Erkrankung durchgeführt. Die Katzen hatten weder den Vorbericht einer Hauterkrankung, noch zeigten sie klinische Symptome einer Hauterkrankung zum Zeitpunkt der Untersuchungen. In beiden Gruppen der Katzen wurden bei der Serum IgE Analyse signifikant mehr individuelle positive Allergenreaktionen gefunden als beim IDT. Erkrankte Katzen zeigten signifikant mehr individuelle positive Allergenreaktionen bei beiden Testmethoden als nicht erkrankte Katzen. Beides, IDT und Serum IgE Analyse, resultierte in einer höheren Anzahl an individuell positiven Allergenreaktionen auf Unkräuter, Bäume, Gräser und/oder Schimmelpilze bei erkrankten im Vergleich zu normalen Katzen. Die Anzahl an positiven Allergenreaktionen zu Hausstaubmilben war bei erkrankten Katzen im Vergleich zu den nicht erkrankten im IDT signifikant höher, nicht aber in der Serum IgE Analyse. Eine unerwartete Hürde im Bezug auf die Verwendung von stärker betroffenen Katzen in dieser Studie war das gleichzeitige Auftreten oder ein Vorbericht von vermuteter oder bekannter allergischer Hauterkrankung. Das gleichzeitige Auftreten von allergischer Hauterkrankung ist bisher bei Katzen im Zusammenhang mit der Erkrankung der kleinen Luftwege noch nicht beschrieben worden. Die erhöhte Prävalenz von individuellen Allergenreaktionen bei den erkrankten Katzen könnte auf eine erhöhte immunologische Reaktivität dieser Katzen zurückzuführen sein. Weitere Studien sind notwendig, um diese Frage zu beantworten und um festzustellen, welche Rolle, wenn überhaupt, die Aeroallergene in der Pathogenese dieser komplexen feline Erkrankung spielen.