

The frequency and severity of cat allergy vs. dog allergy in atopic children

Andrew B. Murray, M.B., F.R.C.P.(C),

Alexander C. Ferguson, M.B., F.R.C.P.(C), and Brenda J. Morrison, Ph.D.

Vancouver, B.C.

Questions were put to parents accompanying 1238 children, 1 to 17 yr old, who had symptoms of respiratory tract allergy. Skin prick tests were then performed. Symptoms after exposure to cats and positive skin test results from cat hair extract were significantly more frequent than symptoms after exposure to dogs or reactions to dog hair extract. The prevalence of symptoms and positive skin test reactions to cat allergens increased with age, significantly more so than the reaction or symptoms after exposure to dog allergens. The greater frequency of sensitivity to cats was not caused by exposure to cats in more homes, since dogs significantly outnumbered cats as the household pet in both atopic and nonatopic families. However, greater intimacy of exposure to cats when they were present may have been a factor because cats, significantly more often than dogs, were inside the house and in the child's bedroom. Two subgroups were examined to determine whether those with cat sensitivity who owned cats had more severe symptoms than those with dog sensitivity who owned dogs. Numbers were small and differences not statistically significant, but those in the cat subgroup more frequently had persistent allergic nasal symptoms and abnormally low spirometric measurements than did those in the dog subgroup. Our findings indicate that children are more often allergic to cats than to dogs and suggest that the greater frequency of sensitization to cats may be due to increased intimacy of exposure to cats. (J ALLERGY CLIN IMMUNOL 72:145-149, 1983.)

A survey of practicing allergists reveals that many consider cats more likely than any other species of animal to cause allergic problems.¹ This belief seems to be founded on clinical experience rather than on scientific study; we can find no reports in the literature comparing the allergenicity of various animals. There are epidemiologic and immunologic studies reporting a higher proportion of positive skin tests^{2, 3, 4} and RAST results^{2, 5} to the cat allergen than to that of dogs or other pets, but in all of these, the findings are incidental; it was not the purpose of any of these studies to determine whether one animal was more likely than another to cause allergic sensitization, to

determine the frequency of symptoms to a particular species compared with other species, or to determine the severity of symptoms.

The relative likelihood of atopic children developing allergies to specific species of animals is of some importance. Ownership of furred animals is as common among atopic children as among nonatopic children,⁶ and if one species of pet is known to cause more allergic problems than others, atopic families can be advised to avoid that species. This advice is more likely to be followed than a blanket prohibition of all pets.

We studied a group of atopic children to find out whether allergic symptoms after exposure to cats are indeed more common or severe than those after exposure to dogs, whether increased exposure to cats in the home as compared with dogs might account for the difference, and whether animal sensitivities change with age.

METHODS

We studied 1238 children with respiratory tract symptoms who were consecutively referred to an allergy clinic.

From the Division of Allergy and Departments of Paediatrics and Health Care and Epidemiology, University of British Columbia, Vancouver.

Supported in part by a grant from the B.C. Lung Association and the Kevin Allen-Newman Fund.

Received for publication Sept. 9, 1982.

Accepted for publication Feb. 11, 1983.

Reprint requests: Dr. Andrew B. Murray, Head, Division of Allergy, Children's Hospital, 4480 Oak St., Vancouver, B.C., V6H 3V4.

Abbreviations used

FEV ₁ :	Forced expiratory flow volume in 1 sec
FEF ₂₅₋₇₅ :	Maximal midexpiratory flow rate

There were 766 boys and 472 girls. Their ages ranged from 1 to 17 yr, with a mean of 6.56 yr.

Before any skin tests were performed, a trained interviewer asked the accompanying parent standardized questions about the patient. Inquiry was made about the following: whether the child had had nasal obstruction, rhinorrhea, sneezing, and nasal itching for periods of 3 wk or longer; whether the child had any wheezing or asthma; whether the child experienced any nose, eye, or chest symptoms when in contact with cats or dogs; whether the family owned a cat or a dog at the time of the interview; and whether anyone in the immediate family had ever had allergic rhinitis, asthma, or eczema. Two hundred and fifty-one subjects questioned consecutively by a single observer were also asked about the "location" of any pets (strictly outdoors, occasionally indoors, often indoors, occasionally in the bedroom, or often in the bedroom).

After history taking had been completed, skin prick tests were performed with the extracts of inhalant allergens that are commonly responsible for allergic respiratory disease in our area. These included concentrated house dust, *Der-matophagoides farinae* (1%), cat hair (5%), and dog hair (5%), all prepared by Bencard Allergy Laboratory in England. The cat and dog hair extracts had both been made in the same way. Hair was plucked from the pelts of dead animals and extracts were made by identical techniques with phosphate-buffered saline. In children 5 yr old and over (866 subjects) skin prick tests were also done for appropriate mold spores (5%, Greer) and tree, grass, and weed pollens (25,000 Noon units per milliliter, Greer). After 20 min the reactions were measured by an independent physician-observer. A positive reaction was one in which the diameter of the wheal was 2 mm greater for the test solution than for the control.

The FEV₁ and the FEF₂₅₋₇₅ were determined in children 7 yr old or over who had a history of asthma.

The chi-square test was used to measure the association between two variables, the chi-square test for trend was used to ascertain whether there was a significant regression of symptoms with age, and a one-tailed test of proportions was used for analysis of differences. The result was significant when $p < 0.05$ and highly significant when $p < 0.01$.

RESULTS

Considerably more children had allergic symptoms caused by cats than by dogs and this difference was highly significant (Table I). The difference in symptoms was most marked in those who were probably atopic, i.e., those who had at least one positive prick test result to an inhalant allergen. Of this subgroup who were probably atopic, 15.4% had allergic symp-

toms when exposed to cats, 4.6% when exposed to dogs, and 16.9% when exposed to either a cat or dog.

Of 1161 children in whom skin prick tests were performed, there was also a highly significant difference between the proportions of subjects that had positive reactions to cats and to dogs: 166 (14.4%) to cats, 9 (0.8%) to dogs, and 42 (3.6%) to both dogs and cats.

A difference was also seen when the total population of children was divided into subgroups by age. Whereas the proportion with symptoms caused by cats and by dogs were the same (12%) in those under 4 yr old, there was a highly significant difference in the rates of increase in allergy development with age. In those 11 yr old or older, 30.7% had symptoms from cats (Fig. 1) and 18.8% from dogs (Fig. 2). A similar divergence between cat and dog sensitivity with increasing age was seen in those with positive skin prick tests. In the 11 and older age group, 24.6% had positive test results to cat allergens (Fig. 1) and 6% to dog allergens (Fig. 2).

The increased prevalence of cat allergy in the atopic population raises the question of whether children are exposed to more cats than dogs. This does not seem to be the case. A significant majority of subjects who owned pets owned dogs (Table II). However, it could be argued that the proportion of cats to dogs in atopic families does not represent that found in the general population since allergic people are more likely to get rid of the pet that is troubling them. To examine this possibility, we analyzed data from a subgroup who had no reason for giving away any pets because they had no symptoms caused by cats or dogs themselves and no one in their immediate family had atopic disease. There was still a significant preponderance of dogs over cats as pets in this subgroup (Table II). Increased intimacy of exposure to cats, on the other hand, could be a factor. Not only were cats more likely than dogs to be in the house, cats were also significantly ($p = 0.032$) more likely (46%) than dogs (32%) to be in the bedroom, especially in the bedrooms of younger subjects (Figs. 1 and 2).

Gender had no significant effect on the proportions of subjects that had symptoms after exposure to, or positive skin test results for, cat allergens compared with dog allergens. Approximately equal proportions of boys and girls had symptoms and positive skin test reactions to cats and dogs.

In order to determine what effect ownership of a cat or a dog had on the severity of symptoms, we examined two more subgroups, those who owned a cat and were allergic to cats, judged by symptoms or skin test result, and those who owned a dog and were allergic

TABLE I. Prevalence of allergic symptoms caused by cats vs. dogs in probably atopic and possibly atopic subgroups of the total population of 1238 children

Allergen	Children reporting symptoms			
	Probably atopic		Possibly atopic*	
	No.	%	No.	%
Cat only	100	15.4(a)	36	6.1(c)
Cat and dog	110	16.9	33	5.6
Dog only	30	4.6(b)	14	2.4(d)
Neither	410	63.1	505	85.9
	650	100.0	588	100.0

Probably atopic = at least one positive prick test to an inhalant allergen; possibly atopic = no positive tests.

*Included 77 subjects on whom skin testing was not performed. Significance of difference of proportions between symptoms from cats alone vs. dogs alone: (1) probably atopic, (difference between a and b), $Z = 6.466$, $p = 0.000$; (2) whole study group (difference between a + c and b + d), $Z = 7.129$, $p = 0.000$.

to dogs. There was an increase, although not a statistically significant one, in the severity of symptoms and signs in the cat-owner subgroup. The percentage with an abnormal FEV_1 ($<80\%$ predicted) was 40.6% in those with cats and 23.5% in those with dogs (Table III). The percentage with an abnormal FEF_{25-75} similarly was greater in those with cats (31.2%) than in those with dogs (17.6%). Persistent allergic nasal symptoms that were present for 3 wk at a time or longer were also more frequent in those with cats. Of the subjects with cats, 21.0% had prolonged nasal obstruction, rhinorrhea, itching, and sneezing, compared with 11.6% of those who owned dogs (Table IV). In addition, children with dogs were increasingly more likely to keep the pet in the bedroom as they got older (Fig. 2), whereas this trend was not seen in those with cats (Fig. 1). Indeed, no child over 11 yr old who had symptoms caused by cats allowed the cat to stay in the bedroom, suggesting that cat-induced symptoms are more severe than those induced by dogs.

The prick skin tests were more likely to detect cat allergy than dog allergy. Of the 273 subjects who had symptoms caused by cats, 112 (41.0%) had a positive cat hair skin test result, whereas only 23 (12.5%) of the 184 with dog-induced symptoms had a positive test result for dog hair. This difference in proportion of falsely negative reactions to cat and dog extracts does not seem to result from any difference in the methods used for preparing the extracts. Cat and dog hairs were collected and extracted in the same way. Our solutions were the standard 5% strength supplied

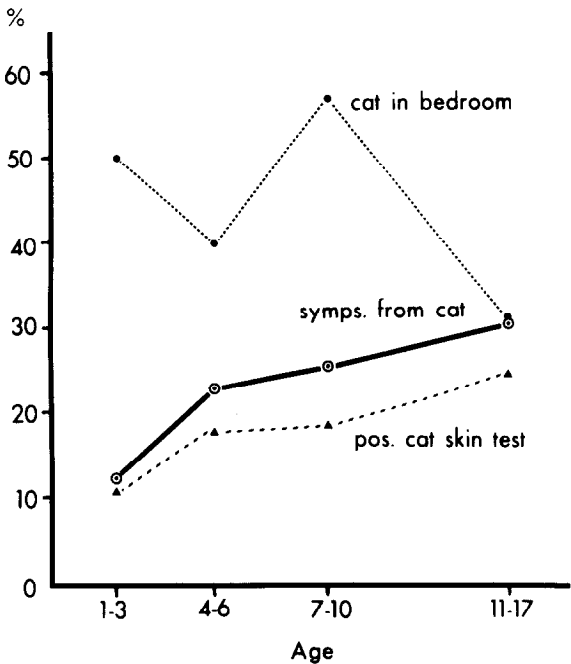


FIG. 1. Prevalence of symptoms and positive skin test results from cat allergens in various age groups. Also shown is the percentage of cats that go into the bedrooms of the children in the various age groups.

by Bencard Allergy Laboratories of Canada, Ltd. Had a stronger concentration of each been used, however, fewer falsely negative reactions for both cats and dogs might have resulted. Using a stronger concentration of the same materials supplied by the parent Bencard Company in England, Haahtela and Jaakonmäki⁵ found that 30% and 15% of unselected Finnish adolescents had positive prick test results to cats and dogs, respectively. These results were comparable to those they obtained for RAST, in which they used materials supplied by another manufacturer.

DISCUSSION

The current belief among allergists that cats are more likely than dogs to cause symptoms in atopic children¹ is correct. We found a highly significant difference between the proportion of subjects experiencing symptoms caused by cats compared with dogs; the same holds for positive skin prick test results.

The reason for the increased prevalence of allergy to cats does not seem to be the fact that cats are present in a greater number of households. Ownership of dogs was more common than of cats in our total study population and also in the subgroup that had no reason to avoid animals, i.e., those children who had themselves never experienced allergic symptoms

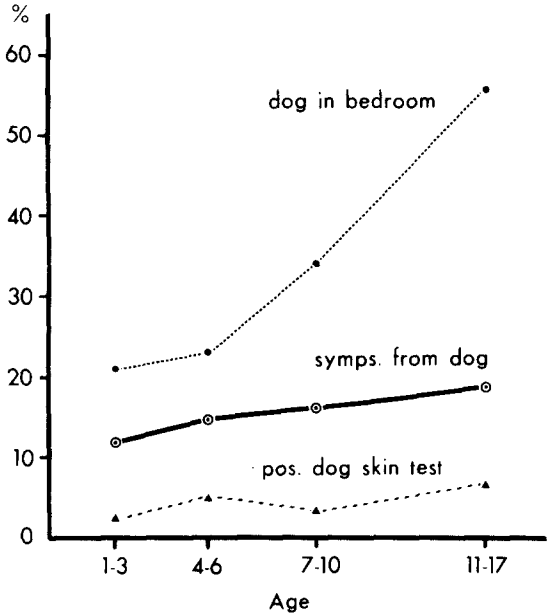


FIG. 2. Prevalence of symptoms and positive skin test results from dog allergens in various age groups. Also shown is the percentage of dogs that go into the bedrooms of children in the various age groups.

TABLE II. Proportions of children owning cats vs. dogs, both in the whole total of 1234 subjects and in the subgroup of 392 in whom atopy did not affect the choice of pet animal

Ownership	Symptoms from cats or dogs and/or the presence of atopy in the immediate family			
	Yes		No	
	No.	%	No.	%
Cat only	115	13.7(a)	67	17.1(c)
Cat and dog	108	12.8	55	14.0
Dog only	193	22.9(b)	87	22.2(d)
Neither	426	50.6	183	46.7
	842	100.0	392	100.0
Total: 1234*				

Significance of difference between proportions of ownership of cat alone vs. dog alone: (1) total study group (difference between a + c and b + d), Z = 5.056, p = 0.000; (2) no symptoms from cats or dogs and no atopy in the family (difference between c and d), Z = 1.797, p = 0.036.

*Data missing in four subjects.

from contact with cats or dogs and whose immediate family members were not atopic. Surveys done in other medical centers also show that there are more households with dogs than with cats.^{2, 6-8} However, increased intimacy of exposure may be a factor because cats, more often than dogs, go in the house and

TABLE III. Association between an abnormal FEV₁ (<80% predicted) and ownership of an animal to which the subject is allergic

FEV ₁	Allergic to and owns			
	Cat		Dog	
	No.	%	No.	%
Abnormal	13	40.6	4	23.5
Normal	19	59.4	13	76.5

$\chi^2 = 0.777$; p = 0.378.

TABLE IV. Association between persistent allergic nasal symptoms and ownership of an animal to which the subject is allergic

Persistent allergic nasal symptoms	Allergic to and owns			
	Cat		Dog	
	No.	%	No.	%
Yes	17	21.0	5	11.6
No	64	79.0	38	88.4
	81	100.0	43	100.0

$\chi^2 = 1.106$; p = 0.293.

in the bedroom, particularly of children in the younger age group. Another possible explanation for the increased prevalence of cat allergy might be that cat emanations are more allergenic than those of dogs. Our data do not clarify this, since the weight-by-volume content of an extract does not necessarily correspond to its content of major allergens⁹ but we do find that 5% cat hair extract more often gives a positive skin test in a patient with cat symptoms than does 5% dog hair extract, prepared in the same way, in a patient with dog-induced symptoms. This observation could be explained by the finding that the major allergen in cat emanations, cat 1,¹⁰ is derived mostly from cat saliva.^{11, 12} Cat allergen may consequently be the more water soluble and hence more easily extracted by phosphate-buffered saline.

There is some evidence that children who are allergic to and own a cat are more severely affected than those who are allergic to and own a dog. Compromised pulmonary function as well as prolonged allergic nasal symptoms were more prevalent in the cat-owner than in the dog-owner subgroups, although the differences were not statistically significant. A possible explanation for this lack of significance is the small numbers in both subgroups; there may be a tendency for people to avoid or give away an animal that causes symptoms, especially if the symp-

toms are severe. In support of the theory that symptoms induced by cats are more severe and that sufferers from cat allergy are consequently more likely than sufferers from dog allergy to distance themselves from the offending species is the observation that older children, who are more likely than younger children to associate cause with effect, increasingly allow dogs into their bedrooms whereas the proportion of children allowing a cat in the bedroom falls off sharply after age 11. This drop is particularly noticeable in those older children who have cat-induced symptoms, none of whom allow the cat to stay in their bedroom.

Our findings indicate that children are more often allergic to cats than to dogs and suggest increased intimacy of exposure to cats as one reason for the difference. It may therefore be preferable for an atopic child to have a dog rather than a cat. Although many allergists suggest that all furred and feathered pets be avoided in homes of atopic children, there are at least as many allergists who disagree.¹ Also, clinical psychologists sometimes recommend pet ownership for some children. Levinson¹³ believes that pets can aid children in developing a favorable attitude toward themselves and confidence in others. It is perhaps a fortunate coincidence that the animal preferred by clinical psychologists is the dog.¹⁴

We thank Mr. Ronnie Sizto for computer programming.

REFERENCES

1. Baker E: A veterinarian looks at the animal allergy problem. *Ann Allergy* **43**:214, 1979.
2. Sarsfield JK, Boyle AG, Rowell EK, Moriarty SC: Pet sensitivities in asthmatic children. *Arch Dis Child* **51**:186, 1976.
3. Haahtela T, Bjorksten F, Heiskala M, Suoniemi I: Skin prick test reactivity to common allergens in Finnish adolescents. *Allergy* **35**:425, 1980.
4. Barbee RA, Brown G, Kaltenborn W, Halonen M: Allergen skin-test reactivity in a community population sample: correlation with age, histamine skin reactions, and total serum immunoglobulin E. *J ALLERGY CLIN IMMUNOL* **68**:15, 1981.
5. Haahtela T, Jaakonmäki I: Relationship of allergen-specific IgE antibodies, skin prick tests and allergic disorders in unselected adolescents. *Allergy* **36**:251, 1981.
6. Herring S, McGeady SJ, Jones JD, Mansmann HC: The maintenance of pets in allergic families. 1. Survey of health beliefs. *Ann Allergy* **46**:24, 1981.
7. Suoniemi I, Bjorkstein F, Haahtela T: Dependence of immediate hypersensitivity in the adolescent period on factors encountered in infancy. *Allergy* **36**:263, 1981.
8. King N: Protection of pets from people and people from pets. *R Soc Health J* **102**:99, 1982.
9. Ohman JL, Lowell FC, Bloch KJ, Kendall S: Allergens of mammalian origin. V. Properties of extracts derived from the domestic cat. *Clin Allergy* **6**:419, 1976.
10. Ohman JL, Kendall S, Lowell FC: IgE antibody to cat allergens in an allergic population. *J ALLERGY CLIN IMMUNOL* **60**:317, 1977.
11. Guerin B, Hewitt B: A comparative study of allergen extracts from cat fur, cat pelt and cat saliva. *Ann Allergy* **46**:127, 1981.
12. Ohman JL, Leitermann K, Brown PR: Studies of the origin and environmental occurrence of cat allergen. *J ALLERGY CLIN IMMUNOL* **69**:127, 1982 (abst.).
13. Levinson BM: Household pets in residential schools: their therapeutic potential. *Mental Hygiene* **52**:411, 1968.
14. Corson SA, Corson EO, Gwynne PH: Pet-facilitated psychotherapy in a hospital setting. *Curr Psychiatr Ther* **15**:277, 1975.