

What should we tell allergic families about pets?

The recent history of medicine includes several episodes in which apparently well-founded, sensible practices have been turned on their heads by the advent of new evidence. Recent observations on the relationship between pet ownership and the presence of asthma and allergic disease necessitate a reevaluation of previous advice that children at risk of asthma should avoid pets.¹

There is a sound basis for advice that people with pet allergy and existing asthma should avoid exposure to pets. Subjects who are allergic to cat allergen manifest airway narrowing in response to exposure to cat allergen particles in a bronchoprovocation challenge.² In population studies in New Zealand and some parts of Australia, it has been shown that allergy to cats and, to a lesser extent, allergy to dogs are linked to the presence of airway hyperresponsiveness and asthma,^{3,4} though this is not a universal finding.^{4,5} Among people with asthma and specific sensitization, the level of exposure to the sensitizing allergen is related to the severity of asthma.⁶⁻⁸ Finally, among cat-allergic subjects, a reduction in exposure to cat allergen achieved by use of a particulate air (HEPA) filter is associated with an improvement in airway hyperresponsiveness.⁹

The advice that people who wish to prevent the onset of asthma should avoid pets represents an extension of the recommendation for people with existing asthma. This advice is supported by evidence that for several allergens, the onset of specific sensitization is related to the level of environmental exposure to that allergen. However, this evidence is not straightforward. Although exposure to house dust mite, cockroach,¹⁰ *Alternaria* mold,¹¹ and various occupational allergens is linked to development of specific allergic sensitization, the evidence in relation to exposure to domestic pets is more complex. The situation is now clouded by an increasing array of evidence that exposure to farm animals (Table I) and cats and dogs (Table II) actually protects children against acquiring allergic disease. This evidence deserves further attention.

Tables I and II list published studies reporting the relationships seen in study samples representative of the gen-

eral population between exposure to a farming environment or to domestic cats in childhood and the risk of allergic disease in childhood or adult life. (In both tables, the term *atopy* refers to the presence of skin prick test or specific IgE responses to common inhaled allergens, and the term *cat allergy* refers to specific IgE directed against cat allergen.)

There is consistent evidence that exposure to the farming environment confers protection against atopy and consequently against allergic diseases—rhinitis, asthma, and eczema. The protection is not limited to a specific allergen; the propensity to develop sensitization to any allergen is reduced. Detailed analyses in several of the published reports point to exposure to farm animals as the feature of the farming environment that is most strongly linked to this protection.

The evidence concerning early life exposure to cat allergen is more complex. There is some—but not universal—evidence that cat exposure is associated with a reduced risk of manifesting allergy to cats in later childhood or adult life. In 3 studies, this protection was limited to children with a genetic predisposition to atopy. Some of the studies, though not all, demonstrated that this reduced risk of developing cat allergy was associated with a reduced risk of acquiring symptoms. The differences in findings did not seem to be related to the study design. In contrast, 2 cohort studies demonstrated that early exposure to cat²⁴ or cat allergen²⁵ was associated with an increased risk of manifesting allergy to cat—in the first year of life in one study and during the first 3 years of life in another study. In the latter investigation, the increased risk of cat allergy was no longer evident when those in the cohort had reached 7 years of age.²⁶

The effect of pet ownership in infancy on the subsequent risk of atopy and asthma has been further investigated in a cohort study reported in this issue of the JACI.²⁷ The design of this investigation, in which information on pet ownership and exposure was obtained from parents during the first year of the child's life, overcomes the problems of recall bias inherent in cross-sectional studies. Like most of the studies mentioned above, this study showed that pet ownership in infancy had no effect, either protective or adverse, on the subsequent risk of atopy to other allergens. Specific allergy to dog was not assessed, but there was no association between cat exposure in infancy and cat allergy at age 11 years. The novel finding of this study is that the incidence of asthma symptoms was reduced in those who owned a dog and probably also in those who owned a cat (though the latter effect was not statistically significant). This protective effect was independent of atopic status but was apparently limited to children without family histories of asthma.

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TABLE I. Protective effects associated with the farming environment

Findings		Study	
Farm environment protects against . .	Farm environment has no effect on . . .	Design	Reference
Atopy, seasonal rhinitis	Asthma symptoms	Cross-sectional	Braun-Fahrlander et al ¹²
Atopy, seasonal rhinitis, asthma symptoms	—	Cross-sectional	Riedler et al ¹³
Allergic rhinitis, wheeze/asthma	—	Cross-sectional	Kilpelainen et al ¹⁴
Allergic rhinitis, wheeze	—	Cross-sectional	Von Ehrenstein et al ¹⁵
Atopy, wheeze, airway hyperresponsiveness	—	Cross-sectional	Ernst and Cormier ¹⁶
Atopy, wheeze	—	Cross-sectional	Downs et al ¹⁷

TABLE II. Protective effects associated with domestic cats

Findings		Study	
Cat ownership protects against . .	Cat ownership has no effect on . . .	Design	Reference
—	Cat allergy,* asthma symptoms	Cross-sectional	Ingram et al ¹⁸
Cat allergy,* asthma symptoms	—	Cohort	Hesselmar et al ¹⁹
Cat allergy (when parents are atopic)	Cat allergy (when parents are not atopic)	Cross-sectional	Roost et al ²⁰
—	Atopy, cat allergy	Cross-sectional	Sporik et al ¹⁰
Atopy† (when parents are atopic)	Atopy (when parents are not atopic)	Cross-sectional	Svanes et al ²¹
Cat allergy	—	Cross-sectional	Platts-Mills et al ²²
Infantile eczema† (when parents are atopic)	Infantile eczema (when parents are not atopic)	Cohort	Nafstad et al ²³
—	Respiratory symptoms	Cohort	Custovic et al ²⁴

*These studies reported similar findings in relation to dog exposure and dog allergy.

†In this study, dog exposure in childhood was protective against subsequent atopy, irrespective of parental allergic status.

In sum, before the study of Remes et al,²⁷ 3 separate phenomena have been attributed to animal exposure in early life:

1. An increased risk of sensitization to cat allergen has been observed during the first 3 years of life in children who are exposed to this allergen in infancy.
2. A reduced prevalence of sensitization to specific pet allergens (usually cat) has been observed in later childhood and adult life in genetically predisposed individuals who were exposed to the relevant allergen source in early life. This is almost certainly an immunologic phenomenon, and it might be explained by the development of allergen-specific IgG4 antibodies as part of a modified T_H2 response, as described by Platts-Mills et al.²² Custovic et al²⁴ have suggested that the difference in effects between early and late childhood might reflect the maturation of the immune response from initial sensitization to later tolerance.
3. A reduced tendency to develop sensitization to all allergens has been observed. This has been noted mainly in relation to farm animals, but it has also (in one study) been attributed to dog ownership in childhood.²¹ The presence of siblings at home²⁸⁻³¹ and child care attendance^{32,33} have a similar effect. The protection does not seem to be limited to those with a genetic predisposition. This nonspecific protective effect is probably not attributable to a direct immunologic mechanism. The “hygiene hypothesis”—that is, alteration of immunoregulation by the action of microbial antigens—has been invoked to explain this observation.²⁹

The findings of Remes et al²⁷ do not fit with either of these direct or indirect immunologic models. They have

shown a reduction in asthma symptoms in association with early-life pet ownership independent of any effect on atopy. Furthermore, the effect was seen in those without a genetic predisposition to asthma. The implication of this finding is that something associated with dog exposure has beneficial effects on airway structure or function. The nature of and actual mechanism for this beneficial effect remains unknown.

What is the status of pets in allergic families in 2001? Certainly, the news is not all bad for cats and dogs. Although people with asthma and rhinitis who are allergic to pets would be well advised to avoid exposure to them, the advice for people who wish to prevent allergies and asthma in their children is more complex. At this stage, we should probably not be advising such people to rid their homes of pets. However, we should probably also not be recommending pet ownership as prophylaxis against asthma. Further research must focus on the mechanisms underlying the observed protective effect and the path to safe, effective, and environmentally acceptable methods of achieving this reduced risk of allergic disease in the general population.

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