

Animal Exposure, Asthma and Allergies

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About This Document

HABRI Central Briefs are peer-reviewed summaries of particular applications and issues within the field of human-animal interaction. Each Brief presents an overview of the subject matter, assesses the current state of research, then highlights unresolved questions or issues. Key resources are identified for further reading.

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Overview

An estimated 62% of all United States households have one or more pet and more than 38% of households with pets have children under the age of 18 (Beck, 2010). Although the total number of pets in the United States does not seem to be increasing (AVMA, 2012), the relationship between people and their pets is intensifying, with pets increasingly occupying more territory in the home (Lockey, 2012). The frequency with which individuals interact with animals poses a special problem for allergic persons and their medical providers (Beck & Meyers, 1987). About 40 million Americans have indoor and outdoor allergies, and approximately 10 million of them are sensitive to material shed by animals (André & André, 2011). For individuals with allergies or a family history of allergies and asthma, the decision of whether to acquire or keep a pet can be a difficult one. This decision is compounded by the strong attachments that individuals have with their pets (Baker, 1979), with many pet owners viewing their pets not solely as an animal, but rather as a member of the family (Beck, 2010).

Despite years of research into the role that animals play in allergies and asthma, the relationship between animal exposure and the development of allergic or asthmatic symptoms still remains unclear. Consequently many

practitioners and pet owners do not know where to turn for reliable sources of information or recommendations. This brief addresses this gap in three ways. First, it summarizes the current knowledge on allergies and animals, including the effect of animal exposure in the first year of life and the maintenance of pets for allergic patients. Second, it makes recommendations for future research. Third, it identifies key resources for individuals who wish to further explore this issue.

State of Current Knowledge

WHAT ARE ALLERGIES?

Allergies are an abnormal response to naturally occurring substances. These substances do not typically cause an immune reaction. However, for unknown reasons, in some persons these usually benign substances are treated by the body as foreign and an immune system response is mounted (AAFA, 2005). Allergies to pets are usually immediate IgE antibody mediated reactions, which are also called Type I hypersensitivity reactions (Armstrong & Botzler, 2008). The terminology used to describe allergies can be confusing and different researchers use terms like atopy, allergic sensitization and hypersensitivity interchangeably, even though some groups have tried to define them.

When your body encounters a material that it is sensitive to, the immune system produces antibodies to that substance. These antibodies are disseminated throughout the body and stored. This process is called sensitization. When your body is re-exposed to the same allergen, the cells storing the antibodies to that allergen release their inflammatory contents into the bloodstream (André & André, 2011). While the typical result is a localized reaction such as skin irritation, red itchy eyes, runny nose, nasal congestion, and sneezing, if these particles are inhaled, breathing problems, such as wheezing, coughing, or shortness of breath can occur. Exposure to allergens can trigger an asthma attack for persons who already have asthma, and over time these exposures can actually lead to the development of chronic asthma (AAFA, 2005).

PET ALLERGIES

Approximately 15 to 30% of persons with allergies will have allergic reactions to cats and dogs (AAFA, 2005). Persons who are allergic to animals are not reacting to the fur of the animal as many people think, but rather to proteins that are present in the animal's dead skin cells, urine, dried saliva, and hair (André & André, 2011). Because these proteins are not exclusive to animal hair, animals with fur are not the only animals to which people can be allergic. These proteins are actually present in all animals and insects, including the feathers of birds or scales of reptiles (Lockey, 2012). However, birds and reptiles tend to have less of these proteins present on their bodies, so the potential for an allergic reaction to a bird or reptile is generally lower than for a dog or cat. Two common myths about pet allergies are that dogs with shorter fur are hypoallergenic and cats are more allergenic than dogs. In reality, all dogs produce these potentially allergenic proteins and there is little observed difference in the protein shedding between different breeds (Nicholas et al., 2010). Even breeds such as poodles, which are often thought of as hypoallergenic, produce and shed these proteins. Cats, while not more allergenic by nature, may induce more allergic reactions because of their grooming practices. Cats groom themselves frequently and in so doing transfer proteins from their saliva to their fur. These proteins are then disseminated to people through handling or to their environment when they rub or lay on furniture or other items (André & André, 2011).

WHO GETS ALLERGIES?

It is not known why some people develop allergies and others do not, although it has long been noted that a predisposition to develop allergies can be inherited (André & André, 2011; Sherman, 1950). Individuals who inherit a predisposition to allergies do not inherit a particular disease or allergy, but rather they inherit a tendency to develop allergies to substances that they come into contact with (Sherman, 1950). It is not necessary to have a family history of allergies in order to develop them and many people with no family history develop them as a child or adult. It was originally assumed that exposure to animals was a risk factor for developing a hypersensitization to animals (Simpson & Custovic, 2003). However, epidemiological studies failed to confirm this hypothesis. In fact, several studies even suggested that the presence of pets could decrease the risk of developing allergies or asthma (Simpson & Custovic, 2003). Since these first studies emerged, there has been a lot of investigation into the relationship between pet exposure early in life and the subsequent development of allergies or asthma.

EFFECT OF EARLY PET EXPOSURE

Many studies that have been done on the relationship between early animal exposure and the development of allergies and asthma have shown a protective factor. However, when the studies are reviewed in totality there appear to be inconsistent results, even between studies of similar designs (Simpson & Custovic, 2005). The majority of studies have shown that the presence of cats in the household has no effect on the development of asthma in children and that the presence of a cat may be a protective factor against the development of allergies (Carlsen et al., 2012; Chen, Tischer, Schnappinger, & Heinrich, 2010). However, these results have to be interpreted with caution since there have been other studies which showed an increased risk of allergy development in children exposed to cats (Chen et al., 2010). Thus exposure to a cat early in life seems to have no effect on whether or not a child will develop asthma, but it has yet to be conclusively determined what effect this exposure has on the development of allergies. The protective effect of cat exposure that is reported by some studies is more pronounced than what has been reported for dog exposure. However, the results of studies on dog exposure have been more consistent and generally suggest that dog exposure has no effect on the development of asthma and a slight protective effect against the development of allergies (Chen et al., 2010;

Custovic & Simpson, 2008). This means that having a dog in the home has not been shown to have an effect on whether or not children develop asthma, but that children with a dog in the home may be slightly less likely to develop allergies.

The inconsistent results of these studies could be due to study design, the way exposures were assessed, regional differences in pet keeping, or genetic differences among study participants (Chen et al., 2010; Custovic & Simpson, 2008). Furthermore, the majority of studies only ask about animals in the household and fail to conduct analysis based on the number and type of animals or the intensity of the exposure to the animal. Some studies that have taken into account multiple pet ownership have found that the protective factor is seemingly more pronounced by either having a dog and a cat (Mandhane et al., 2009) or by having two pets (Wegienka, Johnson, Havstad, Ownby, & Zoratti, 2010). Rather than a linear dose response relationship, it is possible that early exposure to a diverse range of potentially allergenic substances is important (Custovic & Woodcock, 2001). Thus it could be more beneficial to a developing immune system to have multiple animals or species of animals in the house rather than a single dog or cat. These observations are supported by researchers who postulate that it is biologically plausible that early exposure to animals could protect against the development of allergies and asthma. Several biological mechanisms for how this could occur have been put forth, including that the presence of a potential allergen while the immune system is still developing could induce tolerance to that substance (Custovic et al., 2001) and that pet owners may be exposed to a more diverse bacterial environment (Fujimura et al., 2010). Both of these ideas continue to be biologically plausible and supported by subsequent research.

Despite this plausibility, several researchers wondered if the protective effects that were seen among pet owners were influenced by individual behaviors; specifically whether or not individuals with a known history of allergies to animals might be less likely to have animals in their household. If individuals with a history of allergies and animals avoided animal exposure, then it was possible that the supposedly protective effect of the presence of animals might really be explained by the idea that people with pets in the house were already less likely to have or develop allergies. This idea was explored by several researchers, who found that individuals with

a history of allergies or asthma were no less likely to have pets or relinquish pets than individuals without a history of allergies or animals (Mandhane et al., 2009; Svanes et al., 2006). In fact, of the groups studied, the only group that was more likely to relinquish an animal was that of families in which a child developed asthma at an early age and there was no parental history of asthma or allergies (Svanes et al., 2006). According to these studies, the concept of selective avoidance could explain a portion of the protective effect seen by early exposure to pets. However, this avoidance is less likely to explain any of the effect for families with a history of allergies or asthma (Svanes et al., 2006). These findings demonstrate that there does still seem to be a protective effect for early exposure to animals and that families do not make their decisions about pet keeping factors solely on health status.

MAINTENANCE OF PETS IN ALLERGIC FAMILIES

When patients receive a diagnosis of allergies or asthma, it can be a difficult time. They may receive solicited and unsolicited advice on the best way to manage their condition, including the advice to remove pets from the home. The advice to remove pets from the home of individuals with asthma and allergies was standard medical advice given to patients for many years. Veterinarians began to notice this trend in the late 1970s. Their clients with allergies frequently reported that their allergist had recommended removal of the pets from the home, even if they didn't have a specific allergy to that animal. Because they viewed the veterinarian as sympathetic, their clients often revealed to them attitudes and beliefs that they would not as readily share with their allergist, such as their intention to keep their animals in defiance of the allergists' recommendations (Baker, 1979). Subsequent research conducted by Baker found that there was no consensus among allergists regarding the maintenance of pets in allergic patients. In two separate studies, Baker found that one third of allergists surveyed routinely recommended the removal of pets, even though only 30% of those allergists felt that the patient would follow their instructions to remove the pets. Additionally if their recommendation to remove pets was not followed, these allergists indicated that they would not consider hyposensitization treatment, even though they acknowledged that it could be effective (Baker & McCulloch, 1983). There has been a lack of follow up research to determine whether or not these beliefs still exist among allergists. However, an article published

in 2005 recommended removal of pets as the first choice to reduce asthma symptoms. This recommendation was based on the clinical observations of 20 asthmatic patients, 10 who kept their pets and 10 who did not (Shirai, Matsui, Suzuki, & Chida, 2005). Additionally an article by Lockey (2012) in the *Journal of Allergy and Clinical Immunology* maintained that “eliminating animals from the home remains the treatment of choice” (p. 911). From these publications it is clear that the sentiment that animals must be removed from the homes of allergic patients is still present in the medical community. Given people’s strong attachments to their pets, this recommendation may cause many of them to lie to their doctor about the number or types of pets that they have (Baker & McCulloch, 1983) or to discontinue care (Lockey, 2012). There is also concern that removal of a beloved pet could aggravate allergic and asthmatic symptoms due to the emotional distress it would cause (Baker & McCulloch, 1983; Sarsfield, Boyle, Rowell, & Moriarty, 1976). Furthermore, in areas with a high proportion of pet ownership, cat and dog allergens are ubiquitous in the environment. This means that even if pets are removed from the home, it would be impossible to completely avoid being exposed to cat and dog dander (Custovic & Simpson, 2008). Although removal of pets is a seemingly easy and concrete intervention to accomplish, it can be problematic and unpalatable to some patients. Additionally, there are a myriad of other approaches available. One such approach is for practitioners to recommend against the acquisition of new animals, while providing strategies for mitigating the effects of existing pets. These mitigation strategies include utilizing medication as well as environmental recommendations, such as keeping the pet out of the bedroom, bathing the pet weekly, using a vacuum with a HEPA filter, wearing a dust mask while vacuuming, and covering heating and cooling vents with a filter medium (AAFA, 2005).

Taking into account the unclear state of the science as well as the strength of the human-animal relationship, some researchers have cautioned against blanket advice to either remove or acquire pets (Custovic & Simpson, 2008). Instead they advocate for advice tailored for each individual given their unique health situation and home environment (Carlsen et al., 2012; Custovic & Simpson, 2008). This individualized approach is likely to be more effective and better received by patients.

Areas for Future Investigation

A few studies have looked at the potentially mediating effect of socioeconomic status on animal exposure and the development of allergies and asthma. However, further research is needed on the effect across social strata.

The majority of studies have merely looked at the presence of animals in the home at certain time points in a person’s life. Further research on the intensity and duration of exposure is needed to ascertain whether or not the type of exposure is a mediating factor in the subsequent development of allergies and asthma.

Dogs and cats are the animals most frequently examined in studies on animal exposure and the development of allergies and asthma. However, since the popularity of non-traditional animals (e.g. birds, reptiles and farm animals) is increasing, future research could explore the relationship between exposure to non-traditional animals and the development of allergies and asthma.

Some studies have shown that maternal exposure to allergens can increase the potential that a child will develop allergies, however not enough is known to draw any conclusions. Research looking into the relationship between prenatal exposure to animals and the subsequent development of allergies and asthma is needed.

Conclusions

The rate of allergies and asthma is increasing in the developed world, as is our attachment and devotion to our pets. This strong attachment to pets often transcends health and other life issues. As such, many patients are reluctant to relinquish a pet, even if they believe that the presence of the animal may compromise their health. These feelings are compounded by the conflicting information which is available through medical and social formats. Despite the large number of studies that have been conducted, there is still no clear scientific consensus on the relationship between animal exposure and allergies and asthma (Chen et al., 2010). Various studies have indicated that there may be a protective effect when children are exposed to animals from the time of birth, yet many of these studies are contradicted by other studies. Part of the contradictory findings may be explained by having different types of pets or

by differing lengths and intensity of the exposure to animals.

Because of the relatively low percentage of individuals with allergies, a major limitation of most of the studies conducted to date is the small sample sizes in the subgroups analyzed. This needs to be taken into account during the study design phase, and future studies need to begin with large enough populations in order to have robust samples in each of the subgroups. Seeking to address these shortcomings, large birth cohort studies to measure the development of allergies and asthma in children are currently underway. The results of these studies are needed before many in the medical community will feel confident in knowing how to advise patients on the issue of pet ownership (Simpson & Custovic, 2003). In the meantime, allergic patients and pet owners are placed in a difficult situation. The decision whether or not to retain a pet must ultimately be made by the individual after consultation with a trusted medical provider, and after weighing the potential benefits and consequences of the decision.

For prospective parents who wish to acquire or keep their animals, the research trends show that early life exposure to animals does not make children more likely to develop allergies or asthma and that there may actually be a protective effect. Thus having animals in the home when children are born may be beneficial to their immune development and is unlikely to be detrimental. However, if children do develop allergies or asthma, the decision of whether or not to keep household pets may need to be reevaluated. For allergic families who wish to keep their pets, there are medications and environmental management strategies which may help control their condition.

Key Resources

André, A. M., & André, Z. H. (2011). Allergies to pets. In R. G. Davis (Ed.), *Animals, diseases, and human health: Shaping our lives now and in the future* (pp. 1-12). Santa Barbara, CA: ABC-CLIO.

André and André provide an excellent overview of the issues surrounding allergies to pets. They explain what allergies are, what causes them, and the symptoms one may experience. They also cover medical information, such as when to see a physician and diagnostic tests that are available. Finally, they discuss potential treatments including medication, sensitization, and household remedies.

Beck, A. M. (2010). Animals and child health and development. In M. S. McCordle P, Griffin JA, Esposito L, Freund L. (Ed.), *Animals in*

our lives: Human-animal interaction in family, community, and therapeutic settings (pp. 43-52). Baltimore: Brookes Publishing.

Beck summarizes the research exploring the benefits and concerns of human-animal interaction. Many pet owners view their pets as part of the family; in fact, some may view small pets as "the children's children". The potential for allergic reactions to pet dander is a common concern. Beck discusses research which suggests that early exposure to dogs and cats may protect a child from developing allergies later in life.

Chen, C.-M., Tischer, C., Schnappinger, M., & Heinrich, J. (2010). The role of cats and dogs in asthma and allergy—a systematic review. *International Journal of Hygiene and Environmental Health*, 213(1), 1-31.

Chen et al. systematically review observational studies of the role of cats and dogs in asthma allergies published from 2000 to 2009. There are 50 birth cohort, prospective and cross sectional studies evaluating the effects of exposure to cats, and 40 evaluating the effects of exposure to dogs. The results are mixed, even for the same type of study. Chen et al. postulate that these differences could be due to study design, exposure assessment and avoidance behaviors. They maintain that the evidence of pet keeping and development of allergies or asthma is not conclusive and that decisions regarding pet keeping should be based on other factors.

Fujimura, K. E., Johnson, C. C., Ownby, D. R., Cox, M. J., Brodie, E. L., Havstad, S. L., Zoratti, Edward M., Woodcroft, K.J., Bobbitt, K. R., Wegienka, G. (2010). Man's best friend? The effect of pet ownership on house dust microbial communities. *The Journal of Allergy and Clinical Immunology*, 126(2), 410.

Fujimura et al. investigate the biological plausibility of the concept that the microbial environment differs in households with and without pets. They do so by comparing the dust microbial communities of households with dogs or cats to those with no pets. The greatest microbial diversity is found in households with dogs. Although they show a difference in the microbial environment of households with pets, the authors cite their sample size as a limitation and call for more studies in this area.

Svanes, C., Zock, J.-P., Antó, J., Dharmage, S., Norbäck, D., Wjst, M., Heinrich, J., Jarvis, D., de Marco, R., Plana, E. (2006). Do asthma and allergy influence subsequent pet keeping? An analysis of childhood and adulthood. *Journal of Allergy and Clinical Immunology*, 118(3), 691-698.

Svanes et al. evaluate the mediating effect that avoidance behavior may have on the seemingly protective effect of animal exposure against the development of allergies and asthma. The only families who practice avoidance behaviors are those who have a child diagnosed with asthma/allergies and neither parent has a history of asthma/allergies. For families with parental history of asthma/allergies, there is no evidence of selective avoidance of animals. Avoidance behavior may explain some, but not all, of the previously demonstrated protective effect of early animal exposure. Many individuals do not decide whether or not to keep their pets solely on health related factors.

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