



Do hypoallergenic cats and dogs exist?

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The prevalence of human allergy to pets has increased over the past 6 decades,¹ with the most frequently reported animal sensitivity to cats and dogs.² The United States has the highest percentage of household pets in the world,³ and the numbers continue to increase, with approximately 62% of US households having 1 or more domestic pets.⁴ Of the households with cats, 17% of the people who live with them are skin prick test positive to cat extract; that is, they are sensitized to their animal.⁵ However, only 5% of those dog owners are dog skin prick test positive, much lower than cat owners.⁶

Human diseases most commonly associated with environmental allergens include allergic asthma, allergic rhinoconjunctivitis, and atopic dermatitis.¹ Allergens associated with these illnesses are low-molecular-weight proteins, or glycoproteins, derived from various plants or animals. In this case, the allergens are derived from the skin particles or flakes that slough from the animal skin.¹ Even when cats or dogs are removed from a household, up to 6 months may be needed before the pet allergen levels become sufficiently low so as not to cause an allergic exacerbation.⁴

Many misconceptions persist among physicians, health care professionals, and the general population about pet dander allergy. The notion that a particular cat or dog breed is “hypoallergenic” has the potential to be a lucrative business. Several US-based companies (eg, Mindeelyn Siberian Cats, Siberian Cat Breeder, Allerca Lifestyle Pets, Kitails Siberian Cattery) market “hypoallergenic pets.” However, an Internet search resulted in only 1 company stating they have produced the “world’s first scientifically-proven hypoallergenic cat, followed by a true hypoallergenic dog.” In 2004, Allerca Lifestyle Pets, a company based out of San Diego, California, began to market “hypoallergenic” cats and dogs. Although Allerca does not claim a 100% success rate for all customers, they do state that these pets “allow some of the millions of people with feline or canine allergies to finally enjoy the love and companionship of a

household pet without suffering from allergic symptoms.”⁷ At that time, Allerca president Simon Brodie told The Associated Press he ultimately hoped to sell 200,000 cats, at \$3,500 each, annually in the United States.⁸ However, now, in its 7th to 8th year of operation, the price tag is as high as \$7,950 for a hypoallergenic dog and \$6,950 to \$22,950 for a hypoallergenic cat.⁷ A significant number of patients and their families continue to spend large amounts of money for these pets to decrease or eliminate their allergic symptoms without having to remove the animal from their households.

Does Scientific Evidence for a Hypoallergenic Pet Exist?

Allerca’s website claims their pets produce lower allergenic quantities of pet dander (eg, Fel d 1 and Can d 1 from cats and dogs, respectively) through gene mutations.¹ Rather than using genetic engineering to achieve this phenotype, they naturally breed selected animals that possess the genetic defect¹ that “produces a different version of the relevant protein. . . .”⁷ The scientific rationale as explained by Allerca: “Lifestyle pets then targeted those divergences that could potentially produce kittens and puppies with a natural change in the structure of the Fel d 1 and Can d 1 allergens produced by these genes. Using sophisticated bioinformatics to manage our breeding programs, the result was cats and dogs with a naturally occurring divergent gene that produces a different version of the relevant protein—and one that the human body does not recognize as an allergen.”⁷

Allerca states they have many satisfied customers, a physician supports this concept and they have unpublished data to support their claims. However, websites of professional organizations, including the American Academy of Allergy, Asthma and Immunology as well as the American College of Allergy, Asthma and Immunology, cite references refuting these claims. Resources on the American Academy of Allergy, Asthma and Immunology website state that “there are no truly hypoallergenic breeds.”⁴ In addition, evidence to support the concept of “hypoallergenic pets” was not found on Internet searches of the American Lung Association and PubMed. A paper published in July 2011 examined dog allergen levels in homes with hypoallergenic compared with nonhypoallergenic dogs. It indicates that “there was no evidence for differential

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Table 1
Characteristics of cat and dog allergen

Common name	Scientific name	Major allergen(s)	Minor allergen(s)	Allergen size	Source of allergen	Primary reservoirs of allergens	Areas of high concentration
Cat	<i>Felis domesticus</i>	Fel d 1	Fel d 2 Fel d 3 Fel d 4	20 – 25 kD	Feline salivary, sebaceous and perianal glands	Epidermis Fur	Bedding Upholstered Furniture Carpeting
Dog	<i>Canis familiaris</i>	Can f 1 Can f 2	Can f 3 Can f 4 Can f 5	19 – 27 kD	Tongue and parotid glands	Saliva Dander Fur	Bedding Upholstery Furniture Carpeting

shedding of allergen by dogs grouped as hypoallergenic.⁹ No published scientific evidence indicates that such animals truly exist.⁹ Aside from the major allergens (eg, Fel d 1 and Can f 1), minor allergens (eg, Fel d 2, Fel d 3, Fel d 4) also sensitize pet-allergic individuals.¹ Therefore, selective breeding of these animals would be unlikely to result in complete benefit for their affected owners.

The Causes of Cat and Dog Allergy

An allergic patient's immune system is capable of reacting to more than 1 allergen. A major allergen is an allergen to which more than 50% of the allergic population react by skin prick or in vitro specific immunoglobulin E tests, and a minor allergen, to which fewer than 50% of such patients react.¹ Emanations from animals contain many allergens that sensitize allergic individuals; therefore, differences exist not only between animals, for example, between cats and dogs, but also among different breeds, such as a German shepherd and a poodle.¹⁰

Although major allergens are associated with animal dander allergy, so too are minor allergens, present in up to 10% of cat-sensitive individuals.¹ In addition, minor cat and dog allergens cross-react, which results in an elevated prevalence of human co-sensitization to these animals.¹¹

Major Cat Allergen Fel d 1

Felis domesticus, the domestic cat, is one of the most important causes of allergic asthma worldwide.² Ninety to 95% of cat-allergic patients have specific immunoglobulin E as measured by skin prick or in vitro testing to Fel d 1. It accounts for 60% to 90% of the total cat dander allergenicity.¹² This allergen is a globulin found in feline salivary, sebaceous, and perianal glands and transferred to the skin and fur by licking and grooming (Table 1).¹² Although levels are significantly higher in homes that contain cats, Fel d 1 is also present in environments that do not harbor cats, such as schools, cinemas, motor vehicles, airplanes, and hospitals.¹³ Therefore, it is a ubiquitous allergen of 20 to 25 kD capable of being transferred by fomites and airborne particles, which may stay in undisturbed air for days.¹⁴

Direct or indirect exposure to Fel d 1 and other cat allergens sensitizes individuals, ultimately resulting in exacerbations of allergic rhinitis and allergic asthma when exposure to these allergens occur. Sensitized children from households who do not have cats often experience worsening of allergic symptoms when placed in classrooms with high levels of cat ownership.¹³ An increased use of asthma-related medications observed during the first 2 weeks of school after returning from a holiday break is attributed to animal allergy.¹ Children in classrooms with low cat ownership do not display this phenomenon.¹³ Epidemiologic studies also indicate that children without regular contact with cats are sensitized in a dose-response manner, based on the amount of cat exposure of their classmates.¹³ This makes sense in that there is an association between the quantity of airborne cat allergen and the number of cat owners in classrooms.¹⁵ Classrooms with greater than 18% cat owners have an association with worsening symptoms in children with asthma, including increased use of medication after the begin-

ning of school, decreases in peak expiratory flow, and an increase in the number of days with uncontrolled asthma.¹³ These levels may be sufficient enough to cause a decline in symptom control, leading to an acute asthma exacerbation.

Major Dog Allergen Can f 1

The major allergenic proteins associated with dogs are Can f 1 and Can f 2, ubiquitous in dog-infested environments.¹⁶ Both proteins are produced in the salivary glands, and neither is derived from the skin.¹⁶ Can f 1 is formed by tongue epithelial tissue, whereas Can f 2 is produced by both the tongue and parotid glands.¹⁶ Saliva, dander, and fur are the most important reservoirs of dog allergens; urine is not.¹⁷

Can f 1 is the predominant allergen, even though variable amounts are produced between individual dogs of the same breed as well as by different breeds.¹⁷ Twenty percent of Can f 1 allergens are found on particles smaller than 5 μm in diameter. As a result, high levels of Can f 1 can be found in the settled dust in carpets or soft furnishings (eg, couches, pillows, blankets) in the home. The Can f 1 allergen can be present in classrooms, airplanes, automobiles, daycare centers, hospitals, and in households without dogs.¹⁷

Allergic individuals sensitized to dog allergens, as suspected, develop worsening of symptoms when exposed to dog allergens, noted to be up to 250-fold higher in homes with dogs versus those without dogs. Thus, a reduction in such levels results in an improvement in symptoms of sensitized individuals.¹⁷

Interventions and Strategies for Pet-Allergic Patients

The most effective way to treat pet allergy is to remove the pet from the home; however, patients and their families often refuse to do so because up to 90% of American pet owners perceive their pet to be a "family member,"³ and greater than 90%, including non-pet owners, believe that a pet contributes to a more "satisfying lifestyle."³ This accounts for the difficulty in convincing patients to remove pets from their home.

Because no published literature indicates that "hypoallergenic" cats and dogs exist, pet owners need to implement effective lifestyle modifications to reduce their exposure to allergenic dander. The first option for a cat- or dog-allergic individual is to remove the pet from the home, either by dispensing with it or keeping it outdoors, but this recommendation is often not encouraged by some veterinarians, nor adhered to by pet owners.¹ In addition, although the overall allergen concentration in a household will likely be reduced from removal of a pet, levels may still not be reduced sufficiently enough to prevent allergic sensitivity.¹⁸

Another strategy includes extensive home cleaning regimens, encasement of mattresses, removal of carpeting from the home, and pillows with impermeable covers. However, implementation of such interventions is unrealistic and expensive, and it may result in only modest clinical benefits.¹ Thus, studies to investigate more feasible strategies to reduce the allergen burden, such as investigating the benefits of pet bathing, have been performed.

Bathing a cat or dog regularly appears to reduce the quantity of allergen harbored by the pet.¹⁷ To be effective, bathing must be

performed at least twice per week to maintain lower Can f 1 concentrations because of a rapid rise, similar to baseline values, within 3 days after washing.¹⁷ However, the beneficial effects of reducing allergen levels by regular bathing are more likely associated with dogs, because of their rapid buildup of allergen burden as compared with cats.¹⁷ Can f 1 levels may be markedly reduced below baseline values after bathing, which is far superior to vacuuming the fur of a dog, resulting in minimal allergen decline.¹⁷

Conclusion

Approximately 78.2 million household dogs and 86.4 million household cats live in the United States, with numbers continuing to rise.¹⁹ Therefore, the marketing of pets is a growing enterprise, with Americans spending millions of dollars on their cats and dogs annually.³ However, coexisting with their pets is a daily challenge for many pet owners. The incidence of upper respiratory allergies has increased over the past decade, with up to 16% of the general population being affected.¹⁰ Pet allergens may increase morbidity, especially in persons with asthma, by triggering and exacerbating symptoms, with sensitized individuals being particularly susceptible.²⁰

In an effort to decrease morbidity, pet-directed interventions have been established to reduce allergen exposure, but many misconceptions persist. The belief that particular cats and dogs are “hypoallergenic” because of their fur type has revolutionized the pet industry by marketing a “new breed” of pets from a personal health perspective.

Healthcare professionals should educate their patients on the causes of pet dander allergy to help minimize and prevent exacerbations of co-morbid illnesses. The concept of a “hypoallergenic” animal is not supported by scientific evidence; therefore, the implementation of more established practices in preventing pet dander allergy must be considered.

References

- [1] Morris DO. Human allergy to environmental pet danders: a public health perspective. *Vet Dermatol*. 2010;21:441–9.
- [2] McLean MD, Glovsky MM, Hoffman DR, Ghekiere LM. Identification of allergens in dog dander extract: clinical and immunological aspects of allergenicity activity. *Ann Allergy*. 1980;45:199–204.
- [3] American Humane Association. FACTS—pet ownership. Available at <http://www.petfinder.com/for-shelters/facts-petownership.html>? Accessed December 21, 2011.
- [4] American Pet Products Association. Industry Statistics & Trends. Available at: http://www.americanpetproducts.org/press_industrytrends.asp. Accessed December 21, 2011.
- [5] Arbes SJ, Gergen PJ, Elliott L, Zeldin DC. Prevalences of positive skin test response to 10 common allergens in the US population: results from the third national health and nutrition examination survey. *J Allergy Clin Immunol*. 2005;116:377–383.
- [6] Basak P, Arayata R, Brensilver J. Prevalence of specific aeroallergen sensitivity on skin prick test in patients with allergic rhinitis in Westchester County. *The Internet Journal of Asthma, Allergy and Immunology*. 2008;6:2.
- [7] Allerca Lifestyle Pets. Available at <http://www.allerca.com/html/pricingreserve.html>. Accessed December 11, 2011.
- [8] Show cats on line. The online magazine devoted to all breeds of pedigreed cats. Available at <http://www.showcatsonline.com/x/hypoallegenic-cat.shtml>. Accessed December 11, 2011.
- [9] Nicholas CE, Wegienka GR, Havstad SL, Zoratti EM, Ownby DR, Johnson CC. Dog allergen levels in homes with hypoallergenic compared with nonhypoallergenic dogs. *Am J Rhinol Allergy*. 2011;25:252–256.
- [10] Heutelbeck AR, Schulz T, Bergmann KC, Hallier E. Environmental exposure to allergens of different dog breeds and relevance in allergological diagnostics. *J Toxicol Environ Health*. 2008;71:751–758.
- [11] Ichikawa K, Vailes LD, Pomes A, et al. Molecular cloning, expression and modeling of cat allergen, cystatin (Fel d 3), a cysteine protease inhibitor. *Clin Exp Allergy*. 2001;31:1279–1286.
- [12] Kaiser L, Grönlund H, Sandalova T, et al. The crystal structure of the major cat allergen Fel d 1, a member of the secretoglobulin family. *J Biol Chem*. 2003;278:37730–37735.
- [13] Almqvist C, Wickman M, Perfetti L, et al. Worsening of asthma in children allergic to cats, after indirect exposure to cat at school. *Am J Respir Crit Care Med*. 2001;163:694–698.
- [14] Cole SL, Lockey RF. Indoor aeroallergens. *Emedicine*. 2010. Available at <http://emedicine.medscape.com/article/137911-overview>. Accessed December 11, 2011.
- [15] Almqvist C, Larsson PH, Egmar AC, et al. School as a risk environment for children allergic to cats and a site for transfer of cat allergen to homes. *J Allergy Clin Immunol*. 1999;103:1012–1017.
- [16] Konieczny A, Morgenstern JP, Bizinkauskas CB, et al. The major dog allergens, Can f 1 and Can f 2, are salivary lipocalin proteins: cloning and immunological characterization of the recombinant forms. *Immunology*. 1997;92:577–586.
- [17] Hodson T, Custovic A, Simpson A, Chapman M, Woodcock A, Green R. Washing the dog reduces dog allergen levels, but the dog needs to be washed twice a week. *J Allergy Clin Immunol*. 1999;103:581–585.
- [18] Liccardi G, D'Amato G, Russo M, et al. Focus on cat allergen (Fel d 1): immunological and aerodynamic characteristics, modality of airway sensitization and avoidance strategies. *Int Arch Allergy Immunol*. 2003;132:1–12.
- [19] The Humane Society of the United States. Available at http://www.humanesociety.org/issues/pet_overpopulation/facts/pet_ownership_statistics.html. Accessed December 21, 2011.
- [20] Salo PM, Arbes SJ Jr, Crockett PW, Thorne PS, Cohn RD, Zeldin DC. Exposure to multiple indoor allergens in US homes and its relationship to asthma. *J Allergy Clin Immunol*. 2008;121:678–684.