

Common allergens and allergic reactions to dogs

K. Gallagher and R. Roberts

Allergic Reactions

In cases of an allergic reaction, the immune system has developed an inappropriately oversensitive response to an otherwise harmless substance (allergen).

The main types of allergic reaction include; asthma, anaphylaxis (severe whole-body reaction involving narrowing of airways), allergic rhinitis (stuffy or dripping nose), conjunctivitis (red, watery, itchy eyes), urticaria (hives) and eczema.

The prevalence of allergies is increasing worldwide ¹ and it is estimated that over 30% of the UK population suffer from (IgE mediated) allergic reactions ².

A UK study assessing GP referrals to an allergy clinic revealed that only 1 in 5 of their patients were diagnosed with a genuine allergy. This highlights that many individuals may incorrectly label themselves with an allergy due to inaccurate self-diagnosis ³.

Common Allergens in the environment

Individuals are constantly exposed to numerous potential allergens in every day life. Some of the most common allergens are discussed below.

Food

- Allergic reactions to certain food allergens (including food additives and preservatives) are becoming increasingly common in school children ^{4,5}. Reports of serious anaphylactic reactions to food is also reportedly on the rise ⁴. It is estimated that between 2.5 and 6% of children have food allergies in the UK and the USA ^{3,6,7}.
- Major food allergies occur against peanuts, milk based products, egg, tree nuts, fish, shellfish, fruit and vegetables among others ³.

Pollen

- It is estimated that approximately 40% of people in the UK will at some stage be effected by hayfever (seasonal allergic rhinitis) ^{8,9}.
- This condition can have a significant impact on the quality of life ^{8,9}.
- Keeping windows closed and affected individuals indoors would reduce the dose of pollen exposure.

Fragrances and cosmetics

- Fragrances and compounds used in perfumes, deodorants, soaps and cosmetics can cause contact dermatitis (red itchy rash which takes time to resolve) ¹⁰.
- Perfumes can also exacerbate asthma symptoms ¹¹.

- Occupational-associated allergic reactions to fragrances have been studied. Over 9% of office workers, health care workers and teachers are thought to be allergic to the fragrances in products¹⁰.

Cleaning products

- In any public building (be it a school, a hotel, or office), an individual will be exposed to potentially allergenic compounds in cleaning products.
- These include bleach, toilet cleaner, air fresheners, window cleaner and furniture polish¹².

Dust mites

- Allergies (particularly asthma) to house dust mites are very common; ~27% of people (aged 11-44 years) in the UK^{13,14}.
- Significant levels of Der f1 (a major dust mite allergen) have been reported in day care centres, schools and many workplaces¹⁵⁻¹⁷.
- Soft furnishings and carpeted areas can store large amounts of dust mite allergens.

Vermin and cockroaches

- Cockroach allergens can be detected in many public buildings^{16,18}.
- Individuals attending a school or workplace where there is a mouse or rat presence will be exposed to those allergens present in the vermin's urine^{19,20}.

Pet allergens

- Several studies have revealed that dog and cat allergens can be detected at significant levels in schools where these animals have never been allowed^{15,21,22}.
- The dog allergen Can f1 can also be detected at reasonable levels in cinemas, busses, trains, hotels and pubs²³.
- Presumably this occurs via transfer from the clothes of pet-owning individuals.
- Soft furnishings and carpeted areas can act as a reservoir for these allergens and the regularity and intensity of the cleaning regime will impact on how much allergen is present.
- Therefore its likely that dog or cat sensitised individuals are regularly exposed to these pet allergens regardless of whether the animal has been present.

Dogs

Dog allergens

-Allergic reactions to dog allergens can vary considerably in their severity and include asthma, rhinitis, conjunctivitis and bronchial inflammation.

-Several different protein allergens have been identified and some individuals will only react to certain allergens.

-These allergens can be found in many sources, including dander (shed skin), urine, saliva, blood and faeces.

<u>Allergen</u>	<u>% Individuals with dog allergy react to...</u> ^{24,25 26}
Can f 1;	~50%
Can f 2;	~20%
Can f 3	~30% (dog serum albumin)
Can f 5	~70% (prostatic kallikrein protein detected in dander and urine)

There are allergen-reduction products available on the market that can be used to reduce the amount of airborne pet allergens. Also lotions are available for the dog which may reduce the amount of dog allergen on the coat if used frequently enough.

Prevalence of allergies to dogs

-Estimates of the prevalence of sensitisation to dogs varies greatly between reports (<2.5- ~15%) which is presumably due to the different populations enrolled in these studies ²⁷⁻²⁹.

-Custovic et al., reported that approximately 8% of adults in the UK are sensitised to dog allergens, which is similar to the rates of food allergies (~6%). In the same study 39% were sensitised to pollen, 36% to house dust mites and 18% to cats ²⁹. Other UK studies have also shown that less people are sensitive to dogs than to dust mites, pollen, or cats ³.

-Individuals with asthma are also more likely to be sensitive to cat and dog allergens ²⁹.

Breed differences

-There is very little published data available to judge which breeds of dog are best for dog-sensitised owners. Any references to 'hypoallergenic' breeds appear to be anecdotal.

-Research suggests that the quantity of allergens produced by dogs of the same breed can vary so much there is no clear answer³¹. However, Ramadour et al., suggested that despite this variability, labradors in general tended to produce less of the Can f1 allergen ²⁷.

Transfer of dust mite allergens by dogs

-Dogs can also act as a reservoir for dust mite allergen as the presence of Der f 1 allergen has also been reported in dust samples collected from the skin and hair of dogs ^{32,33}.

-It is therefore possible that some anecdotal reports of dog allergy could in fact be a misdiagnosed dust mite allergy following exposure to a dog.

-Air-conditioning and the use of HEPA (high-efficiency particulate air) filter vacuums have both been shown to significantly reduce the levels of allergens indoors^{34,35}.

What do Assistance Dog organisations do to reduce the risk of allergic reactions ?

Behaviour

-Assistance dogs have received excellent training and have been closely assessed in terms of their temperament and obedience.

-A reliable toileting routine will have been established. When working in a public building, the spending area should be carefully considered in terms of its location as urine and faeces contain potential allergens.

Health and care routine

-Regular grooming decreases the shedding of hair and may reduce skin irritation and secondary bacterial infections³⁶.

-Washing dogs has been shown to be effective in reducing levels of Can f 1 in the coat. However, allergens can build up again quite rapidly e.g. Can f 1 can reach baseline levels within 3 days of washing³⁷. Regular washing can also reduce allergens which are contained in saliva and therefore present on the coat of the dog after licking.

-Whilst washing and grooming the dogs will help, it is not sufficient on its own as there may already be large amounts of these allergens in the environment (in the air and deposited in soft furnishings).

-Dogs with dermatological conditions such as flea allergy dermatitis, atopy, primary seborrhoea and various skin infections are more likely to have increased dander production and therefore less suitable to work in enclosed environment with allergic individuals^{27,36}.

Diet

-Assistance dogs are fed on a premium quality diet which may result in reduced dander production³⁹. Many essential nutrients have a direct impact on skin and coat health in dogs.

References

1. World Health Organisation. Prevention of allergy and allergic asthma: World Allergy Organization / World Health Organisation meeting 2002.
http://www.worldallergy.org/professional/who_paa2003.pdf
2. Gupta R, Sheikh A, Strachan DP, Anderson HR. Time trends in allergic disorders in the UK. *Thorax*. 2007;62(1):91-6.
3. Jones RB, Hewson P, Kaminski ER. Referrals to a regional allergy clinic - an eleven year audit. *BMC public health*. 2010;10:790.
4. Young MC, Muñoz-Furlong A, Sicherer SH. Management of food allergies in schools: a perspective for allergists. *The Journal of allergy and clinical immunology*. 2009;124(2):175-82,
5. Rudders SA, Banerji A, Vassallo MF, Clark S, Camargo CA. Trends in pediatric emergency department visits for food-induced anaphylaxis. *The Journal of allergy and clinical immunology*. 2010;126(2):385-8.
6. Björnsson E, Janson C, Plaschke P, Norrman E, Sjöberg O. Prevalence of sensitization to food allergens in adult Swedes. *Annals of allergy, asthma & immunology : official publication of the American College of Allergy, Asthma, & Immunology*. 1996;77(4):327-32.
7. Lack G. Clinical practice. Food allergy. *The New England journal of Medicine*. 2008;359(12):1252-60.
8. Ghouri N, Hippisley-Cox J, Newton J, Sheikh A. Trends in the epidemiology and prescribing of medication for allergic rhinitis in England. *Journal of the Royal Society of Medicine*. 2008;101(9):466-72.
9. Hammersley VS, Walker S, Elton R, Sheikh A. Protocol for the adolescent hayfever trial: cluster randomised controlled trial of an educational intervention for healthcare professionals for the management of school-age children with hayfever. *Trials*. 2010;11:84.
10. Buckley DA, Rycroft RJG, White IR, McFadden JP. Fragrance as an occupational allergen. *Occupational medicine*. 2002;52(1):13-6.
11. Kumar P, Caradonna-Graham VM, Gupta S, et al. Inhalation challenge effects of perfume scent strips in patients with asthma. *Annals of allergy, asthma & immunology : official publication of the American College of Allergy, Asthma, & Immunology*. 1995;75(5):429-33.
12. NHS. Cleaning products and your allergies - Live Well - NHS Choices.
<http://www.nhs.uk/Livewell/homehygiene/Pages/Triggers.aspx>
13. Gupta R, Sheikh A, Strachan DP, Anderson HR. Burden of allergic disease in the UK: secondary analyses of national databases. *Clinical and experimental allergy : journal of the British Society for Allergy and Clinical Immunology*. 2004;34(4):520-6.
14. Jackson AP, Foster AP, Hart BJ, Helps CR, Shaw SE. Prevalence of house dust mites and dermatophagoides group 1 antigens collected from bedding, skin and hair coat of dogs in south-west England. *Veterinary dermatology*. 2005;16(1):32-8.

15. Arbes SJ, Sever M, Mehta J, et al. Exposure to indoor allergens in day-care facilities: results from 2 North Carolina counties. *The Journal of allergy and clinical immunology*. 2005;116(1):133-9.
16. Custovic A, Green R, Taggart SC, et al. Domestic allergens in public places. II: Dog (Can f1) and cockroach (Bla g 2) allergens in dust and mite, cat, dog and cockroach allergens in the air in public buildings. *Clinical and experimental allergy : journal of the British Society for Allergy and Clinical Immunology*. 1996;26(11):1246-52.
17. Custovic A, Fletcher A, Pickering CA, et al. Domestic allergens in public places III: house dust mite, cat, dog and cockroach allergens in British hospitals. *Clinical and experimental allergy : journal of the British Society for Allergy and Clinical Immunology*. 1998;28(1):53-9.
18. Sookrung N, Chaicumpa W. A revisit to cockroach allergens. *Asian Pacific journal of allergy and immunology*. 28(2-3):95-106.
19. Hollander A, Van Run P, Spithoven J, Heederik D, Doekes G. Exposure of laboratory animal workers to airborne rat and mouse urinary allergens. *Clinical and experimental allergy : journal of the British Society for Allergy and Clinical Immunology*. 1997;27(6):617-26.
20. Gordon S, Tee RD, Taylor AJ. Analysis of rat urine proteins and allergens by sodium dodecyl sulfate-polyacrylamide gel electrophoresis and immunoblotting. *The Journal of allergy and clinical immunology*. 1993;92(2):298-305.
21. Karlsson AS, Andersson B, Renström A, et al. Airborne cat allergen reduction in classrooms that use special school clothing or ban pet ownership. *The Journal of allergy and clinical immunology*. 2004;113(6):1172-7.
22. Munir AK, Einarsson R, Schou C, Dreborg SK. Allergens in school dust. The amount of the major cat (Fel d I) and dog (Can f I) allergens in dust from Swedish schools is high enough to probably cause perennial symptoms in most children with asthma who are sensitized to cat and dog. *The Journal of allergy and clinical immunology*. 1993;91(5):1067-74.
23. Custovic, A., Green, R., Taggart, S. C., Smith, A., Pickering, C. A., Chapman, M. D., et al. Domestic allergens in public places. II: Dog (Can f1) and cockroach (Bla g 2) allergens in dust and mite, cat, dog and cockroach allergens in the air in public buildings. *Clinical and experimental allergy : journal of the British Society for Allergy and Clinical Immunology*, (1996);26(11):1246-52.
24. Schou C, Svendsen UG, Løwenstein H. Purification and characterization of the major dog allergen, Can f I. *Clinical and experimental allergy : journal of the British Society for Allergy and Clinical Immunology*. 1991;21(3):321-8.
25. Saarelainen S, Taivainen a, Rytönen-Nissinen M, et al. Assessment of recombinant dog allergens Can f 1 and Can f 2 for the diagnosis of dog allergy. *Clinical and experimental allergy : journal of the British Society for Allergy and Clinical Immunology*. 2004;34(10):1576-82.
26. Mattsson L, Lundgren T, Everberg H, Larsson H, Lidholm J. Prostatic kallikrein: a new major dog allergen. *The Journal of allergy and clinical immunology*. 2009;123(2):362-8.
27. Ramadour M, Guetat M, Guetat J, et al. Dog factor differences in Can f 1 allergen production. *Allergy*. 2005;60(8):1060-4.
28. Plaschke P, Janson C, Norrman E, et al. Skin prick tests and specific IgE in adults from three different areas of Sweden. *Allergy*. 1996;51(7):461-72.

29. Custovic A, Simpson BM, Simpson A, et al. Current mite, cat, and dog allergen exposure, pet ownership, and sensitization to inhalant allergens in adults. *Journal of Allergy and Clinical Immunology*. 2003;111(2):402-407.
30. Rönmark E, Perzanowski M, Platts-Mills T, Lundbäck B. Different sensitization profile for asthma, rhinitis, and eczema among 7-8-year-old children: report from the Obstructive Lung Disease in Northern Sweden studies. *Pediatric allergy and immunology : official publication of the European Society of Pediatric Allergy and Immunology*. 2003;14(2):91-9.
31. Heutelbeck ARR, Schulz T, Bergmann K-C, Hallier E. Environmental exposure to allergens of different dog breeds and relevance in allergological diagnostics. *Journal of toxicology and environmental health. Part A*. 2008;71(11-12):751-8.
32. Glass EV, Reid RA, Hillier A, Needham GR. Use of an amplified ELISA technique for detection of a house dust mite allergen (Der f 1) in skin and coat dust samples from dogs. *American journal of veterinary research*. 2003;64(2):162-5.
33. Randall AJ, Hillier A, Cole LK, et al. Quantitation of house dust mite allergens (Der f 1 and group 2) on the skin and hair of dogs. *American journal of veterinary research*. 2005;66(1):143-9.
34. Lintner TJ, Brame KA. The effects of season, climate, and air-conditioning on the prevalence of Dermatophagoides mite allergens in household dust. *The Journal of allergy and clinical immunology*. 1993;91(4):862-7.
35. Yu CH, Yiin L-M, Tina Fan Z-H, Rhoads GG. Evaluation of HEPA vacuum cleaning and dry steam cleaning in reducing levels of polycyclic aromatic hydrocarbons and house dust mite allergens in carpets. *Journal of environmental monitoring : JEM*. 2009;11(1):205-11.
36. Tubiolo VC, Beall GN. Dog allergy: understanding our "best friend"? *Clinical and experimental allergy : journal of the British Society for Allergy and Clinical Immunology*. 1997;27(4):354-7.
37. Hodson T, Custovic A, Simpson A, et al. Washing the dog reduces dog allergen levels, but the dog needs to be washed twice a week. *The Journal of allergy and clinical immunology*. 1999;103(4):581-5.
38. Lloyd DH, Marsh KA. Optimizing skin and coat condition in the dog. *Waltham focus*. 1999;9(2):2-7.
39. Davenport GM, Reinhart GA. Nutrition for visibly healthy skin and coat. *Care, Nutrition and Management of the Competitive Dog*. 2002:13-19.

