

Key Summary Statements from Environmental Assessment and Control of Furry Animals

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1. Removal of cats is recommended to decrease overall exposure; however, complete removal of all cats is necessary to minimize cat allergen exposure in a home. (C)
2. Cat characteristics, such as length of hair, sex, reproductive status, and time spent indoors, are not associated with levels of Fel d1 in the environment. Therefore, interventions related to these factors cannot be recommended. (C)
3. Data about the effect of neutering a dog or cat are inconsistent, so no specific recommendations can be made at this time about performing such a procedure to reduce allergen exposure. (D)
4. Because 1 or more cat allergens are present in all cats, patients should not be advised that it is safe to obtain a nonallergenic cat. (C)
5. Measurement of cat allergens in settled dust should not be used as a surrogate for airborne exposure. (C)
6. To reduce transport of cat allergen, people should consider changing their clothes when traveling from a high cat allergen environment to a low cat allergen environment. (C)
7. Because 1 or more dog allergens are present in all dogs, patients should not be advised that it is safe to obtain a nonallergenic dog. (C)
8. Dogs should be excluded from rooms in which reduced exposure is desired. (C)
9. Although exposure to elevated cat allergen Fel d 1 concentrations before 3 months of age may reduce the likelihood of developing cat sensitization, the risk reduction is not sufficient to justify a decision to get a cat to avoid IgE sensitization. (C)
10. Although exposure to elevated dog allergen can f 1 concentrations before 3 months of age may reduce the likelihood of developing dog sensitization, the risk reduction is not sufficient to justify a decision to get a dog to avoid IgE sensitization. (C)
11. Cat exposure should be minimized in cat sensitized individuals to reduce the likelihood of developing asthma. (C)
12. Dog exposure should be minimized in dog sensitized individuals to reduce the likelihood of developing asthma. (C)
13. Exposure to cat allergens should be minimized to reduce the likelihood of an asthma exacerbation in cat sensitized school children and adults who already have asthma. (A)
14. Exposure to dog allergens should be minimized to reduce the likelihood of an asthma exacerbation in dog sensitized school children and adults who already have asthma. (A)
15. Patients should be asked whether there is a dog or cat in the house because an affirmative answer is associated with greater exposure to dog or cat allergens. (C)
16. Patients with allergic disorders should be evaluated for sensitization to cat and dog allergens by skin prick testing or in vitro testing for cat and dog specific IgE. (C)
17. Avoidance is the most effective way to manage cat and dog allergy. Patients should be advised to consider removing the cat or dog from the environment, if present, to improve respiratory health. (A)
18. To reduce exposure to cat allergens with the cat still living in the house, a combination of measures, such as removing reservoirs, keeping the cat out of the bedroom, washing the cat, air cleaning with a HEPA room air cleaner, improving ventilation, and mattress and pillow covers, may be helpful. (C)
19. Chemical treatments, such as tannic acid, can be applied to carpet to give short-term reduction of cat allergen, but this is not sustained and there is no evidence that it improves respiratory health. (C)

20. Use of hypochlorite bleach to denature indoor allergens can reduce allergen exposure, improve quality of life, and reduce the likelihood of developing atopy, but it can also lead to increased respiratory symptoms in individuals using it. (C)
21. Washing cats or dogs at least weekly can reduce airborne cat Fel d 1 or dog Can f 1; however, the clinical benefit is yet to be proven and the effect of washing is not sustained. (B)
22. Some woven microfiber bed encasings, generally those with a mean pore size of 6µm or less, block cat allergen from penetrating the fabric though the respiratory health benefit from their use is unclear. (C)
23. Nonwoven microfiber encasings collect allergen on their surface overtime, including cat and mite allergens. Because they cannot be washed, they are unsuitable for allergen avoidance.(C)
24. Long-term regular use of high-efficiency or central vacuum cleaners is associated with reduced exposure to Fel d 1 and Can f 1 in homes with cats or dogs living in them, although the health effects are uncertain. (B)
25. HEPA air cleaners run continuously over time can reduce exposure to dog and cat allergen concentrations, but the clinical benefits are unknown. (B)
26. Duct cleaning has not been proven to reduce exposure to furry animal allergens. Ducts should not be cleaned specifically to reduce exposure to dog and cat allergens. (D)
27. Dog and cat allergens are relatively stable to dry heat so dry heat should not be used specifically to reduce exposure. (C)
28. Sufficient control of exposure to cat allergens to improve health requires a combination of measures, such as removing reservoirs, keeping the cat out of the bedroom, washing the cat, air cleaning with a HEPA room air cleaner, improving ventilation, and mattress and pillow covers. (C)
29. Adherence with avoidance measures can be enhanced with education and monitoring. (C)

Key Summary Statements from Environmental Assessment and Control of Rodents

Annals of Allergy, Asthma & Immunology, 2012 Vol.109

- 1. Exposure to mouse allergen in homes should be minimized to reduce the risk of sensitization. (Rec, B Evidence)
- 2. Exposure to rodent allergens should be minimized to reduce the risk that sensitized individuals will develop sensitivity in the form of respiratory symptoms. (Rec, C Evidence)
- 3. Mouse and rat allergen exposure should be minimized to reduce the risk of asthma morbidity in already sensitized individuals. (StrRec, B Evidence)
- 4. Measurement of mouse-specific IgG4 may help to identify individuals with a reduced risk of mouse skin test sensitivity though the benefit of doing so is unclear. (NoRec, C Evidence)
- 5. Patients with possible rodent allergy should be asked whether they have seen rodents in their home. (StrRec, B Evidence)
- 6. Patients with atopy and likely rodent exposure, such as patients with persistent asthma living in inner-city areas, should be evaluated for sensitization to rodent allergens by skin prick testing, rodent-specific IgE testing, or both if indicated. (StrRec, B Evidence)
- 7. Immunotherapy with rodent extracts has not been adequately studied to determine whether it is effective. (NoRec, D Evidence)
- 8. An assessment for facilitative factors of rodent exposure should focus on identifying food, water, routes of ingress, and the presence of rodent habitats. (Rec, C Evidence)
- 9. Habitat modification should be performed to remove means of rodent ingress, food, water, and shelter. (StrRec, C Evidence)

- 10. Evidence for the presence of rodents should be identified to determine the likely extent of an infestation. (Rec, C Evidence)
- 11. Cats and other rodent predators could be considered as a possible method for reducing rodent populations, although they generally do not completely eliminate an infestation and individuals may become sensitized to a cat. (Opt, C Evidence)
- 12. Rodent traps are an effective way to remove rodents from an infested building. (Rec, C Evidence).
- 13. Rodenticides should be used if other interventions are ineffective. They should be applied according to the manufacturer's instructions that are part of the label. Many pesticides should only be applied by a licensed professional exterminator. (Rec, C Evidence)
- 14. Measurement of rodent allergens in house dust may be considered; however, it has an unclear clinical benefit given the wide range of observed values and uncertain clinically relevant exposure thresholds. (Opt, D Evidence)
- 15. Rodent allergens in homes can be reduced using integrated pest management techniques (StrRec, A Evidence)
- 16. Monitoring for rodent sensitization should be considered at least for the first 3 years of employment in an laboratory animal facility. (Rec, C Evidence)
- 17. Extra avoidance precautions should be taken for individuals with an increased risk of animal sensitization, including those with an atopic background and with high-intensity exposure. (Rec, B Evidence)
- 18. Extra avoidance precautions should be taken when contaminated bedding and high numbers of conscious animals are handled. (Rec, B Evidence)
- 19. Allergen exposure in laboratory facilities should be reduced by engineering controls, staff training, and appropriate personal protection. (Rec, B Evidence)

Key Summary Statements from Environmental Assessment and Control of Cockroaches

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- 1. Exposure to cockroach allergen in homes should be minimized to reduce the risk of cockroach sensitization (StrRec, B Evidence)
- 2. Exposure to cockroach allergens should be minimized to reduce the risk that sensitized subjects will have disease.(Rec, C Evidence)
- 3. Cockroach allergen exposure should be minimized to reduce the risk of asthma morbidity in already sensitized subjects. (Rec, B Evidence)
- 4. Patients with possible cockroach allergy should be asked whether they have seen cockroaches in their homes. (Rec, B Evidence)
- 5. Patients with suspected atopy and likely cockroach exposure should be evaluated for sensitization to cockroach allergens by means of skin prick testing or in vitro testing for cockroach-specific IgE. (StrRec, B Evidence)
- 6. Factors that facilitate the growth and persistence of cockroach populations, such as food and water, paths of ingress, and microenvironments that can provide shelter, should be mitigated to reduce the cockroach carrying capacity of the environment. (StrRec, D Evidence)
- 7. The extent and duration of a cockroach infestation should be monitored by using strategically placed sticky traps. (StrRec, D Evidence)
- 8. Pesticides should be used judiciously and ideally should be applied by a professional exterminator as part of an integrated pest management program. (Rec, C Evidence)

- 9. Boric acid is an effective pesticide; however, surviving cockroaches can produce more allergen after exposure. (Rec, C Evidence)
- 10. Measurement of cockroach allergen exposure in dust can be considered for building occupants at increased risk of cockroach sensitization or sensitivity. (Opt, D Evidence)
- 11. Reservoirs of cockroach contaminants should be cleaned or removed to prevent additional exposure to occupants. (StrRec, A Evidence)
- 12. Integrated pest management with a combination of interventions appears to be the most effective method for preventing and eliminating cockroach infestations. (StrRec, B Evidence)
- 13. Integrated pest management should be used to decrease cockroach exposure to reduce asthma morbidity. (StrRec, A Evidence)
- 14. Immunotherapy with cockroach extracts can be considered; however, it has only been evaluated in a limited number of studies, an effective dose is not known, and it is not clear how effective the treatment is for asthma or rhinitis. (Opt, C Evidence)

Key Summary Statements from Environmental Assessment and Control of Dust Mites

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- 1. Exposure to dust mite allergens should be minimized to reduce the risk for the development of mite-specific IgE in susceptible children. Since intermittent exposure to mite allergens can lead to sensitization, primary prevention may not be possible to achieve in regions where mite exposure is prevalent. (StrRec, A Evidence)
- 2. Exposure to dust mite allergens should be minimized to reduce the risk for the development of asthma and possibly rhinitis in dust mite-sensitized children. (StrRec, A Evidence)
- 3. Exposure to dust mite allergens should be minimized, in conjunction with avoidance of other relevant allergens to which one is sensitized, and with avoidance of irritants, to reduce likelihood of developing symptoms in already dust mite sensitized individuals with asthma. (StrRec, B Evidence) or rhinitis. (StrRec, C Evidence)
- 4. Exposure to dust mite allergens should be minimized to reduce the symptoms of atopic dermatitis in dust-mite sensitized children. (Rec, C Evidence)
- 5. Though 5-15% of patients who are highly sensitized to dust mite also are sensitized to crustaceans, the clinical significance of this is unknown. For that reason, no recommendation can be made regarding the need to advise crustacean-naïve patients about their risk of ingestion. (NoRec, D Evidence).
- 6. Patients who complain of oral symptoms or symptoms consistent with an IgE-mediated reaction following ingestion of grain flour should be evaluated for dust mite sensitization regardless of whether they have wheat-specific IgE. (Rec, C Evidence)
- 7. Patients with suspected dust mite allergy should be tested for the presence of dust mite-specific IgE using either a prick-skin test or in-vitro test for specific IgE. (StrRec, B Evidence).
- 8. There currently is no evidence supporting routine measurement of specific IgE to dust mite components though such measurements may be considered when necessary such as for patients with potential Der p 10 (tropomyosin as found in cockroach and crustaceans) sensitivity. (Weak, D Evidence).
- 9. Dust mite-allergic patients should be encouraged to obtain and use a hygrometer to measure humidity in their home. (StrRec, D Evidence)
- 10. Relative humidity in the home should be kept between 35 and 50% to reduce the growth of dust mites. (StrRec, B Evidence)

- 11. While acaricides can kill mites, they should not be used to eliminate mite populations due to their limited efficacy at reducing allergen levels and concerns about the use of chemical agents in the home. (RecNot, B Evidence)
- 12. Use of physical measures to kill mites such as heating, freezing and desiccation theoretically should be effective; however, controlled trials have not been performed to demonstrate clinical benefit when they are used. (Weak, D Evidence)
- 13. Bedding should be washed weekly in warm or hot water to reduce dust mite numbers and mite-allergen levels. Home hot water should be kept below the temperature (120°F) that causes a scalding risk to occupants. (StrRec, B Evidence)
- 14. Pre- and post-intervention measurement of mite allergens in settled dust may be considered for homes in which mite-sensitive people live if symptoms persist despite reasonable efforts to reduce mite exposure. (Weak, D Evidence)
- 15. To determine whether dust mite allergen is present in a home and to plan allergen avoidance strategies, measurement of airborne mite allergens offers no benefit over their measurement in settled dust and therefore is not recommended. (Rec not, C Evidence)
- 16. Regular vacuuming should be performed using cleaners that have HEPA filtration or with a central vacuum with adequate filtration or that vents to the outside to reduce exposure to dust mite allergen-containing particles. (StrRec, B Evidence)
- 17. Mite-allergen-proof mattress and pillow encasings should be recommended to reduce exposure to mite allergens. (StrRec, B Evidence)
- 18. Sleeping in bunk beds should be discouraged in families with an atopic background and if it is necessary, the sensitized person ideally should sleep in the top bed. Either way, both the top and bottom mattresses (and any fabric-covered “bunk-board”) should be encased in allergen-impermeable encasings. (Rec, B Evidence)
- 19. Tannic acid is not recommended for reducing mite allergens in carpet dust because it is only marginally effective and it has to be applied frequently. (Rec Not, C Evidence)
- 20. HEPA air filtration alone is of uncertain benefit for patients with mite allergy though it can reduce local exposure to airborne mite allergens and to some irritants. If used, HEPA cleaners should be placed in areas of mite contamination where air disturbance is likely to suspend particles so that they are available for removal. (Weak, C Evidence).
- 21. A multifaceted approach utilizing a combination of techniques to dust mite avoidance that includes repetitive and sequential interventions shown to decrease mite exposure, as described above, should be recommended for patients with dust mite allergy who are at risk of mite exposure. (Rec, A Evidence)
- 22. Subcutaneous Immunotherapy should be offered to dust mite-allergic patients with rhinitis, mild-moderate asthma if they meet the general criteria for receiving allergen immunotherapy (StrRec, A Evidence for asthma) (Rec, B Evidence for rhinitis)
- 23. Subcutaneous Immunotherapy should be considered for dust mite-allergic patients with atopic dermatitis if they meet the general criteria for receiving allergen immunotherapy; however, possible exacerbation of the disease during the initial phase of immunotherapy should be clearly discussed with the patient (Rec, A Evidence)
- 24. Patients receiving immunotherapy for dust mite should ideally receive a dose of that delivers approximately 7mcg Der p 1 per injection or 500 to 2000 AU per injection to obtain an optimal balance between efficacy and safety. (StrRec, A Evidence)
- 25. US dust mite extracts can be mixed with pollen extracts including grass and animal dander extracts. Also at maintenance immunotherapy concentration US dust mite extracts can be mixed with fungal or cockroach extracts when glycerin content is kept at 10%. (Rec, LB Evidence)

- 26. Three to five years duration is sufficient to obtain maximum benefit from immunotherapy for dust mite- induced asthma and rhinitis (Rec, A Evidence)
- 27. Sublingual Immunotherapy for dust mite-allergic patients with rhinitis, mild-moderate asthma and/or atopic dermatitis is safe and effective; however, since there currently is no FDA382 approved product available in the United its use cannot be recommended until such a product becomes available. (Rec Not, A Evidence)

How the evidence was evaluated for quality and strength

Category of Evidence

- Ia. Evidence from meta-analysis of randomized controlled trials
- Ib. Evidence from at least 1 randomized controlled trial
- IIa. Evidence from at least 1 controlled study without randomization
- IIb. Evidence from at least 1 other type of quasi-experimental study
- III. Evidence from non-experimental descriptive studies, such as comparative studies
- IV. Evidence from expert committee reports or opinions or clinical experience of respected authorities or both

Strength of evidence supporting recommendation

- A. Directly based on category I evidence
 - B. Directly based on category II evidence or extrapolated recommendation from category I evidence
 - C. Directly based on category III evidence or extrapolated recommendation from category I or II evidence
 - D. Directly based on category IV evidence or extrapolated recommendation from category I, II, or III evidence
- LB-Laboratory based

Table – Allergen Exposure Thresholds for Reporting Symptoms

Environmental Allergen	Published Threshold (mcg/grm)
Dust Mite (Der p 1)	2
Dust Mite (der f 1)	2
Cat (fel d 1)	8
Dog (Can f 1)	10
German Cockroach (Bla g 1)	2 U/gram
German Cockroach (Bla g 2)	0.04
Mouse (Mus m 1)	1.6

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(3):678-84 e2. Epub 2008/02/08.