NIH Public Access
Author Manuscript
Curr Allergy Asthma Rep. Author manuscript; available in PMC 2014 December 01.

Published in final edited form as:
Curr Allergy Asthma Rep. 2013 December ; 13(6): . doi:10.1007/s11882-013-0378-4.

Management of Rodent Exposure and Allergy in the Pediatric Population

Elizabeth C. Matsui, MD, MHS

Abstract

Although rodent allergy has long been recognized as an occupational disease, it has only been in the past decade that it has been recognized as a community-based disease that affects children. Most homes in the US have detectable mouse allergen, but the concentrations in inner-city homes are orders of magnitude higher than those found in suburban homes. Home mouse allergen exposure has been linked to sensitization to mouse, and children with asthma who are both sensitized and exposed to high mouse allergen concentrations at home are at greater risk for symptoms, exacerbations and reduced lung function. Rat allergen is found primarily in inner-city homes and has also been linked to asthma morbidity among sensitized children. The objective of this review is to summarize the scientific literature on rodents and their allergens, the effects of exposure to these allergens on allergic respiratory disease, and to make recommendations, based on this evidence base, for the evaluation and management of mouse allergy in the pediatric population.

Keywords

Childhood asthma; Inner-city asthma; Rodent allergens; Environmental intervention; Integrated pest management; Pediatric; Rodent exposure; Allergy; Sensitization

Introduction

The major mouse allergen, Mus m 1, is a 16–19kD lipocalin that is excreted in large amounts in the urine, but can also be found in other biologic material such as epithelium.(1, 2) Mus m 1 is a pheromone binding protein that is involved in mating habits and its production is regulated by sex steroids so that it is found in much higher quantities in urine from male than female mice.(3) It is carried on small particles, with the bulk of it found on particles 10 microns or less in diameter,(4) so that it is readily airborne and remains so for prolonged periods of time. In occupational settings, it is detected in air samples collected from areas away from mice and is thought to travel from one location to another by a combination of airborne travel and transfer of the allergen on people's clothing.(4–6) A second mouse allergen, Mus m 2, has also been described and is found primarily in hair and dander(1). Rat n 1 is the major rat allergen and has high homology with Mus m 1.(7) It, too, is a pheromone binding protein of the lipocalin family that is primary excreted in urine. It is also carried on small particles so is readily detectable in the air.

Corresponding author: Elizabeth C. Matsui, MD, MHS, The Johns Hopkins Hospital, CMSC 1102, 600 N. Wolfe Street, Baltimore, MD 21287, T: 410.502.3858, F: 410.955.0229, ematsui@jhmi.edu.

Human and Animal Rights and Informed Consent
This article does not contain any studies with human or animal subjects performed by any of the authors.

Conflict of Interest
Elizabeth C. Matsui has served on an EPA Science Advisory Board, received honoraria from ThermoFisher, and received durable goods support for asthma studies from 3M and Clean Brands LLC.

NIH-PA Author Manuscript
NIH-PA Author Manuscript
NIH-PA Author Manuscript

NIH-PA Author Manuscript

NIH-PA Author Manuscript

NIH-PA Author Manuscript

Exposure in Community Settings

Mus m 1 is found in settled dust samples from almost all inner-city homes(8) and 75–80% of US homes.(9–12) Although the prevalence of the allergen is high even in suburban communities, the concentration of mouse allergen varies greatly between inner-city communities and non-inner-city communities, with concentrations being as much as 1000-fold greater in inner-cities. In one study of inner-city children with asthma, >85% of bedroom air samples had detectable mouse allergen, and approximately 25% had airborne concentrations similar to those seen in some occupational settings.(10) However, even among inner-city communities there is variability in mouse allergen concentrations. Inner-city neighborhoods in the Northeastern and Midwestern US cities tend to have higher concentrations than inner-city neighborhoods in the West.(13) In addition, certain home characteristics have been associated with higher concentrations of mouse allergen and these include presence of holes or cracks in the walls or doors; report of mouse sightings; and presence or report of cockroaches.(8, 14, 15) The presence of a cat in the home is associated with lower mouse allergen concentrations; however, in our studies, most inner-city children with asthma who are mouse sensitized are also cat sensitized, so acquiring a cat is not a viable strategy for trying to improve asthma in this population. Although children should not be exposed directly through occupational sources, one study suggests that adults who work with rodents may passively transfer allergen from their work environments to their homes.(16) Children are, however, exposed in schools and daycares, and in some cases may be exposed to higher levels at school than at home.(17, 18) Rat allergen has been studied less than mouse allergen; one multi-center inner-city asthma study found that it was detectable in approximately one-third of settled dust samples from inner-city homes.(19) The difference in prevalence of rat and mouse allergens is consistent with the behaviors of these two rodents as rats tend to be outdoor dwellers and mice indoor dwellers.

Sensitization

Children with persistent asthma from urban communities should be evaluated for mouse sensitization. The currently available tools include allergy skin testing and specific IgE testing. Commercially available extracts in the US are mouse epithelial extracts, and are not urinary extracts. The extracts are also not standardized and there is likely at least a ten-fold range in the Mus m 1 concentration of these extracts.(20) Specific IgE tests are available on the ImmunoCAP platform for mouse urine, mouse epithelium, and mouse serum, and nasal challenge studies in adults suggest that mouse urine specific IgE and/or skin prick testing are the best tests for identifying clinically-relevant sensitization.(20) To my knowledge, diagnostic testing for rat allergy in community populations has not been studied.

The prevalence of mouse sensitization varies from community to community, with one multi-center study finding that 18% of inner-city asthmatics are sensitized,(21) but in some inner-city communities as many as 50% are sensitized.(22) Prevalence of sensitization in suburban and rural asthmatics is approximately 12–13%,(11, 23) but the overall prevalence of mouse-specific IgE in the US population is only 1%(24); however, some of the difference in sensitization prevalence between these two types of populations may be due to use of skin testing in the asthmatic populations and specific IgE testing in the US population-based survey. The prevalence of sensitization to rat in the US population is also 1%,(24) which is not surprising given the high degree of homology at the amino acid level between mouse and rat allergens,(25) and our own observation in occupational and inner-city asthma populations is that sensitization to the two allergens is highly concordant.

NIH-PA Author Manuscript

NIH-PA Author Manuscript

NIH-PA Author Manuscript

Immunologic and Health Effects of Rodent Allergen Exposure

Mouse sensitization is associated with home mouse allergen exposure(21); the risk of sensitization tends to increase with increasing concentrations of mouse allergen, although some evidence suggests that the risk of sensitization may be attenuated at extremely high concentrations of exposure.(26) Mouse-specific IgG is generally associated with exposure and appears to be common in inner-city children with asthma, but its significance is unclear. Whether exposure reduction can reduce the risk of developing sensitization remains unclear, but the lack of success of environmental interventions in primary prevention of sensitization to other indoor allergens suggests that it is unlikely to be of benefit. In addition, mouse sensitization in early life is associated with an increased risk of wheeze, rhinitis, and eczema by age 3 in one inner-city birth cohort, suggesting that it is a risk factor not only for asthma, but other allergic diseases including rhinitis and eczema.(27)

Mouse allergen exposure has repeatedly been linked to worse asthma among sensitized urban children with asthma, particularly in Northeastern and Midwestern US cities.(9, 13, 22) In communities where mouse infestation is common, as many as 40% of children with persistent, uncontrolled asthma are both sensitized and exposed to mouse allergen, suggesting that mouse allergen plays an important role in a large proportion of asthmatic children in these communities. Even though mouse sensitization is uncommon in the US population as a whole, those who report doctor-diagnosed allergies and are exposed to higher mouse allergen concentrations have a greater risk of current asthma.(28) Although several studies have defined exposure as a level above a particular threshold, there appears to be a dose-response relationship between exposure and asthma morbidity,(29) suggesting that reductions in home mouse allergen concentrations should result in a reduction in asthma morbidity. Although mouse allergen concentrations in dust from sites throughout a home are strongly correlated, mouse allergen concentrations in the bed may be most strongly associated with a range of clinical markers of asthma, including lung function, exhaled nitric oxide, and acute visits. Importantly, a recent study of Baltimore children with asthma found that mouse allergen was the major contributor to asthma morbidity in that community, and that other major indoor allergens, including cockroach, contributed little to asthma morbidity.(22) This recent study highlights the fact that mouse allergen may be the major driver of asthma morbidity in some inner-city communities. With respect to the health effects of rat allergen in community populations, there are many fewer studies. One multi-center inner-city asthma study reported an association between rat allergen exposure and asthma morbidity among rat sensitized children.(19) Although rat allergen exposure is likely an important contributor to asthma morbidity in some children, it is important to note that only approximately 1/3 of inner-city children with asthma had detectable rat allergen in their homes, suggesting that fewer children are affected by rat than mouse allergen.

Home Rodent Allergen Interventions

Because of the strong association between home mouse allergen exposure and asthma morbidity in inner-cities, there is great interest in approaches to reduce home mouse allergen exposure as a means of improving asthma. One pilot study demonstrated that a professionally administered integrated pest management intervention reduced mouse allergen concentrations by at least 75%.(30) This intervention was developed by a pest management professional and included education regarding best housekeeping practices to eliminate food sources; emphasis on exclusion work, which includes sealing all holes and cracks that can serve as entry points for mice; placement of traps; and in heavily infested homes, application of low toxicity rodenticide out of reach of pets and children. Recommended housekeeping practices include using food storage containers with lids that are very difficult for mice to chew through, restricting eating to the kitchen and dining areas

NIH-PA Author Manuscript

NIH-PA Author Manuscript

NIH-PA Author Manuscript

of the home, and sweeping floors and cleaning off countertops immediately after eating. Since mice can enter homes through holes as small as ¼ inch in diameter, careful inspection with a flashlight and in some cases, an angled mirror, is required to identify potential entry points. Moving appliances away from walls or surrounding cabinetry is also important for both cleaning up allergen reservoirs and locating potential entry points. The most commonly used trap, the snap trap, is very effective and a variety of baits, including peanut butter and sesame oil, are effective. Bait blocks are not recommended and many pesticides must be applied by licensed pest management professionals. Similar approaches should be effective to eradicate rats, but there are scant data in regards to home interventions for rats.

All of the above approaches are useful for removing mice, the source of the allergen, but additional approaches, in conjunction with integrated pest management, may also help to reduce allergen concentrations. For example, portable air purifiers are known to reduce airborne particulate matter by as much as 25–50%,(31, 32) and since mouse allergen is found on these particles, it is possible that air purifiers may be helpful. In addition, the bed is an important reservoir of mouse allergen and allergen-proof mattress and pillow encasements that are effective for other animal allergens,(33) which are also found on small particles, may be a helpful adjunctive strategy for reducing exposure. However, the efficacy of neither air purifiers nor allergen proof mattress and pillow encasements in reducing mouse allergen concentrations has been studied.

Although it would be reasonable to expect that a substantial reduction of mouse allergen concentrations would result in an improvement in asthma in sensitized children, this notion has not been fully tested in a clinical trial. One multi-center randomized controlled trial in rodent-sensitized asthmatic children was largely negative, but the intervention achieved only a small reduction in home mouse allergen concentrations (27%), likely because the intervention was not administered by pest management professionals and primarily relied on parents/guardians to implement it.(13) Nevertheless, a post-hoc analysis of children whose homes had at least a 50% reduction in mouse allergen concentrations suggested an improvement in a couple of quality-of-life related outcomes. A multi-center clinical trial of a professionally delivered IPM intervention that includes air purifiers and mattress and pillow encasements is underway and should provide important information about the efficacy of a comprehensive home intervention aimed at mouse allergen.

Evaluation of Sensitization and Exposure in Pediatric Patients: Practical Considerations

An important consideration in patient evaluation is whether the community in which he/she resides is likely to have high concentrations of mouse allergen. Assessment of mouse sensitization is important for children with persistent asthma living in urban areas, particularly in the Northeastern or Midwestern US. In addition, if the parent reports seeing evidence of mice (such as droppings, chewed materials) or mice, the patient should also be assessed for sensitization. Although most of the scientific literature focuses on asthma, at least one study has linked mouse sensitization to rhinitis,(27) so children with perennial rhinitis symptoms from urban communities should also be evaluated for mouse sensitization. As discussed above, either skin prick testing or mouse urine specific IgE testing is appropriate for evaluation of sensitization (Table 1).

Assessment of exposure is quite feasible in the research setting but difficult in the clinical setting, particularly when the patients who are affected may not be able to pay out of pocket for an environmental assessment. In addition to knowledge about mouse infestation in the community, a history elicited from the parents that they have seen evidence of mice or mice is very helpful as it provides confirmation that the allergen is present, and potentially present

NIH-PA Author Manuscript

NIH-PA Author Manuscript

NIH-PA Author Manuscript

in high concentrations.(34) A negative history, however, does not rule out clinically relevant concentrations of mouse allergen, particularly when a patient resides in community where infestation is common; this patient still deserves assessment of mouse sensitization. A negative history when a patient resides in a community where infestation is rare suggests that mouse allergen exposure is very unlikely to be contributing to his/her asthma. It is important to note, however, that there are home environmental assessment services available in many communities and that even when this service is not available, a patient can collect a dust sample from their home and send it to a commercial laboratory for measurement of mouse allergen. Third party payers do not cover the costs of these services in many cases, but in some communities these services are available for free through health departments or non-profit agencies. A high quality licensed professional pest management specialist will also perform a thorough home assessment as a part of his/her service and be able to provide an assessment of infestation.

If a patient is sensitized and there is reason to suspect exposure in the home, the first step is to eradicate the source of the allergen, or the mice. There are some steps that families can take that can be successful in eradicating the infestation;(35) these steps include institution of housekeeping practices such as those discussed above that eliminate food sources for mice and identification and sealing of holes through which mice could enter the home. Using caulk alone has limited effectiveness as mice can chew through the dried caulk. Instead, use of copper mesh along with caulking material is best. Families should also set traps and place them in locations where they have seen evidence of mice. In some cases, pest management services are needed, and a high quality pest management professional should be employed. Determining which pest management companies provide high quality service can be challenging, but high quality companies are those that thoroughly inspect the home (including pulling out appliances in the kitchen, checking for gaps around pipes where they enter the home, assessing heating units), emphasize exclusion work (sealing of all holes and cracks), opt for rodenticide only when necessary, and avoid use of bait blocks.

In addition to removing the source of the allergen, measures that might help reduce the concentration of the allergen in the home include washing of all bed linens frequently in hot water and use of allergen proof mattress and pillow encasements. None of these abatement measures has been studied for mouse allergen, but they may help reduce exposure to mouse allergen that has accumulated in bedding. Air purifiers have not been studied for mouse allergen, but clinical trials indicate that HEPA purifiers reduce airborne particles by at least 25–50%, and because mouse allergen is readily airborne, use of air purifiers may reduce concentrations of mouse allergen in the air. However, given the fact that similar interventions aimed at reducing pet allergen concentrations when the pet remains in the home are not very effective, it is likely that the single most important step for reducing home mouse allergen exposure is eradication of the infestation. Finally, although mouse extracts for allergen immunotherapy are commercially available, immunotherapy has not been studied in children with mouse allergy and asthma.

Conclusions

Rodent allergens are a significant cause of asthma morbidity in children, particularly those living in low-income urban areas. Children with persistent asthma living in communities where mouse infestation is common, or whose parent reports evidence of mice in the home, should be assessed for sensitization to mouse. Although eradication of infestation can be challenging, integrated pest management approaches can result in substantial reductions in home mouse allergen levels.

NIH-PA Author Manuscript

NIH-PA Author Manuscript

NIH-PA Author Manuscript

Acknowledgments

This work was funded in part by the National Institute of Environmental Health Sciences (P50ES015903, P01ES018176), the Environmental Protection Agency (R832139), the National Institute of Allergy and Infectious Diseases (R01AI070630 and U01AI083238), and the Johns Hopkins University School of Medicine General Clinical Research Center grant number M01-RR00052, from the National Center for Research Resources/NIH.

References

1. Schumacher MJ. Characterization of allergens from urine and pelts of laboratory mice. MolImmunol. 1980; 17:1087–1095.
2. Schumacher MJ, Tait BD, Holmes MC. Allergy to murine antigens in a biological research institute. JAllergy ClinImmunol. 1981; 68:310–318.
3. Sharrow SD, Vaughn JL, Zidek L, Novotny MV, Stone MJ. Pheromone binding by polymorphic mouse major urinary proteins. Protein Sci. 2002; 11:2247–2256. [PubMed: 12192080]
4. Ohman JL Jr, Hagberg K, MacDonald MR, Jones RR Jr, Paigen BJ, Kacergis JB. Distribution of airborne mouse allergen in a major mouse breeding facility. JAllergy ClinImmunol. 1994; 94:810–817.
5. Curtin-Brosnan J, Paigen B, Hagberg KA, Langley S, O'Neil EA, Krevans M, Eggleston PA, Matsui EC. Occupational mouse allergen exposure among non-mouse handlers. J Occup Environ Hyg. 2010; 7:726–734. [PubMed: 21058157]
6. Krop EJ, Doekes G, Stone MJ, Aalberse RC, van der Zee JS. Spreading of occupational allergens: laboratory animal allergens on hair-covering caps and in mattress dust of laboratory animal workers. Occup Environ Med. 2007; 64:267–272. [PubMed: 17053016]
7. Hilger C, Kuehn A, Hentges F. Animal lipocalin allergens. Curr Allergy Asthma Rep. 2012; 12:438–447. [PubMed: 22791068]
8. Phipatanakul W, Eggleston PA, Wright EC, Wood RA. Mouse allergen. I. The prevalence of mouse allergen in inner-city homes. The National Cooperative Inner-City Asthma Study. JAllergy ClinImmunol. 2000; 106:1070–1074.
9. Matsui EC, Eggleston PA, Buckley TJ, Krishnan JA, Breysse PN, Rand CS, Diette GB. Household mouse allergen exposure and asthma morbidity in inner-city preschool children. AnnAllergy Asthma Immunol. 2006; 97:514–520.
10. Matsui EC, Simons E, Rand C, Butz A, Buckley TJ, Breysse P, Eggleston PA. Airborne mouse allergen in the homes of inner-city children with asthma. JAllergy ClinImmunol. 2005; 115:358–363.
11. Matsui EC, Wood RA, Rand C, Kanchanaraksa S, Swartz L, Eggleston PA. Mouse allergen exposure and mouse skin test sensitivity in suburban, middle-class children with asthma. JAllergy ClinImmunol. 2004; 113:910–915.
12. Cohn RD, Arbes SJ Jr, Yin M, Jaramillo R, Zeldin DC. National prevalence and exposure risk for mouse allergen in US households. JAllergy ClinImmunol. 2004; 113:1167–1171.
13. Pongracic JA, Visness CM, Gruchalla RS, Evans R 3rd, Mitchell HE. Effect of mouse allergen and rodent environmental intervention on asthma in inner-city children. Ann Allergy Asthma Immunol. 2008; 101:35–41. [PubMed: 18681082]
14. Chew GL, Perzanowski MS, Miller RL, Correa JC, Hoepner LA, Jusino CM, Becker MG, Kinney PL. Distribution and determinants of mouse allergen exposure in low-income New York City apartments. EnvironHealth Perspect. 2003; 111:1348–1351.
15. Cohn RD, Arbes SJ Jr, Jaramillo R, Reid LH, Zeldin DC. National prevalence and exposure risk for cockroach allergen in U.S. households. EnvironHealth Perspect. 2006; 114:522–526.
16. Krakowiak A, Szulc B, Gorski P. Allergy to laboratory animals in children of parents occupationally exposed to mice, rats and hamsters. Eur Respir J. 1999; 14:352–356. [PubMed: 10515413]
17•. Permaul P, Hoffman E, Fu C, Sheehan W, Baxi S, Gaffin J, Lane J, Bailey A, King E, Chapman M, Gold D, Phipatanakul W. Allergens in urban schools and homes of children with asthma. Pediatr Allergy Immunol. 2012; 23:543–549. This study demonstrated significantly higher

NIH-PA Author Manuscript

NIH-PA Author Manuscript

NIH-PA Author Manuscript

concentrations of mouse allergen in schools than in homes in one US community. [PubMed: 22672325]

18. Perry TT, Vargas PA, Bufford J, Feild C, Flick M, Simpson PM, Hamilton RG, Jones SM. Classroom aeroallergen exposure in Arkansas head start centers. Ann Allergy Asthma Immunol. 2008; 100:358–363. [PubMed: 18450122]
19. Perry T, Matsui E, Merriman B, Duong T, Eggleston P. The prevalence of rat allergen in inner-city homes and its relationship to sensitization and asthma morbidity. JAllergy ClinImmunol. 2003; 112:346–352.
20. Sharma HP, Wood RA, Bravo AR, Matsui EC. A comparison of skin prick tests, intradermal skin tests, and specific IgE in the diagnosis of mouse allergy. JAllergy ClinImmunol. 2008; 121:933–939.
21. Phipatanakul W, Eggleston PA, Wright EC, Wood RA. Mouse allergen. II. The relationship of mouse allergen exposure to mouse sensitization and asthma morbidity in inner-city children with asthma. JAllergy ClinImmunol. 2000; 106:1075–1080.
22•. Ahluwalia SK, Peng RD, Breysse PN, Diette GB, Curtin-Brosnan J, Aloe C, Matsui EC. Mouse allergen is the major allergen of public health relevance in Baltimore City. The Journal of allergy and clinical immunology. 2013 This prospective cohort study found that mouse, but not cockroach, allergen exposure is the major contributor to asthma morbidity in Baltimore.
23. Welch JE, Hogan MB, Wilson NW. Mouse allergy among asthmatic children from rural Appalachia. Ann Allergy Asthma Immunol. 2003; 90:223–225. [PubMed: 12602670]
24. Gergen PJ, Arbes SJ Jr, Calatroni A, Mitchell HE, Zeldin DC. Total IgE levels and asthma prevalence in the US population: results from the National Health and Nutrition Examination Survey 2005–2006. The Journal of allergy and clinical immunology. 2009; 124:447–453. [PubMed: 19647861]
25. Jeal H, Harris J, Draper A, Taylor AN, Cullinan P, Jones M. Dual sensitization to rat and mouse urinary allergens reflects cross-reactive molecules rather than atopy. Allergy. 2009; 64:855–861. [PubMed: 19154543]
26. Matsui EC, Eggleston PA, Breysse PN, Rand CS, Diette GB. Mouse allergen-specific antibody responses in inner-city children with asthma. JAllergy ClinImmunol. 2007; 119:910–915.
27. Donohue KM, Al-alem U, Perzanowski MS, Chew GL, Johnson A, Divjan A, Kelvin EA, Hoepner LA, Perera FP, Miller RL. Anti-cockroach and anti-mouse IgE are associated with early wheeze and atopy in an inner-city birth cohort. The Journal of allergy and clinical immunology. 2008; 122:914–920. [PubMed: 19000580]
28. Salo PM, Jaramillo R, Cohn RD, London SJ, Zeldin DC. Exposure to mouse allergen in U.S. homes associated with asthma symptoms. Environ Health Perspect. 2009; 117:387–391. [PubMed: 19337513]
29•. Torjusen EN, Diette GB, Breysse PN, Curtin-Brosnan J, Aloe C, Matsui EC. Dose-response Relationships between Mouse Allergen Exposure and Asthma Morbidity Among Urban Children and Adolescents. Indoor Air. 2012 This prospective cohort study found a linear dose-response relationship between home mouse allergen exposure and asthma morbidity, providing a strong rationale for home-based environmental interventions targeting mouse allergen.
30. Phipatanakul W, Cronin B, Wood RA, Eggleston PA, Shih MC, Song L, Tachdjian R, Oettgen HC. Effect of environmental intervention on mouse allergen levels in homes of inner-city Boston children with asthma. AnnAllergy Asthma Immunol. 2004; 92:420–425.
31. Butz AM, Matsui EC, Breysse P, Curtin-Brosnan J, Eggleston P, Diette G, Williams D, Yuan J, Bernert JT, Rand C. A randomized trial of air cleaners and a health coach to improve indoor air quality for inner-city children with asthma and secondhand smoke exposure. Arch Pediatr Adolesc Med. 2011; 165:741–748. [PubMed: 21810636]
32. Lanphear BP, Hornung RW, Khoury J, Yolton K, Lierl M, Kalkbrenner A. Effects of HEPA air cleaners on unscheduled asthma visits and asthma symptoms for children exposed to secondhand tobacco smoke. Pediatrics. 2011; 127:93–101. [PubMed: 21149427]
33. Vaughan JW, McLaughlin TE, Perzanowski MS, Platts-Mills TA. Evaluation of materials used for bedding encasement: effect of pore size in blocking cat and dust mite allergen. The Journal of allergy and clinical immunology. 1999; 103:227–231. [PubMed: 9949312]

NIH-PA Author Manuscript

NIH-PA Author Manuscript

NIH-PA Author Manuscript

34. Curtin-Brosnan J, Matsui EC, Breysse P, McCormack MC, Hansel NN, Tonorezos ES, Eggleston PA, Williams DL, Diette GB. Parent report of pests and pets and indoor allergen levels in inner-city homes. Ann Allergy Asthma Immunol. 2008; 101:517–523. [PubMed: 19055206]

35•. Phipatanakul W, Matsui E, Portnoy J, Williams PB, Barnes C, Kennedy K, Bernstein D, Blessing-Moore J, Cox L, Khan D, Lang D, Nicklas R, Oppenheimer J, Randolph C, Schuller D, Spector S, Tilles SA, Wallace D, Sublett J, Bernstein J, Grimes C, Miller JD, Seltzer J. Environmental assessment and exposure reduction of rodents: a practice parameter. Ann Allergy Asthma Immunol. 2012; 109:375–387. This practice parameter provides a thorough review of environmental assessment and interventions to reduce mouse allergen exposure. [PubMed: 23176873]

NIH-PA Author Manuscript

NIH-PA Author Manuscript

NIH-PA Author Manuscript

TABLE 1

Key points: assessment and management

- Although mouse allergen is found in most homes in the US, concentrations in urban homes in the Northeastern and Midwestern US are orders of magnitude higher than other homes in the US.
- Skin prick testing and/or specific IgE testing are useful for identifying patients with clinically relevant sensitization.
- Although dust samples can be sent to commercial laboratories for analysis of mouse allergen content, a good history focused on sightings of mice or evidence of mice and general knowledge of mouse infestation in the community can be helpful in identifying children who are likely to be exposed.
- Significant exposure reduction can be achieved by eradication of infestation
  - Setting traps
  - Thorough inspection to identify holes and cracks, sealing of holes and cracks with copper mesh and caulk
  - Meticulous cleaning of kitchen and dining areas after food consumption
  - Storage of foods in chew-proof, sealed containers
  - Professionally applied rodenticide, if needed
- Additional measures that may help reduce home mouse allergen exposure include:
  - Washing all bed linens in hot water every 2 weeks
  - Use of allergen-proof mattress and pillow encasements
  - HEPA purifiers