

## House Dust Mites

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Entfact-646

### Fast Facts

- House dust mites are typically found on the floors, mattresses, rugs or infesting dried stored products where they feed on micro molds that develop on skin scales and foods.
- House dust mite feces are known to cause or exacerbate bronchial asthma in sensitized individuals.
- Management of house dust mites requires the medication of the symptoms and the changes in the environmental conditions to eliminate or reduce the populations.

### Introduction and Medical Importance

There are many substances in household dust which can cause allergies in humans, including animal dander, insect parts (especially from cockroaches), mold spores and pollen. The most common allergenic components of house dust, however, are from house dust mites. House dust mites are tiny creatures related to ticks, chiggers, and spiders, that live in close association with humans. Their primary food is dander (skin scales) shed from human and pet activity. Most homes in the United States probably have detectable levels of house dust mites and their allergy-producing fragments. House dust mites are not parasitic nor are they capable of biting or stinging humans. Their significance as pests is due to the powerful allergens contained in the mites, their cast skins, fecal material and secretions. Symptoms of a house dust mite allergy include stuffy or runny nose, sneezing, coughing or watery eyes.

Inhalation of dust mite allergens by hypersensitive individuals can result in acute attacks of bronchial asthma, accompanied by wheezing, shortness of breath, and perhaps even death. Diagnostic tests and clinical studies by allergists have shown house dust mite to be the most common allergy in asthmatics, and an important "root cause" for the development of asthma in young children. Recent studies suggest that at least 45 percent of young people with asthma are allergic to house dust mites. Unlike "seasonal" allergies caused by molds and pollen, people who are allergic to dust mites often will have symptoms year-round. Mite Description and Detection.

### Mite Description and Detection

House dust mites are tiny, adults are about 0.5 mm long and the immatures are even smaller. Consequently, they generally are visible only with the aid of a microscope. The

mites are globular in shape, clear to creamy white in color, with hairs on their legs and body. There are two common species in the United States, the North American house dust mite, *D. farinae*, and the European house dust mite, *D. pteronyssinus*.



Female of *Dermatophagoides farinae*



Female of *Dermatophagoides pteronyssinus*

The presence of house dust mites can be confirmed by collecting dust samples from inside the home and examining them under a microscope. Another diagnostic test more accessible to householders can be purchased from drug and allergy supply stores. The detection kits (e.g., Acarex) measure the presence and infestation level by combining dust samples, collected from various places inside the home, with indicator reagents. Sensitivity to house dust mites and their allergenic proteins can be confirmed by an allergist-immunologist, via a skin and/or blood test.

### **Biology and Habits**

House dust mites have specific environmental requirements for their development. The mites tend to be most numerous in warm homes with high humidity. Optimum conditions for growth and development are around 75-80 degrees F and 70-80 percent relative humidity. House dust mites absorb and lose moisture through their skin, and are very vulnerable to dehydration. Consequently, humidity levels within the home have a significant effect on survival. Some species of house dust mites require a high relative humidity (RH) ranging from 70% to 80%, whereas others can survive in lower levels, between 50% and 60%. As a result, those that can thrive even at lower humidity and move around on floors and in diverse settings, including slightly moldy dry starchy food like dried dog food. Dust mites cannot survive well at relative humidities below 50 percent. Although mite populations tend to be low in dry climates, most homes throughout the United States are capable of supporting dust mites. House dust mites and their allergenic particles are present within homes year-round, but people tend to have fewer symptoms during

the summer, perhaps because they spend more time outdoors.

Food is seldom a problem for house dust mites. Their primary food is skin scales (dander) contained in house dust. People and pets regularly shed small flakes of skin from their bodies as the skin continually renews itself. Since the greatest fallout occurs in areas of human and pet activity, the mites tend to be most numerous in beds, overstuffed sofas and chairs, and adjacent carpeted areas. Relative humidity also tends to be higher in these areas, because people perspire and exhale water vapor where they sleep and lounge. Mattresses, sofas, carpet, and other soft furnishings trap and accumulate dust, dander, and moisture, making them ideal microhabitats for mite development. House dust mites go through five major life stages: egg, larva, protonymph, tritonymph and adult. Between life stages the mites molt, shedding their outer skin. When temperature and humidity are optimum, development from egg to adult takes about one month. Adults live approximately 1-2 months, and the females lay about 50 eggs. It is not uncommon to find thousands of mites in a single gram of house dust (a gram is about the weight of a paperclip). An infested mattress can contain millions of dust mites. The allergenic proteins responsible for causing symptoms are contained within the mites themselves (alive or dead), their shed skins, and especially in their feces. The inhalation of very small fecal material, such as that coming from larvae and protonymphs, can lead to sensitization and cause rhinitis problems (respiratory issues) and even bronchial asthma, especially in cases where mite infestations are high, and colonies are in a reproductive phase. Routine human activity such as housecleaning, walking or playing on carpeting, or making the bed, causes the tiny fecal particles to become airborne and inhaled.

## **Managing Infestations and Alleviating Symptoms**

There are two basic approaches to managing dust mite allergy: 1) treatment of the patient, and 2) modification of the patients' environment to minimize exposure to the mites. An allergist may prescribe quick-relief medications and/or allergy vaccinations (immunotherapy). Immunotherapy involves injecting gradually-increasing concentrations of mite extracts over time in order to desensitize the affected individual. The second approach often done in conjunction with patient therapy is to minimize exposure to the mites and their allergenic materials inside the home. This is not a simple process and usually requires significant effort and expense. Dust mite abatement has become a huge industry, with companies offering many products and services to allergy sufferers seeking relief from their symptoms. While some abatement measures are helpful, others are relatively ineffective or as yet unproven. Of the treatment measures discussed below, numbers 1-3 are generally considered most essential and effective, whereas the others may provide some secondary benefit.

- 1.** Remove or modify furnishings that accumulate dust and provide habitat for dust mites. Carpeting, upholstered furniture, drapes, curtains, stuffed toys, and other fabric-covered furnishings should be replaced with easy-to-clean items. This is especially important in bedrooms and other areas where allergy sufferers spend most of their time. Carpet is a perfect breeding ground for dust mites. If carpeting must be used, select low pile varieties. Area rugs are easier to clean than wall-to-wall carpeting. Hardwood, tile or linoleum floors are much easier to keep clean and dust-free. The same is true of wooden, leather or plastic-covered

sofas and chairs. Do not allow children with dust allergies to sleep or play with stuffed, furry toys.

**2.** Encase mattress, box springs, and pillows in allergen-impermeable covers. Bedding is an extremely important source for dust mite development. Plastic or vinyl covers that zip around mattresses, box springs and pillows seal in allergenic materials so that they are not inhaled while sleeping. They are also easier to keep clean than cotton-based materials. Various styles of dust-proof bedding protectors are available through mattress and allergy supply stores. Many are equipped with an outer layer of material, such as nylon, to enhance comfort. Ideally, it's best to install dust-proof protectors on new bedding items rather than those that are already laden with allergens. Using "non-allergenic" pillows is not a substitute for covering them with allergy-proof encasements; non-allergenic simply means that the materials are synthetic. Moreover, the evidence is contradictory as to whether foam pillows are any less prone to dust mite allergens than are feather pillows. Use only washable bed spreads, sheets and blankets, and launder bedding weekly in hot water.

**3.** Attempt to lower relative humidity inside the home. House dust mites have a difficult time surviving when the relative humidity is below 50 percent. Improving ventilation and installing a dehumidifier can often help to reduce populations indoors. Since fabric-covered surfaces retain air and body moisture better than less porous materials (e.g., wood, vinyl, linoleum), removal or modification of carpets, bedding, overstuffed furniture, etc. will further help to reduce humidity and favorable habitat for dust mite development.

**4.** Maintain good levels of sanitation and housecleaning. Vacuuming and cleaning

activities have not shown much benefit in reducing mite populations, or removing their allergenic materials (feces, cast skins, carcasses). Routine, thorough vacuuming can, however, help to remove dust, dander, and a small percentage of mites. When vacuuming is performed, it's important to use a vacuum cleaner equipped with a HEPA (High Efficiency Particulate Arrestor) filtration system, so that the microscopic allergens are retained within the vacuum bag. Vacuum cleaners lacking this level of filtration will simply re-circulate the tiny allergenic particles back into the air, often causing even greater allergy symptoms. Emphasis should be on bedrooms, mattresses, and other locations where dust mites are likely to be living. Ideally, allergic individuals should not be the ones doing the vacuuming, nor should they be around when vacuuming is being performed. If this is not possible, they should wear a filtered breathing mask. Dusting of surfaces should be done with a damp or oiled cloth.

**5.** Consider the use of allergen-trapping air filters. Microscopic dust mite particles (especially feces) can remain suspended in the air for hours and be inhaled. To help remove these allergens, HEPA-grade filters can be installed in the central air conditioning and heating system of the home. HEPA filters can also be used within portable air cleaners, placed in bedrooms and other critical areas of the house. The value of such portable room air cleaners may be marginal, however, especially in rooms with good ventilation.

Companies that perform air duct cleaning often cite dust mite control as a major reason to purchase their services. As mentioned earlier, dust mites require high relative humidity for their survival. It's doubtful that the humidity levels found within air ducts are high enough to support ongoing mite development. Removing heavy

accumulations of dust and filth from air ducts may be of some benefit, but should be considered secondary to allergy abatement measures 1-3 listed above.

**6.** Consider treating carpets with an acaricide. Mite-killing products containing benzyl benzoate (e.g., Acarosol) are available for treatment of carpeting, upholstery, and other surfaces. Although benzyl benzoate will kill dust mites, clinical trials are lacking that show much improvement in allergy symptoms. The same is true of products containing tannic acid (e.g., Allergy Control Solution), which are designed to denature dust mite allergens so that they no longer cause symptoms. Treatment of the premises with either of these chemicals should be considered only as a supplement to more important allergy-reducing measures, such as encasement of bedding and removal of dust-laden furnishings.

## **Reference**

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01/2000 (Issued)

11/2024 (Revised)