

## Dust Mite Facts

**Genus:** Dermatophagoides; Mites are Arachnids

### Species

- Dermatophagoides Farinae (DF) - found in North America
- Dermatophagoides pteronyssinus (DP) - found in Europe
- Euroglyphomyces (EM)
- Blomia Tropicalis - found in Central America

**Size:** About 250 to 300 microns (mm) in length

**Adult Mite Lifespan:** Up to 3 months; (3 larval stages)

**Reproduction:** Female mites lay about 25 to 50 eggs

**Habitat:** Mites live in carpet, fabric upholstery, and mattresses.

**Diet:** Human skin scale, animal dander and trace nutrients. Mites need to absorb humidity, they cannot drink water.

**Allergen:** Dust mite fecal material.

**Body Color:** Translucent.

**Average Threshold before Developing Allergies:** 100 mites/gm of dust

**Allergic Reactions:** asthma, rhinitis

### Living Conditions

**Temp. Range:** approx. 59°F to 95°F (15°C to 35°C)

**Relative Humidity Range:** approx. 55% to 85%



## Controlling Dust Mites

Mite allergens are considered one of the most potent allergens in house dust. The most common genus of mites found in house dust in north America and Europe is Dermatophagoides, of which there are two species, *D. pteronyssinus* and *D. farinae*. Their body parts and fecal excreta are initially 10 to 50 mm in diameter but break down into smaller fragments that become airborne when dust is disturbed. According to one study, more than half the weight of mite allergens within a home were found to be less than 5 mm in length. Because of their small size, fecal material are the primary health concern due to the fact that they can be inhaled into the lower airways of the lungs. If quantities of mite allergens are significant, IgE antibodies can form, leading to allergic reactions in the susceptible portion of the population.

Along with respiratory symptoms, high levels of dust mite allergens have also been correlated with atopic dermatitis (AD), characterized by itchy, irritated skin. In general, these studies suggest that those susceptible to mites (i.e., those likely to form IgE antibodies) are also likely to develop skin sensitization if exposed to high concentrations of mite allergens.

As one might expect, most mite allergens are formed by adult mite during their active phase. The survival of active adult mites (both male and female) is limited to 4 to 11 days at humidities below 50% RH at 25°C. The protonymph, however, which is one of the dormant larval forms, can survive for months at low humidities and then evolve to the more active forms when optimal conditions return. These protonymphs are particularly difficult to remove with normal vacuuming since they can bury themselves within surfaces.

Very high humidities can inhibit mite development due to the presence of mold growth. Humidity levels above 88%, in particular, lead to mold growth, which restrains mite development. Humidity levels which are very low can also inhibit mite development. Mites contain about 70% to 75% water by weight and must maintain this in order to reproduce. Their primary source of water is ambient water vapor.

Thus, for a given number of mites, the highest levels of allergens found in the environment usually correspond to optimal humidity conditions. Arlian (1992) examined the effect of RH on mite metabolism for a range of relative humidities between 22% and 95% and observed that feeding rates, and consequently the amount of fecal matter produced, increased with increasing RH. The effect was particularly significant between 75% and 85% RH, where there was a fivefold increase in the weight of

food consumed for both *D. pteronyssinus* and *D. farinae*. Below the CEH (Critical Equilibrium Humidity), Arlian found that mites fed sparingly and produced little fecal matter. These results suggest that significant reductions in the level of mite allergens, which consist primarily of fecal matter, may occur if RH is reduced below the CEH. (For more detailed information on the mite life-cycle and metabolism, see Arlian [1992].)

In a study of homes in Vancouver, Murray et al. (1979) detected significant numbers of mites only when the RH was greater than 50% for at least part of every day during the month of collection.

Carpeting can be a localized site of increased humidity and consequently may be an important reservoir for allergens in both homes and schools. Studies conducted in schools have demonstrated that carpets contain high levels of a variety of allergens including pollen, cat and dog dander and mite and mold allergens. This may be the primary source of exposure for young children, who generally live closer to the floor. Children do not have high exposures in bedding since they usually sleep on plastic-covered mattresses. The strong correlation between indoor relative humidity and dust mite population has led to recommendations to reduce indoor humidity. However, the exact upper limit is not obvious. Most of the field studies suggest that when indoor humidity is kept below 50% RH, mite populations do not grow to significant levels. A dedicated dehumidification system is required in most cases in order to achieve this.

*Arlian, L.G., D. Bemstein, I.L. Bemstein, S. Friedman, A. Grant, P. Lieberman, et al. 1992. Prevalence of dust mites in the homes of people with asthma living in eight different geographic areas in the U.S. Journal of Allergy and Clinical Immunology 90 (3): 292-300.*

*Murray, A.B., and P. Zuk. 1979 The seasonal variation in a population of house dust mites in a North American city. Journal of Allergy and Clinical Immunology 64 (4): 266-269.*