

House Dust Mite – the Paradox

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Mankind evolution is towards progress. Sometimes, contrary to the wish, progress may bring regress and problems for a period, instead of a better life.

House dust mites are a good example. Parallel to the development of better living conditions in houses, they multiply and bring a pathology more and more spread and annoying. Asthma caused by house mites is more spread in economically developed countries and in people living in the best hygienic conditions. On the contrary, poor people living in bad houses and in the general conditions of a less developed country have much more rare asthma due to mites. One aspect of this apparent paradox is worth to be discussed.

Mites are minuscule arthropods belonging to the Arachnid class. They are spread almost in all human houses in humid, warm and temperate climate. Their dimensions — about one quarter of a millimeter — make them impossible to be perceived by common eyes. They live in the dust of a room (be it as clean as possible) and, especially, in beddings, pillows and mattresses, carpets and upholstered furniture.

The general rule is that they prefer a humid climate and a temperature level better towards warm than cold. In these conditions every female lays up to 100 eggs in her second half of life (5 out of 10 weeks). In 1 gram of dust there are up to 500 animals and each animal produces during its life more than 2000 fecal particles and much more enzyme covered dust particles, which are all highly allergenic. In these conditions it is believed that more than 1 billion people worldwide suffer of a form of chronic sensitization to house dust mites.

There are four main species of mites: *Dermatophagoides pteronyssinus* (Dp), mainly in Europe, *Dermatophagoides farinae* (Df), mainly in the USA, *Blomia tropicalis* (Bt), mainly in warm climates and *Euroglyphus maynei*, everywhere. Although there could be differences in their biology, the asthma symptoms produced are common and the therapeutic measures do not differ.

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The main issue in treating asthma is prevention (primary prevention to avoid development of asthma and secondary prevention to avoid exacerbations). In respect to the house dust mite allergens, prevention may have the best results, but may be complicate.

One aspect is choosing the best material for beddings and pillows. It was thought that the feather filled pillows and duvets are a better habitat for mites. Recent studies showed the contrary. Kempt et al showed in their study polyester fiber pillows contained 8 times more mite antigen than feather pillows (1). Other studies found that unprocessed feather pillows contain important mite allergens, while processed feather filled pillows do not (2). New processed feather pillows put in a bedroom with high content of mite allergens did not become contaminated (2). Lots of offers for other material fillings for pillows and duvets are available, from which wool and cotton had most different types of offers. Finally, regarding these materials, it seems that unprocessed feathers are not adequate, while all others — processed feathers, polyester fibers, wool, cotton — are under debate.

Some advices may be however given. Use of encased mattresses, pillows and duvets has shown inconclusive results in adequate reduction in dust mite exposure. The humidity created between the warm body surface and the bedding is an excellent ambient for mites; in this respect it is discouraged to sleep with wet hair on the pillow. Bedding (sheets, pillowcases and blankets) should be washed weekly in hot water and ironed if possible.

Another advice is to put the pillows weekly in a cloth dryer at 105 degrees C, or in a cold dryer (3). Few people have these machines over the other many electronic machines in their houses. An alternative would be to wash the pillows in hot water at a few weeks interval. This is another impractical alternative, thinking only of the way to dry them. And in all cases, the same actions cannot be accomplished for duvets. We have to look for other possible measures against mites.

One measure is to use a good HEPA (high-efficiency particulate air) filter vacuum cleaner in the house for floors and mattresses. This is a common alternative, but for dust mites there are also some other advices. It is better to avoid carpets, which are an important source of dust mites. Hard surfaces (wood, linoleum or tile)

are preferred for flooring as are leather or vinyl furniture. It is not good to use humidification, because mites survive and multiply better in humid ambient. Indoor humidity should be kept between 35-40%. It was previously advised to use HEPA filters. These have higher prices than the common filters and the machine has to have a strong power necessary to circulate the air flow through a very dense filter. The vacuum machines clean the floor and the furniture, but not the air, or the bedding. However, the HEPA filters have minimal effect on dust mites particles, which are heavy and stay airborne only for a short period of time. They are more effective for pet dander, that is light and remains airborne for a longer time.

The question of humidification and filter is similar for air conditioners. Humidification is not good to stop mite development and HEPA filters have higher prices. Air conditioners mainly bring air into the room, while the inside air, which may contain mite particles from the floor and furniture, is not filtered. Split air conditioners have longer conducts in which bacteria, fungi and other microorganisms may develop and bring new allergens into the room. The cleaning and disinfection of such conducts is not very simple. So, common air conditioners are only partially effective against indoor allergens in the rooms and particularly against house dust mites. They only help in humid climates by decreasing the indoor humidity below 40%.

Once the asthma due to dust mites develops, it is necessary to use medical therapies, various and efficient in different ways. It means some are acute therapies for crisis (exacerbations), some are long term therapies to treat chronic inflammation (inhaled corticosteroids, leukotriene modifiers), but some are long term therapies trying to desensitize. Subcutaneous immunotherapy (SCIT) is effective in decreasing dust mite sensitization, but gives some pain and necessitates precautions, carrying a small risk of anaphylaxis. Sublingual immunotherapy (SLIT) is developed more and more (Cytos Biotechnology, Stallergenes, ALK together with Merck and Torii Pharmaceuticals and many other). Sublingual immunotherapy tablets or sublingual drops may be used, and there are studies in which asthma went into complete remission in children even after 5 years after completing the sublingual immunotherapy (4). In another study 95% remission of dust mite

induced asthma exacerbations in children was obtained by SLIT (5). SLIT appears safer and more accepted than SCIT, at least in Europe. In United States it is still under investigation, awaiting *Food and Drug Administration* approval.

However, the general primary and secondary prevention methods are at least as important as medical therapy, if they are efficient. Modern houses are built to be energy efficient. It means windows are very compact and often do not open, with minimal air exchange with the outdoor air. Indoor human activity generates high humidity. Heating, cooling and humidification are accomplished by dual function air conditioners. During winter this process is less active and high temperatures are often preferred, obtained by modern heating systems, with humidifying the indoor air for comfort.

These measures lead to dust mite exposure all year round. Prevention of house dust mite allergy implies often refreshing of air, especially in winter, when the outdoor air is cold and dry. In warm season with humid climates and during of periods of high pollen season, it preferable to keep the windows closed and the air conditioners running. In summer in dry climates, dry air, which also comes free from outside, is to be preferred. The paradox is that the modern technologies do not easily fulfill the conditions. And the grand pa and ma advice, to largely open the widow of your bedroom two times a day, probably overpasses all the modern means of fight against house dust mite, along with ironing of sheets and pillowcases.

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