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Environmental control measures for allergy

by Harold Nelson, M.D.

Environmental control measures play a major role in the management of patients with allergies. In particular, antigen-specific avoidance measures can be effective against indoor allergens, while the effect of some irritants can also be mitigated.

The major house-dust allergens include house-dust mites, cockroaches, and animal dander. Indoor-air irritants include tobacco smoke, gas combustion products, formaldehyde, and fumes from cleaning products, personal care products, paints and varnishes.

House-dust mites and cockroaches

The importance of the allergen potential of house-dust mites has been appreciated since the 1960s. Cockroaches have only recently been recognized as a major indoor allergen in warm, humid climates.

Where there is more than 50 percent humidity, the mite and, to a less studied and analyzed degree, the cockroach are the primary antigens of house dust. **In areas where humidity is low, house-dust mites and cockroaches don't constitute a serious problem.**

For example, in a study conducted in Denver, a semi-arid climate, it was

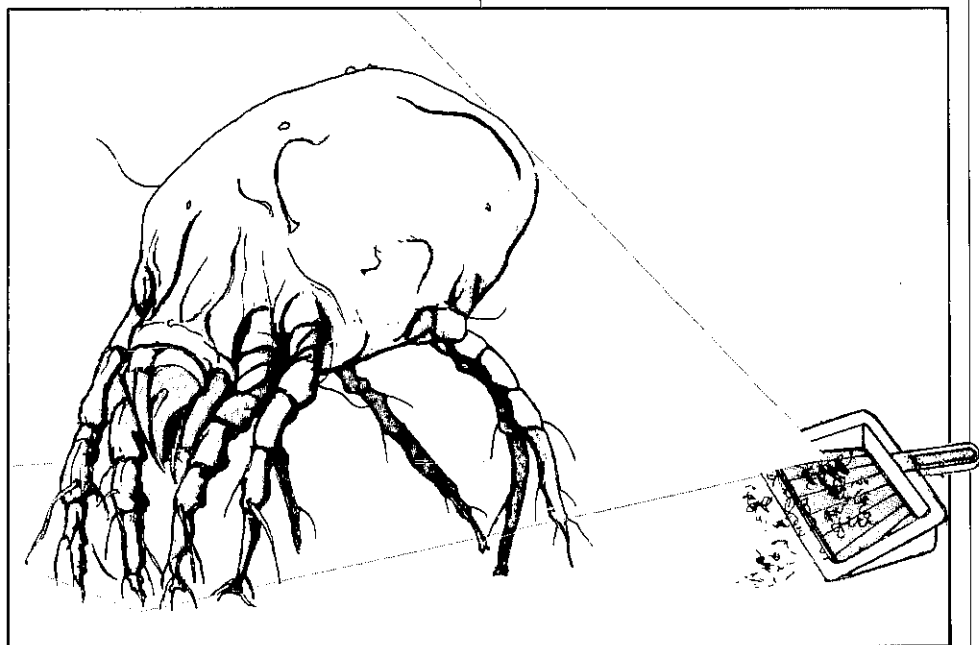
shown that the house-dust mite is not a major allergen — unless the furniture originated elsewhere.¹

In studying house dust from 16 homes with furniture that originated in Denver, there were no detectable mites in 75 percent of the homes, and the levels in the other 25 percent of the homes were very low. On the other hand, in Denver homes where the furniture had moved with the families from damp climates

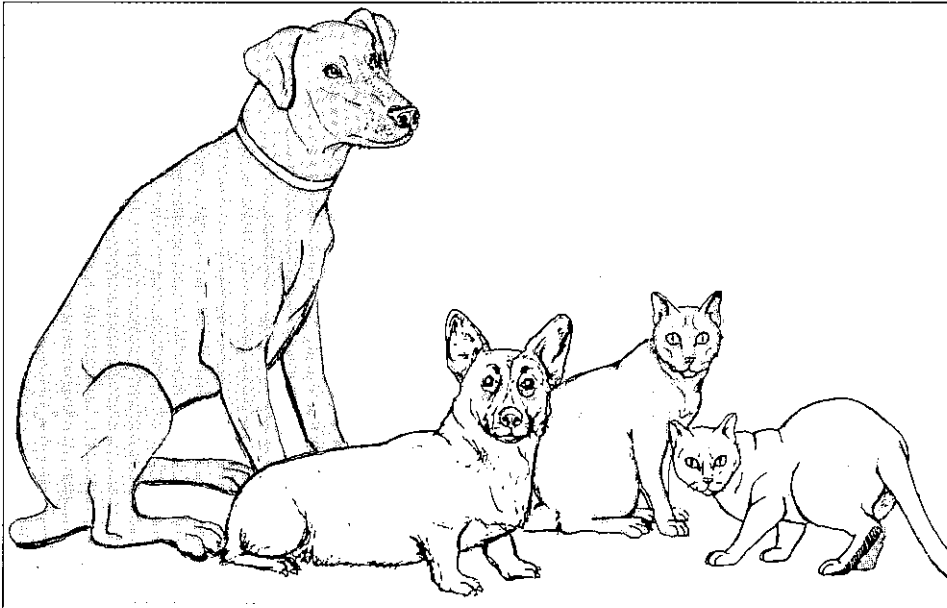
(such as Texas, Tennessee, and Germany), there were large numbers of mites in the furniture.

Surprisingly, mites persist rather well in Denver, despite the unfavorable conditions. In serial sampling after a period of two years, there were still large numbers of viable mites in the furniture.

Another study showed a high correlation between size of the house-dust



Invisible to the naked eye, the house-dust mite is a major allergen.



Animal dander is a significant indoor allergen.

mite population and level of humidity in the house.² This indicates that humidifiers should not be routinely used by allergic patients. It now appears that the humidity should be kept down around 20 to 30 percent to keep mites — and molds — from thriving.

House-dust mite populations proliferate during the summertime and die off during the winter. However, the major antigen — the mites' fecal protein — remains in the environment. Thus, the allergic response to this antigen does not show a marked seasonal pattern.

Animal danders

In a census of house pets in the United States, 42 percent of households were found to have dogs, and 28 percent have cats or other pets. Therefore, animal dander is a significant contributor to the indoor allergen load.

Environmental control studies

That environmental controls can lead to improvement in symptoms was demonstrated in a recent study.³ Nine patients allergic to house dust slept in a house-dust-mite-free hospital from six weeks to four months. They were allowed to go to work, but could not visit any homes or have contact with animals.

After leading this abnormal lifestyle — the ultimate in environmental control — all nine patients achieved a

reduction in their asthma medication. Five out of nine experienced decreased bronchial reactivity, and their levels of both total IgE and mite-antigen-specific IgE declined.

This study showed that effective control of mites can improve asthma and even reduce non-specific bronchial hyperresponsiveness. Similar results have been obtained in children in a Canadian study through strict environmental controls within the home.⁴

Physicians need to consider not only the humidity in their practice area, but also where their allergic patients' furniture originated and if the patient uses a humidifier.

Home environmental controls

To achieve good results at home, patients must employ aggressive environmental control measures. These include covering mattresses and pillows with plastic encasings (available from surgical supply stores) and weekly hot-water laundering of blankets and sheets. In some cases, removing carpets, pets and upholstered furniture from the home also is necessary.

Acknowledging an animal allergy and **removing a favorite pet** is usually difficult. The necessity of limiting exposure to an animal depends on the severity of allergy. With a minimal allergy, keeping the pet outdoors at all

times or out of specific rooms, especially the patient's bedroom, may be sufficient. Severe allergies require the total removal of the pet from the allergic person's environment.

Once an animal is removed from the indoor environment, a thorough cleaning of carpets, upholstered furniture and ductwork by professionals is necessary. Comprehensive cleaning measures will reduce residual allergens, although animal dander may remain in the carpet for four to six months.

Air purifiers

Air purifiers are often recommended to allergic patients. But will air cleaning devices actually give atopic patients relief from allergens that cause asthmatic or allergic symptoms?

The answer depends on the heaviness of the particle of the antigen, which determines its ability to stay airborne. For instance, small particles — such as cigarette smoke and, to a lesser degree, animal dander — settle very slowly from the air. Larger particles, such as pollen or mite fecal pellets drop out of the air very rapidly. In ten minutes, more than 95 percent of the pollen falls from the air sponta-

Major Indoor Allergens

- House-dust mites
- Cockroaches
- Animal dander

neously. Air filters can only be effective on those antigens still in the air.

Panel filters: These are small, inexpensive, desktop machines that do little more than put lemon scent into the air.

Electronic filters: Electrostatic precipitators are not fully efficient and require extensive maintenance. With continuous operation, an electrostatic precipitator falls from a maximum 80

percent efficiency to a very low level as the plates become covered with dust.

When dirty or damaged, these units have a potential for arcing and producing ozone. An electrostatic precipitator on a central heating system can effectively remove dust, but it can easily be overwhelmed by cigarette or cigar smoke, house cleaning or other particle-generating activities.

HEPA filters: HEPA (High-Efficiency-Particulate-Air) filters are made of densely packed, pleated fibers. They are 99.97 percent effective, making these devices the preferred filtering technology. Some brands contain an additional charcoal filter that may remove nitrous oxide and formaldehyde from ambient air. Even with prolonged operation, a HEPA filter continues to function at full efficiency.

Air conditioning

While air conditioners do not filter the air, they allow closing of doors and windows. This is an effective way to reduce indoor levels of pollen and mold during the summer. Air conditioning has the additional advantage in warmer climates of removing moisture from the air, thus reducing the mite population.

One study showed that in a humid environment (Hawaii), air conditioning kept on continuously reduced the mite count to a relatively low level.⁵ When the air conditioning was used only part of the time, the count went up. When the air conditioning was turned off completely, there was a 15-fold increase in the indoor mite count.

In some extremely humid climates, where even air conditioning can't reduce indoor humidity sufficiently, an indoor dehumidifier may be needed to control the mite count.

Health effects of air-cleaning devices

Seasonal allergic responses: The use of air conditioning allows for the closing of windows, thus reducing the pollen count indoors. However, indoor pollen counts are relatively low anyway. One study, looking at whether adding an air filter to the central air

Environmental Controls

- Plastic-covered mattresses, pillows and furniture
- Hot-water laundering of blankets and sheets
- Professional carpet cleaning
- Removal of pets, carpeting and upholstered furniture
- Air conditioning and air filters

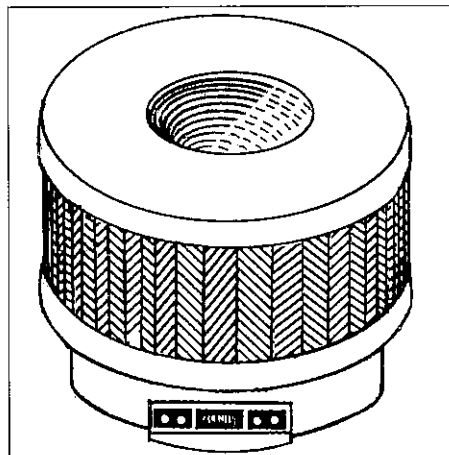
conditioning system had any beneficial effects, showed that air conditioning alone was sufficient to reduce the indoor pollen count from 68 to 3.6 particles per cubic meter.⁶ Little more was achieved by adding an air-filtering device.

Perennial allergic symptoms: These symptoms are mostly due to mite antigen and animal dander. Mite antigens

Where humidity is low, house-dust mites and cockroaches don't constitute a major problem.

are very heavy particles which drop out of the air quickly. They stay on the surface of mattresses, pillows, bed covers, couches and carpets. It probably is useless to filter the air for these antigens; covering, cleaning and avoidance are the most effective environmental controls.

Animal dander remains airborne to a somewhat greater extent. Although surface reservoirs constitute the major animal dander problem, air filtration may play a minor role in relief of symptoms due to this antigen.



If an air cleaning device is indicated, HEPA filters are the best choice.

Summary

Allergens vary in their tendency to remain airborne, a major consideration in deciding whether patients can benefit from an air-cleaning device. Elimination of the antigen source, increased ventilation and reduction of moisture are generally more effective measures of reducing the indoor antigen load. If an air cleaning device is used, a HEPA filter is the best choice. □

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CME Calendar

The following weekly conferences are conducted at National Jewish. Unless otherwise noted, each is held in Heitler Hall in the Goodman Building. All physicians in the community, as well as those traveling through Denver, are welcome to attend.

Immunology

Course/Immunocorrelates—

Monday, 8 a.m.

Research in Progress—

Tuesday, noon

Denver Allergy Rounds—

Wednesday, 8 a.m.

Pulmonary Medicine Grand Rounds—

Thursday, 7:30 a.m.

(Location varies; call for details.)

Pediatric Grand Rounds—

Thursday, 8 a.m.;

8:30 a.m. on second Thursday

Medicine and Pediatrics, Immunology Research in Progress—

Thursday, 4 p.m.

Topics in Pulmonary Biology, Physiology and Pathology—

Friday, 7 a.m.

Pulmonary Research Conference—

Friday, 8 a.m.

Medicine Second Opinion Conference—

Friday, 11:30 a.m.

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