

Dust, Air Cleaners and Health

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Introduction: Scope of Problem

A growing body of scientific evidence, as well as patients' personal experiences shows a strong link between indoor dust and illness, especially regarding asthma and allergy.

This "dust" which can trigger symptoms and cause diseases such as asthma, can consist of a wide variety of particles. These particles vary in size. They may be from biologic or nonbiologic sources, and can originate from outside or within the home. A partial listing is shown in Table I. Symptoms can include nose, throat, and eye irritation. Asthma patients also experience lung congestion, tightness, and difficulty in breathing.

Biologic Sources

Much attention has recently focused on the importance of dust mites and cockroaches in human illness. Droppings from these insects, as well as their body parts, contain powerful allergens (substances causing allergic reactions). Fine particles of these materials can become airborne as "dust," and can be drawn deeply into the lung, causing serious health problems.

One would expect that removal of airborne dust would solve the problem. While this approach can offer some improvement, research has shown that this is not the only solution. Sometimes, other approaches may be more effective. For example, researchers studying asthma patients found that using an air cleaner to remove dust mite particles provided only minor relief of symptoms. Limitations within this study prevent complete answers to the issue of dust removal. However, the researchers did conclude that airborne particle levels are so low, relative to sources such as mattresses and carpeting, as to limit the effectiveness of removal. (It is also noteworthy that dust mite particles settle out of the air rather quickly, and are re-suspended by activities such as vacuuming, and changing the bedding. Asthma patients should avoid these activities.)

Mites and roaches are not the only source of biological particles ("bioaerosols"). Another important source is mold and mildew, commonly found where there are moisture problems, high humidity or standing/stagnant water. These organisms may release irritating spores into the air (along with chemical waste products). The most serious problems are seen when these organisms are dispersed into the air (see the fact sheet *Humidifiers and Health*). Pets can also be a source of particles causing health problems.



Non-Biologic Sources

Dust can also be produced from nonbiologic sources. All types of fuel, when burned, produce fine particles. Some are irritants; others contain known cancer-causing chemicals. Levels of particulates are especially high when wood-burning equipment is in use.

Measures to Control Indoor Dust

There are two approaches to dealing with indoor dust. Equipment can be used to remove dust; or measures can be taken to control occupants' exposure, through avoidance or source control. The latter may be a more effective strategy. Managing indoor moisture levels is a key strategy in controlling sources of harmful biological particulates. Other factors associated with these particulates include rugs, carpets, and upholstery (as breeding areas) and pets, such as dogs and cats.

Removal

Air cleaners can remove dust particles from air in the house. The typical "furnace filter" is not designed to trap the very fine particles and spores that cause health problems, and is not of much use in this regard. For homes heated (and/or cooled) by air systems using ductwork, an electrostatic precipitator offers high efficiency in removing such particles. This type of electronic air cleaner is installed in the return air duct near the home's furnace. (Installation in an existing furnace may require duct work alterations.) These units have a removable dust collecting plate unit that needs to be washed at regular intervals. Pleated (media) filters are also available. These can be installed in place of the standard fibrous filter, and are much more effec-

tive (but less efficient than electrostatic cleaners) and do not require any modifications to the furnace or duct work. These filters must be replaced on a regular basis.

Another strategy is to use room-sized air cleaners, usually placed in sleeping rooms where the most time is spent. They can be moved to other rooms, but the most powerful units are consoles (rather than tabletop models) and may be awkward to move. The most effective room-sized units are of either the HEPA (high efficiency particulate arresting) filter or electrostatic precipitator type. Laboratory evaluations of their performance are based on two factors: the ability to trap specific particle sizes *and* the volume of air that is delivered. These may be combined under a designation such as "Clean Air Delivery Rate" (CADR, measured in cubic feet of fresh air delivered per minute). Small, tabletop units are not likely to be very effective, especially in large or open rooms. For details on test results and selection of these appliances, consult consumer publications.

If you use a vacuum cleaner for dust control, the best ones have a HEPA filter. Less expensive, high performance vacuums may also be acceptable. Filters in conventional vacuums are unable to trap very fine particulates, ejecting them into the air. Sensitive individuals may need to leave a room being vacuumed for several hours. (Vacuums with the exhaust stream directed through a container of water can disperse particulates in tiny droplets of water.)

Avoidance/Source Control

Avoidance is often a more effective strategy than removal, depending on the type of particulate involved. Basic knowledge of how and why particulates are present is often necessary for control. Some examples follow:

Dust mites: these are a major factor in “dust”-related illnesses, and require a high relative humidity (above about 50 per cent) to thrive, so indoor humidity control is important. Also, these organisms grow mainly in mattresses and bedding and are found in upholstery and carpet, too. Plastic mattress covers and pillowcases can block mites and offer good control. Wash bedding in hot water to kill mites, eggs.

Mold, Mildew, Fungi and Algae: these require high moisture levels, wet surfaces, or standing water to grow. Control indoor moisture levels. Make sure drip trays (under refrigerators, air conditioners) are properly drained or regularly emptied. Eliminate standing water in the house and kill visible growths.

Roaches, other insects: eliminate food sources, clean all greasy surfaces, reduce humidity levels, and eliminate any areas of wetness (leakage or condensation on plumbing, etc.).

Pollen: summertime entry of pollen and other outdoor pollutants can be reduced in a closed, air-conditioned house. Air conditioning can also lower indoor humidity, controlling other organisms.

Animal dander: particularly from cats, causes serious problems for many people. Allergy testing can confirm it as a source of problems. If the pet cannot be removed from the environment, at least keep it out of sleeping areas. In homes with pets, weekly bathing of cats and dogs may help to control allergy-causing dander.

Summary

Dust around the house can contain many materials and products that can cause health problems. Asthma patients and those with allergies are most at risk. Understanding a few basic measures to reduce the accumulation of harmful particles, and some simple avoidance measures, can minimize problems.

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TABLE I
Sources of Indoor Particulates
Partial List

Biological Materials

Mold, Mildew, Algae, Fungi
Spores, Whole Organisms (living or dead)
Organism fragments, waste products

Pets
Hair, Dander, Wastes

Insect Infestations (Dust mites, Cockroaches)
Droppings, Body Parts

Combustion Processes

Gas Range Operation
Cooking
Unvented Kerosene or Gas Space Heater
Cigarette Smoking
Operation of Fireplace, Woodstove
Nearby Smokestacks, Fossil Fueled Power Plants

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