

"Biological Pollutants in Your Home"

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This guidance will help you understand:

1. what indoor biological pollution is;
2. whether your home or lifestyle promotes its development; and,
3. how to control its growth and buildup.

Outdoor air pollution in cities is a major health problem. Much effort and money continues to be spent cleaning up pollution in the outdoor air. But air pollution can be a problem where you least expect it, in the place you may have thought was safest--your home. Many ordinary activities such as cooking, heating, cooling, cleaning, and redecorating can cause the release and spread of indoor pollutants at home. Studies have shown that the air in our homes can be even more polluted than outdoor air.

Many Americans spend up to 90 percent of their time indoors, often at home. Therefore, breathing clean indoor air can have an important impact on health. People who are inside a great deal may be at greater risk of developing health problems, or having problems made worse by indoor air pollutants. These people include infants, young children, the elderly, and those with chronic illnesses.

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What Are Biological Pollutants?

Biological pollutants are or were living organisms. They promote poor indoor air quality and may be a major cause of days lost from work or school, and of doctor and hospital visits. Some can even damage surfaces inside and outside your house. Biological pollutants can travel through the air and are often invisible.

Some common indoor biological pollutants are:

- Animal Dander (minute scales from hair, feathers, or skin)
- Dust Mite and Cockroach parts
- Fungi (Molds)
- Infectious agents (bacteria or viruses)
- Pollen

Some of these substances are in every home. It is impossible to get rid of them all. Even a spotless home may permit the growth of biological pollutants. Two conditions are essential to support biological growth: nutrients and moisture. These conditions can be found in many locations, such as bathrooms, damp or flooded basements, wet appliances (such as humidifiers or air conditioners), and even some carpets and furniture.

Modern materials and construction techniques may reduce the amount of outside air brought into buildings which may result in high moisture levels inside. Using humidifiers, unvented heaters, and air conditioners in our homes has increased the chances of moisture forming on interior surfaces. This encourages the growth of certain biological pollutants.

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The Scope Of The Problem

Most information about sources and health effects of biological pollutants is based on studies of large office buildings and two surveys of homes in northern U.S. and Canada. These surveys show that 30% to 50% of all structures have damp conditions which may encourage the growth and buildup of biological pollutants. This percentage is likely to be higher in warm, moist climates.

Some diseases or illnesses have been linked with biological pollutants in the indoor environment. However, many of them also have causes unrelated to the indoor environment. Therefore, we do not know how many health problems relate only to poor indoor air.

Health Effects Of Biological Pollutants

All of us are exposed to biological pollutants. However, the effects on our health depend upon the type and amount of biological pollution and the individual person. Some people do not experience health reactions from certain biological pollutants, while others may experience one or more of the following reactions:

- Allergic
- Infectious
- Toxic

Except for the spread of infections indoors, ALLERGIC REACTIONS may be the most common health problem with indoor air quality in homes. They are often connected with animal dander (mostly from cats and dogs), with house dust mites (microscopic animals living in household dust), and with pollen. Allergic reactions can range from mildly uncomfortable to life-threatening, as in a severe asthma attack. Some common signs and symptoms are:

- Watery eyes
- Runny nose and sneezing
- Nasal congestion
- Itching
- Coughing
- Wheezing and difficulty breathing
- Headache
- Fatigue

Health experts are especially concerned about people with asthma. These people have very sensitive airways that can react to various irritants, making breathing difficult. The number of people who have asthma has greatly increased in recent years. The number of people with asthma has gone up by 59 percent since 1970, to a total of 9.6 million people. Asthma in children under 15 years of age has increased 41 percent in the same period, to a total of 2.6 million children. The number of deaths from asthma is up by 68 percent since 1979, to a total of almost 4,400 deaths per year.

INFECTIOUS DISEASES caused by bacteria and viruses, such as flu, measles, chicken pox, and tuberculosis, may be spread indoors. Most infectious diseases pass from person to person through physical contact. Crowded conditions with poor air circulation can promote this spread. Some bacteria and viruses thrive in buildings and circulate through indoor ventilation systems. For example, the bacterium causing Legionnaire's disease, a serious and sometimes lethal infection, and Pontiac Fever, a flu-like illness, have circulated in some large buildings.

Talking To Your Doctor

Are you concerned about the effects on your health that may be related to biological pollutants in your home? Before you discuss your concerns with your doctor, you should know the answers to the following questions. This information can help the doctor determine whether your health problems may be related to biological pollution.

Does anyone in the family have frequent headaches, fevers, itchy watery eyes, a stuffy nose, dry throat, or a cough? Does anyone complain of feeling tired or dizzy all the time? Is anyone wheezing or having difficulties breathing on a regular basis?

Did these symptoms appear after you moved to a new or different home?

Do the symptoms disappear when you go to school or the office or go away on a trip, and return when you come back?

Have you recently remodeled your home or done any energy conservation work, such as installing insulation, storm windows, or weather stripping? Did your symptoms occur during or after these activities?

Does your home feel humid? Can you see moisture on the windows or on other surfaces, such as walls and ceilings?

What is the usual temperature in your home? Is it very hot or cold?

Have you recently had water damage?

Is your basement wet or damp?

Is there any obvious mold or mildew?

Does any part of your home have a musty or moldy odor?

Is the air stale?

Do you have pets?

Do your house plants show signs of mold?

Do you have air conditioners or humidifiers that have not been properly cleaned?

Does your home have cockroaches or rodents?

TOXIC REACTIONS are the least studied and understood health problem caused by some biological air pollutants in the home. Toxins can damage a variety of organs and tissues in the body, including the liver, the central nervous system, the digestive tract, and the immune system.

Coping With the Problem

Checking Your Home

There is no simple and cheap way to sample the air in your home to determine the level of all biological pollutants. Experts suggest that sampling for biological pollutants is not a useful problem-solving tool. Even if you had your home tested, it is almost impossible to know which biological pollutant(s) cause various symptoms or health problems. The amount of most biological substances required to cause disease is unknown and varies from one person to the next.

Does this make the problem sound hopeless? On the contrary, you can take several simple, practical actions to help remove sources of biological pollutants, to help get rid of pollutants, and to prevent their return.

Self-Inspection: A Walk Through Your Home

Begin by touring your household. Follow your nose, and use your eyes. Two major factors help create conditions for biological pollutants to grow: nutrients and constant moisture with poor air circulation.

Dust and construction materials, such as wood, wallboard, and insulation, contain nutrients that allow biological pollutants to grow. Firewood also is a source of moisture, fungi, and bugs.

Appliances such as humidifiers, kerosene and gas heaters, and gas stoves add moisture to the air.

A musty odor, moisture on hard surfaces, or even water stains, may be caused by:

- Air-conditioning units
- Basements, attics, and crawlspaces
- Bathrooms
- Carpets
- Heating and air-conditioning ducts
- Humidifiers and dehumidifiers
- Refrigerator drip pans

What You Can Do About Biological Pollutants

Before you give away the family pet or move, there are less drastic steps that can be taken to reduce potential problems. Properly cleaning and maintaining your home can help reduce the problem and may avoid interrupting your normal routine. People who have health problems such as asthma, or are allergic, may need to do this and more. Discuss this with your doctor.

Moisture Control

Water in your home can come from many sources. Water can enter your home by leaking or by seeping through basement floors. Showers or even cooking can add moisture to the air in your home. The amount of moisture that the air in your home can hold depends on the temperature of the air. As the temperature goes down, the air is able to hold less moisture. This is why, in cold weather, moisture condenses on cold surfaces (for example, drops of water form on the inside of a window). This moisture can encourage biological pollutants to grow.

There are many ways to control moisture in your home:

- Fix leaks and seepage. If water is entering the house from the outside, your options range from simple landscaping to extensive excavation and waterproofing. (The ground should slope away from the house.) Water in the basement can result from the lack of gutters or a water flow toward the house. Water leaks in pipes or around tubs and sinks can provide a place for biological pollutants to grow.
- Put a plastic cover over dirt in crawlspaces to prevent moisture from coming in from the ground. Be sure crawlspaces are well-ventilated.
- Use exhaust fans in bathrooms and kitchens to remove moisture to the outside (not into the attic). Vent your clothes dryer to the outside.
- Turn off certain appliances (such as humidifiers or kerosene heaters) if you notice moisture on windows and other surfaces.
- Use dehumidifiers and air conditioners, especially in hot, humid climates, to reduce moisture in the air, but be sure that the appliances themselves don't become sources of biological pollutants.
- Raise the temperature of cold surfaces where moisture condenses. Use insulation or storm windows. (A storm window installed on the inside works better than one installed on the outside.) Open doors between rooms (especially doors to closets which may be colder than the rooms) to increase circulation. Circulation carries heat to the cold surfaces. Increase air circulation by using fans and by moving furniture from wall corners to promote air and heat circulation. Be sure that your house has a source of fresh air and can expel excessive moisture from the home.
- Pay special attention to carpet on concrete floors. Carpet can absorb moisture and serve as a place for biological pollutants to grow. Use area rugs which can be taken up and washed often. In certain climates, if carpet is to be installed over a concrete floor, it may be necessary to use a vapor barrier (plastic sheeting) over the concrete and cover that with sub-flooring (insulation covered with plywood) to prevent a moisture problem.
- Moisture problems and their solutions differ from one climate to another. The Northeast is cold and wet; the Southwest is hot and dry; the South is hot and wet; and the Western Mountain states are cold and dry. All of these regions can have moisture problems. For example, evaporative coolers used in the Southwest can encourage the growth of biological pollutants. In other hot regions, the use of air conditioners which cool the air too quickly may prevent the air conditioners from running long enough to remove excess moisture from the air. The types of construction and weatherization for the different climates can lead to different problems and solutions.

Maintain and Clean All Appliances That Come In Contact With Water

- Have major appliances, such as furnaces, heat pumps and central air conditioners, inspected and cleaned regularly by a professional, especially before seasonal use. Change filters on heating and cooling systems according to manufacturer's directions. (In general, change filters monthly during use.) When first turning on the heating or air conditioning at the start of the season, consider leaving your home until it airs out.
- Have window or wall air-conditioning units cleaned and serviced regularly by a professional, especially before the cooling season. Air conditioners can help reduce the entry of allergy-causing pollen. But they may also become a source of biological pollutants if not properly maintained. Clean the coils and incline the drain pans according to manufacturer's instructions, so water cannot collect in pools.
- Have furnace-attached humidifiers cleaned and serviced regularly by a professional, especially before the heating season.
- Follow manufacturer's instructions when using any type of humidifier. Experts differ on the benefits of using humidifiers. If you do use a portable humidifier (approximately 1 to 2 gallon tanks), be sure to empty its tank every day and refill with distilled or demineralized water, or even fresh tap water if the other types of water are unavailable. For larger portable humidifiers, change the water as recommended by the manufacturer. Unplug the appliance before cleaning. Every third day, clean all surfaces coming in contact with water with a 3% solution of hydrogen peroxide, using a brush to loosen deposits. Some manufacturers recommend using diluted household bleach for cleaning and maintenance, generally in a solution of one-half cup bleach to one gallon water. When using any household chemical, rinse well to remove all traces of chemical before refilling humidifier.

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- Empty dehumidifiers daily and clean often. If possible, have the appliance drip directly into a drain. Follow manufacturer's instructions for cleaning and maintenance. Always disconnect the appliance before cleaning.
- Clean refrigerator drip pans regularly according to manufacturer's instructions. If refrigerator and freezer doors don't seal properly, moisture may build up and mold can grow. Remove any mold on door gaskets and replace faulty gaskets.

Clean Surfaces

- Clean mold surfaces, such as showers and kitchen counters.
- Remove mold from walls, ceilings, floors, and paneling. Do not simply cover mold with paint, stain, varnish, or a moisture-proof sealer, as it may resurface.
- Replace moldy shower curtains, or remove them and scrub well with a household cleaner and rinse before re-hanging them.

Dust Control

Controlling dust is very important for people who are allergic to animal dander and mites. You cannot see mites, but you can either remove their favorite breeding grounds or keep these areas dry and clean. Dust mites can thrive in sofas, stuffed chairs, carpets, and bedding. Open shelves, fabric wallpaper, knickknacks, and venetian blinds are also sources of dust mites. Dust mites live deep in the carpet and are not removed by vacuuming. Many doctors suggest that their mite-allergic patients use washable area rugs rather than wall-to-wall carpet.

- Always wash bedding in hot water (at least 130° F "one hundred degrees Fahrenheit") to kill dust mites. Cold water won't do the job. Launder bedding at least every 7 to 10 days.
- Use synthetic or foam rubber mattress pads and pillows, and plastic mattress covers if you are allergic. Do not use fuzzy wool blankets, feather or wool-stuffed comforters, and feather pillows.
- Clean rooms and closets well; dust and vacuum often to remove surface dust. Vacuuming and other cleaning may not remove all animal dander, dust mite material, and other biological pollutants. Some particles are so small they can pass through vacuum bags and remain in the air. If you are allergic to dust, wear a mask when vacuuming or dusting. People who are highly allergy-prone should not perform these tasks. They may even need to leave the house when someone else is cleaning.

Before You Move

Protect yourself by inspecting your potential new home. If you identify problems, have the landlord or seller correct them before you move in, or even consider moving elsewhere.

- Have professionals check the heating and cooling system, including humidifiers and vents. Have duct lining and insulation checked for growth.
- Check for exhaust fans in bathrooms and kitchens. If there are no vents, do the kitchen and bathrooms have at least one window apiece? Does the cooktop have a hood vented outside? Does the clothes dryer vent outside? Are all vents to the outside of the building, not into attics or crawlspaces?
- Look for obvious mold growth throughout the house, including attics, basements, and crawlspaces, and around the foundation. See if there are many plants close to the house, particularly if they are damp and rotting. They are a potential source of biological pollutants. Downspouts from roof gutters should route water away from the building.
- Look for stains on the walls, floor or carpet (including any carpet over concrete floors) as evidence of previous flooding or moisture problems. Is there moisture on windows and surfaces? Are there signs of leaks or seepage in the basement?
- Look for rotted building materials which may suggest moisture or water damage.
- If you or anyone else in the family has a pet allergy, ask if any pets have lived in the home.
- Examine the design of the building. Remember that in cold climates, overhanging areas, rooms over unheated garages, and closets on outside walls may be prone to problems with biological pollutants.
- Look for signs of cockroaches.

Where Biological Pollutants May Be Found In The Home

1. Dirty air conditioners
2. Dirty humidifiers and/or dehumidifiers
3. Bathroom without vents or windows
4. Kitchen without vents or windows
5. Dirty refrigerator drip pans
6. Laundry room with unvented dryer
7. Unventilated attic
8. Carpet on damp basement floor
9. Bedding

10. Closet on outside wall
11. Dirty heating/air conditioning system
12. Dogs or cats
13. Water damage (around windows, the roof, or the basement)

Warning! Carefully read instructions for use and any cautionary labeling on cleaning products before beginning cleaning procedures.

- Do not mix any chemical products. Especially, never mix cleaners containing bleach with any product (such as ammonia) which does not have instructions for such mixing. When chemicals are combined, a dangerous gas can sometimes be formed.
- Household chemicals may cause burning or irritation to skin and eyes.
- Household chemicals may be harmful if swallowed, or inhaled.
- Avoid contact with skin, eyes, mucous membranes and clothing.
- Avoid breathing vapor. Open all windows and doors and use an exhaust fan that sends the air outside.
- Keep household chemicals out of reach of children.
- Rinse treated surface areas well to remove all traces of chemicals.

Correcting Water Damage

What if damage is already done? Follow these guidelines for correcting water damage:

- Throw out mattresses, wicker furniture, straw baskets and the like that have been water damaged or contain mold. These cannot be recovered.
- Discard any water-damaged furnishings such as carpets, drapes, stuffed toys, upholstered furniture and ceiling tiles, unless they can be recovered by steam cleaning or hot water washing and thorough drying.
- Remove and replace wet insulation to prevent conditions where biological pollutants can grow.

Additional Sources of Information

Contact your local American Lung Association for copies of: Indoor Air Pollution Fact Sheets, Air Pollution in Your Home? and other publications on indoor air pollution.

Contact the U.S. Consumer Product Safety Commission, Washington, D.C. 20207, for copies of Humidifier Safety Alert.

To report an unsafe consumer product or product-related health problem, consumers may call the U.S. Consumer Product Safety Commission at 1-800-638-2772. A teletypewriter for the hearing impaired is available at 1-800-638-8270; the Maryland TTY number is 1-800-492-8104.

You may also contact EPA's IAQ INFO Clearinghouse at 1-800-438-4318 (or (703) 356-4020) for more information on indoor air quality and to order publications from the list of IAQ publications.