

Introduction

For over a decade, mold has remained in the news. People are talking about the effect on population health and damage to the building. But what are the risks and issues?

The available science on molds and their potential health effects remains under study, but considerable progress has been made. The US Centers for Disease Control and Prevention (CDC), the Institute of Medicine of the US National Academy of Sciences, the World Health Organization, and Health Canada all agree that living or working in a building with mold damage results in increased risk of respiratory disease. Although there are several guidance documents available, there are no accepted national or international standards for mold investigation, evaluation or remediation. The American Industrial Hygiene Association (AIHA), however, has worked to translate the advice from the previously mentioned government agencies into state-of-the-art inspection and sampling protocols, such as AIHA's *Recognition, Evaluation and Control of Indoor Mold* book, also known as the Green Book. If properly used, these methods are suitable for assessing hidden contamination and directing essential visual inspections. For health outcomes, there are no available exposure assessment methods that can provide useful information for individuals. This is primarily due to the fact that each person's response to mold exposure is unique.

The scientific complexities surrounding this issue would be a huge challenge, but the truth is that other, less scientific, difficulties dwarf them. Media attention on this topic often creates emotionally charged circumstances, making scientific and professional judgment, as well as reasoned dialogue on this subject, very difficult. In some instances, building owners have been known to ignore or dismiss potentially serious problems. Importantly, many indoor air quality (IAQ) problems have nothing to do with mold, and buildings seldom have only one indoor environmental quality problem. It is essential to consider multiple sources of building IAQ problems instead of focusing on just mold concerns. In other instances, building occupants or public officials armed with mold sampling reports of dubious quality have reacted with alarm to potential threats, making risk communication very difficult.

This fact sheet represents a consensus statement by a group of experts about important aspects of the "state of the science." The guidance offered is practical information based on years of experience addressing mold issues, and this document does not claim to be a definitive or comprehensive position statement. Because it is not comprehensive, it should always be used in conjunction with other existing guidance documents, as well as professional judgment by qualified consultants and public health officials.

It should be noted that public and occupational health practice is rarely an exact science. Prevention always poses the challenge of making tough and often costly decisions with incomplete information or understanding. For a more complete analysis of the situation, see AIHA's *Recognition, Evaluation and Control of Indoor Mold*, available from www.aiha.org or by calling (703)-849-8888.

The Facts about Mold: For Everyone

What is mold? The term “mold” is a colloquial term for a group of filamentous fungi that are common on food or wet materials. This includes the green *Penicillium* species that produces penicillin, and fungi that spoil our bread, fruit, cheese and crops. Most of these are Ascomycetes that produce a lot of spores. The majority of the molds that grow on damp building materials are found in the soil and are adapted to grow on a wide variety of materials. Outdoors, molds live in the soil, on plants, and on dead or decaying matter. There are thousands of species of mold and they can be any color. Different mold species are adapted to different moisture conditions ranging from very wet to just damp. Many times, mold can be detected by a musty odor. Live spores act like seeds, forming new mold growths (colonies) under the right conditions. All of us are exposed to a variety of fungal spores daily in the air we breathe, both outdoors and indoors.

How does mold get into a house or building?

Mold and fungal spores occur naturally outdoors, where fungi are the earth’s most important recyclers. Indoors, mold needs moisture to grow; it becomes a problem only where there is water damage, elevated and prolonged humidity, or dampness. Common sources of excessive indoor moisture that can lead to mold problems include:

- flooding from surface waters (i.e., overflowing rivers) or from severe storms;
- roof leaks from damaged or missing roofing materials, ice dams or blocked gutters;
- storm-driven rain through window frames, exterior walls or door assemblies;
- leaking pipes, sewer back-ups or overflows;
- damp basements or crawl spaces due to a high water table (rising damp) or poorly managed rainwater drainage; and
- condensation on cold surfaces.

How can I prevent mold growth?

The key to preventing and stopping indoor mold growth is to control excessive moisture and condensation. Keeping susceptible areas in the home clean and dry is critical. In general, mold will not grow indoors without water, dampness or excessive moisture.

There are three main factors that contribute to condensation of water on building surfaces:

- **Relative Humidity:** Condensation occurs when the air is saturated with water and it cannot hold any more moisture. For example, steam generated from bathroom showers or from cooking can fill up the air with moisture, which will then condense into drops of water on cooler surfaces, such as mirrors and windows. Where possible, localized sources of humidity, such as clothes dryers, should be directly vented to the outdoors. To lower indoor humidity during warm, humid weather, air conditioners and/or dehumidifiers should be used. In chronically damp areas, such as basements or crawlspaces, it is often recommended that dehumidifiers be used to maintain humidity levels below 60%.
- **Temperature:** Warm air holds more moisture than cold air. Condensation occurs when warm humid air comes into contact with a cold surface and the moisture condenses into water. This can often be seen on single-pane windows, where water condenses and then runs down, causing the wood frames and sills to rot and the wall under the windows to blister. Condensation can occur on exterior walls, particularly north-facing walls, if they are not properly insulated. Other chronically cold surfaces, such as cold water pipes, should be covered with insulation to help prevent condensation.
- **Poor Ventilation:** Indoor humidity can build up if there is not enough ventilation and exchange of indoor and outdoor air. Where there is little or no air movement, such as behind dressers and cabinets, surfaces can remain cooler than surrounding areas, which can lead to increased condensation and mold growth. It

THE FACTS ABOUT MOLD

12/16/2011

is recommended that the area be ventilated and the occupants use exhaust fans (vented to the outdoors) to remove moisture from high humidity areas, particularly in bathrooms, kitchens, and laundry areas. Furniture should be moved slightly away from walls so that air can freely pass behind them. Air should be allowed to circulate between rooms and regularly ventilate to remove humid air. Fans should be used as needed.

Other things that can be done are to clean and repair gutters regularly, make sure the ground slopes down and away from the home's foundation, and keep air conditioner drip pans and drain lines clean. In addition, in air conditioned buildings in hot and humid climates, vinyl wall coverings on the interior sides of exterior walls should not be used as these materials can trap moisture, resulting in mold growth underneath them.

In the case of floods or leaking pipes, any standing water should be promptly removed and water damaged materials should either be dried out and cleaned, or removed and replaced. Porous materials that are wet for more than 48 hours are likely to produce mold growth and should be discarded. In instances where the water damage is extensive, it is recommended that professional help, such as a commercial restoration company, be consulted.

Can mold spores contain toxins?

Yes. Some of these fungi produce toxic metabolites (mycotoxins), and almost all molds that grow in the built environment can produce triple helical glucan, both of which are toxic to lung cells. Many studies in appropriate laboratory animals have demonstrated that very low exposures of these compounds can result in inflammation. The health effects of breathing mycotoxins indoors are not well understood and they continue to be under study. This research is done to better understand why epidemiological studies consistently show increased asthma among occupants of damp buildings not associated with atopy. Some studies have shown that in agricultural settings, occupational exposure to fungi that produce mycotoxins on grain may result in significant exposures to their toxins. However, it is important to not relate human exposures to mycotoxins in agricultural settings with those exposures that can occur in the built environment (homes and offices). Exposures to mycotoxins in agricultural environments can be at much higher airborne concentrations, and these levels can result in systemic exposure. It should be noted that these agricultural exposures tend to be fungi that do not generally occur in buildings, such as *Aspergillus flavus* (aflatoxin) and *Fusarium graminearum* (deoxynivalenol).

What is "black mold"?

The news media and some contractors often refer to "black mold" or "toxic black mold." It is usually associated with *Stachybotrys chartarum*, a type of greenish-black mold commonly associated with heavy water damage. Not all molds that appear to be black are *Stachybotrys*. The known health effects from exposure to *Stachybotrys* are similar to those caused by other common molds, and again in high exposure situations (as in agriculture), are known to be associated with severe health effects in some people. Such exposures seldom, if ever, occur in buildings except during remediation activities by people not taking appropriate precautions.

Should I be concerned about mold?

It all depends on how much. Small amounts of mold growth in workplaces or homes (such as mildew on a shower curtain) are not a major health concern. Large quantities of mold growth, however, are an important public health concern. In addition, mold can damage building materials, finishes, and furnishings and, in some cases, cause structural damage to wood.

How do molds affect people?

Most people have no reaction when exposed to molds. Allergic reactions, similar to pollen or animal allergies, and irritation are the most common health effects for individuals sensitive to molds. Flu-like

THE FACTS ABOUT MOLD

12/16/2011

symptoms and skin rash may occur. Exposure to molds may also aggravate asthma. In very rare cases, fungal infections from building-associated molds may occur in people with serious immune disease. Most symptoms are temporary and eliminated by correcting the mold problem.

Who is affected by exposure to mold?

There is a wide variability in how people are affected by airborne mold spore exposure. Currently, there is no established airborne concentration that is known to adversely affect any individual's health. People who may be affected more severely and quickly than others include:

- Infants and children
- Elderly people
- Pregnant women
- Individuals with respiratory conditions or allergies and asthma
- Persons with weakened immune systems

Those with special health concerns should consult their doctor if they are concerned about mold exposure. Symptoms that may seem to occur from mold exposure may be due to other causes, such as bacterial or viral infections or other allergies.

What should I do if I see or smell mold in my home?

The most important step is to identify the source(s) of moisture, which result in mold growth, and to take the necessary steps to make repairs to stop them. If you only clean up the mold, and do not fix the moisture problem, then most likely the mold growth will recur. If the source of the moisture is related to a building failure or fault, such as a burst pipe or leaking roof, it is recommended that a professional contractor be consulted. In instances where the moisture source does not appear to be related to leaks, floods, structural faults or rising damp, it is most likely due to condensation (see "How can I prevent mold growth?"). If you do not see mold growth but smell a musty odor, mold may be growing underneath or behind water-damaged materials, such as walls, carpeting, or wallpaper.

Once the source of the moisture has been identified and fixed, you need to decide if removing the mold from the affected areas is something that can be done without professional assistance. If the mold growth was caused by sewage back-up or other contaminated water, potential pathogens may be present and the work should be performed by a professional contractor that has experience in cleaning buildings damaged by contaminated water.

If the mold growth is due to condensation or small-scale leak and is limited to a small area (less than 10 square feet), you can probably do the work yourself following guidelines such as those that have been prepared by the U.S. Environmental Protection Agency (EPA), Canada Mortgage and Housing Corporation and AIHA. On hard surfaces, such as countertops and furniture, use detergent and water to wash mold off and then dry completely. The use of biocides or chemical disinfectants is not recommended as these may be hazardous to occupants. Moldy porous or absorbent materials, such as ceiling tiles, wallboard, and carpeting, should be removed and replaced. Persons cleaning mold should wear rubber gloves, goggles and an approved respirator to protect against breathing airborne spores (an N95 respirator would be appropriate for most cleanup projects, provided that you are medically capable of wearing a respirator). If you have health concerns, you should consult your doctor before doing any mold cleanup.

Over the past decade or so, the industry has given rise to many individuals and companies who tout themselves as experts and certified in various aspects of mold investigation and remediation, but who may have little or no practical experience. If you choose to hire a consultant to help identify your problem, or a contractor to perform the cleanup in your home, make sure that they have specific work experience in dealing with and cleaning up mold, and check their references.

THE FACTS ABOUT MOLD

12/16/2011

Should I test my home for mold on a routine basis?

Probably not. Looking for evidence of water damage and visible mold growth should be your first step. Testing for mold is expensive, and you should have a clear reason for doing so. In addition, there are no standards for “acceptable” levels of mold in the indoor environment. When air testing is done, it is usually to compare the levels and types of mold spores found inside the home with those found outdoors. If you know you have a mold problem, it is more important to spend time and resources solving the moisture problem and getting rid of the mold than to spend it on sampling.

Who do I call to deal with extensive mold growth in a building?

A professional experienced in mold evaluation and remediation, such as an industrial hygienist, may need to be hired to address extensive mold growth in a building. It is important to correct large mold problems as soon as possible by first fixing the source of the moisture problem and removing contaminated materials, then cleaning the surfaces, and finally drying the area completely. If you use outside contractors or professionals, make sure they have experience cleaning up mold. Check their references, and have them follow the recommendations and guidelines given in the information resources at the end of this fact sheet.