Moisture and Mold in My Home

Indoor moisture problems occur in all climates throughout the United States and Canada. Common symptoms are mold, mildew and condensation. This fact sheet provides information to people who have experienced moisture problems in their home and presents the health concerns related to mold exposure. It also provides general guidelines on mold detection, cleanup, and removal of mold contaminated materials.

Mold: What Is It?

Molds (also known as mildew or fungi) are simple, microscopic organisms, found virtually everywhere, indoors and outdoors.

For mold to grow, it needs:

- a location with a suitable temperature range
- a source of moisture
- a food source - such as leaves, wood, paper and other building materials.

Mold reproduction may occur through dispersal of mold spores which are very tiny and lightweight, allowing them to travel through the air. Mold growths can often be seen in the form of discoloration, ranging in color from white to orange and from green to brown to black.

Should I Be Concerned About Mold In My Home?

Yes, mold becomes a concern when the contamination is extensive. When airborne mold particles and spores are present in large numbers and inhaled, they can cause allergic reactions, asthma episodes, infections, and other respiratory problems. Also, exposure to high spore levels can cause the development of an allergy to the mold leading to allergic reactions.

Mold can also cause structural damage to your home by weakening the wood frame. In addition, when wood goes through periods of wetting then drying, the wood can eventually warp and cause walls to crack or become structurally weak.

How Does Mold Become A Problem In My Home?

Many molds flourish in common building materials at temperatures humans find comfortable. Therefore, mold can thrive and multiply indoors if there is moisture available. The following are sources of indoor moisture that may cause problems:

- flooding
- backed-up sewer
- leaky roof
- cooking, bathing and other interior moisture (humidity) sources such as watering plants or wet clothes hung on indoor drying lines
- humidifiers
- mud or ice dams
- damp basement or crawl space
- constant plumbing leaks
- moisture not exhausted from combustion appliances.

How Do High Indoor Humidity Or Moisture Levels Encourage Mold Growth?

Liquid water can be squeezed (condensed) out of air when the air comes near a cool surface (just like the water droplets that form on a glass of ice water on a humid summer day). This is most likely to happen when the air is humid (higher relative humidity) or when the surface is cold. Condensation may be the most common cause of moisture problems in buildings.

When it is cold outside, condensation can form on cool indoor surfaces such as exterior walls and concrete floors (even under carpeting) causing unwanted mold growth. Moisture problems and mold growth can be prevented by keeping interior surfaces from becoming cold (by increasing insulation) or by lowering indoor humidity levels by controlling ventilation and moisture sources (such as running an exhaust fan while cooking or taking a shower).

Moisture can also be a problem during warm weather. Cold spots can be created when running air conditioning systems. When humid air comes into contact with the cold spot, condensation and mold growth may result.

Important Note:
Moisture is a by-product of combustion. If you see moisture condensation on windows or walls, you may have a combustion problem in your home. It is important to have sufficient air available for fuel-burning appliances (such as the furnace, water heater, stove/range, dryer and fireplace). A shortage of air for these appliances can result in back drafting of dangerous gasses (such as **carbon monoxide**) and moisture into the home. Contact your local utility company or a professional heating contractor to inspect your fuel-burning appliances.

Health Effects Of Mold

How Am I Exposed To Indoor Molds?

Mold is found everywhere, indoors and outdoors. It is common to find mold spores in the air of homes. Mold spores primarily cause health problems when they enter the air and are inhaled in large numbers. People can also be exposed to mold through skin contact and eating.

How Much Mold Does It Take To Make Me Sick?

It depends. For some people a relatively small number of mold spores can cause health problems. For other people, it may take many more. The basic rule is, "if you can see it or smell it" take steps to eliminate the excess moisture and cleanup and remove the mold.

Who Is At Greater Risk When Exposed To Mold?

Exposure to mold is not healthy for anyone inside buildings. It is important to **quickly** identify and correct any moisture sources before health problems develop. The following individuals appear to be at higher risk for adverse health effects of molds:

- infants and children
- elderly
- immune compromised patients (people with HIV infection, cancer chemotherapy, liver disease)
- pregnant women
- individuals with existing respiratory conditions or sensitivities such as allergies, multiple chemical sensitivity, and asthma.

People with these special concerns should consult a physician if they are having health problems.

What Symptoms Are Common?

Allergic reactions may be the most common health problem of mold exposure. Typical symptoms (alone or in combination) reported by people exposed to mold include:

- respiratory problems
- nasal and sinus congestion
- dry, hacking cough
- wheezing, and difficulty in breathing
- sore throat
- shortness of breath
- eyes - burning, watery, reddened, blurry vision, light sensitivity
- skin irritation
- central nervous system problems (constant headaches, memory problems, mood changes).

Are Some Molds More Hazardous Than Others?

Yes. Allergic individuals vary in their sensitivities to mold, both in amount and type needed to cause reactions. In addition, certain molds produce toxins, called mycotoxins, that the mold uses to inhibit or prevent the growth of other organisms. Exposure to mycotoxins may present a greater hazard to occupants than that of allergenic or irritative molds. Mycotoxins and allergens are found in both living and dead molds and spores. Therefore, moldy materials need to be **removed,** even after the molds are killed with cleaning solutions. Mycotoxins have been found in agricultural settings, in food, and indoor spaces of homes and office buildings. Health effects observed in humans vary with the specific toxin, the amount of exposure, and the route of exposure.

Detection Of Mold

How Can I Tell If I Have Mold In My House?

If you can see mold or if there is an earthy or musty odor, you can assume that you have a mold problem. Allergic individuals may have the symptoms listed above. Look for previous water damage, especially on porous materials. Visible mold growth often is found underneath materials where water has damaged surfaces or behind walls. Look for discoloration and leaching from plaster.

Should I Test My Home For Mold?

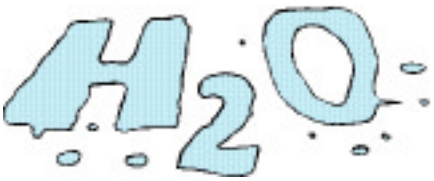
It is not recommended to perform testing as the first step to determine if you have a mold problem. Mold sampling can be expensive. If you can see or smell mold, you have a moisture and mold problem. Cleanup and removal procedures are discussed below.

Airborne mold assessment requires sampling equipment not available to the general public. Standard assessment methods will vary depending on the type of material sampled. If sampling is done, normally a combination of source samples (carpet dust, discolored sheetrock) and airborne samples is recommended. Currently, there are no air standards for levels of mold indoors. An outdoor air reference sample **must always be taken** at the same time that indoor air samples are taken. This outdoor air sample becomes the reference by which the indoor air samples are measured against.

Solving Moisture Problems And Reoccurrence Of Mold

Unless the source of moisture is removed and the contaminated area is properly cleaned, mold growth will reoccur.

- ***Identify and correct the moisture source***
- ***Clean, and thoroughly dry the moldy area (sanitize only if necessary)***
- ***Bag and dispose of any material that has moldy residues, such as rags, paper, leaves, or debris.***



Identify And Correct Moisture Problems

Identify and remove the source of moisture. After the moisture source has been corrected, begin the cleanup and drying out process.

You can usually control a moisture problem by correcting water leaks (such a plumbing or roofing problems), reducing indoor air moisture levels or increasing indoor surface temperatures (to limit condensation problems).

Correcting common problems:

- **Water leaks:** Repair constant plumbing leaks no matter how small. Exterior soil, walkways and driveways should be graded away from the house to prevent water from running into or puddling near the house foundation. Roof leaks should be repaired immediately. Also, cleaning gutters and canales in the fall after leaves have fallen can help prevent mud and ice dams from forming.
- **High indoor humidity:** Source control is often the most effective method of reducing indoor humidity and moisture. Common source control methods include: venting bathrooms, kitchen stoves, clothes dryers, space heaters to the outdoors; removing unvented kerosene or gas space heaters; maintaining dry basements and crawlspaces; and storing firewood outdoors. Exhaust fans can be used to remove moisture from cooking, bathing, or laundering. Dilution of moist indoor air is also a useful method of moisture control. If outside air is more humid than indoor air or if increased ventilation is not an option, consider using refrigerated air conditioning or a stand-alone dehumidifier.
- **Cold surfaces:** A modest increase in indoor temperatures can reduce condensation on cold surfaces. Turning up thermostats, opening doors to closets on exterior walls, opening heating grilles in unused rooms and adding insulation in walls and ceilings can help raise surface temperatures during cold weather. Re-directing cold air from air conditioning units away from walls and other objects during warm, humid weather can also help reduce condensation.
- **Flooding:** Wait for water to recede, then begin cleanup and drying out process.

Cleanup And Removal Of Mold

What Can I Save? What Can I Toss?

In this situation, use your best judgement. If the material absorbs water, it is considered porous. Porous materials should be thrown out if exposed to long periods of dampness. Semi-porous material (such as wood framing, trim, and furniture) may be salvaged if mold contamination has not penetrated the material too deeply or affected its structural integrity. Semi-porous and non-porous materials (such as hard plastic, glass, and metal) can be cleaned and, if necessary, sanitized with a dilute biocide solution.

Removal Of Moldy Materials

Using precautions to avoid mold exposure, remove and throw out porous materials (example: ceiling tiles, sheetrock, plaster, wood products, carpet/carpet pad) and begin drying out the area within 24 to 48 hours. Bag and discard moldy materials. If flooding occurred, remove and replace all sheetrock and insulation damaged by water up to **at least 12 inches** above the high water mark. You will need to **visually inspect** to see if you need to remove more than the 12 inches above the high water mark.

How Do I Clean And Sanitize Mold In My Home?

Clean surfaces:

- You must first clean the contaminated area to remove existing mold.
- Use a **non-ammonia soap/ detergent** or a commercial cleaner in hot water.
- Thoroughly scrub all contaminated surfaces (use a stiff brush to clean block walls and other semi-porous surfaces) with the soap/detergent. It is best to use an excessive amount of cleaning solution for this step.
- Rinse clean with water. You can use a wet-dry vacuum to collect excess water.

Never mix bleach with ammonia -- the fumes are toxic.
Wear eye protection & rubber gloves.
Ventilate the working area well

Sanitize surfaces: Consider the use of a biocide or sanitizing solution only if cleaning did not completely remove the mold and mold spores, and removal of the material was not possible.

- After cleaning, apply sanitizing solution of **3/4-cup household bleach per gallon of water** to the surface. If the mold has already started to grow back, try a stronger solution - **1-1/2 cup of bleach per gallon of water**. Using bleach straight from the bottle will not be more effective. Bleach solution can be applied to large areas with a handheld garden sprayer. In case of flooding, be sure to thoroughly wet the studs, wall cavities, and floors. Avoid excessive run off. Use wet-dry vacuum to collect extra bleach solution. **Allow the bleach solution to dry naturally for a 6 to 8 hour period.** The bleach solution should not be removed or dried quickly, extended contact time is important.

NOTE: Bleach can irritate your eyes, nose and throat. Ventilate the working area well.

Dry Surfaces:

- If flooding occurred, thoroughly dry out the affected area using fans and dehumidifiers. Be patient -- allow six weeks or more for the drying process before installing new building materials (carpet, paint, sheet-rock). Also, allow inside of walls to dry thoroughly.

Can Cleaning Up Mold Be Hazardous To My Health?

Yes. Exposure to mold can occur during the cleaning stage. Mold counts in the air are typically 10 to 1,000 times higher than background levels during the cleaning of mold-damaged materials. Take steps to **protect your health during cleanup**. Consider using an N95 particulate respirator (sometimes referred to as the TC-21C particulate respirator), approved by the National Institute for Occupational Safety and Health, and wear clothing that can be laundered or discarded afterward. Wear rubber gloves and eye protection. Respirators can be purchased at safety supply stores or some hardware and building supply stores may carry them. Ask family members, especially children and the elderly to leave areas being cleaned. Consider cleaning a small test patch of mold first. If you feel that this is adversely affecting your health, you may wish to pay a licensed contractor or professional to carry out the work.

Never use a gasoline engine, powered pressure washer, generator, or space heater indoors -- you could be exposing yourself and your family to carbon monoxide.

Can Air Duct Systems Become Contaminated With Mold?

Yes. Air duct systems can become contaminated with mold. Air duct systems can be constructed of bare sheet metal, sheet metal with an exterior fibrous glass insulation, sheet metal with an internal fibrous glass liner or made of entirely fibrous glass. If your home's air duct system has had water damage, first identify the type of air duct construction that you have. Bare sheet metal systems or sheet metal with exterior fibrous glass insulation can be cleaned and sanitized.

If your system has sheet metal with an **internal** fibrous glass liner or is made entirely of fibrous glass, the ductwork normally will need to be discarded. Underground air ductwork systems may need to be abandoned. If you have other questions, contact an air duct cleaning professional.

After I've Cleaned Everything As Thoroughly As Possible, Can I Still Have Odors?

Yes. It is very possible that odors will persist. Continue to dry out the area and search for any hidden sources of mold. Do not assume that if you've cleaned the front side of a moldy surface that the backside is not moldy. Mold often grows under cabinets, inside walls (insulation), in carpet padding, and under vinyl wall coverings. You will have to be on **"Mold Alert"**. Be particularly careful about moisture which could trigger mold growth. If the area continues to smell musty, you may have to clean the area again (follow the cleaning steps given in this fact sheet). Continue to dry and ventilate the area. Don't replace flooring or begin rebuilding until the area has **dried completely**.

What Kinds Of Moisture Clues Could Appear In My Home This Winter That May Lead to Further Moisture Damage?

- window condensation
- plasterboard cracking
- drywall tape loosening and boards and wood warping
- musty odor

If you see any of the above, seek out and take steps to eliminate sources of moisture as quickly as possible. Keep surfaces dry and the relative humidity between 20 and 40 percent in the winter season and less than 60 percent the rest of the year. Look for appearance of mold on surfaces.

Can Ozone Air Cleaners Help Remove Indoor Mold?

Some air cleaners are designed to produce ozone. Ozone is a strong oxidizing agent used as a sanitizer and to eliminate odors. However, ozone is a known lung irritant. Symptoms associated with exposure include cough, chest pain, and eye, nose, and throat irritation. Although there are no air standards for ozone production from air cleaners, some ozone generators have been shown to generate indoor ozone levels above standards set for other purposes. A recent study by the U.S. Environmental Protection Agency (EPA) demonstrated that ozone is not effective for killing airborne molds and fungi even at high concentrations (6 to 9 parts per million).* Health experts caution against introducing a lung irritant directly into an indoor environment. For these reasons, you are strongly discouraged from using ozone air cleaners in any occupied residential space.

*U.S. Environmental Protection Agency. Ozone generators in indoor air settings. U.S. EPA Report, EPA-600/R-95-154 (NTIS PB96-100201), October 1995.

Questions?

Contact your local or state health department or local American Lung Association office.

This fact sheet has been created for the H.E.L.P. for Kids Project.

Portions of this document have been reprinted with permission from "Mold in My Home: Is Mold a Health Concern?" created by the Minnesota Department of Health Indoor Air Program. For an excellent article on moisture problems in homes see "Fundamentals of Moisture in Houses" by Joseph Lstiburek and John Carmody, ***Home Energy***, Vol. 12, No. 6.