

Frequently Asked Questions About Mold

The presence of unwanted or excessive moisture in buildings can lead to structural performance problems, as well as concerns about possible health risks. One area of concern is mold and mildew growth. Homeowners, builders, and contractors can benefit from having accurate, fact-based information on mold, mildew, and wood decay fungi.

Unlike decay-producing fungi, mold and mildew alone do not cause significant loss in the strength of wood products.

Q: What is mold?

A: Mold and/or mildew are microscopic fungi that are present in damp, warm environments, indoors and outdoors. Mold is typically fuzzy and penetrates surfaces, while mildew is flat, powdery, and easier to clean. They grow on a variety of organic materials, including wood products^{(1)/(2)/(3)}.

Q: How do molds enter an indoor environment?

A: Molds may be present in outdoor or indoor air. Mold spores from the outside may enter a building through open doorways and windows, or through heating, ventilation, and air-conditioning systems. Spores in the outside air also attach themselves to people and animals, making clothing, shoes, bags, and pets convenient vehicles for carrying mold indoors⁽⁴⁾.

Q: How does mold grow?

A: Mold needs oxygen, water, nutrients, and a temperature between 40 degrees and 100 degrees Fahrenheit to grow⁽⁵⁾. Mold spores can grow when they come into contact with a food source (i.e., organic material) where there is excessive moisture, such as where there are leaks from roofs, pipes, walls, or potted plants, or where there has been flooding. Additionally, an average relative humidity of 80% or more over a month's duration will provide sufficient moisture for mold growth⁽⁶⁾. Organic materials (including paper and paper products, cardboard, ceiling tiles, wood, and wood products) provide suitable nutrients to support mold growth. Other materials such as dust, paints, wallpaper, insulation, drywall, carpet, fabric, and upholstery can also support mold growth⁽⁴⁾.

Q: Is mold occurring because buildings are now "air tight"?

A: This rationale for moisture/mold problems is often presented as the main driving force for increases in moisture/mold claims. However, mold needs moisture to grow, and moisture can come from multiple sources in a house, many of which have nothing to do with the amount of fresh air exchange a building experiences. A leaky foundation wall or a chronic plumbing leak releasing water onto drywall are two examples. There can be cases where the humidity level in a house would be lower with more fresh air, potentially alleviating some moisture/mold problems, but to characterize this as the root cause of mold problems is incorrect⁽⁷⁾.

Q: Why is mold a concern?

A: Mold and/or mildew fungi do not cause decay; however, the environment that fosters mold growth will also support decay-producing organisms⁽¹¹⁾. Additionally, mold produces airborne spores, which may cause allergic reactions or respiratory irritation in some people⁽⁵⁾.

Q: A house has a water leak. What is the potential for growing mold in the leak area?

A: Materials that are exposed to a constant leak or have been soaked and not dried thoroughly can support mold growth. Some molds can form a new colony in one or two days on damp materials. Molds do not require light and can continue growing indefinitely without light⁽⁸⁾.

Q: What about moisture in the crawl space?

A: There is no definitive answer regarding moisture problems in the crawl space.

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A symposium on the subject held by the American Society of Heating, Refrigeration, and Air-Conditioning Engineers produced the following recommendations⁽⁹⁾:

- There should be proper drainage, clearance, and access.
- Crawl spaces should have ground covers for moisture control. These should be installed to limit evaporation from the soil.
- Heated crawl spaces should not be vented with outdoor air.
- Unheated crawl spaces may be vented, but there is no overriding need to do so for reasons of moisture control if an effective ground cover is present. (Note: check with local building codes to verify whether this practice is permitted in your jurisdiction.)

Q: With wood, at what moisture content does mold become a concern?

A: A moisture content greater than 19% is sufficient to support mold growth. This moisture content is also sufficient to support decay-producing organisms⁽¹⁰⁾, which, unlike mold, can cause permanent loss of structural strength⁽¹¹⁾. Wood can achieve this moisture content when exposed to direct wetting from any source of moisture, or from extended exposure to high relative humidity (above approximately 90%). Moisture meters can be used to estimate moisture content of the wood.

Q: Do structural adhesives cause mold to grow more readily?

A: A study conducted on fungal susceptibility of pine and aspen oriented strand board (OSB) found that the amount of mold growth on both OSB types was approximately equal to the mold growth on solid aspen⁽¹²⁾. These results indicate that the adhesive in OSB has little or no effect on mold growth. Additionally, molds grow best on sources with freely available nutrients⁽¹³⁾, and since the cured resins used in structural adhesives are a poor source of freely available nutrients, these adhesives are generally not associated with mold growth.

Q: If someone thinks they have mold in their house, should they test for it?

A: According to the EPA, sampling is unnecessary in most cases where visible

mold growth is present. Since no EPA or other federal limits have been set for mold or mold spores, sampling cannot be used to check a building's compliance with federal mold standards⁽²⁾. Testing for mold is also difficult because mold spores are everywhere, and therefore, testing will not prove that a house is free of mold⁽⁷⁾. The U.S. Centers for Disease Control and Prevention (CDC) advises that it is not practical to test for mold growth in a building because large mold infestations can usually be seen or smelled⁽⁴⁾. When testing is done, it is usual to compare levels of mold spores inside the building with levels outside the building⁽⁸⁾.

A thorough inspection of a building, to check for signs of moisture problems or active mold growth, is likely to be more effective than testing as a way to size up potential problems⁽⁷⁾. It is usually not necessary to identify the species of mold growing in a residence, and CDC does not recommend routine sampling for molds.

Evidence indicates that allergies are the primary health problems associated with molds. CDC recommends that if the occupants are susceptible to mold allergies and mold is seen or smelled indoors, there is a potential health risk and the homeowner should arrange for mold removal⁽⁴⁾.

Q: If a qualified environmental lab took samples of the mold inside a home and returned the results, can CDC or anyone else interpret these results?

A: Standards for judging acceptable, tolerable, or normal quantities of mold have not been established. If the homeowner decides to pay for environmental sampling for molds, CDC recommends that the following items be addressed before the work starts:

- Who will establish the criteria for interpreting the test results?
- What are their qualifications?
- What will be done, or what recommendations will be made based on the sampling results?

Keep in mind that the results of samples taken in a unique situation cannot be interpreted without physical inspection

of the contaminated area or without considering the building's characteristics and the factors that led to the present condition⁽⁴⁾.

A qualified environmental professional or an industrial hygienist can help interpret mold results.

Q: How do you determine whether a mold is "toxic"?

A: Unfortunately, it is impossible for homeowners to distinguish between so-called "toxic" and "non-toxic" molds because they all look like black or gray sooty patches. Press coverage about lawsuits and health studies involving mold has typically focused on one type of mold called *Stachybotrys chartarum*, which is often referred to as "the toxic mold." However, there is no particular reason why this mold should be singled out, as all molds should be treated with caution⁽⁵⁾.

Q: Should a homeowner be concerned about possible health risks from mycotoxins produced by mold?

A: The CDC provides the following answer to this question: "The hazards presented by molds that may contain mycotoxins should be considered the same as other common molds that can grow in [a] house. There is always a little mold everywhere—in the air and on many surfaces. There are very few case reports that toxic molds (those containing certain mycotoxins) inside homes can cause unique or rare health conditions such as pulmonary hemorrhage or memory loss. These case reports are rare, and a causal link between the presence of the toxic mold and these conditions has not been proven."⁽⁴⁾ A common-sense approach should be used for any mold contamination existing inside buildings and homes.

The common health concerns from molds include hay-fever-like allergic symptoms. Certain individuals with chronic respiratory disease (such as chronic obstructive pulmonary disorder or asthma) may experience difficulty breathing when exposed to mold. Individuals with immune suppression may be at increased risk for infection from molds. If the home-

owner or any family members have these conditions, a qualified medical clinician should be consulted for diagnosis and treatment. For the most part, one should take routine measures to prevent mold growth in the home.⁽⁴⁾

Q: What is *Stachybotrys chartarum* (*Stachybotrys atra*)?

A: *Stachybotrys chartarum* (also known as *Stachybotrys atra*) is a greenish-black mold. It can grow on material with a high cellulose and low nitrogen content, such as fiberboard, gypsum board, paper, dust, and lint. Mold growing in homes and buildings, whether it is *Stachybotrys chartarum* or other molds, indicates that there is a problem with water or moisture that needs to be addressed.

Q: How common is mold, including *Stachybotrys chartarum*, in buildings?

A: Molds are very common in buildings and homes and will grow anywhere there is moisture. The most common indoor molds are *Cladosporium*, *Penicillium*, *Aspergillus*, and *Alternaria*. The scientific community does not have accurate information about how often *Stachybotrys chartarum* is found in buildings and homes. It is less common than other mold species; however, it is not considered rare⁽⁴⁾.

Q: Will mold affect the structural integrity of the wood in my home?

A: Surface mold on wood from short-term wetting does not structurally damage the wood⁽⁷⁾. Mold and mildew are a different type of fungi than those that cause wood to rot. Unlike decay-producing fungi, mold and mildew alone do not cause significant loss in the strength of wood products. Nonetheless, mold and mildew on wood indicate high moisture, and prolonged periods of high moisture may also support the growth of decay-producing fungi. This is one of the reasons why it is important to prevent the growth of mold and mildew⁽¹⁴⁾.

Q: How can mold growth be prevented?

A: Controlling moisture is the most important part of mold-growth prevention. Mold will not grow if moisture is not present. A properly constructed building is designed to keep the inside of it dry, which

prevents mold growth⁽²⁾⁽⁸⁾⁽¹¹⁾. As part of routine maintenance, buildings should be inspected for evidence of water damage and visible mold, and any conditions that could cause mold (such as water leaks, condensation, infiltration, or flooding) should be corrected⁽⁴⁾.

Specific Recommendations from CDC:

- Keep the overall relative humidity level in the building below 50%. This 50% threshold is often recommended to minimize localized conditions of relative humidity greater than the commonly referenced threshold of 80% that supports active mold growth.
- Use an air conditioner or a dehumidifier during humid months.
- Be sure the home has adequate ventilation, including exhaust fans in the kitchen and bathrooms that vent to outside the building.
- Use paints that contain mold inhibitors.
- Clean bathrooms with mold-killing products.
- Do not carpet bathrooms.
- Clean up and dry out building fully and quickly after a flood. Remove and replace flooded carpets.

Q: How do you get rid of existing mold?

A: It is impossible to get rid of all mold and mold spores indoors; some mold spores will always be found floating through the air and settling with house dust. However, mold spores will not grow unless moisture is present. Indoor mold growth can and should be prevented or controlled by controlling moisture indoors. If there is mold growth in a building, the mold must be cleaned up and the moisture problem must be fixed. If the mold is cleaned up,

but the moisture problem remains, then the mold will probably return⁽¹⁾⁽²⁾.

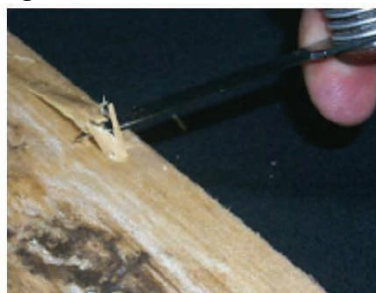
Q: How do I determine if a product has been damaged beyond cleaning?

A: In an initial assessment, the key question is: Does this appear to be a "mold only" condition, or does it appear to have become a potential decay situation? Mold and mildew cause no structural damage to wood other than unsightly discoloration⁽¹¹⁾. Mold growing on sawn lumber or other structural wood products is most likely a surface contamination issue, not a structural issue, so it can be cleaned, dried, and used. However, if there is any evidence of decay, the product should be replaced⁽¹⁵⁾. Conversely, porous materials that are moldy, such as ceiling tiles, sheetrock, and carpet should be discarded⁽¹⁴⁾.

If the wood is badly decayed, this will be quite visible. Two common visual results of decay are a bleached and stringy appearance to the wood, or a darkened surface with cubical cracking. If fungal growth is visible on the surface, the wood has probably suffered strength loss, but do not rely on visual cues alone. Wood can appear stained and be sound, or can appear normal yet still have already suffered significant strength loss from decay. Use the pick test to determine whether or not the wood is sound: Insert the point of a knife at a shallow angle to the surface and attempt to lever up a thin splinter. If the wood splinters, it is sound. If instead it breaks just above the blade like a carrot snapping in half, it is decayed⁽¹⁶⁾. See

Figure 1 below.

Figure 1:



Pick test on sound wood—splintering break



Pick test on decayed wood—brash break

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Q: The homeowner has identified mold growth and fixed the moisture problem. Now, how do they clean up the mold?

A: A detergent and water solution⁽²⁾ (recommended by the EPA) or a bleach-to-water solution (no more than 1 cup bleach per 1 gallon water as recommended by the CDC)⁽⁴⁾ is suggested to clean mold and kill fungi. The detergent/water solution is often recommended because it has less potential than the bleach/water solution to be used in an unsafe manner. This cleaning process will not prevent future growth—only an environmental change

(i.e., eliminating the moisture) can prevent future mold growth. The CDC recommends that large mold infestations should be addressed by a professional who has experience with cleaning mold in buildings and homes⁽⁴⁾.

Q: Does cleaning have any negative effect on the structural performance of engineered wood products?

A: Mold cleaning procedures recommended by the EPA or CDC (i.e., scrubbing with a detergent and water solution or scrubbing with a dilute bleach solution) will not

degrade the structural characteristics of sawn lumber or engineered wood products.

If a remediator wishes to use another type of cleaning solution, he or she should be asked to provide documentation that the solution is not detrimental to wood-based products. If the information is not available, request a copy of the MSDS (Material Safety Data Sheet) for the product and contact Weyerhaeuser engineering for further advice.

Links to More Information

- Canadian Wood Council and FPInnovations have collaborated on a website addressing the durability of wood, with a section specifically addressing mold. cwc.ca
- U.S. Centers for Disease Control and Prevention has developed a Q&A covering mold related topics. cdc.gov/mold-health/about/
- U.S. Environmental Protection Agency covers issues, including cleanup, health concerns, and air quality, in *A Brief Guide to Mold, Moisture, and Your Home*. epa.gov/mold/brief-guide-mold-moisture-and-your-home
- USDA Forest Service, Forest Products Laboratory has a few documents related to moisture in homes. The most notable is *Recognize, Remove, and Remediate Mold and Mildew*. fpl.fs.usda.gov/documnts/pdf2001/claus01b.pdf
- APA – The Engineered Wood Association's informational flyer briefly covers cleanup and prevention of mold and moisture problems. Their Q&A section also has one entry dealing with mold. apawood.org
- American Wood Council (AWC) offers facts about where can I find information on mold and mildew of structural wood members. awc.org/faq/where-can-i-find-information-on-mold-and-mildew-of-structural-wood-members/
- Kansas State University. Although published in 1995, this document contains excellent information relating to the identification of mold in the home, preventative measures, and a highly detailed section on cleanup. water-research.net/Waterlibrary/Mold/moldinhome.pdf
- New York City Health Department publishes *Facts About Mold*, a fact sheet with questions and answers about health concerns, healthy homes, and cleanup information. www1.nyc.gov/assets/doh/downloads/pdf/epi/mold-brochure.pdf
- American Phytopathological Society publishes *Stachybotrys chartarum: The Toxic Indoor Mold*. apsnet.org/edcenter/apsnetfeatures/Pages/Stachybotrys.aspx
- Building Science Corporation, a private consulting firm that specializes in preventing and resolving problems related to building design, construction, and operation, has written a few documents relating to mold. Topics covered include Mold Testing, Moisture, Building Enclosures, and Mold, Mold-Causes, Health Effects and Clean-up, and Mold Remediation in Occupied Homes. buildingscience.com/document-search
- Hurricane Sandy Rebuilding Task Force - Indoor Environmental Pollutants Work Group, published in 2015 provides homeowner's and renter's guide to mold cleanup after disasters. epa.gov/sites/default/files/2017-08/documents/mold._homeowners_and_renters_guide_to_cleanup_after_disasters.pdf

References

1. American Industrial Hygiene Association. 2020. Facts about mold: A consumer focus. AIHA.
2. U.S. Environmental Protection Agency. 2010. *A Brief Guide to Mold, Moisture, and Your Home*.
3. California Dept. of Public Health. 2016. *Mold or Moisture in My Home: What Do I Do?*
4. Centers for Disease Control and Prevention. *Facts about Stachybotrys Chartarum and Other Molds*. cdc.gov/mold-health/data-research/facts-stats
5. NAHB Research Center's ToolBase Services. 2002. *Mold in Residential Buildings*.
6. International Energy Agency. 1990. Annex 14: *Condensation and Energy, Vol. 2: Guidelines and Practice*.
7. NAHB Research Center's ToolBase Services. 2002. *Helping Your Buyers Understand Mold During the Building Process*.
8. Kansas State University Agricultural Experiment Station and Cooperative Extension Service 1995. *Controlling Mold Growth in the Home*. Kansas State University.
9. Rose W, TenWolde A. 1994. *Recommended Practices for Controlling Moisture in Crawl Spaces. Issues in Crawl Space Design and Construction-A Symposium Summary*. ASHRAE Technical Data Bulletin, ASHRAE.
10. Kirby S, Wiggins C. 1998. *Moisture Control and Prevention Guide*. NC State University. studylib.net/doc/18276651
11. Clausen C. 2000. *Recognize, Remove, and Remediate Mold and Mildew. Proceedings of 2nd Annual Conference on Durability and Disaster Mitigation in Wood-Frame Housing*.
12. Laks P et al. 2002. *Fungal Susceptibility of Interior Commercial Building Panels*. Forest Products Journal Vol. 52(5);41-44.
13. Forintek Canada Corp. and University of British Columbia School of Occupational and Environmental Hygiene. 2002. *Discolorations on Wood Products: Causes and Implications*.
14. APA - The Engineered Wood Association. 2017. *Mold and Mildew*.
15. Yost N, et al. 2002. *What You Need to Know About Mold*. Building Science Corporation.
16. Canadian Wood Council and FPInnovations. Website on the durability of wood products. cwc.ca

