

What You Can Do to Reduce Mold Growth

Where Can You Find Mold?

Molds and mildews are fungi that are found almost everywhere, both indoors and outdoors. They can grow on the surfaces of objects, within pores, and in deteriorated materials, as long as favorable conditions are present. Elevated levels of airborne mold spores can lead to allergic reactions in susceptible individuals and potentially to other health effects as well. While it is impossible to eliminate all mold and mold spores in the indoor environment, mold growth can be controlled indoors by controlling moisture indoors.

Necessary Conditions for Mold Growth:

- Temperature range above 40° F and below 100° F
- Mold spores
- Nutrient base (most surfaces contain nutrients)
- Moisture (water or high humidity)

Human comfort constraints limit the use of temperature control. Spores are almost always present in outdoor and indoor air. Almost all commonly used construction materials and furnishings, including wood, paper, carpet, foods and insulation, can provide nutrients to support mold growth. Moisture control is the key strategy for reducing mold growth.

Mold can be white, green, black, yellow, brown, or orange. The texture can vary between appearing like powder, cotton, velvet, or tar-like. Mold can look like spots on an area, or cover an entire area, and it can smell musty. If you can find visible mold growth, please contact Facilities Solution Center at 413-545-6401 or submit a work request through <https://www.umass.edu/facilities/requests> to request cleaning for your area and remediation of the water source. If you do not see visible mold but you suspect a problem, please contact EH&S at 413-545-2682 to identify any potential issues. If you live in a residence hall and have concerns about mold, please see the information on the Living at UMass page (<https://www.umass.edu/living/residence-halls/mold-and-mildew-prevention>) for how to report your concerns.

Tips for Reducing the Risk of Mold Growth:

- Please report any water leaks, including roofs, windows, wall repairs, plumbing, dripping pans, and wet carpet, to Facilities Solution Center at 413-545-6401 or submit a Work Order through <https://www.umass.edu/facilities/requests>.

- Any porous material in a building that has been microbially contaminated should be discarded; disinfection is rarely effective. Contaminated insulation, ceiling tiles and rugs must be removed. Smooth surface materials that have become contaminated can be cleaned with a biocide and have them dry completely. Building materials cannot be thoroughly dried should be removed.
- Clean and dry damp or wet building materials and furnishings, including carpeting and drywall, as soon as possible to prevent mold growth. Dehumidifiers and fans should be used in areas that do not have high air change rates. Carpeting must be thoroughly dried when wetted as soon as possible. As much water as possible should be suctioned from wet carpets followed by the use of fans and dehumidifiers to ensure appropriate drying. Carpeting should never be used in areas such as on-grade concrete floors where persistent moisture is present. EH&S can assess moisture levels in materials. Contact us if you have any concerns at 413-545-2682.
- Ensure ventilation is adequate for the space. Keep room air vents/grills (where applicable) in all areas open and unobstructed to maintain proper airflow. Contact the Facilities Solution Center at 413-545-6401 or submit a work request to <https://www.umass.edu/facilities/requests> if you suspect problems with air handlers. For spaces that rely on natural ventilation, opening windows and using fans can be used to improve air circulation.
- Vent moisture generating sources, such as clothes dryers, to the outside. Exhaust from high moisture areas such as kitchens and shower areas should also be directed outside.
- Indoor relative humidity should be maintained between 20-60%. If ventilation and heating/air conditioning units are not sufficient, humidifiers/dehumidifiers may be necessary. Please see the EH&S fact sheet on humidifiers and dehumidifiers (<https://ehs.umass.edu/humidifiers-and-dehumidifiers-fact-sheet>) for more information. If you have concerns about relative humidity in your workspace, contact EH&S at 413-545-2682.
- Reduce the potential for condensation on cold surfaces, such as windows, piping, exterior walls, roof, or floors, by adding insulation. Increase air circulation of warmer dry air can also increase the material's surface temperature and prevent condensation.
- Do not pile wet towels, clothes, or other materials. Wet items should be dried or removed from spaces as soon as possible.
- If you are experiencing a mold/mildew problem, the moisture source must be identified and controlled or abated. Please contact Facilities Solution Center at 413-545-6401 or submit a work request through <https://www.umass.edu/facilities/requests>.

Mold Testing

According to Federal, state, and local agencies, as well as the AIHA, it is not recommended to conduct sampling for microbial or mold growth when addressing building complaints. Instead, if visible mold or microbial growth is found, it is recommended to immediately begin remediation procedures without further characterization of the mold. The primary focus should be on

identifying and addressing the source of moisture that is causing the growth rather than extensive mold sampling.

However, in some cases after remediation, such as from massive water damage, air sampling may be helpful to ensure that no active mold growth is occurring in the space as a result of inadequate removal of impacted building materials. There are also situations where odors are detected, but no visible mold growth is found in space, in which case air sampling would be helpful to determine whether there is active but hidden mold growth in the space. An air sample alone is not enough to confirm or refute the existence of a problem, and such testing needs to be accompanied by visual inspection and assessment of other parameters that affect fungal growth such as moisture measurements of materials, temperature, and relative humidity. Please contact EH&S for a thorough investigation.

Please submit work request to address water leaks and necessary cleaning procedures by calling Facilities and Campus Services at 413-545-6401 or by online request form:

<https://www.umass.edu/facilities/requests>

Why is sampling not recommended in most cases?

OSHA and EPA have no regulations or recommendations for the level of fungal spore concentrations in the air, so air sampling alone does not provide the data to make an informed decision. The closest thing to a regulation falls under 29 CFR 1910.141(a)(3)(i) which states "All places of employment shall be kept clean to the extent that the nature of the work allows." The ambiguity of this allows for judgment from institutions but also from OSHA when addressing concerns. NIOSH/CDC and MA DPH have found thorough visual inspections and/or detection of problem areas via musty odors are more reliable.

CDC says: "Standards for judging what is an acceptable, tolerable, or normal quantity of mold have not been established" and "Generally it is not necessary to identify the species of mold growth in a residence, and CDC does not recommend routine sampling for molds. Current evidence indicates that allergies are the type of diseases most often associated with molds. Since the susceptibility of individuals varies greatly either because of the amount or type of mold, sampling and culturing are not reliable in determining your health risk... therefore, no matter what kind of mold is present, you should arrange for its removal."

(<https://www.cdc.gov/mold/faqs.htm>)

The U.S. Environmental Protection Agency (EPA) says: "In most cases, if visible mold growth is present, sampling is unnecessary. 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." (<https://www.epa.gov/mold/mold-testing-or-sampling>)

The AIHA position statement on mold and dampness in buildings states that mold air sampling can be useful under specific situations: “If mold is suspected, but not visibly detected after a thorough inspection, then microbial air sampling conducted in accordance with guidance documents can be useful.(2,3,24) This sampling may reveal evidence of indoor mold amplification or reservoirs, particularly of mold that is considered “hidden” behind walls and other building structures...Any mold sampling that does occur must be performed by qualified and experienced investigators familiar with current guidelines and, if applicable, local regulations...Samples should not be taken without a clear purpose (i.e., testing a hypothesis)”

What are the differences between air sampling and surface sampling?

Surface sampling is useful to positively identify suspect materials as mold. Mold’s appearance can be similar to common household materials such as lint, dirt and staining, therefore positively identifying suspect materials is important. However, surface sampling may not be used to evaluate actual exposure to spores. Further, surface sampling is not indicative of current conditions in a space. Fungal spores are around us all of the time and settled on surfaces. Types and quantities of airborne spores change with the seasons and local climate, and as such, if surfaces are not cleaned regularly, spores and other materials found on surfaces could have originated from different points in time and not necessarily from the space in question. For example, opening windows in the summer can lead to abundant quantities of spores and other airborne materials that deposit on surfaces indoors that can still be present on those surfaces in the winter when windows are closed and spores and airborne materials are much lower in the outdoor air.

Air sampling is utilized in many different scenarios. It identifies the presence, types and quantities of airborne mold spores in the area where it was collected. This is done by pulling a metered amount of air through a spore trap, which will collect any particulate within the air including microscopic mold spores. All indoor samples are compared to an outdoor control or baseline sample to determine if the indoor conditions are excessive or “elevated” or if spore types and distributions are skewed. This sampling method is useful in determining the overall air quality in a space specific to mold spores, determining the overall extent of contamination in an impacted space, and is also used as an indicator to help determine if hidden mold sources are present. Air sampling provides a snapshot of the current conditions in a space and as such can be used to support hypothesis about the current state of fungal growth in a space together with other information.

What are the differences between viable and nonviable sampling?

Direct microscopical examination, sometimes called direct examination or direct exam, samples for mold are commonly referred to as “nonviable,” “spore trap” or “total spore count” samples for mold or fungi. The term “nonviable” means that cultures are not grown in the laboratory to identify the fungi detected in these samples. These samples are typically collected using an

inertial impactor with air sampling cassettes. When analyzing direct examination samples, fungi are identified using microscopic techniques to examine spores, mycelial fragments (colloquially termed as hyphal fragments) and other fungal structures captured by the air sampling cassette. Fungi may be identified to the genus level by direct exam.

“Viable” or “culturable” mold sampling is more appropriately called “culture-based analysis” for mold or fungi. Types of fungi in air samples are identified by impaction directly onto growth media and by growth of the fungal cultures on the media in the laboratory. Culture-based air samples for mold are commonly collected by inertial impaction samplers. The sample collected on the impaction surface is incubated in the laboratory. The fungal colonies able to grow on the media are counted and identified by traditional microbiological methods (colony morphology, microscopical examination of spores and mycelial fragments, colony growth characteristics, etc.). A major drawback of culturable sampling is that it is biased towards types of fungi that are able to grow on the medium chosen. As such, other types of fungi may be missed entirely, so it can provide misleading information about spore type distribution. It is generally not necessary to perform culturable sampling as it is seldom necessary to determine to the species level the type of mold present, however, it can be helpful in certain situations.

When should sampling be conducted?

In most cases, if visible mold growth is present, sampling is unnecessary.

If mold is suspected, but not visibly detected after a thorough inspection, then air sampling can be useful. This sampling may reveal evidence of indoor mold amplification or reservoirs, particularly of mold that is considered “hidden” behind walls and other building structures. Sampling for airborne mold spores can indicate whether the mix of indoor spore types and distributions is “typical” of the outdoor mix or, conversely, “atypical” or unusual at the time of sampling.

Why are commercial home mold test kits not recommended?

The presence of biological materials on a particular surface is not a direct indication of what may be in the air. Generally, home mold test kits do not provide meaningful answers. Since mold will be found anytime such testing is done, the home test kits would only confirm what we already know - that mold is everywhere, both outside and inside. Furthermore, even if the home test kit analysis provides detailed information, results can be misleading and difficult to interpret, even for professionals. Results can only be accurately interpreted together with a well-thought-out sampling and analysis plan and visual inspection.

Additionally, Consumer Reports recommends avoiding mold test kits as they have found them to be unreliable. They also said “Each of the kits we tested had significant flaws that were serious enough to earn a Not Recommended Rating in our 2006 tests.”

(<https://www.consumerreports.org/cro/news/2007/04/be-on-the-lookout-for-mold/index.htm>)

Why aren't my symptoms necessarily caused by mold?

Since the susceptibility of individuals can vary greatly, determining health risk through sampling, especially culturing, is unreliable. For those people who are already sensitized to mold, inhaling fungal fragments can cause allergic reactions, including sneezing, runny nose, red eyes, and skin rash. However, a number of illnesses, especially other upper respiratory allergies, have symptoms similar to those caused by an allergic reaction to mold, including viral and bacterial infections and sensitivities to other environmental and food allergens. Therefore, seeking proper diagnosis and treatment from a qualified healthcare provider is essential. Individuals with a weakened immune system are generally at a higher risk of mold infection. A weakened immune system can result from certain medications, medical conditions and diseases that cause immunosuppression, or from cancer therapy that causes temporary immunosuppression.

References:

1. AIHA Mold Resources Center: <https://www.aiha.org/public-resources/consumer-resources/disaster-response-resource-center/mold-resource-center>
2. AIHA FAQs About Spore Trap Air Sampling for Mold for Direct Microscopical Examination: <https://aiha-assets.sfo2.digitaloceanspaces.com/AIHA/resources/FAQs-About-Spore-Trap-Air-Sampling-for-Mold-for-Direct-Examination-Guidance-Document.pdf>
3. *Recognition, Evaluation, and Control of Indoor Mold*, 2nd edition. Hung, L; Caulfield, S.M.; Miller, D.J. (eds.) Falls Church: American Industrial Hygiene Association, 2020
4. OSHA: A Brief Guide to Mold in the Workplace: <https://www.osha.gov/publications/shib101003>
5. NIOSH: Testing and Remediation of Dampness and Mold Contamination: <https://www.cdc.gov/niosh/topics/indoorenv/moldtesting.html>
6. MA DPH: Guidance Regarding Testing for Mold in Water Damaged Buildings: <https://www.mass.gov/info-details/guidance-regarding-testing-for-mold-in-water-damaged-public-buildings>
7. EPA: Mold Testing or Sampling: <https://www.epa.gov/mold/mold-testing-or-sampling>