

What is Mold?



Mold is a growth of various types of fungi that produce a furry mass on the surface of materials. Mold spores are everywhere and invisible to the naked eye. Mold reproduces by sending out a large number of spores into the air which then travel to new locations and germinate under specific conditions. When the spores germinate, they produce fuzzy hair-like stalks called *hyphae* which in turn produce more spores. **Mildew** is an early stage of mold that appears as a thin film. Mold can be found in a multitude of colors and will attach to a vari-

ety of surfaces and organic materials. Molds will attack the starches found in adhesives, sizings and textiles, proteins found in leather, parchment and animal glues, and cellulose which is the main component in paper.

Mold damages the objects it settles on by excreting digestive enzymes. These enzymes alter, weaken, and stain the objects. Once an object is weakened by mold, it becomes more susceptible to future damage as it becomes more fragile and porous.

Prevention is Key

The easiest way to preserve objects is to prevent the mold from forming in the first place.

In order to germinate, specific environmental conditions need to be in place. Molds love high humidity, still air, darkness, and a food source (i.e. adhesives, cellulose, leather).

The best way to prevent mold growth is by maintaining stable and moderate temperature and relative humidity (RH). Ideally, temperatures should be kept below 70 F with RH between 30% and 50%. Relative humidity below 60% will keep objects within a safe level. Do

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not store collections in spaces that are known to be damp or prone to leaks and flooding. Avoid attics, basements, and spaces along exterior walls. Air-conditioners and/or dehumidifiers should be used to lower the RH. Be sure air-conditioners or dehumidifiers are properly draining and drip pans are emptied regularly.

Still air allows mold spores to settle and can increase the moisture content of collections. Maintain good air circulation in storage areas. Do not aim fans directly at collection items.

Keep storage areas and objects as clean as possible. Dust and dirt house spores and can also act as

food for active mold. Protective enclosures keep any dust and dirt off the object and provide an extra layer of protection. Keep windows closed to prevent dust and spores from entering the storage space. Vacuum storage areas and objects regularly.

Change HVAC filters according to the manufacturers recommendations. Have the HVAC system regularly maintained to prevent the system itself from growing mold and affecting the entire building.

Make sure pipes and exterior walls are well insulated to prevent condensation from forming and creating pockets of moisture where mold can form. Regularly check pipes for leaks and make sure gutters are cleared.

Create a separate receiving space for incoming collection items. Check all incoming items for mold or other pests. This prevents contamination of the rest of the collections. If a new acquisition is found to contain mold, follow the steps below.

Protect Staff

If a mold problem is detected or suspected, contact a conservator before any cleanup is carried out. Once a conservator has been consulted, and before cleaning begins, it is important to protect staff first. All molds are potentially dangerous, particularly to people with

weakened immune systems or who may be sensitive to mold. The most common symptoms of mold exposure are runny nose, skin and eye irritations, cough, congestion, aggravated asthma, and flu-like symptoms. Most symptoms are temporary and will be alleviated

when the source of the mold is eliminated.

Any persons working or handling moldy items should be well protected. They should wear long latex, nitrile or rubber gloves to protect the skin. The greatest vehicle for mold exposure is through inhalation. An N95 respirator should be worn at all

times. (See page 5 for more information) Goggles should be worn to protect eyes. Respirator, gloves and goggles should be the minimum of protection used when working with mold outbreaks. If you have any health concerns, contact your doctor before doing any mold cleanup.

Identify the Problem

Once you have taken personal safety precautions, the next step is to locate the source of the problem. Look for sources of high humidity such as a leaking roof or pipe, a broken window, damp floors, or leak in the HVAC system. Check for nearby vents that may be obstructed by storage furniture.

Next, lower the humidity. Do not run the HVAC system if you suspect it is contaminated with mold as this

will disperse it throughout the building. Install dehumidifiers as needed, making sure to arrange continuous drainage or by frequently emptying reservoirs.

Use fans to increase air circulation in the affected area. Be mindful not to point fans directly at the affected materials. This will avoid spreading any active spores and prevent damage to the materials.

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Isolate Materials

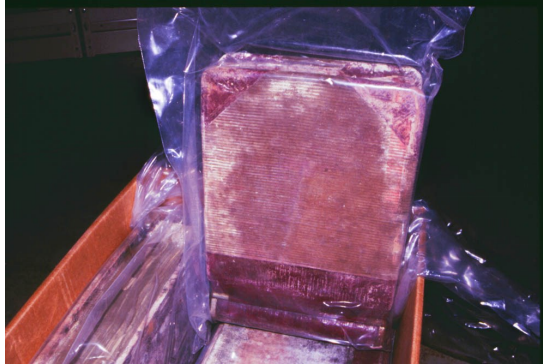
Contact a conservator before you move or handle any collection items. For non-collection items that can be disposed of, put them in sealed polyethylene bags and discard.

For large outbreaks, quarantine the area and contact professional outside help immediately. Close doors and windows, hang plastic sheeting between affected and unaffected areas, and reduce air circulation from the contaminated area to the rest of the building.

For small outbreaks, it is best to dry collection items in-situ to reduce contamination to the rest of the building or collection. Cover wet items with a moisture permeable materials such as Tyvek to prevent spores from spreading as air circulates. Items that are dry and appear unaffected should be put into polyethylene bags and sealed. These should be monitored periodically to insure that no mold growth forms.



Remediation / Isolation



“If items cannot be dried within 48 hours, they should be sealed in polyethylene bags and frozen at temperatures below -20° F until they can be properly dried.”

Under the supervision of a conservator, begin drying affected objects. Do not attempt to dry items that are actually wet; this drying is only for reducing damp items and reducing humidity. Spread papers out, stand books on end, fan out pages, and separate individual objects to create space for air flow. Position fans so that air can circulate without blowing directly on the collection. Drying will inactivate the mold.

If items cannot be dried within 48 hours, they should be sealed in polyethylene bags and frozen at temperatures below -20° F until they

can be properly dried. This can be done in a standard freezer for small outbreaks, but larger outbreaks and long-term freezing should be done by an outside vendor.

Using extreme caution and under supervision of a conservator, small outbreaks can be exposed to sunlight. Ultraviolet light is always damaging to objects because it accelerates aging and can cause fading and discoloration. But if carefully controlled, UV light can inactivate mold.

Once mold is inactivated, it will appear dry and powdery. It can be carefully vacuumed with a small, soft brush and an adjustable suction HEPA vacuum. Dry cleaning with grated vinyl eraser or vulcanized rubber sponge may be necessary.

Cleaning of active mold and/or fragile and valuable collections materials should only be carried out by a conservator.



Cleaning the Space

Once the inactive mold has been removed from the objects, they can be safely moved to a another location. It is imperative that the moisture problem be fixed before remediation and cleanup can be considered complete. After items have been removed, it is important to follow up by cleaning the storage furniture and room surfaces to prevent a new mold outbreak.

Clean the entire affected area including floors, work surfaces, and shelves with the one of the following solutions:

- 0.5% household bleach by volume of water
- at least 40% isopropyl (rubbing) alcohol by volume of water
- 70% ethyl alcohol by volume of water



Leave the solution on the surface for 15 to 20 minutes before wiping dry and rinsing. Make sure the area is completely dry before returning collection items.

Continue to monitor the building and storage areas regularly for any environmental changes. Maintain a regular housekeeping schedule that includes checking for mold. Upgrade any faulty equipment and carry out any necessary repairs to the building.

N-95 Respirators

The N95 respirator is the most common particulate filtering face piece respirator. It can filter at least 95% of airborne particles but is not resistant to oil.

You can find more information on appropriate respirators on the website for National Institute for Occupational Safety and Health (NIOSH) at https://www.cdc.gov/niosh/nppt/topics/respirators/disp_part/n95list1.html

According to the FDA's website: "To work as expected, an N95 respirator requires a proper fit to your face.

Generally, to check for proper fit, you should put on your respirator and adjust the straps so that the respirator fits tightly but comfortably to your face. For information on proper fit, refer to the manufacturer's instructions." More information can be found on the Food and Drug Administration's website: <https://www.fda.gov/MedicalDevices/ProductsandMedicalProcedures/GeneralHospitalDevicesandSupplies/PersonalProtectiveEquipment/ucm055977.htm>

Additional Resources

American Industrial Hygiene Association

<https://www.aiha.org/publications-and-resources/TopicsofInterest/Hazards/Pages/Facts-About-Mold.aspx>

<https://www.aiha.org/publications-and-resources/TopicsofInterest/Hazards/Pages/Mold.aspx>

Centers for Disease Control

<https://www.cdc.gov/mold/default.htm>

Conservation Center for Art & Historic Artifacts

http://www.ccaha.org/uploads/media_items/managing-a-mold-invasion-guidelines-for-disaster-response.original.pdf

Northeast Document Conservation Center

<https://www.nedcc.org/free-resources/preservation-leaflets/3.-emergency-management/3.8-emergency-salvage-of-moldy-books-and-paper>

<https://www.nedcc.org/free-resources/preservation-leaflets/2.-the-environment/2.1-temperature,-relative-humidity,-light,-and-air-quality-basic-guidelines-for-preservation>

https://www.nedcc.org/assets/media/documents/02EV_02TempRH.pdf

<https://www.nedcc.org/free-resources/preservation-leaflets/2.-the-environment/2.6-low-cost-no-cost-improvements-in-climate-control>

Smithsonian

https://www.si.edu/mci/english/learn_more/taking_care/mnm.html



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