



**MOLD
AWARENESS
TRAINING**

**LOYOLA UNIVERSITY
CHICAGO**

WHAT IS MOLD?

Mold is a type of fungus that consists of small organisms found almost everywhere which can be black, white, orange, green, or purple.

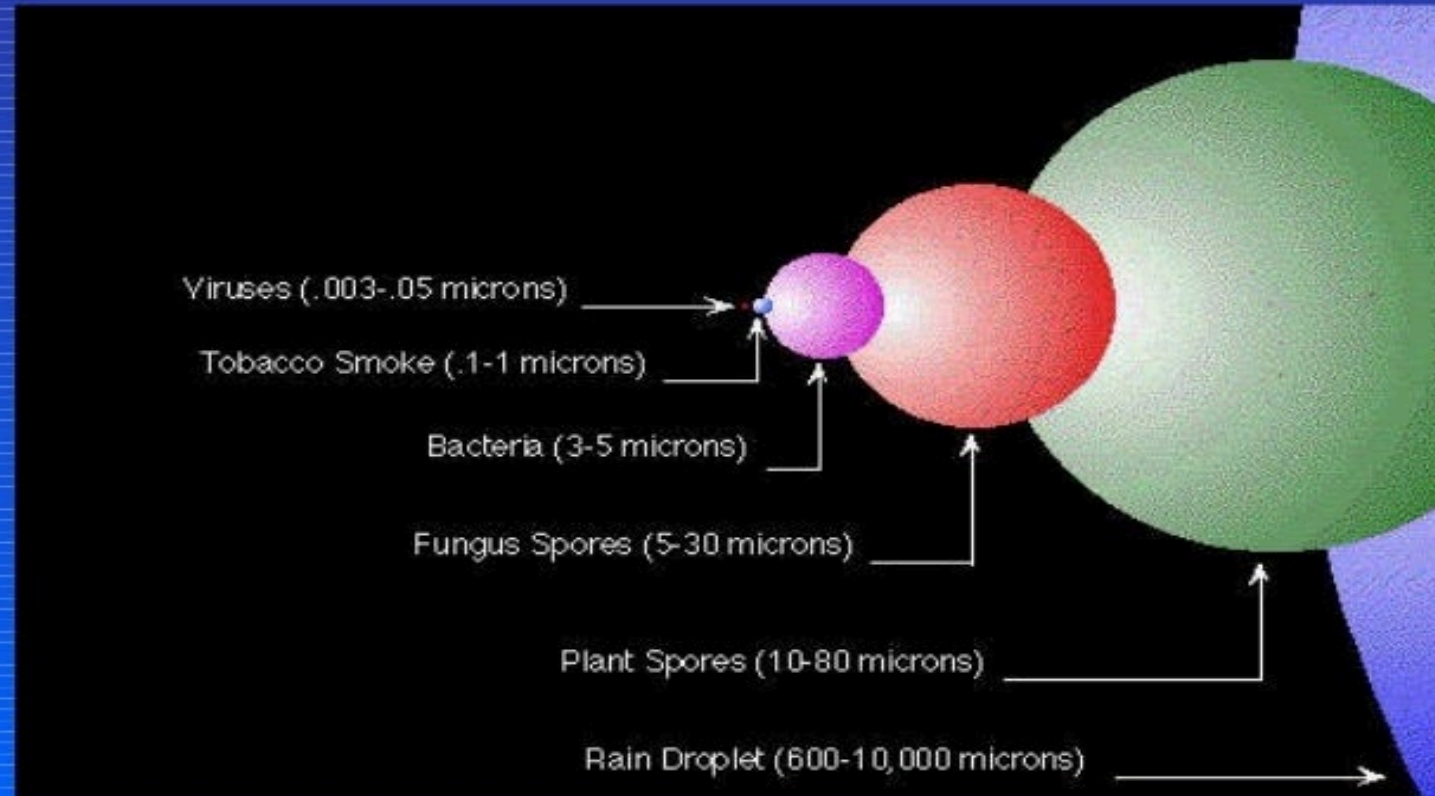
There are many different types and they can occur both indoors and outdoors.

Molds thrive in environments which are moist and warm and reproduce by means of tiny, lightweight spores that travel through the air searching for food and moisture. There is no way to prevent spores and they can persist in conditions where mold itself cannot grow.

Outdoors, molds play an important role in nature by breaking down dead leaves, plants, and trees.

Molds can grow on a variety of different surfaces, including fabric, paper, wood, glass, and plastic. As they grow, they may digest the material they are growing on.

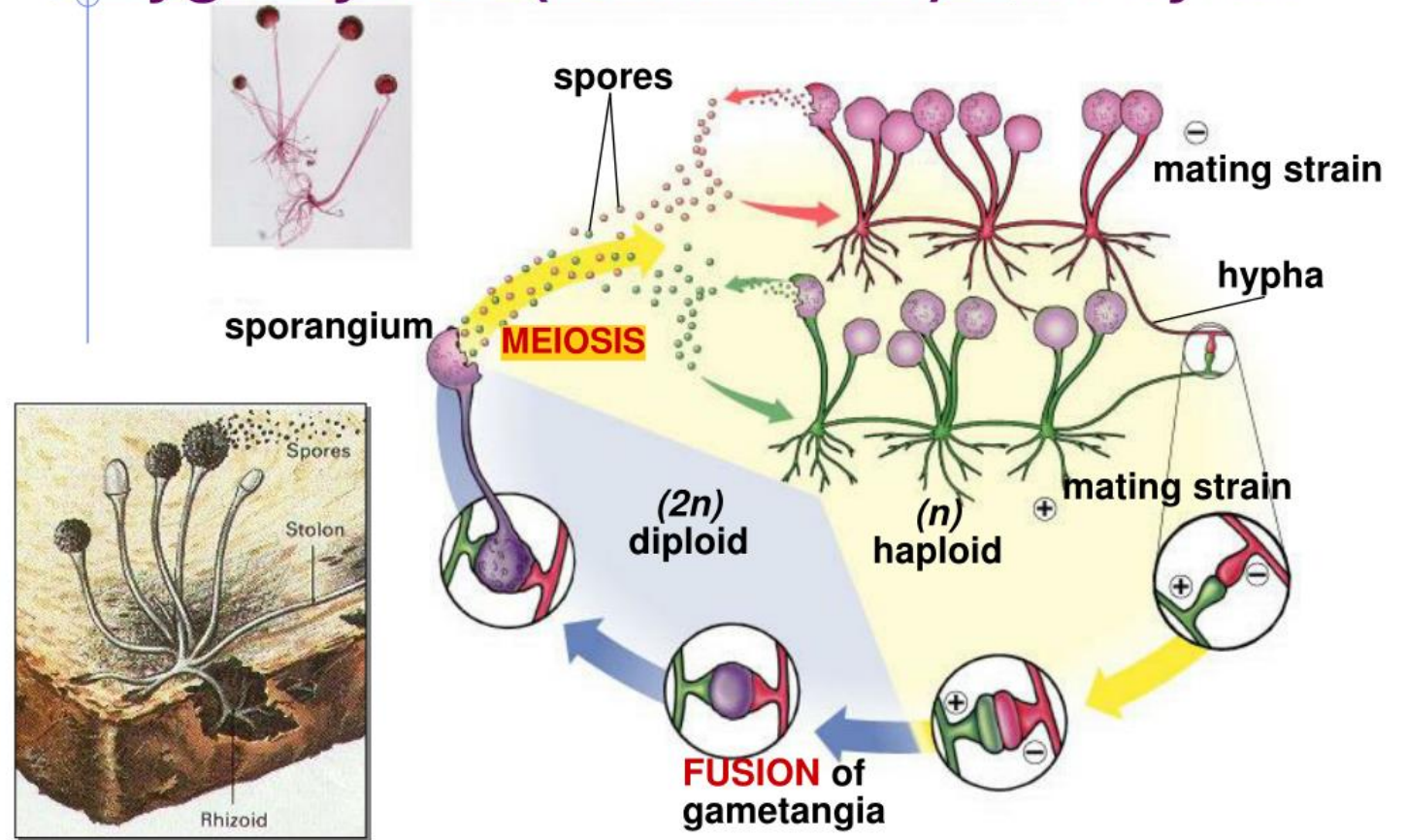
Relative size scale

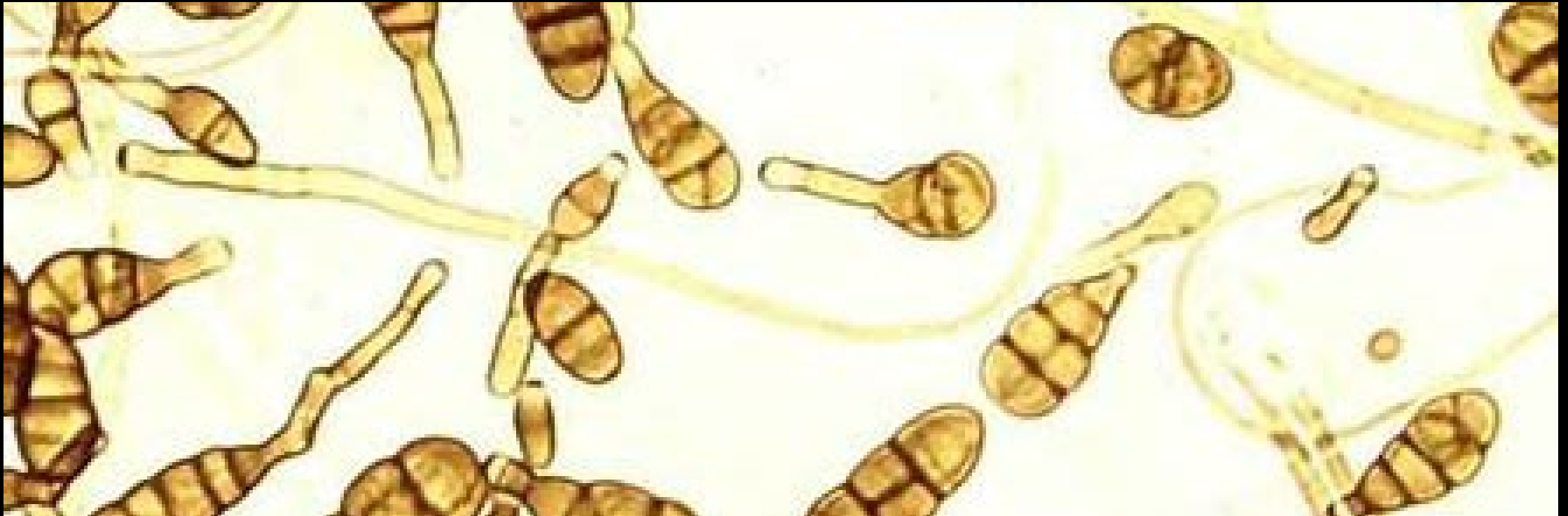


LIFE CYCLE OF MOLD

Mold prefers a moist environment with temperatures ranging between 60 degrees and 80 degrees Fahrenheit. Mold can survive cold temperatures, but it cannot grow or reproduce in them. Mold spores are opportunistic and wait for the right conditions to spread. Extreme temperatures do not kill mold, but they can deactivate them.

Zygomycete (Bread Mold) Life Cycle

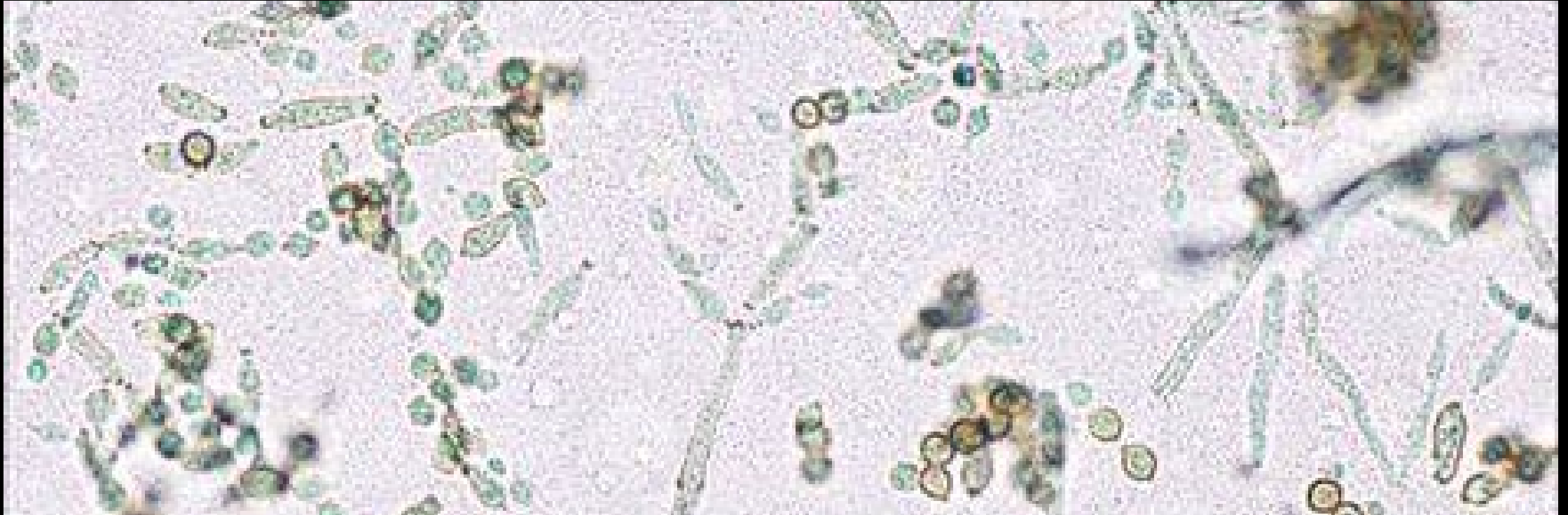




TYPES OF INDOOR MOLD - ALTERNARIA



TYPES OF INDOOR MOLD - ASPERGILLIS



TYPES OF INDOOR MOLD - CLADOSPORIUM



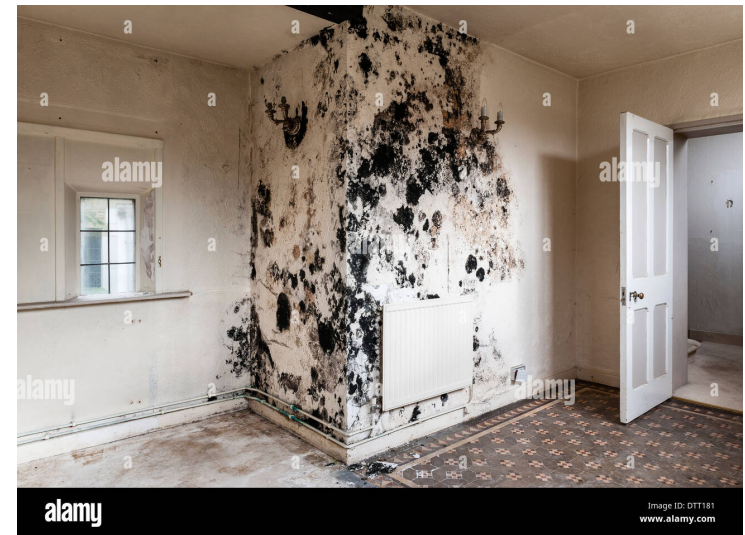
TYPES OF INDOOR MOLD – PENICILLIUM

TYPES OF INDOOR MOLD

- **Alternaria** is predominantly an outdoor family of molds, so any growth that happens inside a building likely began with spores from the outside. Alternaria prefers plants and wood for growth, but if it finds its way inside, it can colonize on tiles, drywall, plywood, paint and polyurethane. Like most molds, it grows best in dark, damp areas.
- **Aspergillus** starts out white and then becomes green, brown, black or yellow as it grows, depending on species. Aspergillus spores spread in the air and are thought to be more concentrated indoors than outdoors. Many Aspergillus species grow fastest in carbon-rich environments, such as rotting leaves, compost piles, and decomposing vegetables. High-starch foods such as bread and potatoes are also common growth areas. Some species can spread rapidly in relatively low-nutrient areas like damp walls, carpets, doors, windows, and pillows.
- **Cladosporium** species show up as black, brown, or olive-green molds and are some of the most common molds found indoors and outdoors. Most species prefer temperatures between 65 - 82 degrees Fahrenheit and it's most likely to grow in wet, damp or humid areas. Outdoors, Cladosporium is often found on dead or dying plants and rotting organic material. Indoors, it can grow in bathrooms, carpets, wallpaper, fabrics, wood and painted surfaces.
- **Penicillium** species produce blue, green, or yellow spores. The species are soil fungi preferring cool and moderate climates, commonly present wherever organic material is available. The species is a major importance in the natural environment, food spoilage, and food and drug production (some species produce penicillin).

STACHYBOTRYS

Stachybotrys is a greenish-black mold that grows on wet materials with high cellulose, such as paper, wood, and fiberboard. It is not very common in indoor environments and its spores are usually present in very low concentrations in the air. It is also known as "black mold" or "toxic mold" because it produces mycotoxins, which are harmful substances that can affect human health. The best way to prevent Stachybotrys growth is to act quickly when there is water damage, leaks, condensation, and flooding in buildings and remove any moldy materials promptly.



MOLD SOURCES

Mold needs two things to survive: food and water. Moist conditions provide water. Mold lives on organic matter (food source), which is generally present outdoors. Mold can also live on indoor organic food sources such as building materials, which include the following:



Drywall



Wood



Ceiling Tile

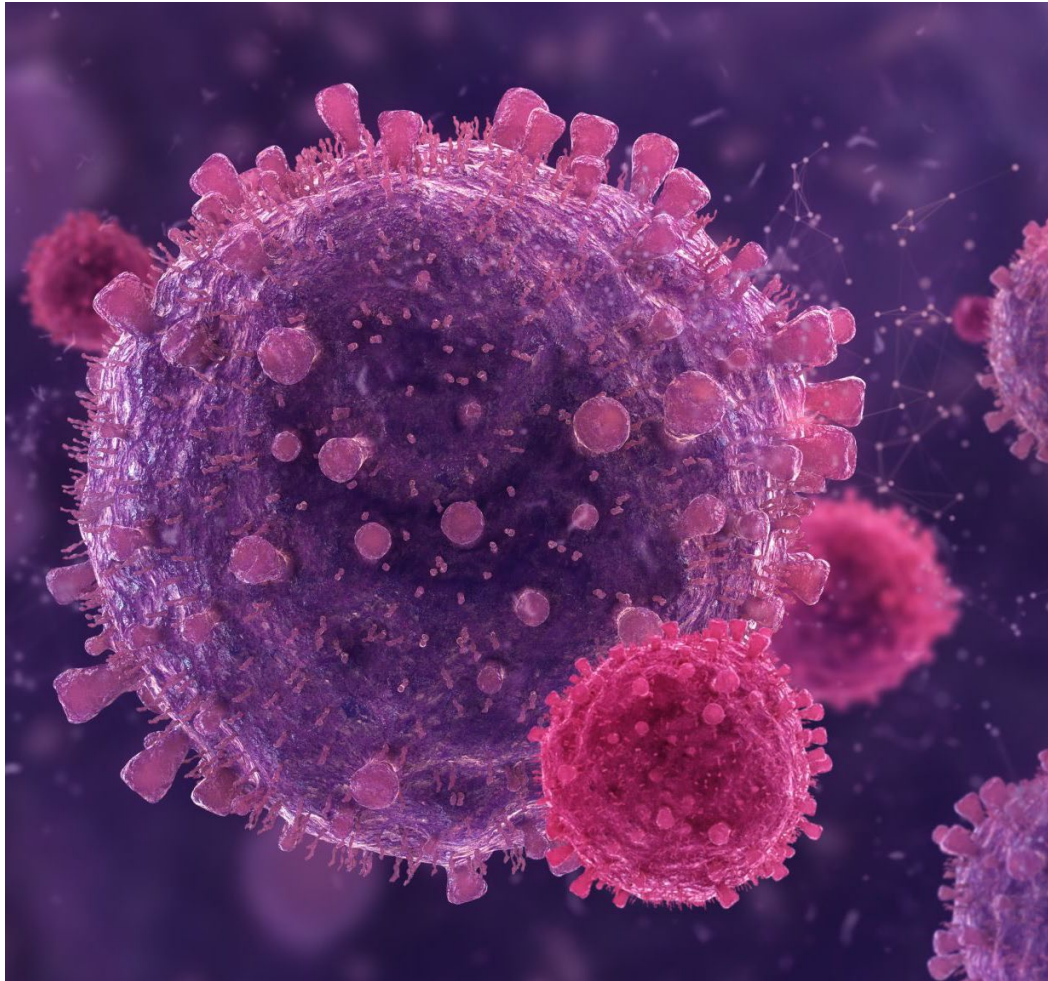


Carpet

COMMON HEALTH SYMPTOMS FOR BUILDING OCCUPANTS

Building occupants may experience the following symptoms when exposed to mold. Symptoms may range from mild to extreme depending on the type(s) of mold and the person (since everyone reacts differently).

- Headaches
 - Nasal irritation
 - Dizziness
 - Fatigue
 - Nausea
 - Breathing difficulties
 - Skin irritation
 - Allergic reactions
 - Aggravation of asthma symptoms
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HEALTH EFFECTS

Most have an allergic response to mold spores which may include rashes, watery eyes, fever, or difficulty in breathing.

- **Causes:**

The over reaction of the immune system when mold spores are inhaled. The spores are recognized as foreign bodies and this activates formation of antibodies.

- **Symptoms:**

Symptoms include rashes, watery eyes, fever, difficulty breathing, wheezing, runny nose, coughing, and skin irritation.

- **Diagnosis:**

Diagnosis involves physical examination and allergy tests. Treatment involves avoiding exposure to the triggers and medications to manage the condition.

HEALTH EFFECTS

Complications may arise from exposure to mold that can produce the following health effects:

- **Allergic Reaction** - various conditions caused by hypersensitivity of the immune system to typically harmless substances in the environment which can develop from inhalation or touching of spores. These diseases include hay fever, food allergies, atopic dermatitis, allergic asthma, and anaphylaxis. Symptoms may include red eyes, itchy rash, sneezing, coughing, runny nose, shortness of breath, or swelling.
- **Hypersensitivity Pneumonitis** - a syndrome caused by the repetitive inhalation of antigens from the environment in susceptible or sensitized people. Common antigens include molds, bacteria, bird droppings, bird feathers, agricultural dusts, bioaerosols, and chemicals from paints or plastics. This can develop after acute or chronic exposure. This is not as common and happens more in an occupational setting.
- **Opportunistic Infections** - are illnesses that strike when the immune system is weak, such as in HIV/AIDS, cancer, or organ transplant patients.
- **Mycotoxic**- toxic compounds that are naturally produced by certain types of molds (also known as toxigenic). Exposure can be from ingestion, inhalation, or contact. The presence of mold in a building does not necessarily mean that mycotoxins are present. Molds that can produce mycotoxins grow on numerous foodstuffs such as cereals, dried fruits, nuts, and spices. Mold growth can occur either before harvest or after harvest, during storage, on/in the food itself often under warm, damp and humid conditions. Most mycotoxins are chemically stable and survive food processing.

MOLD PREVENTION



FIX LEAKY PLUMBING AND OTHER LEAKS AS SOON AS POSSIBLE



WATCH FOR CONDENSATION AND SOURCE(S) OF MOISTURE



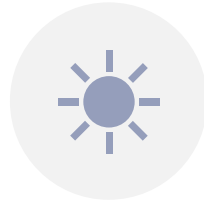
PREVENT MOISTURE DUE TO CONDENSATION BY INCREASING SURFACE TEMPERATURE OR REDUCING THE MOISTURE LEVEL IN AIR. INSULATE OR INCREASE AIR CIRCULATION



KEEP HEATING, VENTILATION, AND AIR-CONDITIONING (HVAC) DRIP PANS CLEAN, FLOWING PROPERLY, AND UNOBSTRUCTED



VENT MOISTURE-GENERATING APPLIANCES TO THE OUTSIDE, WHERE POSSIBLE



MAINTAIN LOW HUMIDITY BETWEEN 30 AND 50%.



PERFORM REGULAR BUILDING AND HVAC INSPECTIONS



CLEAN AND DRY WET OR DAMP SPOTS WITHIN 48 HOURS

WHO SHOULD CLEAN UP THE MOLD?

Who should do the cleanup depends on a number of things.

- One consideration is the size of the mold problem.
- If the moldy area is less than about 10 square feet (less than roughly a 3-foot by 3-foot patch), in most cases, the job can be handled by staff following [EPA's mold guidelines](#).
- If there has been a lot of water damage and/or mold growth covers more than 10 square feet, the situation shall be evaluated and a contractor (or other professional service provider) may be hired to conduct the cleanup.
- If the water and/or mold damage was caused by sewage or other contaminated water, then a professional may be hired who has experience cleaning and fixing buildings damaged by contaminated water.



CLEAN-UP AND MOLD PREVENTION

A moisture meter may be utilized to assess whether a material is wet.

Carpet and Backing

- Dry within 24-48 hours.
- Water should be removed by a carpet extraction vacuum.
- Humidity should be reduced with a dehumidifier.
- Drying process can be expediated with the use of fans.

Ceiling Tiles

- Remove and discard. Replace with new ceiling tiles.

Wallboard (Drywall and Gypsum Board)

- May be dried in place if there is no obvious swelling and the seams are intact. If not, remove, discard, and replace materials
 - Ventilate the wall cavity, if possible.
 - Be aware that mold growth may extend up to 1 foot past the visible mold as the material may be wet.
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CLEANUP AND MOLD PREVENTION

Non-Porous, Hard Surfaces (Plastics, Metals)

- Vacuum (HEPA filter) and/or damp wipe with water and a mild detergent. Scrub surface, if necessary.

Wood Surfaces

- Remove moisture immediately and use dehumidifiers and fans for drying.
- Treated or finished wood surfaces may be cleaned with water and a mild detergent and allowed to dry.
- If applicable, wet paneling should be pried away from the wall and allowed to dry.

Concrete or Cinderblock Surfaces

- Remove water with a water extraction vacuum.
 - Dry with dehumidifiers and/or fans.
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CENTER FOR DISEASE CONTROL (CDC)

8 TIPS TO CLEAN UP MOLD



Protect Yourself

Put on personal protective equipment (gloves, mask, goggles) to protect your eyes, nose, mouth, and skin.



Toss!

Take it out! Anything that was wet with flood water and can't be cleaned and dried completely within 24 to 48 hours should be taken outside. Take photos of discarded items for filing insurance claims.



Air it out

Open all doors and windows when you are working, and leave as many open as you safely can when you leave.



Circulate

When electricity is safe to use, use fans and dehumidifiers to remove moisture.



Don't mix cleaners

If you use cleaning products, do not mix cleaning products together. **DO NOT** mix bleach and ammonia because it can create toxic vapors.



Scrub surfaces

Clean with water and a detergent. Remove all mold you can see. Dry right away.



Don't cover it, remove it

Painting or caulking over mold will not prevent mold from growing. Fix the water problem completely and clean up all the mold before you paint or caulk.



Dry it up

Dry your home and everything in it as quickly as possible – within 24 to 48 hours if you can.

<http://www.cdc.gov/mold/cleanup.htm>



HOW DO YOU KNOW IF THE CLEANUP IS COMPLETED?

- The water or moisture problem must be completely repaired before the cleanup or remediation can be considered finished.
 - The mold removal must be completed. Visible mold and moldy odors should not be present. (Please note that mold may cause staining and cosmetic damage.)
 - The site should show no signs of water damage or mold growth.
 - People should be able to occupy or re-occupy the area without health complaints or physical symptoms.
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WHY AND WHEN IS SAMPLING CONDUCTED?

If there is visible mold or obvious water damage, sampling is usually not necessary.

Sampling may be conducted when there is a potential problem or to determine if there are elevated counts within an area.

Sampling may be conducted to:

Document whether there is an indoor source of mold growth.

Determine the cause of a specific diagnosed disease.

Determine the effectiveness of a mitigation program.



WHEN NECESSARY, CONSULTANTS CONDUCT SAMPLING

MOLD SAMPLING METHODS

- Source Samples
 - Tape samples or bulk samples
 - Cultured or analyzed by microscopy
- Air Samples
 - Non-viable samples
 - Analyzed by microscopy
 - Viable samples
 - Cultured, identified, and counted
- Settled Dust Sampling
 - Vacuum Samples
 - Cultured or analyzed by PCR techniques
- Gas/Vapor sampling for mold metabolites





SAMPLING AND THE PROFESSIONAL

When necessary, mold sampling can play a vital role in determining whether mold is present, as well as what types may be present. However, sampling is not a tell all. Mold sampling should always be done in combination with a thorough physical inspection of the property in an effort to avoid false positives and/or false negatives. Additionally, both the inspection and the sampling should only be performed by a certified, professional microbial investigator. A good investigator will be certified to perform mold investigations and collect microbial samples, be able to think outside of the box, diligent in examining specialty situations, and have background knowledge in areas like construction, water restoration, mold remediation and indoor air quality.

AT THE END OF THE DAY.....

Molds can be found **almost anywhere** and grow on virtually any substance, providing moisture is present.



RESOURCES

- Environmental Protection Agency (EPA) Mold Remediation in Schools and Commercial Buildings:
<https://www.epa.gov/mold/mold-remediation-schools-and-commercial-buildings-guide>
 - Center for Disease Control (CDC)/National Institute of Occupational Safety & Health (NIOSH): Dampness and Mold in Buildings [Dampness and Mold in Buildings | NIOSH | CDC](#)
 - A Brief Guide to Mold, Moisture, and Your Home:
<https://www.epa.gov/sites/production/files/2016-10/documents/moldguide12.pdf>
 - CDC Mold After a Disaster:
<https://www.cdc.gov/disasters/mold/>
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