

# Mold and mold spores

Mold and mold spores are everywhere around us and have always been a part of our environment. The air we breathe is a virtual jungle of fungal spores. We routinely encounter mold spores as part of everyday life both indoors and outdoors. Spore levels may vary seasonally, but some spores are always present. At present there is growing public concern about the potential health effects of mold in homes and structures that has been heightened by media reports and litigation.

Mold is part of the fungi kingdom, a fuzzy cob-web-like, growth that lives off of organic matter rather than a photosynthetic process. Fungi are diverse groups of organisms that include a wide range of species from the largest mushrooms to the tiniest molds. Distinguishing features of fungi are the need to extract their food from the organic materials they grow on and the ability to reproduce by way of minute spores. Fungi are a part of nature's recycling system and play an important role in breaking down material such as plants, leaves, wood, and other natural matter. Mold is the common name for micro-fungi. In order to grow, molds require food, suitable temperature, (between 70-85 degrees Fahrenheit), oxygen, and moisture. When these conditions are met, mold will grow and reproduce by creating spores that are released into the air. Molds are very adaptable and can even grow on damp inorganic materials such as glass, metal, concrete or painted surfaces, if a microscopic layer of organic nutrient is available.

Mold and mildew are commonly used interchangeably, although mold is often applied to black, blue green, and red fungi growths. Color depends on the infecting organism and the type and moisture condition of the nutrient. For example, white mold is commonly found on water saturated wood at room temperature. Both appear as woolly or powdery growth on numerous substrates. Mold spores are always present in outdoor and indoor air, and almost all building surfaces can provide nutrients to support growth.

Mold resembles the animal kingdom in that they cannot produce their own food as plants do. Therefore they must consume organic, carbon based compounds to survive, meaning they have to eat. Also molds do resemble the plant kingdom in that they cannot move by themselves. They depend on animals, or the forces of nature, such as the wind to carry them to a food source, or food to them.

Conservatively more than 100,000 species are common in the U.S. It is estimated that molds and other fungi make-up some 25 percent of the earth's biomass. Most mold spores land on places that are unsuitable for growth and eventually die. A select few land on surfaces containing nutrients and where the moisture, oxygen, and temperature conditions are right for

growth. Humans are exposed constantly to mold in the environment, whether indoors or outdoors. Our immune system and respiratory clearance system normally provide defense mechanisms that protect us from effects of airborne molds. Mold infections are possible in people with immune system suppression, but this has not been reported to occur due to mold in residential settings. Molds can produce Volatile Organic Compounds (VOC) that can be irritating when present in high concentrations. Dermal exposure to mold occurs when the skin is in contact with mold spores. The spores do not pass through the skin, but may cause irritation if there is contact with large amounts of spores or moldy material. Mold spores or particles that become air-borne can be inhaled. Bigger particles are stopped in the upper air-ways of the nose or mouth and in the trachea and bronchi. Generally only the smallest particles -5 microns- are able to reach the lungs.

Some molds are referred to as "toxic-molds" because under certain conditions, they can produce mycotoxins. Those that arbitrarily have been cited as "toxic molds" include stachybotry's chartarum (or atra) and various species of aspergillus, fusarium and penicillium.

Mycotoxins are secondary metabolites. This means that the mold does not need to produce mycotoxins to grow or survive. Mycotoxins are produced only when certain environmental conditions are in place and when produced are found in extremely small quantities on a per-spore basis. Mycotoxins are contained in the spore itself, and also may be found in the substrate or material in which the mold is growing.

The isolation of a mold type that has shown to produce toxins ("toxigenic" species) does not substantiate the presence of mycotoxins.

Mycotoxins are relatively large and heavy molecules. This means that they are not volatile and do not evaporate from the mold spore or substrate particle.

Stachybotrys is a mold that grows well on chronically wet cellulose material. Outdoors, stachybotrys typically grows on and breaks down dead plant material. Indoors it can grow on chronically wet cellulose building materials, such as lumber, wood panels, drywall backing, insulation and ceiling tiles. Moisture contributing to indoor growth of stachybotry'sis usually provided by flooding or leaks, left wet, the spores are not easily released into the air.

Molds play an important role in nature by breaking down organic materials. We routinely encounter mold spores as part of everyday life, in both indoor and outdoor environments.

In the early 90's, the Environmental Protection Agency (EPA), began to study material properties, temperatures and ecological niches that allowed

fungi and mold to thrive, expand, and then eventually die. One of the results discovered was that humidity played a very indirect role to the growth of mold. Though small amounts of moisture can foster the development of certain mold cultures. Other types of mold require much greater levels or moisture.

Recent studies and cases have revealed greater rates of poisonous fungal species in poorly maintained office/homes with water damage or moisture problems.

Mold growth in homes has not necessarily increased in recent years, but new court cases involving mold media coverage and publication or questionable scientific research have increased public awareness of the issue.

Mold spores may be present in a home but out of site inside a wall or a floor cavity. This may grow during construction, it also may grow after a leak has been repaired. Environments that support mold growth are ample moisture, darkness or low light and stagnant airflow, nutrients, oxygen.

Since there are numerous materials in a building on which mold can grow, moisture control is widely recognized as the only viable method of controlling mold growth.

Moisture control measures:

- design of the structure and use of exterior moisture management systems; such as flashing.
- storage and handling of wood products through-out the distribution process and at the jobsite.
- maintenance and operation of the building, including control of interior humidity level.

Effects of mold and mildew growth on wood components. As an organic material, mold and mildew readily grow on wood if moisture is present. Mold grows on wood if exposed to water or prolonged humidity in excess of 70%.

Mold and mildew are of a different type of fungi than those that cause wood to rot. Unlike wood decay fungi, molds do not cause significant loss of the strength of wood products. Nonetheless, mold and mildew on wood may cause a health concern and indicate high moisture conditions are present. Prolonged periods of high moisture may also support the growth of wood decay fungi, which is another reason why it is important to follow proper methods of design, handling, installation, and maintenance that will control the growth of mold and mildew.

Mold has become a construction and real-estate issue because some common building materials, including wood, the paper that clads drywall, OSB board and acoustic tiles contain organic matter, food for mold. When this organic material is combined with water, mold finds a feeding ground.

Mold resistant building products remain new and not yet widely used. These resistant products cannot completely eliminate the risk even if widely accepted. Wood and drywall are not likely to go away anytime soon. Not primarily on the control of moisture.

While California has passed a mold related law, far nine other states including New York and New Jersey, now have such legislation pending. On the federal level the "United States" has been introduced to the house of representatives. If passed, it would codify standards pertaining to the prevention, detection and remediation of mold in residential and commercial buildings.

Wood is a biological material consisting primarily of cellulose, lignin, and hemicelluloses. These three structured polymers make up 90-99 percent of the wood mass and give wood its unique properties that make it an excellent structural material.

Wood also contains a variety of other materials, including sugars, starches, proteins, lipids and fatty acids. These materials are present in the storage tissues of the living tree and are essential for a variety of functions. Even after a tree is harvested, these materials remain in the wood and can provide the initial food source for mold fungi.

Lumber is just one of thousands of materials that can be a potential growth substrate for mold under the proper conditions. In a vast majority of cases, mold problems in homes are related to flooding or water leaks that affect many materials in the structure, including lumber.

Moisture is essential for mold growth and controlling moisture offers the best protection against mold. While all wood contains moisture, mold growth is not supported on wood dried to below 20 percent moisture content. Lumber used in construction will typically dry to below 20 percent moisture content before the structure is enclosed. Drying lumber does not guarantee the wood will remain free of mold. If lumber is exposed to moisture after it has dried, it can provide a surface for mold to grow.

Thus, the two major ways of preventing mold in buildings are 1) develop and use of building material that mold can't eat and 2) prevention of too much water accumulation in the building and its materials.

Decay control in wood construction, an over view of proper design, storage, construction and maintenance of details that minimize the potential of reaching a harmful moisture level.

FLOORS- are low risk, except where they are over soil crawl spaces, or plumbing leaks. Treated sill plates, ventilation, at least 6" between grade and untreated wood , are just some measures to help prevent mold in floors

ROOFS- Wood roofs may be exposed to moisture from leaks, moisture introduced at the time of construction, and from condensation. Attention to design and construction details can significantly reduce these moisture hazards, also ventilation, vapor retarders, low slope roofs, moisture content or wood components, moisture accumulation due to condensation. After installation, protect panels as soon as possible, with felt or finish roofing material.

WALLS- Wood components used in walls may be subjected to moisture generated from condensation or moisture intrusion. To help in prevention are vapor retarders, adequate flashing around doors, lack of building paper, proper exterior siding systems.

STORAGE- Proper storage to prevent moisture, covered lightly with plastic sheets or tarps, and exposed to air circulation.

The south eastern section of Louisiana, along with Mississippi, Alabama, South Georgia, Florida, and the eastern seaboard have the highest probability of mold decay with structures and in the construction of residential and commercial projects.

Mold remediation; its understandable that the growth of mold after the release of water in a structure presents grave problems for insurers and owners. High humidity increases the risk of mold growth. If decay of wood product is suspected, an inspection should be made by a trained professional, especially if the decay involves structural elements. If decay of wood products has occurred, it is imperative to identify and correct the source of moisture. If the source of moisture is eliminated and the wood products are dried down below the threshold moisture content for decay, then the decay will not progress. Although it is usually advisable to remove the decayed areas, it is not always necessary if the moisture source is completely eliminated and the structural is not damaged. Reduction of the moisture content will stop the decay as spores will still be present. The decayed area will re-establish its growth if the moisture content once again exceeds 20 to 25 percent.

Sources of information for this research have been obtained from manufactures of wood products, contractors, contractor associations, residential and commercial property owners as well as:

ENVIRONMENTAL PROTECTION AGENCY

DEQ. DEPT. ENVIRONMENTAL QUALITY

ASSOCIATED BUILDERS AND CONTRACTORS ASSOCIATION

ENVIRONMENTAL EPIDEMIOLOGY & TOXICOLOGY OF LOUISIANA

APA ENGINEERED WOOD ASSOCIATION

INTERNET; [WWW.CONSTRUCTION.COM](http://WWW.CONSTRUCTION.COM)

[WWW.TOXIC-MOLD-NEWS.COM](http://WWW.TOXIC-MOLD-NEWS.COM)

GEORGIA-PACIFIC CORPORATION

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