Understanding the Causes of Fungi Growth in Building Structures

Mold – What is it? Where is it found? Why the Concern?

Molds are microscopic fungi that live on organic matter. Most molds produce spores, which can be air-borne, water-borne, or insect-borne and are highly adapted to grow and rapidly reproduce under the right conditions. Mold spores are found in virtually every environment indoors and outdoors, and as a result, we all encounter mold spores daily. These spores may enter homes and buildings through air infiltration such as windows, doors, heating, ventilation, air conditioning systems, or by attaching themselves to people, clothing, and pets thus bringing mold spores indoors.

Mold spores are ready to spring to life as a growing colony if they are provided with three primary conditions:

1. A temperature range between 47-120 degrees F.
2. Nutrients (something to eat- organic matter).
3. Moisture/Water.

Two of these three supporting conditions for mold growth (temperature and nutrients) are a part of most buildings. Regarding temperature, our buildings are kept at temperatures that can en-courage mold reproduction. Regarding nutrients, our buildings are built with and furnished with suitable organic nutrients that encourage mold to grow. An example of suitable organic materials which could provide nutrients for mold growth include: carpet, fabric, upholstery, paper and paper products, cardboard, ceiling tiles, drywall, wood, and wood products, dust, paints, and wallpaper. The missing ingredient in most buildings for mold growth is moisture/water.

Given humid or wet conditions, molds will naturally grow in an indoor environment. In Canadian homes over 270 species of mold have been identified.[1] It's not that all molds are bad, they can be useful to people, for example, Penicillin is obtained from a mold. Nor does mold exposure always present a health problem indoors.

According to a Questions & Answers Fact Sheet from the Center for Disease Control (CDC) on Stachybotrys chartarum and other molds, they reported, "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." [2]

With this in mind it is important to understand there are potential health effects from mold in homes and buildings that might pose health problems to people sensitive to molds.

Because two of the three conditions for mold growth exist in our homes, mold growth can occur where there is excessive moisture, such as where leakage may have occurred in walls, roofs, potted plants, or where there has been flooding.

The Truth about Mold Growth on Insulation

Highly publicized cases of mold growth in homes and buildings have led to confusion. For example, consider the nationally televised case in Dripping Springs, Texas where Stachybotrys mold growth resulted in a home being destroyed. In this case mold was growing on building materials such as drywall, the floor substrate and the fiberglass insulation, but the problem was not the building materials but the water, which led to the growth of the mold. Regarding this case, Dr. Straus appearing on 48 Hours said, "mold most commonly grows as a result of water damage." One TV segment, showed workers in space suits removing mold contaminated fiberglass insulation batts with the voiceovers referring to mold growing on cellulose. While the term "cellulose" probably meant the kraft-faced backing on the fiberglass batts, or the dust in the fiberglass some took it to mean cellulose insulation even though there was none shown, only fiberglass!

Here's where the confusion comes, **cellulose is a favorite nourishment for mold growth, while cellulose insulation does not promote mold growth.** Cellulose is the primary cellular makeup of any wood product and can be found in: cardboard, ceiling tiles, drywall, dust, the kraft-facing on fiberglass insulation, etc.. The dictionary definition of cellulose is:

> *"A polysaccharide $(C_6H_{10}O_5)_n$,of glucose units that constitutes the chief part of the cell walls of*

plants, occurs naturally in such fibrous products as cotton and kapok, and is the raw material of many manufactured goods (as paper, rayon, and cellophane)"[3]

Another recent cause for confusion was fostered by CertainTeed Corporation who was recently sued for misrepresentation about the St. Charles East High School near Chicago. The school was closed due to mold problems. The information distributed by CertainTeed was fabricated to make people believe the mold was the result of cellulose insulation wall-spray when, in fact, there was no cellulose insulation in the building - and -the mold was on fiberglass![4]

Applegate Cellulose Insulation is tested to be fungi resistant under ASTM C-739.Under extreme conditions mold can grow on cellulose insulation, however if that were to occur mold would likely be growing on everything else in sight.

Jeffrey C. May author of "My House is Killing Me!" is a home inspector and is well known for his investigations into homes with poor indoor air quality. He wrote, "The DUST in all fiberglass insulation is an excellent source of mold nutrients**… I find that approximately 70% of all unfaced basement ceiling and crawl space fiberglass is severely contaminated with growing mold…"**

In a discussion about mold Jeffrey was asked, "What does your book say about cellulose insulation? How about wet spray cellulose insulation that is sprayed into wall cavities?"

Jeffrey replied, "I have not looked at samples of wet sprayed material but I have looked at quite a few samples of blown-in ceiling and wall insulation.…**I have yet to see a moldy cellulose insulation sample.** …in general, blown-in cellulose insulation, surprisingly, is not found moldy." [5]

Both fiberglass and rockwool insulation (inorganic materials) have been tested. In the rockwool insulation tests showed enough nutrients to keep mold spores alive, probably from dust in the mineral fibers. In the fiberglass insulation mold growth was found but it could not be determined if it was growing on the binder or on the dirt collected within the in-sulation.[6] To date the serious reported cases of mold growth in insulation have all involved fiberglass.

The Insulation Contractors Report January/ February 2002 issue, in an article entitled, "Mold The Enemy Within", reported that, "Ninety-eight percent of the moisture that enters a building cavity and condenses is from an air leakage mechanism…. An airtight building will prevent moisture from entering the assembly…" [7]

If this is true, then the cellulose-insulated building will provide a major inhibitor to mold growth because it significantly reduces air leakage and results in a more airtight building thus preventing moisture, which is needed for mold growth, from entering the assembly! According the University of Colorado study *Fiberglass vs. Cellulose Installed Performance* "Cellulose cuts air infiltration 38% better than fiberglass!"

Mold Prevention & Control

Knowledge is Key for Preventing & Controlling Mold

Mold prevention strategies focus on moisture control. The presence of mold is a sign that there is too much moisture or water. Mold needs moisture to grow. Controlling the moisture and keeping the living area dry prevents the growth of mold. If we keep things dry, molds do not grow. It's helpful to keep humidity levels indoors below 40%, at this level mold growth can be slowed and generally prevented unless there is a water leakage problem.[9] According to the information available from the CDC "Questions and Answers Fact Sheet:" "What should people do if they determine they have *Stachybotrys chartarum (Stachybotrys atra*) in their buildings or homes? Mold growing in homes and buildings, whether it is *Stachybotrys chartarum (Stachybotrys atra)* or other molds, indicates that there is a problem with water or moisture. This is the first problem that needs to be addressed." [10]

Regarding mold prevention and keeping our buildings dry it's helpful to keep in the mind the sources that most commonly bring in or keep moisture in our homes and buildings. These sources for moisture need to be understood, discovered and controlled they include:

1. *Ground water (including snow melt, rain)*
2. *Humid air entering the home and condensing on cooler surface*
3. *Interior moisture from human bodies, cooking, bathrooms, unvented clothes dryers, etc.* [11]

Keeping outdoor moisture and high humidity outside of our indoor living environment and exhausting interior high humidity to the outdoors will contribute to avoiding mold growth in our homes and buildings.

If you discover mold inside what should you do? How do you get the molds out of buildings, including homes, schools, and places of employment? According to the National Center for Environmental Health, "In most cases mold can be removed by a thorough cleaning with bleach and water." [12]

Summary

To date the serious reported cases of mold growth in insulation have all involved fiberglass, but no insulation or building materials are in themselves the cause for mold growth.

The key to stopping mold growth in our buildings is halting moisture; mold and fungus problems aren't inherent in a building that is relatively dry.

From Dan Lea, "The key point of all this is that mold is everywhere in the environment. Given heat, moisture and organic material it will grow. Fiberglass and other inorganic materials quickly become coated with organic materials. Fiberglass contains no fungicidal additives, so it soon becomes a very hospitable environment for fungal growth because of air infiltration which may lead to moisture migration. All the misinformation spread by the fiberglass people and "experts" can't change the basic fact that **cellulose insulation does not cause problems with mold**

Sources:

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