Mould

WHY ARE MOULDS OF SPECIAL CONCERN?

Some moulds have been linked to ill health in sensitive people. Mould in buildings is currently a topic of considerable interest, although the relationship between moulds and human health is not yet well-understood.

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WHAT IS MOULD? IS IT THE SAME THING AS DECAY?

Moulds are a specific group of fairly simple fungi that are often colourful and can appear as spots or fuzzy masses. Moulds are everywhere and are widely used for beneficial purposes in the food industry, in medicine and in science. Moulds that grow on wood are NOT decay fungi, although many people make the mistake of thinking they are the same thing. Mould does NOT damage the wood. If you see a stain on wood, from mould or something else, this is not necessarily an indicator or a precursor for decay. Nor does wood decay indicate that the wood is also mouldy. However, since both mould and decay fungi require moist conditions, if you have one it is possible you have – or will have – the other.

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WHERE ARE MOULDS FOUND?

Moulds are everywhere, including indoors, but spore counts are typically much higher outdoors. Common indoor locations for mould are places that are moist such as bathroom walls, metal window frames and basements.

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DOES MOULD GROW ON WOOD?

Yes, mould will grow on almost anything, but it prefers more nutritious materials.

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MY WOOD IS STAINED – IS IT MOULD?

Probably not, although only an expert can tell, using a microscope. These are some of the indicators of mould: a mouldy smell, a colourful, spotty, smudgable stain that does not go below the wood surface, and a cloud of spores produced upon disturbing the affected area for the first time. Please see next FAQ. Mould is not common on wood, and the stain is quite likely due to something harmless such as dirt, iron filings, or staining fungi that merely colour the wood without damaging it. Please see the fact sheet "Discolourations" for a thorough explanation including photos. Mould can not be diagnosed using bleach – mold is not the only type of stain that will react to bleach.

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I THINK I FOUND MOULD – WHAT SHOULD I DO?

As a precaution, avoid breathing in spores. If spores were dislodged, the safest action is to walk away, ventilate the area, and let the spores settle to the ground before clean-up. Heavily contaminated materials should be replaced, while smaller areas of contamination can be spot-treated. Please see our Links page for resources on mould.

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WHAT ARE THE LIMITING CONDITIONS FOR MOULD GROWTH (MINIMUM RELATIVE HUMIDITY, MINIMUM MOISTURE CONTENT, MIN/MAX TEMPERATURES)?

Relative humidity (RH), moisture content and temperature of the material are inextricably linked and are some of the most critical factors for mold growth or lack thereof, although substrate nature and mold species are also important. Most research has been done under steady state laboratory conditions where a material is in equilibrium with a constant atmosphere. Under these conditions, prolific mold growth does not occur when RH is maintained below 75-80%, as most fungi do not germinate and grow below this level. Small amounts of growth of some dry-loving fungi will occur on some susceptible materials below 80% RH, but growth is very slow. Generally, above 80% RH the rate of mold proliferation progressively increases. Some wet-loving molds, among which are several toxin producers (such as Stachybotrys) require the effective RH to be above 90% (described as a water activity aw of >0.90). Toxin production is increased at aw >0.95. Virtually no molds are able to grow below aw 0.65. In general higher aw is required for sustained linear growth than for germination of spores. Depending on the substrate the minimum for the same species can vary substantially. Laboratory work generally indicates that if susceptible surfaces can be kept below aw 0.80 by manipulating temperature and RH, mold growth will essentially be stopped. The equilibrium moisture content of softwood at this point is approximately 16%. Depending on the nature of the material, other substrates would show quite different moisture contents for the same aw.

Little work has been reported on the effects of the fluctuating humidity that occurs in real-life situations. The history of moisture and temperature conditions in-service is

difficult to monitor and to simulate, but, together with the properties of the substrate, they affect the state and survival of mold. Fluctuating moisture conditions appear to lengthen the time for spore germination and fungal proliferation, and the growth rate is therefore less. The range and frequency of fluctuations undoubtedly affect the degree of how much growth occurs.

Molds show active growth at temperatures from 5 to 40ºC, but growth with some species can still occur between -7 and 55ºC depending on fungal species and other environmental conditions. Most mold mycelia can survive well below -7ºC, but heating above 55ºC will kill them, although killing thermo-tolerant ones and resistant spores requires unknown higher temperatures.

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WHAT TIME / TEMPERATURE / MOISTURE CONTENT COMBINATIONS ARE EFFECTIVE FOR KILLING MOULD?

There is little information in the literature on killing molds found in indoor environments or on wood per se, but scattered data are available for food-spoiling molds or other wood-inhabiting fungi. Moisture content control alone (i.e., dehydration) will not kill many molds. Establishment of simple killing criteria for molds is confounded by: a) complex interactions between exposure time, temperature and presence of moisture; b) molds have high proportions of spores, a relatively resistant fungal structure; c) a few molds are adapted to warm temperatures (40-50°C) and are innately heat resistant. A temperature of 56°C held for 30 minutes (to be heated at the core) is a scientifically-based criterion that has been adopted as a standard to kill most problem organisms (including fungi) in wood packaging material. While this is adequate for the vegetative state of most molds, it is inadequate for complete mold disinfestation if resistant species are present. However it is a practical compromise. Usually the temperature achieved during kiln drying of lumber and especially during pressing of panel products is sufficient to kill molds which may have been in the raw materials. Mold subsequently growing on these products is contamination and a sign they were improperly stored or transported.

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HOW DO I AVOID ENCOUNTERING MOULD PROBLEMS IN MY HOUSE

Mould growth in homes is caused by allowing building materials to get wet and stay wet. These moisture problems may be caused by errors in building design, construction errors that allow water intrusion and entrapment, plumbing leaks, interior and exterior floods, lack of house maintenance or even occupant activity.

Design errors are simply failures to plan for moisture management by control of groundwater penetration, rain intrusion, movement of moist air and diffusion of water vapour resulting in condensation in wall assemblies, thermal bridging, and lack of air ventilation. Construction errors usually mean failure to apply moisture management measures and lack of good workmanship, such as failure to protect building materials from getting wet on the construction site and enclosing building envelopes before the inside materials are dry. If you are buying a new house, the

first step is to investigate and purchase from a reputable builder or developer. Ask for references to satisfied customers that have been in their homes for more than 3 years. Sometimes it takes that long for design and construction defects to create detectable moisture problems. Hiring a building inspector before deal closure may be a smart investment even for newly built homes.

There are several types of surface treatment for lumber and wood sheathing designed to reduce mould growth during transport, storage, construction and, for some products, all or part of the life of the building. However, it is of no value to simply protect the wood components. Mould can grow on a wide variety of building materials including drywall, wallpaper, insulation, tiles, carpet, fixtures and fittings, etc. You would have to get virtually everything in the house surface-treated if you assume moisture problems are unavoidable. Mould also readily grows on organic dust that settles over time on inorganic material and treated elements. Furthermore, it is the moisture-conscious builders that are more likely to use surface-treated products and the less conscientious builders that are more likely to create moisture problems.

Despite what many believe, solid wood is often the material showing the least mould growth when moisture problems occur. Dried wood has certain inherent water repellency and is more resistant to mould than highly processed pure cellulose materials like paper. Research on walls deliberately wetted over 16 to 19 weeks at the University of Waterloo found "Mould growth did not form on the solid wood framing during any of the tests, even under the worst conditions." Similar research at Forintek Canada Corp. found after two wetting and slow drying periods of 9 weeks plus 12 weeks, studs and sillplates were "generally free of any fungal growth". Look closely at photographs and films of mould in houses and you will often find the drywall is covered with mould but the solid wood components remain clean looking. If mould does grow on wood-based products, the chance is almost negligible that this will be the so called "toxic black mould" (specifically Stachybotrys chartarum).

If you are buying an older house, do get it inspected by a competent building inspector for code compliance, design and construction defects and moisture problems. Again, ask for references because in many jurisdictions no qualifications are required for someone to call themselves a building inspector. British Columbia is the first province in Canada to require licensing of building inspectors. There is no good evidence that a specific mould inspection is worthwhile. There are no internationally accepted numerical guidelines on healthy mould levels or on how to correctly sample for mould and understand the findings. Dampness has been scientifically linked to ill heath in people so the major focus should be to prevent dampness in dwellings.

Maintenance errors include not keeping eavestroughs and downspouts free of leaves and perimeter drains free of tree roots. All interfaces and junctions should be checked regularly to prevent any intrusion of rain or ground water. Paint and caulking also need to be checked over to make sure they are not breaking down. Heating, particularly in basements, can also reduce the dampness in a home. However, the main problem comes from not dealing with signs of interior moisture problems when they first appear. A water stain is often a sign there is a plumbing leak or moisture penetration that needs to be fixed quickly. Rapid drying of the building using dehumidifiers and fans is essential to prevent mould growth after

major plumbing leaks or floods. Insurance companies will cover fixing moisture damage but they will not cover mould growth resulting from a leak not being fixed for months or years.

Certain occupant activities can cause high indoor humidities. Examples include boiling large volumes of liquids without operating a cooker hood, extended showering without operating an effective bathroom fan and drying of large volumes of wet laundry at home.

The key to prevent mould at home is to control moisture effectively.

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