

Mouldy Homes and Buildings

What is mould?

Moulds, also known as fungi or mildew, are living organisms that are neither plants nor animals. There are many different species of mould; the species commonly found outdoors are also common to water-damaged buildings. They reproduce by releasing millions of very small spores and through the spread of mycelial fragments. These spores and mycelia fragments are carried by air currents, settle on different surfaces, and grow in the presence of a food source and moisture. Mould spores and mycelia can contain toxins and growing mycelia can release airborne volatile compounds (e.g. musty odour). The mould spores and mycelial fragments may settle on indoor surfaces as a part of household dust.

In nature, moulds decompose dead plant material. In spring and fall, airborne mould levels increase as a result of biological decomposition.

What concerns exist about indoor mould growth?

Indoor mould reservoirs develop by growing in buildings with water leakage, excessive humidity or condensation problems, and whether viable or nonviable (non-viable mold spores do not propagate but exposure may still result in ill health).

What are possible health effects of exposure to mould?

We are all exposed to moulds, both indoors and outdoors, on a daily basis, usually without ill effect. The indoor levels in buildings without water damage are normally lower than outdoor levels. In spring and fall, or during extended periods of wet weather, the airborne mould levels in outdoor air normally increase and may aggravate allergies, including asthma, in sensitive individuals.

Health risks increase with exposure to higher mould levels, especially in an indoor setting where occupants spend more time (i.e. home, school, workplace). The health effects are dependent upon the type and amount of mould, and each person's susceptibility.

Mould exposure may result in irritant, allergic or toxic responses and include:

- ◆ wheezing or difficult breathing
- ◆ nose, eye or throat irritation
- ◆ nasal or sinus congestion
- ◆ dry, hacking cough
- ◆ skin irritation or rashes

For more vulnerable individuals (i.e. infants, elderly, those with pre-existing respiratory illness or mould allergies), low-level exposure to mould may result in these symptoms. For immune-compromised individuals or individuals routinely exposed to excessive mould levels, a fungal infection could develop.

Generally, the presence of indoor mould reservoirs, whether alive or dead, does not support a healthy indoor environment, and anyone experiencing ill effects should consult a physician. It must be stressed however that these symptoms are also consistent with and can also be associated with sensitivities or exposures to other indoor and outdoor allergens and pollutants including pet and or animal dander, seasonal pollens, indoor dust mites, emissions from consumer goods (i.e. cleaning products, cosmetics and deodorants, air fresheners, humidifiers, etc.), second hand smoke, emission from combustion appliance emissions (e.g., furnace or gas stove), furnace or HVAC design and maintenance issues, occupant activities such as hobbies and renovation, and occupational exposures.

What are some common causes of indoor mould growth?

- ◆ Leaky foundations
- ◆ Leaky walls, roofs or windows
- ◆ Leaking water pipes or wastewater lines
- ◆ High indoor humidity
- ◆ Inadequate window or wall construction and insulation
- ◆ Insufficient weather stripping around doors or windows
- ◆ Inadequate exhaust ventilation in kitchen or bathroom(s)
- ◆ Damp basements or crawl spaces
- ◆ Flood or sewer back-ups. Flood and sewer backups require special attention as they likely contain bacterial and viral pathogens and possibly chemical hazards.

What are signs of possible indoor mould growth?

- ◆ There are stains or speckled areas on walls, ceilings, floors or furniture.
- ◆ The 'mould' appears to be spreading or returns after cleaning.
- ◆ There is evidence of water leakage such as water pooling, dripping or staining.
- ◆ There is evidence of water condensation or frost on interior building walls.
- ◆ There is a musty or earthy odour in the building.
- ◆ Occupant repeatedly experiences symptoms of mould exposure when in the building.

What can be done to prevent indoor mould growth?

The key to preventing indoor mould growth is to control indoor moisture. Thus, it is important for a building to be properly constructed and maintained.

- ◆ Ensure roof, exterior walls, windows and foundations are in good repair and weatherproof.
- ◆ Ensure surface water runs away from house with proper grading, eaves troughs, downspout extensions, and sump pump drainage lines.
- ◆ Prevent groundwater seepage into basements or crawlspaces with moisture barriers, weeping tile systems and sump pumps.
- ◆ Ensure good general ventilation throughout building including local exhaust ventilation in damp areas such as crawlspaces, bathrooms and kitchens.
- ◆ Ensure any earthen crawlspaces are covered, sealed and made watertight.
- ◆ Ensure that exhaust systems are properly installed and vent to the outside, not into the attic.
- ◆ Ensure heating vents are not obstructed.
- ◆ Ensure adequate insulation in walls and ceilings to prevent thermal bridging and vapour barrier installation on the warm side of exterior walls and ceilings to prevent condensation.
- ◆ Maintain indoor relative humidity below 60% to prevent mould growth. Maintain relative humidity below 45% to prevent dust mite growth and above 30% for comfort and airway health.
- ◆ Prevent excessive humidity generation (e.g. unvented dryer, high humidifier setting).
- ◆ There are some areas in buildings where moisture cannot be avoided. In these areas, the key to mould growth control is exhaust ventilation, good maintenance and routine cleaning.
- ◆ Bathroom and kitchen exhaust systems should be cleaned regularly.
- ◆ Bathroom walls and ceilings that are chronically wet should be regularly wiped clean.
- ◆ Humidifiers should be regularly descaled, cleaned and sanitized.
- ◆ Wall-to-wall carpets should not be installed in chronically damp/wet areas (i.e. bathrooms, entries).
- ◆ To prevent mould growth after an adverse water or moisture control event, it is important to thoroughly dry water damaged areas, including wall cavities, within 48 hours.

What about flood and sewer back-up clean-up?

These incidents may result in substantial moisture damage and mould growth. It is important that clean-up efforts be completed within 48 hours to prevent mould growth. However, flood and sewer backups contain bacterial and viral pathogens and require a different clean-up or remediation protocol than that for mould. Refer to 'Where can I find more information?' below.

What can be done if indoor mould growth has occurred?

Firstly, the moisture problem must be identified and corrected or the mould will return. This may require the assistance of a building expert (e.g. construction engineer, building repair or construction specialist for foundation, roof, or exterior wall problems). Alternatively, this may require a plumber for leaky plumbing fixtures or sewer back-ups.

Secondly, any visible mould, whether alive or dead (viable or non-viable), must be removed through a process referred to as mould remediation. This involves identifying the areas of mould growth and removing mould and mould contaminated materials in a manner that does not further contaminate the building or increase occupant exposure and protects the worker. The extent of this effort depends on the extent of mould growth (i.e. the surface area affected by mould contamination) and the nature of mould-damaged materials (i.e. porous vs. non-porous).

General principles to follow for mould remediation are:

- ◆ The work area should be unoccupied.
- ◆ Avoid dry disturbance of mouldy surfaces and materials to minimize the aerosolization of mould particulates. Dust suppression methods, such as water misting (not soaking) are recommended.
- ◆ Porous materials that are visually mouldy (e.g. carpet, upholstered furniture, wall-board, ceiling tiles, clothing, books, pressed wood products) should be removed because they cannot be effectively cleaned. Alternatively, some porous materials can be restored by restoration specialists.
- ◆ Non-porous material such as metal, plastic and glass usually can be surface cleaned to remove mould growth.
- ◆ With semi-porous material such as wood framing, the surface often can be cleaned and material left in place, unless the mould has penetrated into the material in which case it must be removed.
- ◆ For mould growth present in HVAC systems, replace porous materials such insulation lining ducts and filters, clean the nonporous materials by an appropriate method such as HEPA-vacuuming, wet wiping, pressure washing etc. HVAC manufactures may recommend use of biocides on certain HVAC components, such as cooling coils and condensation pans. Consult HVAC manufactures for the products they recommend for use in their systems. The biocides acceptable for use in duct system are very limited and must not leave residues in the HVAC system and require Health Canada certification.
- ◆ Any mould containing waste should be placed and sealed in plastic bags and transferred to a regular outdoor garbage bin.
- ◆ For all cleaning work, scrub surfaces clean using cleaning agents (e.g. soap and water solutions). The use of a biocide, such as chlorine bleach, is not recommended as a routine practice during mould remediation, although there may be instances where professional judgment may indicate its use, for example when immune-compromised individuals (e.g. individuals have undergone recent surgery, are pregnant, are undergoing chemo or radiation therapy for cancer, or a person with chronic inflammatory lung disease) are present. In all other circumstances, the recommendation is to use only a detergent and water solution. The use of biocide is also necessary or required when clean-up is associated with sewer backups or surface flood waters.
- ◆ When remediation work is complete, the work area and exit pathway should be well-cleaned (e.g. HEPA vacuumed or wiped with a damp cloth).
- ◆ All work area should be left dry and visibly free of contamination and debris.

Depending on the types of building and the size of the remediation, or the length of time it takes to conduct the remediation, a remediation project may require involvements from professionals other than the building owner:

1. **For very small localized areas of mould growth** (i.e. less than 1 square foot of contiguous mould contamination):
 - ◆ Building owners or regular maintenance staff can easily remediate these areas using standard cleaning techniques: scrubbing surfaces clean using a cleaning agent (e.g. soap and water solutions). The use of personal protective equipment (PPE) is discretionary but is recommended. At a minimum, wash hands immediately after the work.
2. **For small localized areas of mould growth** (i.e. between 1 to 10 square feet of contiguous mould contamination):
 - ◆ Building owners and regular maintenance staff can easily remediate these areas using standard cleaning techniques, such as scrubbing surfaces clean using cleaning agents (e.g. soap and water solutions). Staff or workers doing remediation should be provided with proper training on clean-up methods, personal protection and potential health hazards. At a minimum, PPE consists of a disposal N95 respirator and disposable gloves and goggles (goggles that do not have ventilation holes are recommended).
 - ◆ Limited containment and vacating people from spaces adjacent to the work area is not necessary but is recommended in the presence of infants (less than 12 months old), persons that are immune-compromised or have pre-existing respiratory disease or allergy. At a minimum, seal door openings, ventilation system openings (i.e. vents and grills) and other openings that allow for air movement.
3. **For large isolated areas** (i.e. greater than 10 square feet and less than 100 square feet of contiguous mould contamination) the following apply:
4. **For owner-occupied homes**, it is recommended that a remediation contractor and environmental consultant be hired. If the owner decide to conduct remediation by in-house maintenance staff, the following containment measures are recommended:
 - a. **PPE:** Full face N95 respirator and disposable gloves and goggles should be worn (goggles that do not have ventilation holes are recommended).
 - b. **Limited Containment:** Isolate work area with floor to ceiling plastic sheet(s) with slit entry and covering flap to contain dust/debris, and isolate unaffected ceilings walls, or floors.
 - c. **Isolation:** Use barriers and signage to isolate and restrict access to the remediation area and prevent further dispersion of mould particles. Seal potential routes of cross-contamination, such as the HVAC system vents and grills, pipe chases, electrical outlets and others openings or pathways for air movement.

- d. **Pressurization Control:** Use negative pressure to allow air movement into but not out of the work area. Block supply and return air vents within containment area.
- e. **Dust Suppression:** Use misting (not soaking) of surfaces prior to remediation to prevent generation of airborne contamination
- f. **Post Removal Cleaning:** After the completion of mould removal activities, the work area and surrounding areas should be HEPA vacuumed or cleaned with a damp cloth and/or mop and a detergent solution. Ensure all exposed surfaces that are part of the building are wiped dry.

For rental accommodation, public facilities (e.g. school, daycare, hospital) and commercial buildings – a remediation contractor and expert consultant must be retained. The consultant is an independent third party who provides quality assurance/quality control (QA/QC) for the remediation work to both Alberta Health Services (AHS) and to the owner.

- 5. **For extensively contaminated building** (i.e. greater than 100 square feet of contiguous mould contamination) and Marihuana Grow Operations (MGOs):
 - ◆ Expert consultant and remediation contractor must be retained for the project. The consultant is an independent third party providing QA/QC for the remediation work to both AHS and the owner.
 - ◆ Expert consultant responsibilities include a thorough investigation, delineation and remediation of all moulds, both visible and hidden. Refer to handout ***Fungal Air Testing, Investigation, and Reporting Requirements for Extensively Mould-Contaminated Buildings*** for detailed requirements for an acceptable remediation.
 - ◆ Marihuana Grow Operations (MGOs) are considered as Extensively Mould-Contaminated Buildings and will be subject to thorough assessment for all moulds, both visible and hidden. Refer to handout ***Fungal Air Testing, Investigation, and Reporting Requirements for Extensively Mould-Contaminated Buildings*** for detailed requirements for an acceptable remediation.

Where can I find more information?

- ◆ Mould Guidelines for the Canadian Construction Industry (Canadian Construction Association, 2004) www.cca-acc.com/mould
- ◆ Guidelines on assessment and remediation of fungi in indoor environments (New York City Department of Health and Mental Hygiene, 2008) www.nyc.gov/html/doh/html/epi/moldrpt1.shtml
- ◆ Fungal contamination in public buildings: Health effects and investigation methods (Health Canada, 2004) www.hc-sc.gc.ca
- ◆ Flood Cleanup: Avoiding Indoor Air Quality Problems Fact Sheet (US EPA, 2003). <http://www.epa.gov/iaq/pdfs/floods.pdf>
- ◆ A Brief Guide to Mold, Moisture, and Your Home (US EPA, 2010). <http://www.epa.gov/mold/pdfs/moldguide.pdf>

- ◆ Mold Prevention Strategies and Possible Health Effects in the Aftermath of Hurricanes and Major Floods (Centers for Disease Control and Prevention, 2006) <http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5508a1.htm>.
- ◆ Best Practices for Mould at the Worksite (Government of Alberta – Employment and Immigration, Occupational Health & Safety <http://employment.alberta.ca/documents/WHS/WHS-PUB-BH019.pdf>

Who can I call for further assistance?

- ◆ For workplace health concerns, contact Alberta Occupational Health & Safety 1-866-415-8690.
- ◆ For public health concerns, contact your nearest AHS Environmental Public Health office. Please see Inform Alberta (informalberta.ca) and search for “Environmental Public Health” for AHS zone contact phone number and office locations.
- ◆ For mould remediation services, refer to telephone directories or online resources under Asbestos Abatement and Removal.
- ◆ For mould assessment services, refer to telephone directories or online resources under Environmental Consultants.
- ◆ For clean-up services, refer to telephone directories or online resources under Fire and Water Damage Restoration.

For more information, please contact your nearest Environmental Public Health office.

Edmonton Main Office
 Calgary Main Office
 Lethbridge Main Office

780-735-1800
 403-943-2295
 403-388-6689

Grande Prairie Main Office
 Red Deer Main Office
www.albertahealthservices.ca/eph.asp

780-513-7517
 403-356-6366

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