Guide to addressing moisture and mould indoors

1. Introduction

The purpose of this guidance is to summarize ways to identify, remediate, and prevent moisture and mould issues indoors. This guidance provides practical recommendations to address this potential health hazard, including guidance for assessing the magnitude of the problem, a prevention checklist, and considerations when hiring a professional to remediate mould and moisture issues indoors. This guidance aligns with what is available internationally and is intended for the general public, including property owners, landlords and tenants, as well as public health and building professionals.

2. Background

The word “mould” is the common name referring to fungi that grows on food or materials in homes or other buildings. Health Canada has concluded that indoor mould growth may pose a health hazard. Health Canada and other internationally recognized organizations do not propose a health-based exposure limit for mould exposure indoors, as current scientific information is not available to support its derivation.

3. Health effects of dampness and mould exposure

People living in homes with mould and damp conditions are more likely than others to have[1]:

- eye, nose and throat irritation;
- coughing and phlegm build-up;
- wheezing and shortness of breath; and/or
- worsening of asthma symptoms.

More recently, there is increased recognition that exposure to indoor mould and dampness may contribute to the development of asthma, bronchitis and other respiratory infections, as well as eczema[2].

The level of risk depends on the extent of mould growth, regardless of the species, how long it has been present, and the susceptibility and overall health of the individuals exposed. Some people are considered to be at greater risk of experiencing adverse health effects from mould exposure, such as infants, children, seniors, pregnant people and those with respiratory conditions such as asthma.

Any health concerns suspected to be caused by poor indoor air quality, including mould exposure, should be discussed with a healthcare professional. These professionals are best suited to determine whether symptoms may be related to environmental factors or other underlying causes. In addition, tools exist to support healthcare workers in identifying health conditions associated with or worsened by exposure to mould[3].

In some regions of Canada, a changing climate is predicted to result in increased moisture levels and mould exposure in the indoor environment. Changing or intensifying weather patterns such as rainfall, storms and flooding may produce higher levels of water infiltration and dampness in buildings; these are scenarios favourable for increased mould growth. Energy saving measures such as increased building tightness can also result in higher relative humidity and moisture indoors if there is not sufficient ventilation[4].

Health Canada recommends controlling dampness indoors and cleaning up any visible mould regardless of the type of mould present[1].

4. Moisture: identifying and finding solutions

Mould will typically grow indoors if moisture is present. Moisture problems may result from:

- daily indoor activities such as showering or bathing, washing clothes or cooking, particularly if exhaust fans from kitchen and bathrooms are not working properly, not vented outside or are not used;
- infiltration of water from the outside through cracks or leaks in the foundation, floor, walls, roof or any unsealed windows or entryways;
- plumbing leaks;
- moisture condensation on cold surfaces, such as windows;
- flooding due to weather conditions (e.g., snow melt, storm surges, prolonged or heavy rainfall);
- overcrowding (e.g., too many individuals breathing, bathing, washing and cooking);
- indoor cannabis cultivation[5]; and
- inadequate ventilation.

Moisture accumulates indoors when it cannot be vented outside and becomes a problem when building or other materials (e.g., drywall, wood, paper, textiles) become damp or wet.

Moisture problems are preventable.

Unless the cause of the moisture problem has been identified and solved, mould will reappear. To prevent future problems, measures should be put in place to control sources of moisture indoors, including[6]:

- using exhaust fans in kitchens and bathrooms, increasing ventilation and using air conditioning systems to reduce moisture levels;
- maintaining relative humidity levels between 30% and 50%, using a dehumidifier as necessary;
- using moisture resistant materials in areas likely to get wet (e.g., kitchen, bathrooms, laundry areas);
- ensuring rain, irrigation water and snowmelt drain away from the home or building by sloping the grade away from the structure;
- keeping eavestroughs and downspouts clean of debris and ensuring that the outflow runs away from the building and not into neighbouring foundations;
- repairing plumbing leaks and drying moisture promptly; and
- limiting the number of cannabis plants indoors, or preferably, growing them outside the home[5].

Run a dehumidifier in damp areas such as basements, and if moisture is condensing on cold surfaces such as window panes or relative humidity is >50%.

See Appendix A for a moisture and mould prevention checklist designed for use in homes.

5. Personal protective equipment

Personal protective equipment (PPE) should be worn while identifying and evaluating the extent of mould growth, as well as preparing for and undertaking the cleanup. Using PPE can help prevent health effects from exposure to mould. Below is a list of the minimum protective equipment recommended:

Minimum protective gear needed:

- **safety glasses or goggles;**
- **a disposable well-fitting N95 respirator (mask); and**
- **household disposable gloves.**

N95 respirators can be purchased from most home improvement stores. Make sure that the label says “N95” [2;7]. If N95 respirators are unavailable, consider using one with greater protection such as a P100 or N100 respirator. Other masks are designed to provide limited protection against dust and are not suitable for protecting against mould exposure. Make sure masks are properly fitted and you can breathe through them.

6. Identifying the presence of mould

Mould growth can be hidden. It can grow behind walls or above ceiling tiles, so it is important to check for the presence of mould anywhere that is damp, and especially where water damage is known to have occurred.

In cases where a moisture or mould problem is suspected, a walk-through should be done of all rooms, as well as attics, basements, crawl spaces and storage spaces. Start with a visual inspection[6;8]. Look for signs of mould as well as for indications of excessive moisture, such as stains or discolouration on floors, walls, window panes, ceiling tiles, fabrics and carpets. Additional signs of excessive moisture may include peeling paint, wrinkled wallpaper, cracks in plaster, warped wood, or efflorescence (white powdery salt crystals on the surface of walls or masonry). Check for obvious signs of leaks, condensation, or flooding, and for musty/earthy odours.

Immediate action is important. Mould will begin to grow in an area with excessive moisture within 48 hours.

If strong, musty odours are detected but no clear signs of water damage or mould are seen, consider consulting with a professional about hidden mould within walls and ceiling/floor cavities[5] (see section 10).

Inspect surfaces around plumbing, under and adjacent to windows and doors, and places where items such as wires pass through openings in the building's exterior. Condensation observed on windows and pipes should be noted. An association of odours with the start-up of fan-driven heating or cooling systems should lead to inspection of any accessible filters and humidifiers. If problems persist after these parts are changed or cleaned, the systems may need to be evaluated by qualified individuals.

On the building exterior, look for obvious signs of issues with building integrity (such as damage that may allow water intrusion), or deteriorated materials or surfaces (including missing downspouts or staining)[6;8].

7. Extent of mould growth

It is important to determine the extent of the mould problem to help decide on the path forward for cleanup. The following table can be used as a decision chart to facilitate categorization of mould area by size and the appropriate path forward for remediation, as well as whether professional assistance is required.

Table 1: Extent of mould - decision chart for cleanup purposes

Total surface area affected by mould		
Small	Medium	Large
Three or fewer patches and the total area is less than 1 m^2	If there more than 3 patches or if the patches are greater than 1 m^2 but less than 3 m^2	If a single patch is larger than 3 m^2
		
Small mould area: cleanup using proper precautions	Medium mould area: Expert assessment recommended, but may be cleaned up using proper precautions	Large mould area: Expert assessment and cleanup required

An area of mould is considered **small** if it covers one square metre or less. There should be no more than three patches of mould, with the total combined area staying within one square metre. Many small patches of mould in one area or throughout the home or building can be a sign of a larger moisture issue that needs to be investigated and addressed immediately.

If ignored, small mould areas may become larger over time, so it is important to address immediately. A small amount of mould may be cleaned up using proper procedures and protective equipment.

The area of mould is considered **medium** if there are more than three patches of mould (each patch smaller than one square metre), but the total combined area is less than three square metres. In this case, while assessment by a qualified professional is recommended, in most cases a medium amount of mould may be cleaned up using proper procedures and protective equipment without involving a professional.

An area of mould is considered **large** if a single patch of mould is larger than three square metres. Immediate action and an assessment by a professional is required to determine the cause of the extensive mould growth and develop/implement a remediation plan.

Health Canada recommends that a qualified professional assess and clean up large areas of mould.

The presence of odour may also help determine the extent of mould growth. Subjectively rate mouldy or musty odours in each room as "mild," "moderate" or "strong," and take immediate action, in consultation with professionals, if there are any ratings categorized as "strong." Consider further investigation in cases where levels of mustiness are rated "mild" (but detectable) or "moderate" if there are any additional signs of mould, water damage, water stains, wetness or dampness[2;6;8] .

8. Preparing for mould cleanup

Any indoor mould growth should be removed. As discussed above, the underlying water or moisture problem that led to mould growth should be fixed first to prevent mould from returning. For example, the building envelope (i.e., roof, walls, windows, doors, foundation) must be repaired if moisture or water is entering your home from the outside.

As mentioned previously, anyone involved in mould cleanup should ensure that they are using appropriate PPE. Susceptible individuals, such as infants, children, seniors, pregnant people and those with respiratory conditions such as asthma, should not be in or near the area where the mould is being cleaned up. It is recommended to keep pets away from the area as well.

In a flood situation, put your own safety first. Avoid electrical shock. Shut the power off to the flooded area at the breaker box and ask the local electrical utility for help if needed. Wear rubber boots at all times while standing in water, and keep extension cords out of the water. See **Flood clean up and indoor air quality** for more information[9] on how to properly clean up after a flood.

The following six-step process is recommended to prepare for mould cleanup[2;10]:

Step 1—Discard mouldy or damaged materials

- Porous materials, such as fabrics, often cannot be properly cleaned and must be discarded.
- Where possible, open windows and exterior doors to provide fresh air.
- Place and seal all mouldy items that cannot be properly cleaned in a plastic bag.
- Take the sealed bags outside using the closest exit and dispose of them.

Items that may need to be discarded include:

a) Soft furnishings, mattresses, bedding and plush toys

- Check non-washable furnishings for mould. Moisture and mould can get into soft or upholstered furnishings.
- Cleaning the surface may not be effective. It is important to make sure that mattresses, pillows, blankets and stuffed toys are entirely mould-free.
- Stuffed toys should be considered as bedding because they are often used as pillows or held close to children's faces.
- Throw away carpets, sofas, cushions, mattresses, pillows, stuffed toys or bedding that have gotten wet, been exposed to damp conditions or been stored in a wet environment. Mould can begin to grow within 48 hours. It is not possible to properly clean a mouldy mattress.

b) Clothing

- Clothing with mould growth or that is located in a site of active mould growth should be discarded.
- Clothing found nearby mould growth, and possibly containing spores from nearby mould growth, can be cleaned.
- Wash with laundry soap at the highest temperature compatible with the manufacturer's recommendations, followed by air drying, or drying in a dryer that vents to the outdoors.

c) Paper and cardboard

- Mouldy paper is one of the most difficult materials to clean.
- Throw away any books, paper, cardboard, puzzles, or other paper products that show signs of mould.
- Remove cardboard boxes that have been placed directly on the concrete floor as these may have become damp and allowed mould to grow.

Step 2—Vacuum

- Use a vacuum cleaner with a high efficiency particulate air (HEPA) filter or use a central vacuum system that is exhausted outside.
- Vacuum all surfaces thoroughly.
- Vacuum all non-washable furnishings (e.g., sofas, chairs, mattresses) that remained dry.
- Vacuuming the surface of furnishings may not be effective if they have been wet or exposed to dampness over a long period.
- Clean and/or replace the vacuum filters often according to the manufacturer's recommendations.

Step 3—Clear wet areas

- Pull wet carpets and furnishings away from walls.
- Carpets and underpads that are mouldy should be cut out and discarded. In addition, the surface underneath removed materials should be cleaned and dried.

Step 4—Dry

- Dry areas that are wet.
- Speed up the drying process by using fans, and if outside weather permits consider opening doors and windows.
- Use a portable dehumidifier, particularly if you observe condensation on cold surfaces or your relative humidity level is above 50%. Ensure that the drain pan of the dehumidifier is emptied regularly or that the dehumidifier directs water into a drain.

Step 5—Isolate, if necessary

- If the mould is limited to one area, isolate the area to reduce occupants' exposure, if possible.
- Cover the affected surfaces with plastic sheeting secured at the edges with duct tape. Note that this is only a temporary measure to minimize your exposure while waiting for the cleanup work to begin.

Step 6—Seek professional assistance, if necessary

- Consider seeking professional assistance if the moisture source(s) or corrective actions required are unclear (see section 10 below).

9. Cleaning up small and medium areas of mould growth

As discussed above, a professional is generally not required to clean up small areas of mould if the proper procedures are followed and the right protective equipment is used.

In most cases, medium areas of mould can also be cleaned up safely and effectively by following the proper procedures and using the right protective equipment. Materials damaged by mould must be physically removed and disposed of under safe conditions. However, it is important to seek professional assistance if there is a large mould problem or if mould comes back after cleaning.

Washable surfaces

Do not use bleach to clean up mould.

Materials with mould contamination that can be properly cleaned must be non-porous, such as glass, metals, leather, plastics and vinyl. Examples of washable surfaces include window sills, wood, hard surfaces and tiles.

- Scrub surfaces using a cloth with an unscented soap solution and dry completely and quickly.

Walls

- Clean the surface of the wall with a damp cloth using baking soda or a small amount of unscented soap solution. Do not allow the drywall to get too wet. Cleaning with too much water adds moisture and can damage the surface.
- If the mould is underneath the paint, the drywall will need to be removed and replaced.
- Painting over a mouldy surface does not kill mould and does not stop it from growing back. Painting only temporarily hides the problem.

Concrete surfaces

- Scrub surface using a brush with an unscented soap mixed with warm water.
- Sponge with a clean, damp cloth and dry quickly.

Mould that comes back after cleaning is usually an indication that the source of moisture has not been removed. Seek professional assistance.

10. Hiring a professional

In some cases, seeking advice on how to address moisture and mould problems indoors is necessary. A qualified professional with experience dealing with moisture issues and mould remediation can examine the condition of the home or building and document concerns. Qualified professionals can identify the moisture issues and sources and suggest a prioritized action plan consisting of various options on mitigation and remediation of moisture and mould problems.

Situations that require the involvement of a qualified professional include:

- A single patch of mould that measures larger than three square metres (3 m^2);
- Mould that returns following cleaning, indicating that the source of moisture has not been addressed;
- The water involved in floods or significant leaks was contaminated with sewage, or chemical or biological pollutants;
- Previous efforts have not solved a recognized or perceived problem. This may include the ongoing health symptoms or discomfort of occupants, possibly related to or influenced by unresolved mould contamination;
- There is suspected hidden mould contamination inside walls or above ceilings;
- Flooding has penetrated into wall cavities or ceiling/floor cavities, preventing drying-out by traditional methods.

When considering working with a professional, be sure to solicit proposals and interview candidates the same way you would for home renovations. A preliminary site visit may be needed for the professional to understand the problem and generate an appropriate response. Ask the professional for his or her general approach to resolving the problem. A systematic approach based on a thorough visual inspection is usually more effective than relying on extensive air, bulk, or swab testing. Proposals should indicate the estimated fees and expenses for each planned phase of the project. Find out what criteria will be used to decide on testing or remediation strategies, and what potential follow-up investigation activities may cost. For major projects involving extensive mould growth, it is a good idea to make a written outline in advance laying out:

- the project scope, indicating activities to be performed (including sampling, if required) and results required (e.g., recommendations, interpretation of results, corrective actions);
- the documentation to be provided, such as drawings, reports, tables, and supporting information;
- quality control procedures;
- project budget estimates, fee schedules and frequency of status updates;
- a reasonable remediation schedule that takes into account the health and safety of occupants; and
- the anticipated need for a post-remediation inspection by an independent third party consultant done to ascertain effective mould removal.

Here are some ways to recognize qualified professionals:

- The company has certification from the Institute of Inspection Cleaning and Restoration Certification (IICRC), and/or training certified by the U.S. Occupational Safety and Health Administration (OSHA), or equivalent training and experience.
- The company prioritizes removing damaged materials that have been sites of mould growth rather than attempting to seal or chemically treat them.
- If mould removal is involved, the company has liability insurance specifically covering that task.
- The company's designated qualified professional will give you a copy of the planned inspection procedures and, where applicable, the clean-up procedures, and discuss actions to be taken, associated costs, health and safety considerations, warranties and follow-up inspections, if needed.
- If any laboratory work is involved, the laboratory will have accreditation to the ISO/IEC 17025:2017 standard, administered by the Canadian Association for Laboratory Accreditation (CALA), the Standards Council of Canada (SCC), the American Industrial Hygiene Association (AIHA), or another equivalent recognized accreditation body.
- If extensive cleanup work involving structural elements like walls is involved, the company should recommend you consider hiring a separate company to perform a post-remediation 'clearance' study to ensure mould has been correctly removed and moisture addressed.

11. Air testing for mould

Health Canada does not recommend testing the air for mould.

In most situations, Health Canada does not recommend testing the air for mould. An air test does not provide information that can predict health effects and often offers little information on the cause of mould damage in the house. In some cases, however, where concerns remain unexplained after inspection for dampness and mould, especially if there is a history of flooding, roof leaks or pipe leaks possibly affecting wall cavities, a qualified professional may recommend a 'non-viable' air test for mould spores. This test involves microscopy done on machine-collected samples without culturing, and can be used to detect specific indicator mould types. High counts for these mould types may help direct qualified professionals to hidden problems within wall and ceiling cavities[2;11].

Appendix A: Checklist – preventing moisture and mould in the home

The key to mould prevention is to remove excessive moisture build-up and control relative humidity through proper home maintenance and by following these steps:

Bathroom

- Use an exhaust fan when you shower or bathe. An exhaust fan should be installed in each bathroom.
- Check and maintain exhaust fans to make sure there is adequate air movement and that they are vented to the outside and not into the attic.
- Keep the exhaust fan running for at least 30 minutes after a shower or bath.
- Keep surfaces clean and dry. Squeegee and dry the walls around the bathtub and shower after use.
- Repair or replace open, cracked or damaged tiles, grout and caulking around showers and tubs.
- Repair plumbing leaks promptly.
- Remove any visible mould by scrubbing with unscented dishwashing detergent and water.

Kitchen

- Always use a kitchen range hood exhaust fan when cooking, preferably on the highest setting.
- Consider using the back burners only.
- Maintain the exhaust fan to make sure there is adequate air movement and that it vents to the outside.

Laundry room

Washing machine

- Leave the washing machine door open when not in use so that any remaining water can dry. This will help reduce mould and bacteria growth inside the washing machine.
- Make sure that the washing machine drains directly into the laundry sink/drain without dripping or splashing outside of the basin. Use pipe extensions to reduce any splashing.
- Regularly check hoses and connections for leaks.
- Be aware that hanging wet laundry indoors can increase indoor relative humidity levels.

Clothes dryer

- Check that your clothes dryer vents to the outside.
- Seal the joints in the dryer duct with foil tape.

- Clean the lint tray every time you use the dryer.
- Routinely inspect the outside exhaust vent and remove any built-up lint.
- Make sure the outside vent is kept clear of obstructions, such as snow and foliage.

Condensation on windows, window frames and sills

- Promptly repair any leaks.
- Maintain your home's relative humidity level between 30% and 50%.
- Use exhaust bathroom fans and a kitchen range hood.
- Keep window coverings open to allow warm air to reach the windows. Heavy curtains or blinds can trap the cold and moisture and cause condensation on your windows.
- Keep baseboards or heating vents clear of furniture and leave interior doors open to facilitate airflow.
- Dry your window frames and sills daily to keep water from dripping and causing mould to grow.
- Unplug and remove humidifiers.

Basement

- Run a dehumidifier in your basement to help reduce dampness year-round, if necessary. Make sure the windows are closed when the dehumidifier is running.
- Check plumbing pipes for condensation. Dry pipes and insulate them with foam insulation.
- Keep areas and storage spaces free of clutter, especially if near an outside wall.
- If you use the basement for storing items, use plastic bins with lids instead of cardboard.
- Never place cardboard boxes directly on the basement floor.
- Consider removing any carpets from the basement floor.

General considerations

- Ensure prompt and complete cleanup after a flooding event.
- Store firewood in the garage or shed, not inside the house.
- Have family and friends take off their shoes at the door before entering your home.
- Keep beds, bedding and furniture away from outside walls for good airflow.
- Keep closets and storage spaces free of clutter, especially if near an outside wall.
- Vacuum often. Use a vacuum with a high efficiency particulate air (HEPA) filter, or a central vacuum vented outdoors.
- Clean hard floors with a damp mop.
- Never use bleach to clean up mould.

NOTE: If renting a house or an apartment unit speak to the property owner about any moisture or mould problems. Information on landlord/tenant issues, rights and responsibilities is available from your provincial/territorial government.

For more information, please visit Health Canada's indoor air quality webpage (https://www.canada.ca/en/health-canada/services/air-quality/improve-indoor-air-quality-in-your-home.html) or contact us at air@hc-sc.gc.ca.

References

[1] Health Canada. (2007). Residential Indoor Air Quality Guidelines: Mould. Government of Canada, Ottawa, Canada.

[2] Hung LL, Caulfield SM, Miller JD. (2020). Recognition, Evaluation, and Control of Indoor Mold, 2nd edition (AIHA Green Book). American Industrial Hygiene Association, Falls Church VA, USA.

[3] Chew GL, Horner WE, Kennedy K, Grimes C, Barnes CS, Phipatanakul W, Larenas-Linnemann D, Miller JD. (2016). ; Environmental Allergens Workgroup. Procedures to assist health care providers to determine when home assessments for potential mold exposure are warranted. J Allergy Clin Immunol Pract. 4(3):417-422.e2.

[4] Berry P., & Schnitter, R. (Eds.). (2022). Health of Canadians in a Changing Climate: Advancing our Knowledge for Action. (https://changingclimate.ca/site/assets/uploads/sites/5/2022/02/CCHA-REPORT-EN.pdf). Ottawa, ON: Government of Canada.

[5] Eykelbosh A., Steiner L. (2018). National Collaborating Centre for Environmental Health. Growing at Home: Health and Safety Concerns for Personal Cannabis Cultivation. (https://ncceh.ca/documents/evidence-review/growing-home-health-and-safety-concerns-personal-cannabis-cultivation).

[6] 6 - Palaty C, Shum M. (2010, rev. 2014). National Collaborating Centre for Environmental Health. Mould Assessment Recommendations. (https://ncceh.ca/sites/default/files/Mould_Assessment_Evidence_Review_March_2014.pdf).

[7] New York City Department of Health and Mental Hygiene (NYCDHMH). (2008).

Guidelines on Assessment and Remediation of Fungi in Indoor Environments (https://www1.nyc.gov/assets/doh/downloads/pdf/epi/epi-mold-guidelines.pdf). 25 p.

[8] National Institute for Occupational Safety and Health (NIOSH). (2018). Dampness and Mold Assessment Tool for General Buildings - Form & Instructions. (https://www.cdc.gov/niosh/docs/2019-115/pdfs/2019-115.pdf). Cox-Ganser J, Martin M, Park JH, Game S. Morgantown WV: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 2019-115.

[9] Health Canada. (2021). Infographic: Flood clean up and indoor air quality. (https://www.canada.ca/en/health-canada/services/publications/healthy-living/infographic-flood-clean-up-indoor-air-quality.html).

[10] Institute of Inspection Cleaning and Restoration Certification (IICRC). (2015). ANSI/IICRC S520 Standard and IICRC R520 Reference Guide for Professional Mold Remediation.

[11] Mendell MJ, Adams RI. (2022). Does evidence support measuring spore counts to identify dampness or mold in buildings? A literature review. J Expo Sci Environ Epidemiol. 32(2):177-187.