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# Occupational Health & Safety

## Facts About Mould

A large, stylized graphic consisting of two overlapping, curved bands. The upper band is dark green and the lower band is yellow-green. Both bands have a 3D effect with a white highlight on the top edge and a grey shadow on the bottom edge. The text "Partners in Safety" is centered within the space between the two bands.

**Partners in Safety**

## Introduction

This information has been developed by the Occupational Health and Safety Division of Saskatchewan Labour and Saskatchewan Health. It is intended to apply to private residences, public buildings and workplaces. Actions indicated in this document may differ between private residences and workplaces. For more information on workplace requirements, contact Saskatchewan Labour's Occupational Health and Safety Division.

## Should I be concerned about mould in my building?

Inhaling large amounts of moulds and their spores can cause health problems. You should be concerned if:

- Building materials or furnishings have visible mould contamination.
- Moisture problems have gone untreated. Moulds rapidly multiply when indoor moisture problems are not promptly dealt with. This can result in extensive contamination that may or may not be visible.
- Occupants have been medically diagnosed with building-related illnesses. All other potential building-related causes have been eliminated, and a physician or another health professional suspects mould exposure as a possible cause.

## About moulds

### *What are moulds?*

Moulds are a type of fungi. They are simple, small organisms found virtually everywhere – indoors and outdoors. Moulds have an important ecological role in breaking down organic material.

Usually, most indoor moulds come from the outdoors. It is common to find moulds and their spores in the air of buildings and growing on certain moistened structural materials, furnishings and other building contents. Mould growth can often be seen as coloured, woolly or sooty textured growth. Common colours include white, orange, green, brown and black. Moulds may give off a musty or earthy odour or smell faintly like alcohol.

As moulds grow they produce a variety of chemicals. Some of these chemicals, like antibiotics, have a beneficial effect in people. Some moulds, including the most common moulds that we consider harmless, produce chemicals that can have toxic effects at sufficient exposures or doses. These chemicals, which are called mycotoxins, may be present in live or dead moulds or mould spores. The term “toxic” mould is a non-scientific name that has been used to describe moulds that produce toxins. It is an unfortunate term because it implies that these moulds are more dangerous, when in fact, all moulds have the potential to affect health.

The presence of mycotoxin-producing mould does not necessarily mean that mycotoxins are present or that individuals have been exposed to mycotoxins. Mycotoxin production varies widely depending on species and growth conditions. Some moulds can produce several mycotoxins.

***What do moulds need to grow?***

- A food source, such as leaves, wood, paper or dirt
- A source of moisture
- A place to grow (mostly in darker areas)

Indoor food sources include cellulose and other carbohydrates contained in structural materials, such as ceiling tiles, gyproc, ventilation insulation, wallpaper, wood, fabric and dust. These materials also provide a place for moulds to grow.

The following are some sources of indoor moisture:

- Flooding
- Condensation on walls and windows
- Damp basement or crawl spaces
- Saunas
- Clothes dryers vented inside
- Moisture build-up in wall spaces
- Backed up sewers
- Cool air humidifiers
- Constant plumbing leaks
- Steam from cooking
- Shower/bath steam or leaks
- Combustion appliances (e.g. stoves) not vented outside
- Leaky roofs
- Mud or ice dams
- House plants (watering can generate large amounts of moisture)
- Wet clothes on indoor drying lines
- Water damage to insulated air-ducting systems

## **Health problems associated with indoor moulds**

### *How are people exposed?*

Mould fragments and spores are very tiny and lightweight. This allows them to travel through the air. People regularly inhale some amount of moulds and mould spores. Some of the inhaled particles reach the lungs, while the larger particles end up in the throat and are swallowed. People may also have some skin contact when they handle, touch or disturb mouldy materials. Mycotoxins, if present, may be associated with the spores and mould fragments. They are not released as gases or vapours at normal indoor temperatures.

### *Do these moulds affect a person's health?*

People are exposed to some amount of moulds and their mycotoxins on a daily basis, usually without harm.

Exposure to substantial amounts of mould and mould spores may contribute to skin, eye and respiratory irritation. This is the most common effect of indoor mould exposure.

Other less common health effects generally fall into three main categories: 1) allergies or sensitivities, 2) infection, and 3) toxicity. Not every person exposed to mould will develop symptoms. Whether or not symptoms develop depends on the characteristics of the mould, the degree of exposure and the susceptibility of the exposed individual.

1. Allergy and other sensitivity reactions: Next to irritation, these are most common health effects of mould exposure. The symptoms are similar to those seen in individuals allergic to pollen or animal allergens.

Moulds are common allergens. Although the percentage of people sensitized to moulds is not known, estimates range up to 40%<sup>1</sup>. Most allergic responses result from exposure to outdoor moulds.

Mould fragments and mould spores may cause or worsen the symptoms of asthma and other respiratory sensitivities, usually in susceptible individuals. Allergic reactions are most commonly experienced in the following ways:

- Allergic rhinitis (“hay fever”): a condition with symptoms such as sneezing; itchy eyes, nose and throat; sore throat, cough, watery eyes; headache and fatigue.
- Allergic asthma: a chronic lung disease characterized by inflammation of the larger airways around the nose and mouth causing contraction of surrounding muscles, which results in difficult breathing. Symptoms include chest tightness, shortness of breath, coughing and wheezing.
- Hypersensitivity pneumonitis (HP): a condition characterized by inflammation of the alveoli (small air sacs in the deepest areas of the lung). It is produced by exposure to a variety of biological aerosols and organic dusts.

<sup>1</sup> Institute of Medicine, 2000. Clearing the Air: Asthma and Indoor Air Exposures. Washington D.C: National Academy Press.

2. Infection: A small number of moulds have caused sinus and respiratory infections. Although a few moulds can infect healthy individuals, this is unlikely to occur in persons with healthy immune systems. To date there are few, if any, medical tests to differentiate mould or mycotoxin-related health effects from other unrelated causes.
3. Toxic effects:
  - Significant effects on the immune, nervous, circulatory, reproductive and gastrointestinal systems have been reported in animals and humans who have eaten food heavily contaminated with moulds and mycotoxins.
  - Adverse health effects, in part due to mycotoxins, have been reported among agricultural workers. However, these effects have been due to inhaling very high concentrations of mixed organic dusts (bacteria, fungi, mycotoxins, and endotoxins) found in spoiled grain or silage.

Similar high-level exposures and effects are not expected in indoor settings, even when large areas of mould contamination are disturbed.

- Concerns have been raised about the potential for mycotoxins to cause hemorrhagic effects in people. This is not supported by evidence for adults in the home, school or office buildings. There is some concern that infants' lungs could be more susceptible to these effects because:
  - Their lungs are less able to eliminate inhaled particles
  - There was an unproven suspicion that mycotoxin exposure may have contributed to a small number of cases of pulmonary hemorrhage/hemosiderosis in infants
  - Mycotoxins have shown a potential for hemorrhagic effects in animal studies. However, these effects were seen at exposures more than a million times greater than levels seen in heavily contaminated buildings.

- Some mycotoxins have been classified as possible carcinogens based solely on animal experiments. Direct evidence that mycotoxins cause cancer in people is inadequate.

### ***Who is at greater risk when exposed to mould?***

Certain individuals may be more likely to experience adverse health effects from mould exposure:

- Infants and children (see above)
- Pregnant women
- Elderly
- Immune compromised patients (e.g. people with HIV infection, lung diseases, uncontrolled diabetes, people receiving cancer chemotherapy, or immunosuppressive drugs) are at an increased risk of severe opportunistic fungal infection
- Individuals with existing respiratory conditions, such as asthma, environmental or other types of sensitivities.

### ***What symptoms are reported by persons exposed to moulds?***

The most common and well-established symptoms of indoor mould exposure are:

- Runny nose
- Eye irritation
- Cough
- Congestion
- Aggravation of asthma and other respiratory symptoms (e.g., wheezing, chest tightness, shortness of breath).
- Headache and fatigue
- Skin rash

There have been reports of other symptoms in buildings where substantial amounts of moulds were present. Reported symptoms have included (alone or in combination): weakened resistance to infections, skin irritation and rashes, memory problems, mood changes, aches and pains and possible fever.

## Preventing mould problems

The best way to prevent mould problems is to prevent the growth of moulds. This can best be done by preventing and treating excessive moisture and maintaining heating, ventilation and air conditioning (HVAC) systems. Humidifiers, dirty filters, accumulated debris in ducts that are subject to condensation, can be sources of mould growth.

Mould should always be kept to a minimum in occupied buildings. Employers have a responsibility to prevent workplaces from becoming extensively contaminated with moulds.

To do this:

- Keep the humidity in the building below 60%, ideally between 30-50%.
- Regularly clean and disinfect humidifiers and air conditioners.
- Ensure the building has adequate ventilation, including exhaust fans in kitchens and bathrooms.
- Consider mould resistant paint for humid rooms such as bathrooms and kitchens.
- Avoid carpeting bathrooms and kitchens.
- Clean bathrooms with a fungicide
- If the building has a crawl space, make sure that it is kept dry
- In a dirt crawl space ensure that porous structural materials like drywall and cardboard do not contact the dirt floor
- Continually monitor and deal with moisture problems. Signs may include condensation on windows, swelling or cracking of plasterboard, drywall tape loosening, wood warping and musty odours
- Discard ceiling tiles that become water soaked
- Repair leaky roofs, walls and basements
- Promptly clean up, disinfect and dry everything after a sewer back-up or flooding
- Promptly dry carpets, drywall, wood, upholstery, etc. that could become water soaked



## Detecting indoor moulds

### *How can I tell if I have mould in my house or workplace?*

In a workplace an employer has a duty to monitor worker exposure to substances that may be harmful, including moulds and mycotoxins.

If you can see mould, you can assume you have a mould problem. Look for sources of mould and signs of previous water damage. Mould growth may also be found underneath materials where water has damaged surfaces or behind walls. Look for discoloured plaster.

Where moisture problems or mould contamination are not visible on a wall but are suspected, baseboards should be pulled away from the wall and the base of the wallboard examined for mould growth. In some cases a small hole in the wall may be needed. When disturbing materials wear an N95 respirator and mist the area first. Additionally, consider using a HEPA vacuum if significant amounts of building materials are being disturbed. Note that an earthy or musty odour may be a sign of a mould problem but odour alone should not trigger an extensive search for moulds behind walls, etc.

If mould growth is found behind building materials, determine if it poses an exposure risk or if it is isolated from occupied areas. Since there is typically some mould on building materials, it is important to consider the extent of the contamination and exposure.

During renovation work, if mould is detected and or disturbed, stop the work and assess the extent of mould contamination. Clean-up the mould before continuing the renovations using the steps and protective equipment described in the following section.

### ***When should sampling for moulds be considered?***

Sampling should not be part of a routine assessment because:

- Decisions on the type of clean-up can usually be based on a visual inspection
- Sampling can indicate what moulds are present, but this will not change the procedures for cleaning
- Air sampling will not indicate what are safe levels and what are not. To date we do not know what is a safe or unsafe amount of mould in the air.

Sampling for mould can be expensive, and requires equipment not readily available to the general public. Residents of individual private homes must pay a contractor to carry out such sampling, as it is not usually done by public health agencies. Mould cleanup is usually considered one of the housekeeping tasks of the private citizen, along with roof and plumbing repairs, sweeping and house cleaning.

Sampling may be considered when 1) there is no visible mould, or 2) visible mould has been properly removed and affected areas cleaned and disinfected, but:

- One or more individuals continue to suffer from medically diagnosed, building-related illnesses and all other potential building-related causes have been eliminated; and
- The attending physician suspects mould exposure as a possible cause.

An employer's duty to monitor worker exposure to moulds may include sampling. In some, but not all circumstances, sampling may be the most appropriate way to monitor exposure, for example when extensive mould contamination is suspected, but not visible. Additionally, an employer or owner may need to do sampling after an extensive clean-up to provide assurance that high air concentrations of mould produced by a clean-up have been reduced. In the latter case the results should indicate levels that are comparable to measured levels in uncontaminated areas.

Check the yellow pages under *Mould Removal Services* or *Environmental Consultants* for a list of agencies that provide this service. The Occupational Health and Safety Division can be contacted to discuss the need for sampling and different sampling approaches for workplaces. It is important to check the experience and qualifications of outside agencies doing mould testing and analyses and to ensure that appropriate sampling methods are chosen to yield meaningful and useful information.

## Clean up

To do an effective clean up, make sure to:

1. Identify and remove the source of the excess moisture.
2. Use the simplest clean up method that effectively and safely removes the mould growth.

Unless the source of moisture is removed and the contaminated area is cleaned and disinfected, mould growth is likely to reoccur.

In workplaces, the employer must ensure that procedures are prepared prior to the cleanup that ensure that the clean up does not increase worker exposures during and after the clean up. The procedures must identify personal protective equipment (PPE) and other measures to protect staff. Additionally, the employer must ensure that:

- Workers are informed ahead of time of plans to clean up mould contamination
- Additional protection is provided during the clean up to workers with mould allergies and sensitivities
- Any PPE or other supplies identified in the procedures is supplied to workers
- The procedures are followed
- The clean up is done by properly trained staff (maintenance staff, etc.). If an employer contracts this work out, the employer must ensure that the contractor fulfills the above duties.

Owners of apartments should notify occupants. Infants and persons with hypersensitivities may need to be removed during a remediation.

There are a number of useful guidelines available that describe clean up procedures and control measures for various sized areas of mould growth. (For example see *New York City Department of Health and Mental Hygiene: Guidelines on Assessment and Remediation of Fungi in Indoor Environments* <http://www.nyc.gov/html/doh/html/epi/moldrpt1.shtml>).

### **Small Areas**

**The clean up of small areas (< 10 sq. ft.) of visible mould contamination normally does not require personnel with specialized training in the handling of hazardous materials.**

### **Preparation**

- Identify and correct the moisture source
- Vacate people from the immediate area. Vacate more susceptible people from adjacent areas (e.g. infants, persons with allergies and compromised immune systems)

### **Protective Equipment**

- A NIOSH-approved N95 disposable respirator
- Gloves
- Eye protection

### **Cleaning and Disinfecting Contaminated Materials**

- Mist the mould-contaminated areas to keep the dusts down.
- Bag and dispose of porous materials with visible mould growth, such as ceiling tiles, wallboard, rags, paper, leaves or debris. Carpets should be discarded if they are extensively contaminated. If the contamination is known to be limited the carpet can be shampooed. Include a carpet disinfectant (e.g. a quaternary ammonium compound) in the carpet shampoo.
- As materials are removed, check exposed areas for mould growth and clean up as needed.

- Thoroughly clean less porous surfaces (such as glass, plastic, concrete or metal) using a strong detergent followed by lots of water. If the area is open and well-ventilated the surfaces may then be disinfected (for example, using a 1 in 10 dilution of household bleach in water). The contact time with the surface area should be a minimum of 10 minutes. Note: If a bleach solution is used in a confined, poorly ventilated area use a respirator with NIOSH-approved cartridges that remove both particulates (N95 filter) and chlorine. Typically cartridge approved by NIOSH for acid gases are also approved for chlorine.
  
- Clean the work area and areas used by the clean up workers using wet methods and a detergent.

### **Larger Areas**

If the area or combined areas are greater than 10 sq. ft., but less than 30 sq. ft use the above procedures, but also take additional steps to contain the mould damaged areas. This includes the use of well-sealed (with tape) plastic barriers, and the regular use of a HEPA vacuum. Clean up personnel must be trained on the procedures, but do not require specialized training in the handling of hazardous materials.

Where there is extensive contamination of larger occupied areas, consult a health and safety professional before proceeding and ensure that the personnel doing the clean up have specialized training on the containment and handling of hazardous materials.

Steps for the clean up of larger or concealed areas are described in the New York City guidelines (See Resources). You can also contact your local public health inspector or, in the case of a workplace, Saskatchewan Labour - Occupational Health and Safety Division for advice.

### ***Can cleaning up mould be hazardous to my health?***

Yes. Disturbing and removing mould-contaminated materials can release massive amounts of mould materials into the air. Wearing a N95 respirator is critical. It is also essential that steps are taken to prevent the spread of mould to adjacent areas.

### ***Can air duct systems become contaminated with mould?***

Yes. Air duct systems can be contaminated with mould. This type of contamination may have been identified by sampling. Duct systems can be constructed of bare sheet metal, sheet metal with exterior fibrous glass insulation, sheet metal with an internal fibrous glass liner, or made entirely of fibrous glass. If your building's air duct system has had water damage, first identify the type of air duct construction that you have. Bare sheet metal systems or sheet metal with exterior fibrous glass insulation, can be cleaned and disinfected. If your system has sheet metal with internal fibrous glass liner, or is made entirely of fibrous glass, the ductwork may need to be removed and discarded. Ductwork in inaccessible locations may have to be abandoned. Contact an air duct cleaning professional or contractor for assistance. Improper cleaning of forced air ventilation systems can cause serious air quality problems.

### ***After I've cleaned everything as thoroughly as possible, can I still have mould odours and problems?***

Yes. It is possible that the problems and odours may persist. Continue to dry out the area and search for mould. If the area continues to smell musty, you may have to reclean the area (follow the cleaning steps given earlier). Continue to dry and ventilate the area. Don't replace flooring or begin rebuilding until the area has dried completely. In some cases, if problems persist, a more extensive assessment may be needed.

## Resources

- Fungal Contamination in Public Buildings: Health Effects and Investigation Methods. Health Canada. 2004. ([http://www.hc-sc.gc.ca/ewh-semt/pubs/air/fungal-fongique/index\\_e.html](http://www.hc-sc.gc.ca/ewh-semt/pubs/air/fungal-fongique/index_e.html))
- New York City Department of Health and Mental Hygiene: Guidelines on Assessment and Remediation of Fungi in Indoor Environments <http://www.nyc.gov/html/doh/html/epi/moldrpt1.shtml>
- Fighting Mold — The Homeowners' Guide, Canadian Mortgage and Housing Corporation, Product # 60516. [http://www.cmhc-schl.gc.ca/en/co/maho/yohoyohe/momo/momo\\_005.cfm](http://www.cmhc-schl.gc.ca/en/co/maho/yohoyohe/momo/momo_005.cfm)

## For further help or information

- In the case of workplace environments contact Saskatchewan Labour - Occupational Health and Safety Division at 1-800-567-7233.
- In the case of private residences or public places, contact your local public health inspector.

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