

Transcript: Mold and Moisture Training Module for Local Health Officers and Code Enforcement Officers

Presenter:

□ 1. Mold, Moisture and Air Quality

Thank you for taking the time to participate in this mold moisture and air quality training. You will notice that there are a few slides that are in your handouts but will not be displayed during this presentation. The **HIDDEN** slides are for your general information.

Key areas of interest

- ✓ Recognizing mold
- ✓ Science of Mold
- ✓ Mold contamination and damage
- ✓ Repair mold-damaged materials
- ✓ Mold- clean-up
- ✓ Removal
- ✓ Standard maintenance

□ 2. Content Sources

Materials for this training module are drawn from a broad range of statutory and regulatory texts, agency guidance documents, and expert commentaries. Access to the transcript, glossary and bibliography can be found at: _____

□ 3. About the training - Who would benefit from this training

This document should be used only as guidance. It is not a substitute for a site-specific assessment and remediation plan. *The information provided is to explain in part the role of the local health officers, code enforcement officers, building inspectors in handling mold complaints.*

This course does not cover all situations and all potentially useful methods or techniques. The absence of a method or technique from this course does not indicate or imply that it is not effective. It is designed to provide a general understanding of mold.

□ 4. Outline

1. *What you need to know about mold*
2. *Learn how to visually detect mold growth and when to test*
3. *Discover practical and cost-effective solutions to prevent, and control mold and moisture*
4. *Learn about the health effects and risk*
5. *Learn about the most common sources of mold and moisture in homes*
6. *Learn which Maine laws are appropriate*
7. *Learn about clean up mold*

□ 5. Recognizing Mold – Mold is everywhere

That green fungus growing on your bread is called mold. When you smell musty odors that don't come from dirty laundry or garbage cans – something may be wrong. It is also present on clothing, carpet, air we breathe, everywhere.

○ Odor

Musty odors **could indicate mold or bacteria** growing behind walls or above the ceiling.

○ Color

There is an amazing diversity of colors produced by molds and other fungi, and *they can vary regionally*. Examples: *Mold Blues and greens are prevalent in the Pacific Northwest, whereas oranges are more common in the amazon. Most people are familiar with black mold.*

○ Appearance

Black mold is very fuzzy, almost looking as if it has hair. It is black in color, but the intensity of the black can vary depending on how thick the mold has grown. In some areas the mold may appear somewhat transparent, and completely solid in others.

□ 6. Mold is everywhere

If it looks like mold, it's mold.

If it smells like mold, it's mold.

□ 7. SLIDE HIDDEN. Recognizing Mold

Color can also be an indication of mold growth. Notice that the outer cover of this book is dark blue, but there are yellow and orange stains on the inside. If the cover had gotten wet and the ink ran, the stain should be the same color as the cover. *Use a book as a simple example: (Look at the pictures)*

Does the stain re-appear on adjacent pages?

#1. *The cover had gotten wet and the ink ran, the stain should be the same color as the cover.*

Another helpful hint is to check the book for water damage. If the book has been wet, even if it was a long time ago, there is a greater risk of mold growth. Notice the watermark on the cover of this book, and the spots on the bottom.

Mold exists in two states: active and dormant. Active mold is eating, growing and producing spores. Dormant mold is inactive but may reactivate if the conditions are right. It is difficult to determine if mold is active or dormant.

□ 8. SLIDE HIDDEN Recognizing Mold

Dormant mold can be much harder to spot than active mold. Dormant mold can appear to be a stain left on the pages or the cover of a book.

Active Mold: #2, the mold on this bread is active mold. The mold is alive and currently producing spores. Sometimes active mold can appear powdery, like on this bread. Other times it may appear damp and slimy **#3**.

Molds come in many colors including white. "Black mold" is not a species or specific kind of mold, and neither is "toxic mold." Sometimes the news media use the terms "*toxic mold*" and "*black mold*" to refer to molds that may produce mycotoxins or for a specific mold, *Stachybotrys chartarum*. Molds that produce mycotoxins are often referred to as toxigenic* fungi. (*Toxigenic producing poisonous substances)

9. What is Mold?

There are many different types of mold, with some 1.5 million species estimated to exist. We encounter mold very frequently, if not daily.

Molds are fungi and are very small living, breathing organism that are found everywhere – indoor, outdoor, Antarctica, the Amazon jungle, the Gobi desert - and inside us - just to name a few locations. Fungi are amazingly well adapted to just about any condition on Earth. But maybe that is not so surprising – they have had over one billion years to figure it out.

Fungi are decomposers. This means they break down dead organisms and recycle their nutrients back into the ecosystem. They can be found growing on organic material such as soil, foods, plant matter, decaying things. Unlike plants, fungi cannot make their own food. They must rely on other food sources to support them. There are also differences in the basic makeup and chemistry of their cells.

Quick Mold Facts

- Mold is considered a sub-group of the Fungi Kingdom
- Present on clothing, carpet, air we breathe, everywhere
- Under the right conditions fungi are highly adapted to grow and reproduce rapidly
- Molds are asexual fungi
- Types Include: Aspergillus, **Penicillium**, Botrytis **Stachybotrys** and Fusarium, to name a few.

The terms fungi and mold are often used interchangeably, but mold is actually a type of fungi. (2 examples of fungi are mushrooms and yeasts). They

tend to live in dark, moist places, such as on the forest floor or in the back of the refrigerator.

In order to reproduce, mold produces spores, which spread through air water, or by insects. These spores act like seeds and can form new mold growth if the conditions are right. *(In other words -It produce spores that are extremely small and can be airborne)*

Some fungi are beneficial to humans. The antibiotic penicillin is derived from a fungus called Penicillium and blue cheese is made using a fungus to add the taste to it. *The yeast used to make bread is also an example of a fungus.*

□11. Mildew – Which is the mold? Is it #1 or #2? (pictures)

Sometimes it is difficult to differentiate between mold and mildew. Usually one can tell from the smell and appearance. Mold and mildew are types of fungi; typically, mold is black or green, and mildew is gray or white. Mold tends to grow on food, whereas mildew is an issue on damp surfaces, like bathroom walls, basement walls, or fabrics. Mold grows in the form of multicellular filaments or hyphae, while mildew has flat growth. Mildew is often referred to as a kind of mold (or mold in its early stages), and is classified as powdery and downy

To prevent mildew at home, keep all the areas moisture-free. There are mildew removers available at stores to eliminate mildew. To protect crops from mildew use mildew-resistant seeds, remove infested plants, avoid overhead heating.

□12. Just add water and they grow

Mold can also grow on moist, dirty surfaces such as concrete, fiberglass insulation, and ceramic tiles. It is neither possible nor warranted to eliminate the presence of all indoor fungal spores and fragments; however, mold growth indoors can and should be prevented and removed if present.

Under the right conditions fungi are highly adapted to grow and reproduce rapidly mold is, black, green and red whereas mildew is gray or white. **Definition:** A substrate is the medium in which a chemical reaction takes place or the reagent in a reaction that provides a surface for absorption.

*In biochemistry, an enzyme substrate is the substance the enzyme acts upon. **Examples:** In the fermentation of yeast, the substrate the yeast acts upon is sugar to produce carbon dioxide.*

□13. Condensation – Is the opposite of evaporation

Condensation starts as moisture in the air, usually produced by cooking, washing, or drying clothes indoors on radiators. It occurs on cold surfaces.

When warm, moist air comes into contact with a surface that is too cold, moisture condenses. When it hits cool surfaces such as walls, mirrors, wall tiles and windows it condenses and forms water droplets. The moist air rises when it is warm and often ends up on ceilings and in upstairs rooms and then it forms mold.

Left untreated, condensation can result in mold growth on walls, ceilings, furniture, furnishings, and clothing in cupboards and drawers. It can also affect wall plaster and cause woodwork to rot.

The water and frost that you see collecting on windows is a visible example.. Condensation may also be collecting in your attic, and inside the exterior walls. Over time, if the air in the house is too humid, the result may be damage to the house structure, your possessions and possibly your health. Often we look to quick fixes for moisture problems. There's no silver bullet for moisture removal. If you see mold growth, the source of moisture must be eliminated and remove the damp material.

The best way to prevent damp walls and floorboards is to avoid condensation. Vent your bathroom, vent your kitchen, and vent your dryer to the outside. If you can't afford a venting system, open a window until all the steam disappears

Note: Adding insulation of exterior walls can prevent or reduce the potential for condensation and mold growth on cold surfaces (such as windows, piping, roof, or floors) during the winter.

□14. Humidity and Relative Humidity

Humidity is simply the amount of water vapor or moisture in the air is referred to as humidity. Relative humidity does not tell us how much water is in the air, but rather, what percentage of the maximum vapor pressure has been reached. Therefore, the more water that is in the air there is, the higher we say that the humidity has risen.

Relative humidity is the most common way that we measure humidity.

□ 14.1. Temperature Conditions

Although most molds grow best around 70 degrees Fahrenheit, different types of mold require certain temperatures to grow. For example, the mold type *Penicillium* grows best at 34 degrees Fahrenheit, which is the typical temperature inside of a refrigerator. In contrast, *Aspergillus* is mold that prefers warmer temperatures of 98 degrees Fahrenheit, which is the normal temperature inside the human body.

□ 14.2. Water Vapor

When relative humidity (*a temperature-dependent measure of water vapor in air*) becomes elevated indoors, building materials and furnishings absorb the moisture. Those **damp** materials can then provide a good place for mold to grow. If there are no cold-condensing surfaces and the relative humidity (RH) is maintained below 55-60 percent indoors, there will

not be enough water in those materials for mold to grow. However, if the RH stays above 70 percent indoors for extended periods of time, mold will almost certainly grow.

The removal of any one of these items will prohibit mold growth.

In the summer, air conditioning can de-humidify indoor space. But if the system is too large or too small for the space it serves, the cooling system can create high humidity by cooling without removing water vapor. A properly sized and maintained system will dehumidify and cool a building.

It is that simple

“Acceptable Temperature and Humidity Ranges” can be found at *ASHRAE Standard 55-1992, Thermal Environmental Conditions for Human Occupancy*

15. When and how mold grows

There are 4 critical requirements for mold to grow:

1. Available mold food;
2. Appropriate temperatures; and
3. Considerable moisture; and of course
4. Available mold spores;

16. How damp is damp

Dampness results from water incursion either from internal sources (e.g. leaking pipes) or external sources (e.g. rainwater). Dampness becomes a problem when various materials in buildings (e.g., rugs, walls, ceiling tiles) become wet for extended periods of time. *Excessive moisture in the air (i.e., high relative humidity) that is not properly controlled with air conditioning* can also lead to excessive dampness. Flooding causes dampness. Dampness is a problem in buildings because it provides the moisture that supports the growth of bacteria, fungi (i.e., mold), and insects.

- 16.1. *Damp is generally caused by a fault in the structure of the building. There are two basic types of damp:*

1. *Penetrating damp* happens when water enters your home through an external defect (for example, a crack in a wall or a loose roof tile).
2. *Rising damp* is when there is a problem with the damp proof course or membrane and water rises from the ground into the walls or floor.

▣ 16.2. *Reduce condensation and prevent mold forming.*

The best way to prevent damp walls and floorboards is to avoid condensation.

Vent your bathroom, vent your kitchen, and vent your dryer to the outside.

If there is no venting system, open a window until all the steam disappears.

Background: Dampness

Building dampness degrades indoor environmental quality in many ways. Mold growth is perhaps the most common and noticeable result of excessive or chronic indoor dampness. Molds are fungi (as are mushrooms and yeasts). To grow and reproduce, molds need only moisture and nutrients. As nutrients are almost always available from organic material (e.g., leaves, wood, paper, and dirt), the presence or lack of moisture generally is what allows or limits mold growth.

In addition to mold, indoor dampness can support bacterial growth and contribute to infestations of house dust mites, cockroaches, and rodents, which also pose health risks for building occupants. Moisture also may alter the chemistry of damp materials. Hence, while excessive or chronic dampness is not by itself a cause of ill health, it may indicate or increase other exposures that do have adverse health effects.

Source: World Health Organization. WHO Guidelines for Indoor Air Quality: Dampness and Mould. Copenhagen: WHO Europe, 2009 (see Chapter 4, Health effects associated with dampness and mould); available at www.euro.who.int/_data/assets/pdf_file/0017/43325/E92645.pdf.

Institute of Medicine. Damp Indoor Spaces and Health. Washington, D.C.: National Academies Press, 2004; available at www.nap.edu/openbook.php?isbn=0309091934.

- 17. **Mold Growth – The science** [Section Divider]
- 18. **YOUTUBE VIDEO**
- 19. **Mold growth starts on a damp food source**
- 20. **Given nutrients, the spore germinates.**
- 21. **Growth speeds up as available water increases.**
- 22. **Growth stops when food dries out**

SAMPLE

19. **HIDDEN** **Mold Growth (Step 1 of 4)**

Mold growth starts on a damp food source

When a spore lands on a damp food source, the enzymes on the spore's surface react with the damp food, breaking it down into a kind of "soup of nutrients." Slowly, that nutrient soup is pulled into the spore, sucked in by the dry material inside the spore.

20. **HIDDEN** **Mold growth (Step 2 of 4)**

Given nutrients, the spore germinates. After the nutrient soup is pulled into the spore, the fungus has the resources it needs to germinate and grow. Unlike plants, fungus does not need sunlight—it just needs damp food. The filaments which grow out of the spore also have enzymes on their surfaces. So they can help dissolve more of the damp food and absorb its nutrients, accelerating the mold growth.

21. **HIDDEN** **Mold growth (Step 3 of 4)**

Growth speeds up as available water increases. The filaments grow thicker, extending the reach of the fungus over any food source which is damp enough to dissolve. All that fungal chow time generates additional water—just like human metabolism generates water in the form of urine. The metabolic water helps the fungus dissolve even more of the food source—so the fungus grows faster.

22. **HIDDEN** **Mold growth (Step 4 of 4)**

Growth stops when food dries out.

Growth slows or stops entirely when the food source runs out, or when it dries up enough to keep the fungus from dissolving it. At that point, the fungus often puts its efforts into reproduction, generating billions more spores which drift off into the air. These land on other damp food sources, where the fungus can grow again.

□ 23. Buildings and Mold (Section header)

- Molds have found a great climate and plenty to eat in buildings.
- The presence of *water damage, dampness, visible mold, or mold odor* in schools, workplaces, residences, and other indoor environments is unhealthy.

□ 24. Mold in buildings <http://www.cdc.gov/niosh/topics/indoorenv/mold.html>

Fungi (mold) are present almost everywhere. In an indoor environment hundreds of different kinds of mold are able to grow wherever there is moisture and an organic substrate* (food source). They can grow on building and other materials, including: the paper on gypsum wallboard (drywall); ceiling tiles; wood products; paint; wallpaper; carpeting; some furnishings; books/papers; clothes; and other fabrics.

Federal agencies recommend against measuring indoor microorganisms or using the presence of specific microorganisms to determine the level of health hazard or the need for urgent remediation.

Rather, the agencies strongly recommend addressing water damage, dampness, visible mold, and mold odor by:

- (a) Identification and correction of the source of water that may allow microbial growth or contribute to other problems,*
- (b) The rapid drying or removal of damp materials, and*
- (c) The cleaning or removal of mold and moldy materials, as rapidly and safely as possible, to protect the health and well-being of building occupants, especially children.*

Exposure to mold or fungi can cause a variety of respiratory disorders including allergic diseases such as asthma and pneumonitis and other health effects in some people. Mold spores are always found in the air we breathe, but extensive mold contamination may cause health problems. Breathing mold can cause allergic and respiratory symptoms. It is hard to say how much mold will cause health problems as some people are more sensitive to mold than others. Always discuss your health concerns with your doctor, because the symptoms of mold exposure could be caused by other exposures and illnesses.

People who may be more susceptible to health problems from mold exposure include:

- People with current respiratory conditions (e.g., allergies, asthma, or emphysema)
- People with a compromised immune system (e.g., HIV/AIDS infection, organ transplant patients, or chemotherapy patients)

□ 25. Why is mold a problem

Mold can be harmful for two reasons.

- First, mold can feed on and destroy most of the organic materials found in buildings, such as wood, paper, carpet, and glue. Almost any surface can support the growth of mold.
- Second, airborne mold can cause harmful health effects when inhaled. Although the species *Stachybotrys chartarum* has received most of the press, many other types of fungi are potentially harmful to humans. For this reason, *Stachybotrys chartarum* is not treated as a unique case.

□ 26. Dry rot fungus growing in a house

*The wood destroying fungus, (*Serpula lacrymans*), is commonly known as **DRY ROT**.*

[Definition: A fungal disease that causes timber to become brittle and crumble into powder.]

However, the name DRY ROT might be considered rather inappropriate, since like all wood destroying fungi, it requires water for germination, growth and survival. Wood destroying fungi, or dry rot, cause the most structural damage. Dry-rot and structural damage to the exterior

walls are key signs that mold may be evident. But to the untrained eye the signs of dry rot and fungus may not be evident.

When looking at wood rotting fungi which may be found in the average domestic environment, it is first essential to understand that WATER IS REQUIRED TO INITIATE AND SUSTAIN ROT. So whilst there is some importance to be able to distinguish between dry rot, and the rest (wet rots), they have ALL been caused by excess water in timber! *And the basic control is to eliminate the water causing the rot - dry wood does not rot.*

The first practical observation which should be made is to determine the nature of the rot - is it a '*brown rot*' or a '*white rot*'?

- Brown rots cause the wood to crack in a cuboidal manner; the wood also goes slightly darker in color.
- Wood attacked by a white rot looks completely different to attack by a brown rot: The wood takes on a 'fibrous appearance and tends to go slightly lighter in color (this may not be too noticeable). There is no cuboidal (simple cube like cells, consist of only one single cell) cracking as in the brown rots. Tend to be more common in hardwoods

Picture: The fruiting body - Phellinus forms a dark brown, hard 'woody' fruiting body, often quite thin, and remains on the wood.

□ 27. Uncontrolled moisture in buildings

There are two types of moisture problems—leaks and condensation.

Uncontrolled moisture is the most prevalent cause of deterioration in older and historic buildings. It leads to erosion, corrosion, rot, and ultimately the destruction of materials, finishes, and eventually structural components.

The challenge to building owners is *to understand the patterns of moisture movement in order to better manage it -- not to try to eliminate it. There is never a single answer to a moisture*

problem. Diagnosis and treatment will always differ depending on where the building is located, climatic and soil conditions, ground water effects, and local traditions in building construction.

Moisture is notorious for traveling far from the source, and moisture movement within concealed areas of the building construction make accurate diagnosis of the source and path difficult. Obvious deficiencies, such as broken pipes, clogged gutters, or cracked walls that contribute to moisture damage, should always be corrected promptly.

Dampness results from water incursion either from internal sources (e.g. leaking pipes) or external sources (e.g. rainwater). Dampness becomes a problem when various materials in buildings (e.g., rugs, walls, ceiling tiles) become wet for extended periods of time. Excessive moisture in the air (i.e., high relative humidity) that is not properly controlled with air conditioning can also lead to excessive dampness. Flooding causes dampness. Dampness is a problem in buildings because it provides the moisture that supports the growth of bacteria, fungi (i.e., mold), and insects.

In the presence of damp building materials the source of water infiltration is often readily apparent (e.g., leaks in the roof or windows or a burst pipe). However, dampness problems can be less obvious when the affected materials and water source are hidden from view (e.g., wet insulation within a ceiling or wall; excessive moisture in the building foundation due to the slope of the surrounding land).

OSHA presents temperature and relative humidity guidelines within the OSHA Technical Manual (OTM). Associated interpretive documents state; "As a general rule, office temperature and humidity are matters of human comfort. OSHA has no regulations specifically addressing temperature and humidity in an office setting."

□ 28. Contaminants in buildings

Mold contamination has become an increasing problem in homes, offices, and other indoor places across the United States. Mold can cause a lot of health problems to people who are exposed to it, and in severe cases, exposure to mold spores can even be fatal. Due to this growing concern, many different laws have been passed, which protect the rights of people in case of mold contamination. Here are some of the legal aspects of mold contamination.

Buildings can contain many contaminants. Some come from living organisms and are grouped as biological contaminants, for example, bacteria, viruses, dust mites, animal dander and molds. Other contaminants, which are not associated with living organisms, are classified as chemical contaminants. Contaminants, whether biological or chemical, can be in the form of particles (e.g. dust, fibers) or gases.

(Source- Bioaerosols: *Assessment and Control*, 24.1.3. ACGIH, Cincinnati, OH 1999)

Taking air samples for mold spores is easy. Knowing how to interpret the laboratory results is another matter. There is no one level of mold that can distinguish a clean and moldy building. Good indoor air quality is achieved when there are very low levels of contaminants.

After you have reduced as many known sources of contaminants as possible, you can enhance the quality of the air with ventilation. This may mean airing out the house by briefly opening the windows or by installing a heat recovery ventilation system.

The next section, *Mold and your health*, (slides 29-33) provides a brief overview, but does not describe all potential health effects related to mold

□ 29. Mold and your health

Some of the most common molds found in buildings are Cladosporium, Aspergillus, Penicillium and Alternaria. All of these are considered toxic. Other toxic molds that are frequently found are Stachybotrys, Fusarium, Trichoderma, and these molds produce mycotoxins that are easily absorbed into the skin, intestinal lining, airways and lungs. Most molds have not yet been studied for toxicity and not all species are toxic. Even though not all species of mold are toxigenic, it is prudent to assume that when these organisms are found in excess indoors, that they are all treated as toxigenic.

Mold toxicity is often the end result with constant exposure to mold of a toxic substance.

- Mold growth is undesirable to look at and to smell. It's difficult to be productive and do high-quality work in a moldy building... and it's very annoying to live in one.
- Why be concerned - controlling moisture/dampness will control microbial growth
- Different molds grow at different levels of moisture
- Molds have characteristics that make measurements difficult
- Building systems fail if not maintained controlled moisture in buildings

Throughout the nation, deaths of infants from bleeding lung disease (pulmonary hemosiderosis) have been attributed to inhalation of toxins produced by the fungus *Stachybotrys chartarum*.

The potential for health problems occurs when people inhale large quantities of the airborne mold spores. For some people, however, a relatively small number of mold spores can cause health problems. Infants, children, immune-compromised patients, pregnant women, individuals with existing respiratory conditions, and the elderly are at higher risks for adverse health effects from mold.

Stachybotrys is a fungi that has the ability to produce mycotoxins, ones that are extremely toxic, suspected carcinogens, and immunosuppressive. Exposure to these mycotoxins can result through inhalation, ingestion, and dermal exposure.

30. Mycotoxins

Some specific species of mold produce mycotoxins under certain environmental conditions. Potential health effects from mycotoxins are the subject of ongoing scientific research and are beyond the scope of this training. However, mycotoxins have also been linked to symptoms such as sore throats, headaches, fatigue, dermatitis and generalized malaise. (OSHA)

As molds grow, some (but not all) of them may produce potentially toxic byproducts called mycotoxins under some conditions. Some of these molds are commonly found in moisture-damaged buildings. More than 200 mycotoxins from common molds have been identified, and many more remain to be identified. The amount and types of mycotoxins produced by a

Mold is, "*Toxigenic*"*, which means it may not always be producing toxins into your environment. However, for no explainable reason the same mold that was not producing toxins yesterday may indeed today begin to produce toxic spores. Remember: *mold is a living breathing organism.*
(* produces poison)

particular mold depends on many environmental and genetic factors.

No one can tell whether a mold is producing mycotoxins just by looking at it. Some mycotoxins are known to affect people, but for many mycotoxins little health information is available. Research on mycotoxins is ongoing. Exposure to mycotoxins can occur from inhalation, ingestion, and skin contact. It is prudent to avoid unnecessary inhalation exposure to mold.

Reminder:

- Presence of active growth (past or current) of mold can impact your health
- Airborne mold can be inhaled

□ 34. Section divider

Indoor dampness and mold (fungal growth) are common problems in Maine and worldwide. To date, no clear state or federal policy has been issued on how to assess the health risks that dampness and mold pose to building occupants

So you *don't* want to inhale mold particles. And you *don't* want to eat the molds that grow in a building the way you'd eat the *harmless* and tasty mold in blue cheese.

The problem of mold in buildings is one that no building owner can afford to ignore. Mold has been suggested as one of the possible factors in so-called "Sick Building Syndrome." Opposite of which is - "*Healthy Buildings*", and "*Green Buildings*".

Don't panic when you see or smell mold indoors—but don't ignore it either. There's no point wasting time worrying about *which* sort of mold is growing. If you see mold or smell it in a building... mold is growing, it means there's a problem, or there will be a problem in the near future, and it must be removed.

Decay fungi can cause severe structural damage to any wood member, even wood species such as redwood and cedar (Pacific Northwest). All that is needed is a source of water in contact with the wood. Decay will occur in untreated wood in direct contact with ground, concrete, or exposed to a source of moisture such as rain seepage, plumbing leaks or condensation. Wood kept dry will never decay.

31. Health effects

- Burning eyes
- Headache
- Nausea
- Nose bleeds
- Cognitive disorders
- Allergic Reactions
- Asthma
- Exhaustion
- Sinus infections
- Pulmonary hemorrhage
- Liver damage
- Brain damage
- Cancer
- Death
- Central nervous system damage

Of the thousands of molds that exist, some are known allergens (aggravating or causing skin, eye, and respiratory problems), and a few molds produce harmful mycotoxins that can cause serious problems. But all molds, in the right conditions and high enough concentrations, are capable of adversely affecting human health.

Background: Health Risks

It is not possible to predict the degree of severity of the health risks associated with mold in the home. Allergic individuals vary in their degree of susceptibility to mold, and the risk may also depend upon the extent and exact type of mold that is present.

In 2004, the Institute of Medicine (IOM) found there was sufficient evidence to link indoor exposure to mold with upper respiratory tract symptoms, cough, and wheezing in otherwise healthy people. Mold also was linked to the worsening of asthma symptoms in people who have asthma. Mold was also reported to be linked to hypersensitivity pneumonitis in individuals susceptible to this immunologic condition. This uncommon disease is similar to pneumonia and can develop in susceptible individuals after brief or prolonged exposure to mold.

According to the U.S. Centers for Disease Control and Prevention (CDC),

"A link between other adverse health effects, such as acute idiopathic pulmonary hemorrhage among infants, memory loss, or lethargy, and molds, including the mold *Stachybotrys chartarum* (*Stachybotrys atra*), has not been proven."

32. Vulnerable populations

Children, babies, elderly....Whether health effects will occur depends, for each person, on how much mold gets into their body, the amount and potency of various substances that the mold mixture can contain, and the unique susceptibility of each person to the effects of these

substances. Unfortunately, mold tests alone will not determine if a specific problem environment is causing a person's complaints

In research conducted in human populations, the World Health Organization found sufficient evidence to show that occupants of damp and moldy buildings are at increased risk of respiratory symptoms, respiratory infections, shortness of breath, and worsening of asthma.

In people who have a weak immune system, some molds may cause infections

Molds produce irritating substances that may act as allergy-causing substances (allergens) in sensitive individuals. Furthermore, some molds produce toxic substances known as mycotoxins, but mold itself is not poisonous or toxic. The conditions under which some molds produce toxins are poorly understood, and the presence of mold, even a mold that is capable of producing toxins, does not always imply that toxins are being produced. Mold may not cause any health effects, or it may lead to symptoms in people, including adults and children, who are sensitive to molds.

It is not possible to predict the degree of severity of the health risks associated with mold in the home. Allergic individuals vary in their degree of susceptibility to mold, and the risk may also depend upon the extent and exact type of mold that is present.

33. **Dangerous vs. safe mold**

Mold has well-known associations with human disease. People can develop fungal infections of various types, *especially those with poorly functioning immune system.*

Fungi are also known to produce toxins, which have been blamed for causing various diseases. Molds can also cause severe immune reactions as a result of colonizing (living in, but not causing an actual infection) the lungs (hypersensitivity pneumonitis) and the sinuses.

Molds are also well known to cause various allergic diseases, such as allergic rhinitis and allergic asthma.

Most typical indoor air exposures to mold do not present a risk of adverse health effects. Molds can cause adverse effects by producing allergens (substances that can cause allergic reactions). Potential health concerns are important reasons to prevent mold growth and to remediate existing problem areas.

Molds can also cause asthma attacks in some individuals who are allergic to mold. In addition, exposure to mold can irritate the eyes, skin, nose and throat in certain individuals. Symptoms other than allergic and irritant types are not commonly reported as a result of inhaling mold in the indoor environment.

34. What measures can be used to decrease indoor mold levels?

[Section divider]

Environmental Protection Agency (EPA) guidelines state that “visible mold, mold damaged materials, and moldy odors should not be present” in a home.

35. Some common moisture sources are:

Indoors	Outdoors
<ul style="list-style-type: none"> • Humidifiers • Cooking and dishwashing • Bathing / Showering • Plumbing / Roof leaks • House plants • Firewood stored inside • Unvented clothes dryer/indoor clothes line • Improper venting of combustion appliances • Occupancy load 	<ul style="list-style-type: none"> • Flooding • Rain or snowmelt • Seasonal high humidity • Ground moisture • Wet building materials

▣ 35.1. Tips for preventing mold in the home

Keep indoor humidity low. When showering, dishwashing or cooking, increase ventilation by running a fan or opening a window. Use air conditioners and/or dehumidifiers when needed. When water leaks or spills, *act quickly*. If wet or damp areas are dried within 24-48 hours, in most cases mold will not grow. Cleaning more frequently will usually prevent mold from recurring, or at least keep mold to a minimum. Chlorine bleach is not recommended as a routine practice during mold cleanup; a background level of mold spores will remain. These spores will not grow if the moisture problem has been resolved. If you choose to use chlorine bleach, always ventilate the area and vent the exhaust to the outdoors. *Never mix chlorine bleach with other cleaning products that contain ammonia because toxic fumes could be produced.*

Please Note: Dead mold may still cause allergic reactions in some people, so it is not enough to simply kill the mold, it must also be removed.

Source of information: *A Brief Guide to Mold, Moisture, and Your Home* – U.S. Environmental Protection Agency (EPA 402-K-02-003)

▣ 37. Cleaning the mold usually involves eliminating moisture

The use of a, such as chlorine bleach (biocide) is not recommended as a routine practice during mold remediation, although there may be instances where professional judgment may indicate its use (for example, when immuno-compromised individuals are present). In most cases, it is not possible or desirable to sterilize an area, as a background level of mold spores comparable to the level in outside air will persist.

Biocides are toxic to animals and humans, as well as to mold. If you choose to use disinfectants or biocides, always ventilate the area, using outside air if possible, and exhaust the air to the outdoors.

When using fans, take care not to extend the zone of contamination by distributing mold spores to a previously unaffected area. **Never mix chlorine bleach solution with other cleaning solutions or detergents that contain ammonia because this may produce highly toxic vapors and create a hazard to workers.**

Do not use fungicides developed for outdoor use in any indoor application, as they can be extremely toxic to animals and humans in an enclosed environment.

When you use biocides as a disinfectant or a pesticide, or as a fungicide, you should use appropriate PPE, including respirators. Always, read and follow product label precautions. It is a violation of Federal (EPA) law to use a biocide in any manner inconsistent with its label direction.

□ 38. To find mold that might be growing in the home:

- Search for moisture in areas that have a damp or moldy smell, especially in basements, kitchens and bathrooms.
- Look for water stains or colored, fuzzy growth on and around ceilings, walls, floors, windowsills and pipes.
- If you smell a musty odor, search behind and underneath materials such as carpeting, furniture or stored items.
- Inspect kitchens, bathrooms and basements for standing water, water stains and patches of out-of-place color.

□ 39. What kind of mold do I have?

Once the mold is found, you ask yourself what kind it is. It is not necessary to know what kind it is. It is in the home. It is a health risk. It must be cleaned. **Treat all molds with suspicion.**

▣ 40. Poor reasons for testing

www.epa.gov

Doing mold testing well is often expensive. EPA, U.S.CDC and other similar agencies **do not** recommend mold testing in many cases, especially as the first response to an indoor air quality concern.

1. To find out if there is mold
2. To identify what type of mold is present
3. To learn if the mold is the toxic kind
4. To find the cause of health complaints
5. To determine if the environment is safe
6. To decide how to correct a mold problem
7. To make a party respond to the problem

Despite these limitations, there are situations where mold testing by skilled investigators may be valuable – for example, to “justify” remediation expenses or to document that cleanup has met expectations.

It is vital to realize that a test result only gives a “snap-shot” estimate for a single point in time and a single location – how well it represents other locations and times is uncertain since the amounts and types of mold in the environment is always changing.

▣ 41. Standards

Currently, there are no EPA or government regulations or standards that have been established (by OSHA, CDC, NIOSH, or EPA) for airborne concentrations of mold or mold spore levels in indoor environments. In other words, there are no standard *Permissible Exposure Limits (PELs)* for mold. Surface sampling may be useful to determine if an area has been adequately cleaned or remediated.

However, contrary to much currently popular opinion, mold testing is often not an appropriate or effective way to answer many of the questions that lead people to ask for it. In a great deal of the cases that come to the state attention, people seeking mold testing really need a thorough investigation into moisture problems and the damage it can cause – often times this is something they can do on their own.

Sampling for mold should be conducted by professionals who have specific experience in designing mold sampling protocols, sampling methods and interpreting results.

Commercial and laboratory standards

Mold spores are measured per cubic meter of air.

- 1 to 6499 = **Low**
- 6500 to 12999 = **Medium**
- 13000 to 49999 = **Heavy**
- Over 50000 = **Extremely Heavy**

Mold in the Workplace

The General Duty Clause of the OSH Act (the law that created OSHA) requires employers to provide workers with a safe workplace that does not have any known hazards that cause or are likely to cause death or serious injury.

OSHA has no standard for mold exposure

OSHA has no enforcement directive for mold exposure

Most Compliance Officers use 1910.22(a) (1) to require employer to clean up surface mold

42. Control the mold (Read from slide #42)

You Can Control Mold - What Measures Can Be Used to Decrease Indoor Mold Levels?

- Prevent outdoor molds from entering the home by keeping doors and windows closed and using air conditioning equipped with allergen-grade air filters

- Control indoor moisture with the use of dehumidifiers
- Fix water leaks in bathrooms, kitchens and basements
- Ensure adequate ventilation of moist areas
- Clean (or replace) contaminated surfaces with diluted a chlorine bleach solution (one part household bleach in 10 parts water), while using proper protective gear (mask and goggles)
- Utilize HEPA-filters on vacuums or as a stand-alone air filter
- Limit indoor houseplants, and ensure those that are present are free of mold on leaves and in potting soil

43. **Cleaning Mold**

Mold cleanup procedures are somewhat dependent upon the extent of contamination and the type of surface that has been contaminated. Large areas of mold may require the services of a professional contractor skilled in mold removal and remediation. Hard surfaces that harbor mold may be scrubbed with detergent and water, and these should be dried completely. Porous or absorbent materials (such as cloth, ceiling tiles, carpets, etc.) may have to be discarded if they become moldy.

Area mold is dispersed? Small it is okay to clean it. But, if it is larger than 10 sq. ft. you may also need a trained contractor to clean extensive areas of mold.

Level I: Small Isolated Areas (10 sq. ft. or less) - e.g., ceiling tiles, small areas on walls.

Level II: Mid-Sized Isolated Areas (10 - 30 sq. ft.) - e.g., individual wallboard panels.

Level III: Large Isolated Areas (30 - 100 square feet) - e.g., several wallboard panels.

Level IV: Extensive Contamination (greater than 100 contiguous square feet in an area).

❑ 44. Household bleach is ineffective.

Chlorine bleach causes long term breakdown of wood products like studs, sheathing, plywood, OSB (Oriented strand board) and other building materials over time. [OSB is an engineered wood particle board formed by adding adhesives and then compressing layers of wood strands (flakes) in specific orientations.]

BLEACH IS A STRONG OXIDIZING AGENT THAT CAN CORRODE, ETCH OR DISCOLOR SOME MATERIALS. IF HARM TO SURFACES IS ANTICIPATED, OTHER DISINFECTANTS MAY BE USED AS SUBSTITUTES.

If you choose to use bleach to clean up mold: Never mix bleach with ammonia or other household cleaners. Mixing bleach with ammonia or other cleaning products will produce dangerous, toxic fumes.

- Open windows and doors to provide fresh air.
- Wear non-porous gloves and protective eye wear.
- Always follow the manufacturer's instructions when using bleach or any other cleaning product.

A suggested bleach solution for initial use is a 20:1 or a 10:1 dilution of standard household bleach with water. A 20:1 dilution (1 part bleach to 20 parts water) yields about a 5% bleach solution. A 10:1 dilution (1 part bleach to 10 parts water) will yield about a 10% bleach solution.

❑ 44.1. Does bleach kill mold?

Mold's hyphae (root structures) actually grow into wood and drywall like roots. The hyphae are not killed by bleach because bleach's ion structure prevents chlorine from penetrating into porous materials such as dry wall and wood. It stays on the outside surface, whereas mold has

protected enzyme roots growing inside the porous construction materials. When you spray porous surface molds with bleach, the water part of the solution soaks into the wood while the bleach chemical sits atop the surface, gasses off, and thus only partially kills the surface layer of mold while the water penetration of the building materials fosters further mold growth.

If you choose to use bleach to clean up mold:

- Never mix bleach with ammonia or other household cleaners. Mixing bleach with ammonia or other cleaning products will produce dangerous, toxic fumes.
- Open windows and doors to provide fresh air.
- Wear non-porous gloves and protective eye wear.

If the area to be cleaned is more than 10 square feet, consult the U.S. Environmental Protection Agency (EPA) guide titled *Mold Remediation in Schools and Commercial Buildings*. Although focused on schools and commercial buildings, this document also applies to other building types. You can get it by going to the EPA web site at

http://www.epa.gov/mold/mold_remediation.html.

Always follow the manufacturer's instructions when using bleach or any other cleaning product.

Here is an example of why bleach does not kill mold: Have you ever used bleach or products like Tilex® to clean mold or mildew out of grout in a tiled shower? If so, you would notice that it does a great job getting the "mold stains" off the grout, however 1-2 weeks later, the mold is back again....Why? The ionic structure of bleach does not allow it to get to the roots and kill the mold and mildew. The mold is just being "bleached out" and the roots remain intact; thereby allowing the mold to return 1-2 weeks later, stronger than ever.

▣ 45. PPE Safety

- Eye protection
- Hand protection
- Foot protection
- Disposable coverall
 - Tyvek
- Respiratory protection

▣ 46. Additional clean-up resources

- [Indoor Air - Molds and Moisture, U.S. Environmental Protection Agency](http://www2.epa.gov/indoor-air-quality-iaq)
<http://www2.epa.gov/indoor-air-quality-iaq>
- [Guidelines on Assessment and Remediation of Fungi in Indoor Environments, New York City Department of Health & Mental Hygiene](http://www.nyc.gov/html/doh/html/environmental/moldrpt1.shtml)
<http://www.nyc.gov/html/doh/html/environmental/moldrpt1.shtml>
- [Centers for Disease Control and Prevention - National Center for Environmental Health](http://www.cdc.gov/mold/default.htm)
<http://www.cdc.gov/mold/default.htm>
- [New York City Department of Health & Mental Hygiene - Facts about Mold](http://www.nyc.gov/html/doh/html/environmental/mold.shtml)
<http://www.nyc.gov/html/doh/html/environmental/mold.shtml>
- [New York State Department of Labor](http://www.labor.ny.gov/home/) <http://www.labor.ny.gov/home/>

Mold Remediation in Schools and Commercial Buildings.

If the area to be cleaned is more than 10 square feet, consult the U.S. Environmental Protection Agency (EPA) guide titled *Mold Remediation in Schools and Commercial Buildings*.

Although focused on schools and commercial buildings, this document also applies to other building types. You can get it by going to the EPA web site at http://www.epa.gov/mold/mold_remediation.html.

▣ 47. **Investigating the mold complaint** (Section divider)

Caveat: This presentation does not provide comprehensive guidance on remediation of severe mold contamination.

▣ 48. **Respond – Investigate**

The main objective of any mold investigation should be to locate sites of indoor mold growth in order to determine how to best control the underlying moisture problem and remove the contamination. The best way to identify a mold problem is to conduct a visual inspection and moisture investigation to identify the moisture sources.

Investigating hidden mold can be difficult and may require a professional with experience investigating water and mold-damaged buildings. There is no need to test the mold or air quality.

Instead, careful detailed visual inspection and recognition of moldy odors should be used to find problems needing correction. Efforts should focus on areas where there are signs of liquid moisture or water vapor (humidity) or where moisture problems are suspected.

The investigation goals should be to locate indoor mold growth to determine how to correct the moisture problem and remove contamination safely and effectively.

According to the U.S. Environmental Protection Association (EPA), if visible mold is present on inspection, testing is usually unnecessary. Likewise, the CDC does not recommend routine sampling and testing of mold in the home. Tolerable or acceptable limits of mold exposure for

Respond - Investigate	
<p>Responding to mold Calls</p> <ul style="list-style-type: none"> • Ask landlord or tenant about possible sources of water or moisture • Perform building investigation first - not air sampling • Document the mold, water or moisture damage if found <ul style="list-style-type: none"> – Primary role is to identify environmental conditions – water or excessive moisture in the residence 	<p>Investigating –primary strategy</p> <ul style="list-style-type: none"> • Use eyes and nose to identify a mold problem <ul style="list-style-type: none"> • If you see it and smell it - it's mold • Find the source of water or moisture - sight, touch <ul style="list-style-type: none"> • Evidence of water or moisture damage in the absence of visible mold is unlawful • May require increasingly invasive building investigation methods <ul style="list-style-type: none"> • Best left to the building owner or representative

humans have not been defined, and since individuals vary in their susceptibility to mold, testing cannot reliably predict the degree of health risks from any occurrence of mold.

48.1. Landlord and Tenant

The landlord has a responsibility to ensure proper living conditions for his tenants, which includes having premises free from any kind of mold contamination. If the tenants have discovered any mold in their rented premises, then it is the duty of the landlord to get the mold removed and pay for any such removal. Landlords, who fail to make their property free from mold contamination, can be sued by their tenants.

49. Objectives

1. When inspecting a home, keep in mind that moisture may not originate from the same room.
2. The source may be located elsewhere inside or outside a home. As you inspect each room, use the checklists provided.

WATER IS THE PROBLEM, MOLD IS THE SYMPTOM

50. NIOSH – Dampness & Mold Assessment Form

Local Health Officer Dampness & Mold Assessment Form - Residential (One sheet per room)
 This form is adapted from the NIOSH Dampness & Mold Assessment Form Revised May 2003.

Date: _____ Observer: _____ Apartment: _____ Room: _____ Room: _____ Apt Number: _____

Room Type: Fill in the bubble for the type of room you are assessing.
 Bathroom # _____ Basement Bedroom # _____ Closets Entrance area
 Hallway Kitchen Stairwell Storage

Mold Odor: Be sure to smell for mold odor when you first walk into the room / area. Fill in the appropriate bubble.
 0 - None 1 - Mild 2 - Moderate 3 - Heavy Source of Mold Odor? _____ Source Unknown

Fill in bubbles NA

For each column Androw.	Mark "X"	Damage or Stains			Visible			Wet or Damp			Row Totals	Notes			
		0	1	2	3	0	1	2	3	0			1	2	3
Ceiling		<input type="checkbox"/>													
Walls		<input type="checkbox"/>													
Windows		<input type="checkbox"/>													
Floors		<input type="checkbox"/>													
Pipes		<input type="checkbox"/>													
Furniture		<input type="checkbox"/>													
Other _____		<input type="checkbox"/>													
Column Totals															
Column Averages															

Size based scores → 0 = None
 1 = Size of this form or smaller
 2 = Larger than this form, smaller than a standard interior door
 3 = Larger than the size of a standard interior door

50

51. Objectives (cont'd)

- The use of **personal protective equipment** (PPE) should be considered during a mold investigation.
- The primary function of PPE is to avoid inhaling mold and mold spores and to avoid mold contact with the skin and eyes.

Exposure to mold has increased along with public awareness that exposure to mold can cause a variety of adverse health effects.

The health officer and the code enforcement officer should serve as a local resource for indoor air quality information regarding building dampness and indoor mold.

You may conduct site visit and make recommendations to remediate the problem.

52. How will I know when the mold problem is fixed

A mold problem is fixed when:

- All the mold has been removed.
- Any remaining damp material has been dried out or replaced.

The problem which led to the moisture accumulation is understood and fixed

53. Your role and the law

Landlord has a duty to fix the problem. The landlord cannot require the tenant to clean the mold. It is not the tenant's responsibility. If the landlord says that the tenant caused it because of long showers, cooking too much. Look carefully at the dwelling so as to determine the cause or source of the moisture.

Other sources such as U.S. CDC, EPA, HUD or NIOSH

▣ 54. **Mold and Maine law**

Although Maine does not have a specific statute on mold, you may rely on the principles of common law and similar statutes or ordinances.

Some common law claims in mold cases are - *breach of the implied warranty of habitability, breach of the implied warranty to construct and/or repair in a good and workmanlike manner and nuisance, and fraudulent concealment.*

Federal statutes govern federal government construction and subsidized housing projects (Housing Authority). Such statutes are incorporated into the federal government contract, or rental lease. (HUD)

HOWEVER,

▣ 55. **Statutory support**

- ***Implied warranty of habitability - Title 14 M.R.S.A. §6021***
- ***Dangerous building - Title 17 M.R.S.A. §2851***
- ***Health and safety laws (Hazard/Risk)***
- ***Common nuisances - Title 22 M.R.S.A. §2741***
- ***Nuisance (abatement) - Title 22 M.R.S.A. §2853,***
- ***Emits odors, smells - Title 17 M.R.S.A §2802***
- ***Place/building becomes offensive - Title 17 M.R.S.A §2853***
- ***Duties of the Landlord - Title 14 M.R.S.A. §6021-A(2)(D)***

55.1. Uninhabitable Conditions

1. Warranty of Habitability in Maine

- Maine requires landlords renting space to tenants to provide a reasonably safe and healthy living environment. Landlords have a duty to provide housing free of toxic mold and vermin and must maintain electrical and plumbing systems. Landlords must ensure tenants live in units with adequate heat that are without sewage problems and lead-based paint.

Implied warranty of habitability - Title 14 M.R.S.A. §6021

- Maine law gives tenants an "implied warranty of habitability."
- A warranty of habitability implies that the landlord must provide a structurally sound residence with suitable drinking water, locks on the doors and other common housing necessities.
- The warranty imposes a duty on the tenant to pay rent.
- This warranty is usually coupled with rules prohibiting landlords from retaliating against tenants who complain about housing code violations.
- It is an implied promise, imposed by the law and may specifically agreed to by the parties
- The premises will be suitable for habitation in a safe and sanitary manner.
- A warranty of habitability is **implied** in a lease
- Basic, important items such as a roof that keeps out rain and snow, hot water, heat, and sturdy floors and walls that aren't in danger of imminent collapse.
- Absence of significant danger from lead, asbestos and most recently...mold.

2. Repairs

- Maine's implied warranty of habitability law requires landlords to repair unsafe heating supplies, fix broken windows, repair leaking ceilings and exterminate apartments when there is a roach infestation. Landlords must provide tenants with plumbing capable of providing drinkable water.

Example using §6026. Dangerous conditions requiring minor repairs

Citation	Maine Rev. Stats Title 14 M.R.S.A. §6021
Highlights	The statute provides that every landlord warrants that the premises he is renting is fit for human habitation. Any condition on the premises that endangers or materially impairs the health or safety of the tenants breaches the warranty, provided it was not caused by the tenant or anyone under his control, the landlord was promptly notified of it, and the landlord did not promptly correct the condition.
Remedy for breach	The tenant may sue to landlord to have the repair made, to reduce the rent for the period of time the condition existed, and for other damages and remedies.
Publication	<u>Rights of Tenants in Maine</u>

▣ 56. U.S. Center for Disease Control and Prevention – Q & A

▣ 57. Where can I find out more about mold?

National Institute of Environmental Health Sciences <http://www.niehs.nih.gov/>

U.S. Department of Agriculture

<http://www.usda.gov/wps/portal/usda/usdahome>

U.S. Environmental Protection Agency <http://www.epa.gov/>

U.S. Food and Drug Administration <http://www.fda.gov/>