MOLD PREVENTION FOR ALL

Largely excerpts from

MOLD MATTERS - *Solutions and Prevention*

by

Charles and Danielle Dobbs,
Mold Detection Experts,
Instructors and Lecturers
Most unwanted!

Stachybotrys, the so-called toxic “Black Mold”
seen under a microscope.
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Mold is a serious matter and it brings misery to many people with regards to health and buildings. The title of our book was chosen for a very good reason because mold concerns everyone and everyone should practice mold prevention.

Controlling mold has nothing magical or mysterious about it because it can be controlled with common sense measures. Having said that mold can be controlled, we must also acknowledge and recognize that sometimes certain events happen that are totally beyond our control - even while following all the mold prevention measures listed in this book. But, at the very least, the extent of mold will be minimized - that we can promise!

Mold is a result of water intrusion, leaks, or high humidity. Thus, if we control water and moisture, we control mold. That is pretty simple, isn’t it? This small paragraph is the object of this entire e-book - controlling water and moisture.

There are many things that you, as a home or building owner, can do to prevent mold and water related damage. But, unless you implement these preventive measures you will have a mold problem at some point in time.

Prevention is just like brushing teeth - it’s a question of developing and keeping good healthy habits. It’s all about spotting red flags and correcting potential problems before they develop. Knowing what to do is not enough; you must take action.

This book is for everyone concerned about protecting health and building structures. The red flags and prevention tips outlined in this book apply equally to homeowners, to schools, and large corporations. Instead of having a 2,000 sq. ft. home, it may be a 20,000 or 200,000 sq. ft. building,
but the principles are the same - keep water out and control the humidity within.

The first two chapters will give you an understanding of mold, and why this four-letter word needs to be taken seriously.

Mold prevention is for everyone - home and building owners, large corporations, hotels, and government buildings, including schools, must practice prevention. You and your family won't get sick from mold, tenants won't sue you, your employees will not report you to OSHA, and parents won't sue the school board. We are sure you now see the many fringe benefits of MOLD PREVENTIÓN FOR ALL.

DISCLAIMER - For illustrative purposes, the authors have included many pictures, diagrams, and flowcharts to heighten understanding or to clarify a point. Pictures of equipment and instruments are not intended to imply the recommendation or endorsement of companies or manufacturers. Unless quoted or referenced, the comments and recommendations expressed in this book represent the opinions of the authors.
ALL ABOUT MOLD
WHAT IS MOLD?

Mold matters are not simple and what you don’t know can hurt you. All buildings are subject to developing mold at some point. Learning about mold will help you understand the conditions that lead to the problem and how to prevent it in the future. It will also help you understand why a three-step process in mold removal is necessary: 1) the mold assessment phase when the problem is being qualified and quantified, 2) the mold remediation phase when the problem is being fixed, and finally 3) the post-remediation phase which insures that the mold remediation has been carried out properly.

Mold, known scientifically as fungus, is a microscopic living organism and you might be surprised to learn it is not always bad. In fact, mold is highly beneficial to the environment. Its purpose in life is to help in the decomposition of dead organic material, and it has done so for millions of years. One of the earliest recorded references to mold remediation is found in the Bible, Leviticus 14:33-53, “Cleansing From Mildew”. At that time, priests had a major role in overseeing the treatment of a contaminated house. With the advent of science we have been able to analyze mold in order to understand its composition, structure, and habits, but research is still in its infancy with regards to the effects of mold on human health.

Mold spores are found everywhere – outdoors, inside homes and buildings, on our clothes, our hair, and on everything we touch. Fortunately, this is a normal occurrence and is simply part of living on earth. If mold disappeared tomorrow we would literally be living on a trash heap and all life on earth would become extinct in a matter of months.

Mold becomes a problem when it is growing inside homes or buildings. There are common molds found everywhere in nature, such as Penicillium, Aspergillus, Cladosporium,
and Basidiomycetes, and there are molds that are rarely found outdoors, such as Stachybotrys. When common molds are found growing indoors in large quantities it can affect our health just as much as low levels of highly toxic mold. We must think of mold as being potentially toxic because mycotoxins have also been found in common mold. The levels of toxicity differ from one species to the next and the effect on human health varies according to the particular make-up of the individual.

Mold is highly resilient and has learned to adapt and thrive in many different climates. It can be found all over the globe, even in the harshest of environments, such as Antarctica. It has also been found in outer space. In 1988 it was discovered aboard the space station Mir and was later identified by Natalia Novikova, a microbiologist, from the Microbial Laboratory of the Russian government’s Institute for Biomedical Problems. The fungi were from the genera Aspergillus, Penicillium, and Cladosporium.1

The scientific name for mold is fungi (singular: fungus). The classification is broken down further into genera (singular: genus). These are then classified further into species. All living things can be classified into seven kingdoms with fungi being number five:
- Protomonera
- Monera
- Protista
- Myxomycophyta
- Fungi
- Plantae
- Animalia

Fungus is both friend and foe. It fills a vital ecological niche, but when growing in a home or building it can compromise building materials and cause serious health problems.

In our everyday lives we benefit from its presence in our wine, our cheese, in our medicines, and in many commercial applications. Certain fungi provide us with
penicillin and other antibiotics, and we eat other fungi, such as mushrooms and truffles. The yeast found in dough causes bread to rise and gives it a light texture, and the bubbles in champagne and beer give us something to cheer about.

Mold can also destroy precious artifacts from antiquity. Recently, forty varieties of mold have been identified eating away the 2,200-year-old army of terra cotta Chinese warriors found in the tomb of Qin Shihuang, the first emperor of China. A Belgian company has been commissioned to eradicate mold from 1,400 of the 8,000 life-sized statues of soldiers and horses.\(^2\)
There are between 1.3 and 3 million species of mold. With that many, mold comes in all colors of the rainbow. Some molds can even change color based upon what they are feeding upon at the time.

DIFFERENT FACES OF MOLD

- Pink and orange
- Grey and black
- Green
- Brown
- Mosaic
- Circular patches
- Like a rose
- Lace
- Galaxies
LIFE CYCLE OF MOLD

1. Moist food source
   Spore lands on a moist surface
   Enzymes use surface moisture to dissolve food

2. Spore germinates, producing filaments (hyphae)
   Hyphae extend both reach and area of absorptive surface. Fungal metabolism generates more surface moisture to accelerate growth.

3. Hyphae grow thickly, digging into the surface and forming a protective mat (mycelium) that keeps the surface moist even if surrounding air is dry.

4. The mold grows conidia, which generate and release spores to the air.

Source: ASHRAE 2001
Humidity Control Design Guide
To understand the physical structure of mold, a simple analogy with a dandelion can be made. Generally, a dandelion has a root structure, a stalk, and a seed releasing body at its top. Similarly, mold has a stalk-like structure with a spore-releasing body at the end. Mold even has root-like structures, although they act more as a digestive lattice than the benign roots of a dandelion. As wind blows across a dandelion, it releases its seeds to propagate itself; so too with mold. The least disturbance will cause the release of spores into the air. Some molds do not even need a breeze, and the spores simply fall around the main structure. This explains why mold often appears as small spots, or as a sort of ring. Other molds do not aerosolize easily and require active disturbance for spores to become airborne.

When spores floating in the air land in a suitable environment, they start to germinate, much like the seeds of a dandelion. The root-like structures of mold, called hyphae, then emerge. They anchor themselves into the substrate and start secreting enzymes to help it rot so that it can be absorbed. This cycle then repeats, ad infinitum.

Some people refer to mold as “mildew”, but it is not the same thing. According to the Dictionary of Fungi (9th edition): mildew is a plant disease in which the pathogen is seen as a growth on the surface of the host. There are at least two kinds of plant pathogens, powdery mildews and downy mildews. These are common plant disease names given to distinct group of fungi. According to Dr. Payam Fallah of the Environmental Microbiology Laboratories in San Diego, “Mildews are considered plant pathogens and such terms should not be used in indoor air issues as they potentially confuse certain issues relating to microbial activities in indoor environment.” As of this writing mold, with its spores and possible mycotoxins production, can directly affect human health, while mildew is a plant disease, which has no effect on human health.
WHAT ARE THE CONDITIONS FOR MOLD GROWTH?

Spores need three things in order to grow: food, a surface to grow on, and water. When conditions are right, mold can start to grow and propagate in as little as 24 to 48 hours.

Of these three things, water is the only one we can control. For better or for worse, buildings will continue to be made from organic material: wood studs, pressboard, drywall, and many other common building materials that provide a food source for mold. Once water has been allowed to infiltrate into the home or building, time is the crucial element. The faster repairs are made, and the faster drying is implemented, the less likely that mold will gain a foothold.

The source of moisture can sometimes be difficult to locate, but there are a few common places to look. The air conditioning system is a common hiding place for mold colonies; check the air handler coils on a regular basis for any sign of mold growth. Take a look at the drain pan and condensate line to make sure they drain efficiently. The air conditioning system may not be functioning efficiently, causing the humidity in the building to be high enough for mold to grow. If this is the case, a supplemental stand-alone dehumidifier should be considered. Conversely, if the air conditioning is working too efficiently, a residence or building may be cool and moist, as a result of the system not running long enough to remove the humidity from the air. If a large home requires more than one air conditioning unit, care should be taken to ensure that the thermostats do not interfere with each other. If this happens, it can cause one air conditioning unit to switch off prematurely and mold may grow in one part of the house because of the elevated humidity. The humidity generated when you take a bath or shower makes it essential to turn on the bathroom exhaust fan or open a window; otherwise mold can start growing on the walls and ceiling. See the section on MOLD.
PREVENTION - Tips on controlling moisture and water intrusion.

The relative humidity (RH) of the air is critical for mold. The total amount of moisture air can hold depends on the temperature of the air. Warmer air can hold a greater amount of moisture than colder air. The RH is based on two factors - the amount of moisture in the air and the temperature. The RH is defined as the ratio of the amount of water vapor in the air at a specific temperature to the maximum amount that the air can hold at that temperature, expressed as a percentage. At an RH of 100%, dew point is reached when moisture condenses on surfaces cooler than the surrounding air. The extent of fungal contamination is related to the indoor relative humidity. Below 30% relative humidity very little mold growth occurs, while at 70% conditions are optimum for mold growth. High humidity allows moisture to condense on cool surfaces, such as windows and sills. Moisture can also seep through walls, ceilings, basements, and concrete slabs.  

Pipe leaks are also notorious culprits leading to mold growth. Once a month, check under sinks, behind toilets, refrigerators, next to the water heater, etc. for any possible leaks. Copper pipes in older homes can develop pinhole leaks and with time these small leaks can cause tremendous damage. Be aware of the risk, and think about re-piping the house before problems occur. Grout and caulking around the showers and bathtubs should also be checked on a regular basis. Re-grouting is simpler than you think, and many hardware stores offer do-it-yourself classes. The worst kind of leak is an undiscovered one. See the section on MOLD PREVENTION.

Water intrusion from the outside is the next most likely source of moisture for mold. Missing roof shingles, cracks and breaks in walls, leaky windows, sprinklers less than two feet away from the outside wall, blocked gutters, vines, and poor drainage are all common culprits for water intrusion. Walk around the outside of your home, and check your attic.
at least three times a year to keep an eye out for any of these potential problems. The fixes are simple enough; a leaky roof warrants an inspection from a consultant. Likewise, get leaky doors and windows repaired. Sprinklers too close to the house should be moved away from the building or sprinkler splash guards can be purchased at most hardware stores. Gutters are often forgotten, causing rotting debris and, eventually, leaks into the building. Although the look is beautiful, decorative vines on the outside wall will cause façade deterioration and fine cracks will give water a conduit to the inside.

Seasonal allergies caused by mold can be a sign of a larger problem, such as mold growing inside the air conditioning duct system. When weather forces the change from air conditioning to heat, the dry, warm air coursing through ductwork can dry out condensation, and therefore mold. When the source of moisture stops, some species will release more spores into the air. If your allergies hit a peak around that time of year, it could mean mold is growing in the ductwork.
HOW MOLD AFFECTS HEALTH

Mold can be classified into three broad types as far as health effects are concerned. The first category is allergenic molds, which cause allergic or asthmatic reactions, but do not usually cause permanent health effects in most healthy, active people. There are pathogenic molds, which can cause serious health problems in those who are more susceptible. And finally, there are toxic molds that can cause serious health problems in everybody. The severity of these problems differs depending on age, immune system, and sensitivity. Children, the elderly, and people with depressed immune systems due to cancer, organ transplants, or AIDS, can become very sick when exposed to higher than normal levels of mold. Even some healthy individuals happen to be very sensitive to mold and are unable to tolerate a slight elevation of mold spores.

Most reactions to mold are due to inhaling spores that are floating in the air. Dr. Burge warns that nonviable (dead) spores retain their allergenic properties.5

The health effects of mold are varied, from mold growing on you, such as simple athlete's foot, to far more serious infections, such as Aspergillosis, which is caused by Aspergillus mold growing inside the body. Aspergillosis is a non-contagious disease of the genus Aspergillus that affects humans and pets equally, particularly in immunocompromised hosts. The infection starts with fungal inhalation and is then dispersed to tissues and organs. The disease can affect the eyes, nose, heart, lungs, intestines, kidneys, and more.

In recent years, so called “mold dogs” have been in the news as celebrity and novelty. Their job is to sniff and locate mold, and thus they are being exposed to mold on a daily basis. What people may not know is that long nose dogs are at relatively high risk of developing Aspergillus
sinusitis or nasal Aspergillosis.\textsuperscript{6} We personally have heard of two mold remediators who had to put their dogs to sleep after two years because both developed nose cancer.

Contaminated food can also affect animals. As recently as December 31, 2005, the Associated Press reported that a prominent pet food company had to recall 19 varieties of dog and cat food because some of the food had been contaminated by \textit{Aflatoxin}, a chemical produced by mold. Twenty-three animal deaths have been linked to the contaminated pet food.

A 1994 Harvard study of 10,000 homes found that half had “conditions of water damage and mold associated with a 50 to 100\% increase in respiratory symptoms”\textsuperscript{7}.

The condition called St. Anthony's Fire, which killed thousands of people during the Middle Ages and in the ancient world, is caused by \textit{ergotism}, or the eating of bread made with grain contaminated with the \textit{ergot fungus}. St. Anthony’s Fire is a gruesome disease characterized by rotting flesh, hallucinations, convulsions, and dry gangrene. People once believed that by making supplications and pilgrimages to St. Anthony and his shrine, a cure could be granted. Interestingly enough, these actions often worked because the pilgrims, traveling from place to place, would cease ingestion of the contaminated bread.\textsuperscript{8}

The fungus \textit{Phytophthora infestans} caused the Irish potato famine of the 1840s. The famine caused a million people to die from disease or starvation. The impact of mold on crops is staggering; it is said that over one third of all worldwide crop losses are caused by fungal disease.\textsuperscript{9}

During the Second World War, as well as for some years after, a condition named \textit{Alimentary Toxic Aleukia} struck a large percentage of the Siberian populace. The hemorrhaging, low leukocyte count, and high fatality rate were caused by mold. The war had caused a manpower shortage, which in turn resulted in the grain being harvested in the spring
instead of the fall. The grain had moldered in the fields and had become extremely toxic when eaten.³⁹

An unusually high incidence of esophageal cancer among the Xhosa people in Africa seems to be linked to the native beer of their diet. This drink is commonly made with grain contaminated with the fungus *Fusarium moniliforme*.³⁹

Even in our modern day, mold still causes problems in both livestock and crops. In 1960 the death of more than 100,000 turkeys in England, and the subsequent investigation, brought about the discovery of *Aflatoxin* on peanuts used as animal feed. *Aflatoxin*, caused by the common mold *Aspergillus flavus*, was found to have alarmingly potent carcinogenic properties and, as a result, limits of contamination were immediately implemented. Mold continues to harm livestock, causing “Hole in the Head” disease in horses, facial eczema and lupinosis in sheep, and “Grass Staggers” in cattle to name just a few.³⁹

The Mayo Clinic, a renowned research institution has pioneered several studies on chronic sinusitis to determine whether mold spore exposure and inhalation played a part in the disease. A research project conducted in 1999 indicated a link between chronic sinusitis infections and fungus (mold) in 93% of the subjects.¹⁰

Dr. Harriet Burge from The Environmental Microbiology Laboratory has found that different fungi have different temperature requirements for optimal growth. She states:

> In tropical and subtropical places where both heat and moisture are present . . . incidence of fungal infections (including sinus infections) tends to be higher in these areas in part because the fungi that can withstand human body temperatures are more abundant than in temperate climates.

According to a recent survey by the National Center for Health Statistics 14.1% of the U.S. population suffers from
chronic rhinosinusitis. This means that 1 in 7 people suffer from the disease.\textsuperscript{11}

In 2005 researchers from the Mayo Clinic found that fungi plays a large role in chronic rhinosinusitis. In fact, the findings indicates that chronic rhinosinusitis is a result of a fungal driven inflammation rather than a bacterial infection.\textsuperscript{12}

Indoor air quality problems in schools affect both students and teachers. The following statistics were published on February 2, 2005 by the IEQ Review:

- One in five schools in America has indoor air quality problems.
- Asthma accounts for 14 million missed school days each year.
- The rate of asthma in young children has risen by 160 percent in the past 15 years.
- 1 out of every 13 school-age children has asthma.\textsuperscript{13}

The Center for Indoor Environments and Health at the University of Connecticut states “the most common types of illnesses directly related to mold are type I responses of allergic rhinitis and asthma.” They go on to say “… allergic inflammation can trigger bronchospasm, chest tightness, and shortness of breath, leading to either new onset of asthma or asthma exacerbation in sensitized individuals.”\textsuperscript{14}

Poor maintenance in schools and lack of money are often cited as excuses for mold problems, but little is done about it. This does not only pertain to public schools; some private schools are just as bad. Many university dorms, regardless of school prestige, are in poor condition and some harbor mold. Students accept these conditions as status quo and fail to complain. This situation does not have to be. If money can be found to modernize a gym and re-sod the school lawn, money can be found to maintain buildings properly. Air quality should be a priority of any institution, and parents and teachers should demand it.
Many apartment buildings have mold problems and maintenance personnel know little or nothing about mold. Their lack of knowledge can sometimes cause them to wipe and paint over a contaminated area in hopes that the problem will go away. Predictably within a few months mold will reappear. This is because the hyphae (the root system) are still embedded in the wall. Unless the source of moisture is corrected and the contaminated area physically removed, mold will continue to grow.

Sometimes, people are not aware that a mold problem exists in their home or workplace, and when they develop allergy-like symptoms they seek the help of an allergist. If medical tests are negative or inconclusive, allergy specialists should recommend having the home or workplace tested for mold. If the levels of mold spores are elevated, the problem can be found and fixed, and with luck the person will regain his or her health without suffering permanent damage.

With regard to toxic mold, the United States Environmental Protection Agency (EPA) states:

Molds can produce toxic substances called mycotoxins. Some mycotoxins cling to the surface of mold spores; others may be found within spores. More than 200 mycotoxins have been identified from common molds, and many more remain to be identified. Some of the molds that are known to produce mycotoxins are commonly found in moisture-damaged buildings. Exposure pathways for mycotoxins can include inhalation, ingestion, or skin contact. Although some mycotoxins are well known to affect humans and have been shown to be responsible for human health effects, for many mycotoxins, little information is available.

Aflatoxin B1 is perhaps the most well-known and studied mycotoxin. It can be produced by the molds Aspergillus flavus and Aspergillus parasiticus and is
one of the most potent carcinogens known. Ingestion of aflatoxin B1 can cause liver cancer. There is also some evidence that inhalation of aflatoxin B1 can cause lung cancer. Aflatoxin B1 has been found on contaminated grains, peanuts, and other human and animal foodstuffs. However, Aspergillus flavus and Aspergillus parasiticus are not commonly found on building materials or in indoor environments.

Much of the information on the human health effects of inhalation exposure to mycotoxins comes from studies done in the workplace and some case studies or case reports. Many symptoms and human health effects attributed to inhalation of mycotoxins have been reported including: mucous membrane irritation, skin rash, nausea, immune system suppression, acute or chronic liver damage, acute or chronic central nervous system damage, endocrine effects, and cancer. More studies are needed to get a clear picture of the health effects related to most mycotoxins. However, it is clearly prudent to avoid exposure to molds and mycotoxins.

Some molds can produce several toxins, and some molds produce mycotoxins only under certain environmental conditions. The presence of mold in a building does not necessarily mean that mycotoxins are present or that they are present in large quantities.

The Internet has a wealth of information on the subject of mold. One can find cases in which mold has caused irreversible and permanent damage in humans and pets. If you have concerns or questions relating to your health, do not try to diagnose your health problems with information found on the Internet or information contained in this book - see your doctor. If you want to ascertain whether a mold problem exists in your home, get it tested by a professional mold inspector.
HOW MOLD AFFECTS BUILDING STRUCTURES

We should not be surprised to learn that mold destroys building structures since its purpose in life is to break down organic material. Yet, we tend to build with organic materials. With time we learn from Mother Nature and we improve building codes when certain building practices prove to be contrary to the laws of nature.

The increase in incidence of mold contamination in recent times can be attributed in great part to energy conservation measures. This has made our homes much tighter than they used to be. In so doing, natural ventilation has been cut down, which would otherwise help dry water infiltration, condensation, or leaks when they happen. Other factors contributing to mold are cheaper building materials, poor workmanship, leaving building materials on job sites unprotected from rain, and cutting down on time allowed to cure materials. All this and more has contributed to making homes and buildings more susceptible to mold.

When mold attacks solid pieces of wood, it takes longer to deteriorate, because its cells are not fractured. Pressboard, on the other hand, has fractured cells and cellulose-based glues (sugar). This means that the rate of decomposition in pressboard is much higher than in solid wood and the glues used are candy for mold.
Impermeable materials, such as vinyl wallpaper can also lead to mold problems. Condensation can form on the back of the vinyl because of temperature differences between the inside and outside air. Where there is water and food (condensation and wallpaper glue), mold can settle in.

There are two areas in a home especially prone to mold – bathrooms and closets. The high humidity caused by daily baths and showers, coupled with skin cells and body oils (mold food) makes a perfect environment for mold to grow. Mold will settle in and deteriorate grout, caulking, paint, and sheetrock. The high humidity in closets is usually due to poor ventilation, or being too cold.

Any plumbing system has a potential for leaks. Think for a moment what we do to shower and bathtub plumbing – we enclose the pipes inside walls and forget about them. This means that if a leak occurs it will not be detected immediately. Over time building materials will deteriorate and mold will grow. Homeowners having closets backing up to shower stalls should consider themselves lucky rather than having the plumbing backing up to the outside wall. Neither condition is ideal, but the former is somewhat better than the latter. Leaks are more easily detected and repaired through a closet wall. On the other hand, if the plumbing backs up to an outside wall, there is no way to fix anything without tearing down the entire shower. Architects should never design a bathtub or shower backing up to an outside wall. A means of accessing the plumbing should always be in the design plan. See MOLD PREVENTION.

There are some exterior finish systems that do not allow water to drain, such as EIFS, or Exterior Insulating Finishing Systems. This can be bad news. In an ideal, perfect, and controlled environment, EIFS works great. But, our world is not perfect, nor controlled. Water comes through the faux stucco and has nowhere to go. The result is wood rot and mold. To check whether an exterior finish is EIFS, do a “tap” test. Tap on the outside of the exterior wall, and if it
sounds hollow, you may have EIFS. Some new exterior finishing systems are being improved to allow for drainage.

There are three main strategies to minimize the risk of moisture damage, says Dr. Lstiburek:

1. Control of moisture entry
2. Control of moisture accumulation

This is easier said than done. Dr. Lstiburek summarizes the problem as follow:

Strategies effective in the control of moisture entry, however, are often not effective if building assemblies start out wet, and in fact can be detrimental. If a technique is effective at preventing moisture from entering an assembly, it is also likely to be effective at preventing moisture from leaving an assembly. Conversely, a technique effective at removing moisture may also allow moisture to enter. Balance between entry and removal is the key.15

There are two sides to every coin. Searching for the perfect building construction methods must be left to experts, but real estate owners must assume the responsibility of building maintenance, and must also practice prevention. It is a fact of life that things deteriorate over time. Proper maintenance and timely repairs are the answers. See MOLD PREVENTION.

Water can do an enormous amount of damage to a building. Wind-driven rain during hurricanes seems to defy gravity; water can enter homes sideways, up under the soffits, and through cracks you didn’t even know you had. Homeowners should prepare their homes for the inevitable and prevent water entry by sealing the walls, cracks, and other openings in the building.
IS THERE ANYTHING THAT CAN KILL MOLD?

The answer is: yes and no! There are non-commercial grade products, such as germicidal bleach, that are effective in killing some fungi and can be used as a cleaning solution. But, it should only be used on non-porous surfaces, such as metal or glass, and not on materials such as sheetrock/drywall, which is porous. Do not attempt to remediate large mold contaminated areas by yourself. You could affect your health and contaminate your entire home – leave it to professional mold remediators. They have the know-how, the right equipment and protective gear. As a rule, the mold you see on the wall is the tip of the iceberg and the infestation is often coming from within the wall cavity. If this is the case the wall has to be remediated – meaning part of the sheetrock, or the entire wall must be removed. Contaminated wood should be replaced whenever possible, or be soda or dry ice blasted, or sanded to remove any embedded hyphae.

Professional mold remediators have chemicals (fungicides) they use as final cleaning solutions during remediation. Mold remediation is the physical removal of the mold-infested medium performed under safe conditions. Do not confuse disinfectants with fungicidal products. Disinfectant kills (some) germs; fungicide kills (some) fungus. Both should be used with all necessary precautions.

There are many claims about all kinds of devices that are supposed to kill or prevent mold, such as “ozone generators”. The EPA warns:

Manufacturers and vendors of ozone devices often use misleading terms to describe ozone. Terms such as "energized oxygen" or "pure air" suggest that ozone is a healthy kind of oxygen. Ozone is a toxic gas with vastly different chemical and toxicological properties from oxygen. Several federal agencies have established health standards or recommendations to limit human exposure to ozone.
WHY CAN’T I JUST GET AN AIR CLEANER?

We have all seen TV commercials for indoor air cleaners that promise to “get rid of mold!” (whether you have it or not). Know one thing - nothing will “get rid of mold”, except the physical removal thereof.

Having said that, we must tell you that air cleaners equipped with HEPA filters work well in removing excess mold spores from the ambient air of a room. HEPA stands for High Efficiency Particulate Air, which traps airborne particles as small as 0.3 microns.

With respect to mold, we recommend stand-alone HEPA filter air cleaners only as a temporary fix and only in two instances. They are helpful for homeowners who know they have mold, but must wait until professional mold remediators can come to remediate the situation. While they wait, a HEPA filter unit will help clean the air of mold spores and will therefore help protect their health. Another instance is when tenants are unable to leave a mold-infested apartment, perhaps because of a landlord unwilling to help, or they are financially unable to move out. An air cleaner will aid in protecting the health of the tenants until they can move to a new place.

An air cleaner should not be used as a band-aid for mold issues. It is always preferable to fix the problem rather than mask it. Once the problem is repaired, the amount of mold spores inside a home will be less than or equal to the levels found outside. So, there would not be any reason to obtain an air cleaner to remove excess mold spores from the air.

If you are allergic to pollen and live in an area with excessive vegetation, a HEPA filter unit may help your allergies while you are inside your home.

HEPA filter air cleaners come in all kinds of shapes and sizes. Usually the unit is a freestanding electrical appliance
that can be plugged in anywhere. They can be purchased at major hardware stores and some department stores carry them as well.

Television commercials are scaring people into believing that everybody has mold problems. This is not true. Many air quality tests we have performed showed normal levels of mold spores. We have seen instances where people were so paranoid about mold that they had purchased a HEPA filter unit for each room of their house. We have tested their homes after all filtering devices were off for 48 hours to get a true reading and found the air quality to be normal. One lady felt she had to leave her home and stay with a friend during these 48 hours because she felt that she would not be able to breathe without her HEPA filters. Test results showed that the readings in her house were ideal without the units, and the levels of mold spores were less than the levels found outside for all types of mold.

If you suspect you have a mold issue get the air tested to ascertain whether a problem exists. If laboratory results indicate a mold problem, get a mold inspection to locate the source of water and mold infestation, and get the problem fixed. If the air quality is normal, don’t waste your money with a HEPA filter unless you buy it for a specific purpose other than a permanent, so-called, solution for mold. See MOLD PREVENTION.
RED FLAGS
On the following page we have outlined a list of red flags, which are known to be conditions conducive to mold growth. It would be important for you to relate all those points to your own house, building, or school. These red flags materialize at strategic places that require regular maintenance or corrective measures.
LIST OF RED FLAGS

Red flags are conditions conducive to mold growth. MLS is a term used by mold inspectors to refer to a “mold-like substance” before it has been analyzed by a microbiologist.

INSIDE
- Musty smell
- Inside relative humidity above 60 percent
- Any visible water stains
- Any visible MLS (mold-like substance)
- Caulking missing around the bathtub
- Holes or grout missing in the shower
- Floor buckling or warping
- Leaky plumbing – under sink, toilet, washing machine, etc.
- Signs of corrosion, rusty nails
- Wood discoloration
- Paint discoloration, bubbling, or cracking
- MLS at air vents
- MLS in the air handler
- Two or more thermostats too close together
- A/C drain pan improperly tilted
- A/C drain line clogged
- Bathroom fans not working

OUTSIDE
- Blocked gutters
- Cracks in masonry, around windows
- Sprinkler heads too close to the house
- Sprinkler heads pointing towards the house
- Improper grading – slopes towards the house
- Built-in planter boxes
- Vines growing on the façade of the building
- Debris on the roof, leaves, vines, etc.
- Cracks in the chimney
- Any rotten wood on the outside of the structure
- Missing roof shingles
- Missing flashing
- EIFS – Can cause major problems if improperly installed.

PLEASE NOTE: The above list is not complete.
EXAMPLES OF RED FLAGS

Ferns growing inside the chimney and crack seen in the chimney.

Vines and dead leaves

A leak

Sprinkler too close to the building
WATER ALARMS
HOW TO DETECT LEAKS WITH WATER ALARMS IN HOMES

Mold prevention is all about water control. Homeowners are familiar with a smoke alarms and most people wouldn’t dream of doing without them in their homes. Few people, however, know that leak detectors even exist. Similar to a smoke detector that sounds an alarm when smoke is present, leak detectors sound an alarm when water is present. All homes will have leaks at one time or another. The question is not if, but when they will occur.

There are two main types of leak detector systems that alert the occupants – active and passive.

ACTIVE
The active detector is a system that is wired throughout the house. It not only beeps at a central location when a leak occurs, it turns off the water automatically. Some systems use moisture sensors, others a flow sensor coupled with a timer to activate the shut-off valve. Some systems can be connected to a home security system and programmed to call a monitoring company.

Such systems are very desirable, especially if a leak occurs when you are away from home. This type of system is ideal but it is rather expensive to have the system wired and installed. Nevertheless it is a good investment. More information can be found on the Internet.

PASSIVE
The passive detector is a system made up of individual, self-contained units that are battery-operated and are placed in areas prone to leaks. This system is very affordable, and for the cost of a few pizzas, you can protect your entire home from leaks. Once the units are in place, you simply change the batteries according to instructions. Some will beep to warn you that the batteries are low and need to be replaced.
There are various brands that operate in the same fashion. The units are placed throughout the home next to appliances and plumbing connections. An alarm will sound upon contact with water. We recommend five units for an apartment and ten units for an average home. This system is simple and affordable. It is best to choose small units—some of them are bulky and impractical in small spaces. Follow the manufacturer's directions.

**CONCEPT OF A LEAK DETECTOR UNIT**

1. Water appears
2. Contact is made at the sensors
3. Alarm sounds

Photo courtesy of www.waterwarning.net

The following appliances are prone to leaks:

- Sinks
- Toilets
- Dishwasher
- Refrigerator
- Washing Machine
- Water Heater

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Suggested placement of the units:

- Under the kitchen sink
- Under bathroom sinks
- Inside shower walls (as explained on next page)
- Behind toilets
- Underneath the dishwasher
- Next to the water softener
- Behind the refrigerator
- Behind the washing machine
- Next to the water heater
- Below the air handler (A/C) condensate pan
- In the basement
- Water filtration

We mentioned earlier in the section *WHAT ARE THE CONDITIONS FOR MOLD GROWTH?* how builders hide pipes from view. They do that for a good reason - pipes are ugly. However, the building industry should really look at ways homeowners could perform plumbing maintenance checks because every pipe has the potential for leaks. Because they are hidden from view, leaks may not be detected for months. This means that along with water damage to building materials, mold can settle in and contaminate surrounding areas. We find that if a slow leak goes undetected for a long period of time, such as a shower plumbing leak, toxic mold like *Stachybotrys* will likely become the predominant type of mold. Now, your health is at stake.

After seeing so many problems with shower leaks, including our own (oh yes, we had leaks too) we came up with a simple and inexpensive solution – have a small piece of drywall held by screws, as shown on next page, or a small wooden door, installed behind the shower or next to the bathtub. We placed two water-warning units at the base of the plumbing - one on each side of pipes because our floor is not even. Two units may be overkill, but having lived through a nightmare once, we want to make doubly sure that it will not happen again.
Repairing a leak is cheap. The cost of fixing damage caused by water and mold is another matter. This can run into tens of thousands of dollars depending on the situation. Slow leaks are usually not covered by home insurance. We are not trying to scare you, but we want to impress upon you that you must take matters into your own hands and practice prevention. A leak detector system, whether active or passive is a must in every home. Cost cannot be cited as an excuse since individual units are inexpensive.

Homeowners having rental properties should also get water alarm detectors for their rental homes or apartments. Do not count on your tenants to change the batteries. Do it yourself.

Once your water alarm system is in place, check with your insurance company for possible premium discounts.

PS – Remember us in your prayers after you have followed our recommendations and you hear one of your units beep.

Sheetrock covers the opening in our closet wall. This allows access to the wall cavity of our shower and lets us replace the batteries of our water detectors.
In the previous chapter two types of water alarms were discussed - active and passive. The active system is wired throughout the building and is more costly than the passive system.

Buildings and schools are equipped with fire alarm systems that trigger an automatic sprinkler system to extinguish fire. However, sometimes a pipe may burst when no one is around causing great water damage to the building. One head that malfunctions typically releases 25 gallons of water per minute. On a 10-hour hypothetical night situation that comes to 15,000 gallons of water - the equivalent of a medium sized swimming pool. Over the weekend, greater flooding and water damage would occur. Considering what could happen, the cost of an active water alarm system may seem very reasonable when considering the potential alternative of an incidental pipe burst or sprinkler head malfunction.

Water delivery rate per number of sprinkler heads

<table>
<thead>
<tr>
<th>Delivery method</th>
<th>Gallons/minute</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sprinkler (1)</td>
<td>25</td>
</tr>
<tr>
<td>Sprinkler (2)</td>
<td>47</td>
</tr>
<tr>
<td>Sprinkler (3)</td>
<td>72</td>
</tr>
</tbody>
</table>

Source: http://www.gulfwidesafety.com/gws/intro_detection_alarm_sprinker.asp
MOLD PREVENTION
This chapter defines specific preventive measures found in and around a typical home. We must stress that the prevention tips outlined for a home apply equally to buildings and schools. The incidence of potential problems is naturally compounded when instead of two toilets or showers found in a home, one can find fifty or more toilets and showers in an apartment building or school.

The same maintenance principles that apply to homes apply to any buildings.
MOLD PREVENTION

Mold prevention is about controlling moisture and water intrusion, and making timely repairs. It therefore behooves the home or building owner to perform simple periodic maintenance checks to prevent or catch leaks early and minimize the chances for mold growth. Responding quickly is of the utmost importance.

As you read the preventive measures outlined in this chapter, keep in mind the locations where a water alarm unit (discussed in the previous chapter) would be helpful. Suggestions regarding their locations are indicated with the acronym “WW” (water warning) to mean a device that will warn you of a leak. The following list of recommendations is not exhaustive.

INSIDE YOUR HOME/BUILDING

BATHROOMS

UNDER THE SINKS AND BEHIND TOILETS
Check under the sinks of your bathrooms for any possible leaks. Check the plumbing behind toilets. Repair immediately if defective. (WW)

SHOWER HEADS
Every few years have a plumber replace the shower arm in your showers. With time the shower arm can corrode, and leaks can start behind walls without your knowing it. Shower plumbing is notorious for leaks and the damage caused is tremendous. (WW)

SQUEEGEE AND SPONGE
To keep the humidity down, it is a good idea to use a squeegee to remove the excess water from the shower walls and shower door prior to stepping out of the shower. A big sponge finishes the job. This takes only a minute.
CHECK GROUT and CAULKING
Check the grout of your shower(s) regularly and replace it when it begins to become thin. Do not wait to see holes in order to make repairs. Similarly, check the caulking around bathtubs regularly.

VENTILATION
Did you know that showering releases approximately one cup of water into the air? If you have a window in the bathroom, open it while taking a shower to let steam escaped, or use a ceiling exhaust fan, which should vent to the outside, and not into the attic.

FUNGICIDE
It is a good idea to include fungicide in the bathroom paint to discourage mold from growing on walls and ceilings. Ask your paint/hardware man.

WALLPAPER
Vinyl wallpapers, which are impermeable, and “washable” can lead to mold problems, whether in the bathroom or anywhere else in the house.

Do not use wallpapers (permeable or impermeable) in the bathroom. With time they will peel off because of high humidity and mold will grow on the back of the wallpaper.

CLOSETS
POOR VENTILATION
Poor ventilation in closet can be remedied by leaving the door open or installing a fan.

LOW TEMPERATURE
In cold climates, closets can become very cold, which can lead to mold growth (if RH is high). Leaving a 150-watt bulb on can help warm up the closet. Closets can become crowded - so make sure that no piece of clothing or box can touch or fall on the bulb.
HUMIDITY FROM THE SLAB
People tend to stack boxes and personal effects on the perimeter of the closet. The humidity from the slab will be transferred to the boxes and personal effects. To remedy this, put your personal effects on small shelves or racks elevated off the floor.

KITCHEN
SINK
Keep the area under the sink organized. Clutter can hide small leaks for a long period of time and a serious mold problem can develop. (WW)

DISHWASHER
From time to time, unscrew the bottom front cover and look under the dishwasher with a flashlight for leaks. (WW)

REFRIGERATOR
If your refrigerator is equipped with an icemaker and water dispenser it is essential that you pull the refrigerator out from time to time to make sure that no leaks are developing. (WW)

HEATING, VENTILATION, AIR CONDITIONING (HVAC)
AIR FILTERS
A dirty HVAC system will not necessarily promote mold growth unless there is a source of water or elevated amount of humidity present. Dust is food for mold. Keeping an HVAC system clean is essential for clean air. We recommend obtaining a pleated paper filter with a MERV rating of 8. The MERV (Minimum Efficiency Rating Value) rating was implemented by the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) to provide a standard for the size of the pores in filter systems. A rating of 8 is small enough to aid in catching particles, dust, etc. while remaining large enough to permit good airflow.
A/C MAINTENANCE
We cannot overstress the importance of getting the HVAC system checked and serviced regularly, as it is a possible reservoir for mold growth. An HVAC system in poor working condition can cause mold to grow because of high humidity in the air, and, in turn, can spread that problem throughout the house.

RELATIVE HUMIDITY
Ask your A/C professional to check the relative humidity inside your home. The relative humidity should be kept below 60%. If the reading is continuously above 60%, it may be time to change your system, or get a dehumidifier to supplement your A/C.

DEHUMIDIFIER
Some molds do not need an active leak in order to grow. Some can take the humidity from the air and start growing on any surface. The relative humidity of the air should always be kept below 60%. An older A/C unit may not operate efficiently in removing the humidity from the air. When this happens it is time to replace the unit. If you are unable to purchase a new A/C for budgetary reasons, a stand-alone dehumidifier will serve you well until such time you are able to do so.

NORTHERNERS’ MISTAKE
Many Northerners who purchase property in subtropical climates make the mistake of leaving their A/C off when they return up North. When they come back six months or a year later, they find their vacation home inundated with mold. This is because some molds can simply take the moisture they need from the high humidity in the air.
OVERSIZED A/C
An oversized A/C will cool a house quickly and, in so doing, it will not remove enough moisture from the air.

MULTIPLE THERMOSTATS
The problem can be compounded for larger homes that possess multiple air handlers. Not only is the probability for mold growth increased, but the placement of the thermostats can also create problems of their own. If two thermostats, A and B, are too close to each other, thermostat A may cause thermostat B to shut off prematurely. Thus, the humidity can be high in one part of the premises and mold can start growing in the B duct system and around the air vents.

DRAIN PAN
Installing an air handler on the second floor or in the attic of a dwelling should be avoided. Leaks or overflow from the drain pan can cause major mold problems between floors.

Every month pour a cup of bleach into the drain line. This will prevent debris or sludge from accumulating and clogging the line causing water to back up inside your home. (WW)

WATER HEATER
Water heaters should never be put in attics. A one time or another they will leak. Set a WW in the drip pan.

CEILING FANS
Ceiling fans help reduce the humidity in the air. If you happen to live in a humid climate and have ceiling fans in your home, use them. If you don’t have fans, think about installing a few. They help air circulate and they offer energy savings in both the cooling and heating seasons.
ATTIC
Twice a year check your attic for roof leaks and signs of rodents. Rodents in the attic may chew on ductwork. When leakage occurs, warm air from the attic and cool air from the A/C may cause condensation around the opening and mold will have a chance to grow inside the ductwork.

PINHOLE LEAKS
Older homes have copper pipes. Over time chemicals in water will corrode the pipes resulting in pinhole leaks. Some holes will seal themselves while others will get bigger causing water damage and mold.

Re-piping can be quite costly because it is labor intensive. The pipes are usually installed overhead. The process requires making holes in walls and ceilings to install the new CVPC pipes and it involves reconstruction of the drywall, re-texture and painting. Once completed the owner will have a brand new plumbing system, which should last a very long time.

Another alternative involves removing chemically the corrosion inside the existing pipes and then coating the inside of the pipes with an Epoxy based resin. The coating is supposed to seal the holes and prevent future pinholes. It is quite convenient. However, it is usually more costly than re-piping and the end result may be less than satisfactory because once completed you will still have an old plumbing system. It would behoove you to do your own research before choosing this alternative.

BASEMENT
Periodically check the sump pump to make sure it is in good working order and it discharges a good distance from the house. Having a battery backup system can be very useful in case power is lost. Place several WW units throughout the basement.
OUTSIDE YOUR HOME/BUILDING

CHECK FOR SMALL CRACKS
Make it a habit to walk around your home once a month to check your home for small cracks around windows and doors or in the stucco. Caulk any cracks immediately.

GUTTERS
Regularly clean the gutters of leaves and debris that may accumulate and cause water to infiltrate your home.

SPRINKER SYSTEM
Sprinkler heads should be two feet away from the house, at a minimum. Do not assume that they point away from the house. While the sprinklers are on, look to see if water hits the house. Sprinkler splash guards can be purchased at hardware stores.

PROPER DRAINAGE
The slope around the house should allow water to drain away from the house.

VINES
Do not put vines against outside walls. If you absolutely want the look, check with your hardware store for a trellis system that will allow for a gap between the vines and the structure. Vines keep moisture up against the house, and they destroy the outside stucco/paint or other coatings and will cause you trouble sooner rather than later.

PLANTER BOX
Do not install a planter box against the house unless it has a liner to allow water to drain to ground level and away from the house. Otherwise the humidity in the soil will migrate to the inside of the house and cause mold to grow.
TIMELY PREVENTIVE MAINTENANCE

INDOOR AIR QUALITY MONITORING
It is highly recommended that once a year random air samples be taken and analyzed to make sure that the air quality in relation to mold remains within the normal range.

ROOF INSPECTION
Have your roof inspected every year, and immediately after you experience a hurricane or major windstorm.

BEFORE LEAVING FOR VACATION
Do three things:
1. Leave your air conditioning on. See MOLD PREVENTION: AIR CONDITIONING SYSTEM – Northerners’ Mistake
2. Turn off the power to the water heater,
3. Turn off the water at the main. If pipes break or leaks develop when you are away, your home won’t be flooded. Obviously this will be bad for your lawn if you depend on city water and you are gone a while.

INFRARED SURVEYS – THERMAL IMAGING
Thermal imaging has become the avant-garde tool of predictive maintenance in commercial applications and is slowly gaining popularity in the private sector. By doing periodic audits of structures and systems, companies are becoming proactive so that potential problems can be averted. Now, private individuals are also taking advantage of this unique predictive safety maintenance tool to protect their own personal real estate. Infrared cameras are great tools in finding water intrusion in a home, building, or boat. Preventing water intrusion prevents mold.

There are two types of flat roofs – those that leak and those that do not leak yet. For small residential roofs an infrared survey can be performed (by walking) on the roof. For large commercial roofs an aerial infrared survey is best. It allows seeing the areas of moisture intrusion at a glance. It is also faster and more economical than on-roof surveys.
Benefits of aerial infrared surveys of commercial roofs:

- Accurate roof assessment for water intrusion
- Extension of roof life by periodic aerial surveys
- Buyer beware - pre-purchase moisture surveys
- Seller beware - pre-existing condition exclusion
- Forced warranty compliance by roofers
- Mold prevention through early water detection

Images courtesy of Stockton Infrared, Inc.
INVENTORY YOUR POSSESSIONS
INVENTORY YOUR POSSESSIONS

The Insurance Information Institute (iii) has made available a free program to help owners inventory personal possessions. This inventory is highly recommended for many reasons – when submitting a claim for damage suffered as a result of a natural disaster, a theft, or creating a will, to name a few. The software can be downloaded from its website: www.knowyourstuff.org

The Insurance Information Institute gives the following tips on taking a home inventory:

This software will help you create a room-by-room inventory of your personal possessions. Having an up-to-date home inventory will help you:

- Purchase enough insurance to replace the things you own;
- Get your insurance claims settled faster;
- Substantiate losses for your income tax return.

You can always make a list in a notebook and save receipts and photos in a file, but this software should make this task fun and simple. More importantly, with a click of a mouse, you can update your inventory as you buy or eliminate personal possessions.

GETTING STARTED
If you are just setting up a household, starting a home inventory can be relatively simple. You could even attach recent wedding registries to substantiate new possessions. But, if you have been living in your house for many years, this task may seem daunting. If you set aside an afternoon and get your entire household involved, it can be an enjoyable experience. In all cases, it is much easier to document your possessions before you suffer a loss from a fire, hurricane, burglary or other disaster, rather than having to document them in time of crisis.
BIG TICKET ITEMS
Make note of expensive items, such as jewelry, furs, and collectibles. Valuable items may need separate insurance. But, don't forget more commonplace items such as toys, CD's, and clothing.

TAKING PHOTOGRAPHS
Along with the written information, consider adding photographs of your possessions, which can be done easily with a digital camera. You can also simply store your print photographs along with a copy of your inventory, or have the photographs scanned and the images saved to disk.

VIDEOTAPE YOUR INVENTORY
Walk through your house, apartment or building videotaping the contents. Remember to open drawers and closets. One advantage of videotaping your possessions is that you can narrate what you are filming.
SAMPLING AS PREVENTION
HOW TO TEST INDOOR AIR FOR MOLD

Most of the time mold inspectors are called when a mold problem is suspected or water intrusion has occurred. Occasionally mold inspectors are called to simply check the air quality in a building in relation to mold. The inspector collects air samples and sends them to a laboratory for analysis. The process of testing air quality is called sampling. See SAMPLING.
WHAT TYPE OF MOLD ASSESSMENT DO I NEED?

Many people are on a budget and are faced with the dilemma of choosing between what they need and what they can afford. If you are faced between the choice of a mold inspection and taking mold samples, always choose sampling. If you can afford doing both at the same time, do so. Below are some hypothetical situations. See WHEN IS SAMPLING WARRANTED? and WHEN IS A MOLD INSPECTION WARRANTED? The important question is “What is your objective?” If a renter needs to convince his landlord that there is visible mold in several rooms, a minimum of one surface sample will be sufficient to obtain a laboratory report to prove scientifically to the landlord that mold is present in the apartment.

- Proof of mold
- Buying a home
- Air quality analysis
- Selling a home
- Proof for landlord
- Checking a suspect room
- Identify extent of damage
- Proof for litigation
- For insurance company
- Obtain a remediation protocol
- MOLD INSPECTION + SAMPLING

What is your objective?
WHAT IS SAMPLING?

If you ever thought about purchasing a do-it-yourself mold test kit, don't. A mold kit is basically a Petri dish. "Petri" comes from a German bacteriologist, Julius Petri, who came up with the technique of using little dishes with a perfect environment for growing bacterial strains in his laboratory. You learned earlier that mold spores are everywhere and when they find a good environment they settle and grow. By setting a Petri dish on a table you are betting that mold spores may or may not land on the dish. Although interesting, it will give you no useful information. Sampling is a scientific procedure; testing air quality cannot be done with a do-it-yourself kit.

There are two main types of sampling methods: Culturable and non-culturable samples. The culturable method allows the microbiologist to differentiate between species whose spores are visually similar, but it takes longer to obtain the results and it is also more costly. In addition, there are certain types of mold that do not grow well in a laboratory setting. Mold spores collected in a residence are grown (cultured) in a laboratory and analyzed after more extensive growth has occurred. Thus, it is believed that the non-culturable method provides a more accurate "snapshot" of the air besides being cheaper and quicker. The method outlined in this book refers to the spore trap (non-culturable) method.\textsuperscript{18}
Sampling is the scientific approach to mold assessment, the purpose of which is to qualify and quantify the environment in relation to mold. According to the American Industrial Hygiene Association (AIHA) about 50% of mold problems are not visible. Thus, sampling is a vital tool to help assess air quality even when mold is not visible.

Certain conditions must be met before sampling takes place. For 48 hours prior to sampling any stand-alone air cleaning devices must be turned off and all windows and doors must remain closed. Normal traffic in and out of the house or building is ok. The reason for this is to obtain a true reading on indoor air quality without any filtering devices or mixing indoor/outdoor air. In addition, the inspector must wait at least two hours after the last rain to collect an outdoor control air sample. This is because during rain, the spores floating in the air fall to the ground. If the above conditions are not met, the sampling results would be inaccurate.

The mold inspector should follow a rigid sampling protocol. In order to obtain accurate results, samples must be collected in a precise and controlled manner by a mold inspector in the field and then analyzed with a high degree of precision by a degreed microbiologist in a laboratory.

The mold inspector should keep both a written and visual record of the sampling as it is performed. He should also provide you with a copy of the sampling records at the time of sampling, and reference them again in his report. Should anyone question the results, the mold inspector ought to be able to provide proof of his sampling methodology. Likewise, the laboratory should follow a precise methodology and keep impeccable records.

You should receive two reports - a laboratory report and a companion report by the mold inspector. We call our companion report a *Mold Assessment Report*. The latter should explain the laboratory results in more detail and provide recommendations, if necessary.
Sample results provide a snapshot of the environment at the time of sampling at a particular location, as conditions can change over time. Mold can start growing within 24 to 48 hours when food and a moisture source are present. The results do not guarantee that conditions will not change or that mold may/may not grow on the premises in the future.

In general, a mold problem exists when the amount of mold spores found inside a home/building is greater than or different from the types and levels found outside.
SAMPLING FLOWCHART

MLS= Mold-like substance

Scenario: A home inspector noted in his report that he saw something that looked like mold in the air handler. Sellers disclosed having had mold on the north wall of the dining room, but stated that it was remediated and the leak was repaired. Homebuyer wants to have the home checked for mold by sampling.

Hire a Mold Inspector

(Collect surface sample in the air handler & several air samples including 1 north wall cavity sample)

Samples are analyzed by a laboratory.

Are results normal?

NO

Are results normal?

YES

Dining room ambient air and wall cavity samples are elevated but the surface sample is not mold. Recommend mold remediation in the dining room.

Mold remediation of the dining room north wall. Make sure water problem is repaired.

Post-remediation sampling (Clearance test)

Additional remediation is necessary.

Surface sample is not mold, and all air samples OK. Buyers buy the house.

Is air quality normal?

NO

YES

Air quality normal. Passed clearance. Reconstruction can begin.

Buyers buy the house.

Hire a Mold Inspector

(Collect surface sample in the air handler & several air samples including 1 north wall cavity sample)

Samples are analyzed by a laboratory.

Are results normal?

NO

Are results normal?

YES

Dining room ambient air and wall cavity samples are elevated but the surface sample is not mold. Recommend mold remediation in the dining room.

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Surface sample is not mold, and all air samples OK. Buyers buy the house.

Is air quality normal?

NO

YES

Air quality normal. Passed clearance. Reconstruction can begin.

Buyers buy the house.
INSURANCE TIPS INVOLVING WATER DAMAGE

There are lessons to be learned from past natural disasters. As a homeowner, there are several things you can do to minimize the damage caused by water intrusion. Water can cause tremendous damage and mold settling in on wet organic materials only compounds the problem. Considering that mold can start growing within 24 to 48 hours following water intrusion, it is important to take action immediately and to document everything. See WHAT TO DO WITH WET BUILDING MATERIALS AND FURNISHINGS.

Hurricanes and floods bring much misery and frustration to real estate owners who are desperate for anyone to come and assess the damage. Insurance adjusters seem slow to respond but this is because of the large number of claims. Many home and building owners may feel the need to preserve evidence and leave things as they are until an insurance adjuster comes to inspect the premises. In the meantime, nature takes its course and mold starts growing on building materials. In some cases, respiratory distress causes occupants to leave their homes.

Some homeowners call drying companies. Unfortunately, those companies are also overwhelmed with work, and they may not get on site right away. In many cases the delay will allow mold to grow. This brings up another dilemma: if mold is present and containment is lacking, the powerful fans used for drying could spread mold spores from contaminated materials to other parts of the home.

Taking things in your own hands during the first 24 hours has never been so critical since recently many insurance companies are excluding mold damage while continuing to cover water damage. This exclusion does not make sense because mold can grow only when moisture is present. This action will undoubtedly cause much grief to all concerned. Mold contaminated materials will be handled by
handymen, not by trained mold remediators. Lack of personal protective gear will expose workers and occupants to potentially toxic mold and possibly make them sick. Lack of proper equipment and lack of containment during the demolition will cause millions of mold spores to be released into the air and contaminate the rest of the house. Lawyers will be busy.

We advise you to read your insurance policy now. Do not wait until you need to submit a claim to find out what is included or excluded in your policy. You may want to add mold coverage as an option. Become familiar with the terms of your insurance policy and extent of coverage. If you feel you have insufficient protection, contact your insurance company and make the necessary changes NOW, before disaster strikes.

Do your homework and follow these tips:

- Assess the damage and report it to your insurance company immediately.

- Keep track of whom you talk to with names, telephone numbers, and dates.

- Take as many pictures of the damage as you can and date the pictures.

- If possible, obtain an infrared survey. This will document, usually with pictures or video, where water intrusion took place. Keep in mind that IR surveys are useful only when the material is currently wet. Over time the material will dry out and water intrusion will no longer be visible in infrared.

- As time goes on, take more pictures to document the deterioration of material, water stains, or what may appear to be visible mold. Date the pictures.

- Keep all your receipts for expenses, such as tarps, etc.
INSURANCE TIPS INVOLVING MOLD

If time has elapsed and mold has had a chance to grow, you must be prepared to provide your insurance company with proof of mold contamination and damage. Many insurance companies will not pay or reimburse homeowners for the initial samples. This is easy to understand. As long as you do not produce a report that says there is mold growing inside the residence, they will assume there is no mold. If there is no mold, there is nothing to fix, and therefore nothing to pay. First, try to get authorization from your insurance company to hire a mold inspector. If they give you a hard time, it would behoove you to hire one at your own cost to collect samples and establish if there is a mold problem. Should a problem be found, your insurance company will not be able to contest the findings of a scientific laboratory report.

Mold can make people sick based upon their own sensitivity, the amounts and species of mold present. If you feel you or a member of your family is getting sick because of mold, move out immediately.

We recommend that mold samples be taken in places where visible mold is present as well as taking air samples in rooms where mold is suspected. If you are on a tight budget, we recommend taking an air sample in the worst room of the house with one outside control. After the laboratory report comes back confirming an elevated amount of mold spores, the insurance company will be more likely to pay for the cost of additional samples recommended by the mold inspector.

Many insurance companies will also want to see a mold inspection report that documents signs of water intrusion and visible mold. Some insurance companies will go a step further and request a mold remediation protocol, which is detailed instruction on how the remediation should be done.
If you have any disagreement with your insurance company, write a letter addressed to your adjuster and if possible, include pictures. Don’t forget to send the letter certified with return receipt.

If you have problems with your insurance company with regards to your claims, you can contact “Policy holders of America” (POA), www.policyholdersofamerica.org. This is a great place where you can get self-help with insurance claims and a wealth of useful information.

Mrs. Ballard, President of POA, advises:

While most insurance policies exclude or cap mold remediation costs, most do not exclude the cost to repair water damage. Mold is always a consequence of water damage. Policyholders of America can help homeowners get paid for repairs when water damage occurs even when the insurer balks at coverage. Knowing how to file and document a claim is critical and Policyholders of America can guide homeowners through the maze for free.

It is also a good idea to take inventory of your possessions BEFORE a disaster strikes. See INVENTORY YOUR POSSESSIONS.
GREEN BUILDINGS
INDOOR AIR POLLUTANTS

Research by Dr. Wolverton, one of the world’s leading scientists on plants and indoor pollutants, has led to the recognition that plants can help clean the air of toxic chemicals in sick-building related illnesses. One of the most common toxins found in an indoor environment is Formaldehyde. It is not surprising that since this chemical is known to cause cancer in rodents, that it also causes many health problems in humans. The effects range from eye, nose and throat irritation to asthma, cancer, chronic respiratory diseases and neuropsychological problems.

SOURCES OF CHEMICAL EMISSIONS

Off-gassing from building materials and new products will slowly become a thing of the past. In an effort to reduce indoor air pollution, the concept of “green building” has forced many manufacturers to produce environmental friendly materials that release low to zero volatile organic compounds (VOCs). The objective of the green building concept is to provide energy efficient buildings that are healthy for their occupants and good for the planet.

The push is on to develop “green” building products for home building and remodeling. To facilitate the exchange of ideas and as an educational opportunity, on a yearly basis, the National Association of Home Builders sponsors the National Green Building Conference. There, builders, remodelers, developers, architects, engineers, and other building professionals come together to share new ideas and products.

With a name like “green building” you would almost expect that it involves plants, but this is not the case. Builders construct buildings and gardeners grow greens. We can’t expect builders to be concerned with plants nor can we expect gardeners to be concerned with buildings. It is thus up to the owners to embrace the work of Dr. Wolverton by bringing plants into homes and buildings, not only to help purify the air but also provide psychological well-being to the occupants.

It is said that indoor air pollution is one of the major threats to health. Considering that most people spend 90% of their time indoors, it would be an ideal solution to provide an indoor environment “that mimics the way that nature cleans the earth’s atmosphere.”

There are hundreds of VOCs found in homes and buildings. Because formaldehyde is the predominant pollutant found indoors, Dr. Wolverton chose this particular toxin in his research as the standard for rating the ability of fifty plants to remove volatile organic compounds. The results of his study are found in the following table:
REMOVAL OF THE TOXIC GAS FORMALDEHYDE
BY HOUSEPLANTS IN $\mu$g PER HOUR

REFERENCES

Please note: Since this e-book includes excerpts from
MOLD MATTERS - Solutions and Prevention
some of the listed references may not be referred to in this e-book.


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