

**HOW TO PROTECT YOUR
BUILDING FROM TOXIC
MOLD
or
EVERYTHING YOU
DIDN'T WANT TO
KNOW ABOUT MOLD**

SafestartSM
ENVIRONMENTAL

“Protecting Your Health”

4256 N. Arlington Heights Rd,
Arlington Heights, IL 60004, USA
tel (847) 253-7340 - fax (847) 253-8748
www.safestart.info

Larry Schwartz, IH, BSME, MBA
**Listed Consultant of the American
Industrial Hygienists Association
Illinois Licensed Building Inspector
President of Safestart Building Consulting, Inc**
January, 2001
revised 2003, 2004 and June 2005

ABOUT THE AUTHOR

Larry Schwartz

- is a graduate of Purdue University, BSME.
- holds a master's degree from Northwestern University, MBA.
- has successfully passed the Indiana Professional Engineer's Examination and the National Inspection Examination, and Illinois License Exam.
- holds a patent pending on determining the likelihood of mold in buildings and how preventive measures effect it.
- is a listed consultant and member of the American Industrial Hygienist Association specializing in indoor air quality and mold.
- has appeared numerous times on major Chicago TV news regarding mold stories.
- has been featured in the Daily Herald and other Chicagoland newspapers.
- has been a guest speaker multiple times for the Northern Illinois Real Estate Attorneys Association as well as the North Shore-Barrington, DuPage, McHenry and Kane County Boards of Realtors
- has been a guest speaker at the Chicago Bar Association many times.
- has conducted numerous investigations and testing of residential and commercial property, as far as California, Florida, Virginia and more.
- has authored articles regarding the subject of mold in buildings for the *Illinois Institute for Continuing Legal Education*.
- is the only individual licensed by the state of Illinois to teach his proprietary and licensed mold course to licensed real estate practitioners in Illinois, for their continuing education license requirement.
- has preformed investigations for many large developers, manufacturers, and building owners, such as Bank-One, Berthold Electric, LR Development, McHugh Construction, and more.

Treating a building to eliminate mold is very similar to treating a person for cancer. The mold, in effect, metastasizes. In fact, the building can reach a point of no return in which the mold will take over and destroy it. Therefore, the sooner it is dealt with, the better. To effect a cure, the mold itself must be excised, removed or remediated. In the process of removing or remediating it, containment must be used to keep it from spreading to other areas. Using ozone generators and filters do not do the job. They may clean the air, but the source keeps spreading the spores.

There may be cases whereby a professional air cleaner may allow an equilibrium of air quality to be established until remediation is a reasonable alternative.

Correct the moisture and ventilation issues AND remove the mold!

Nothing short of this procedure will totally cure the problem.

When components of the building cannot be removed feasibly or economically, remediation may be done. The methods vary depending on the materials and locations.

If there is any one thing I cannot stress enough, it is: CONTROL HUMIDITY.

Good luck, and let us know if we can be of service to you.

Table of Contents

| | |
|--|--------------------------|
| Introduction | 1 |
| Part One - The Nature of the Beast | 2 |
| Part Two - Don't Let It Start | 6 |
| Part Three - How Do We Know If We Have It? | 10 |
| Part Four - Now That We Have It, How Can We Get Rid Of It For Good? | 14 |
| About The Author | inside back cover |

INTRODUCTION

In recent years, biologists have shifted fungi, which include mold, mildew and slimes, out of the plant kingdom and given it its own domain. Fungi are now one of the five kingdoms of life forms. One of the reasons for this is that the cell walls of mold organisms seem to be more similar in make-up to animal than plant. However, that is not to imply that mold is like animal in nature.

The more I leaned about mold, the more fascinated I became, because it was more like reading and learning science fiction. The sad fact is that it isn't science fiction, but real. That made it even more fascinating. **Most of the common knowledge about mold is totally insufficient, and, to a large degree, inaccurate.** It is one of those subjects that everybody talks about like an expert. I will dispel some common myths as well as tell you the things about mold that most of us don't know.

This is especially important when it comes to preventing and getting rid of mold. **The common methods you have been told don't usually do the job!**

Once mold gets a foothold in a home or building, it may spread like wildfire to a point of no return. This is a point where it is not economically feasible to fix the situation. I have investigated buildings where entire roofs needed to be replaced, including wood sheathing and structural components, as well as buildings needing to have sections totally removed.

Beside the damage to property, there are the health effects. Many common indoor molds produce mycotoxins. These are airborne toxins, which reside on spores as well as on pieces of the mold cells, which may become airborne. The spores are the reproductive part of the mold, which will be discussed in more detail later. People with sensitivities, when exposed to these toxins, may experience direct attack to organs and tissues. Symptoms such as sinus irritation, headaches, swollen tongue, dizziness, headaches, eye aches, asthma, pneumonia, bleeding from the nose and lungs, and more may be allergic irritation or direct infective system reactions. The degree of sensitivities may be related to the health and condition of the immune system as well as allergic reactions.

THERE ARE TWO ELEMENTS OF THE FORMULA TO STOP AND GET RID OF MOLD IN A BUILDING. BOTH OF THESE ELEMENTS MUST BE DONE TO FIX THE SITUATION, AND IN SEQUENCE.

IF BOTH ARE NOT DONE, THE MOLD WILL NOT GO AWAY!

I cannot emphasize this enough because I have had many past clients do only one, or one and some of the other. It won't work that way! This is not something you can skimp on or try to deduce your own logic on ... it just won't work!

Here are the two rules, and they must be done in the proper order to work:

- 1. The moisture and ventilation issues must be corrected.**
- 2. The mold found must be entirely removed, or remediated if it cannot feasibly be removed.**

The reasons for this will be explained in other sections of this booklet. I kid you not, this mold stuff is like reading about "the killer spores from outer space." I believe that after you read this entire booklet, you will agree with me.

PART FOUR

**NOW THAT WE HAVE IT,
HOW CAN WE GET
RID OF IT FOR GOOD?**

PART ONE

THE NATURE OF THE BEAST

There are over 10,000 known molds. Common molds found in buildings distill down to about forty or fifty. Almost all genera of mold are capable of producing and carrying different toxins. These may cause numerous effects in people and animals. Mold may also cause allergic irritation or immuno responses. Which toxins are produced are a function of many variables such as the mold's food source and the time and amount of moisture present.

Molds are not all bad. Some are used in industry such as in the manufacture of chemicals. Many are used in the production of certain cheeses and wines. As I am sure you know, mushrooms are also in the fungi family.

The sole purpose of molds in nature is that of recyclers. Molds eat organic material and recycle it back into the environment. Molds cannot digest food for energy without water. This is a most important point. The digestion actually occurs outside the mold cell walls. The food source is mixed with water and dissolved (digested), and then the dissolved mixture is allowed to enter the mold cell through its cell wall. Many molds can start and continue to grow without free water. They have the ability to prosper just on high humidity levels in the air. Some may grow when relative humidity is above 60%, and more thrive at levels at and over 70%. When free water or high humidity stop, the mold cells die. Here's the "rub": The mold cells go dormant, but the spores don't. The spores are the principal carriers of the toxins and they are virtually indestructible. Furthermore dead mold parts and spores have been shown to also cause health complaints. Cleaning with a proper solution may kill the mold cells, but not the spores. This is also why the mold will start growing if the area becomes wet again or if the humidity becomes too high. Spores have endured testing in continuous hot desert conditions as well as in conditions where there has been no humidity for over eleven years or more.

The mold cells connect to each other through channels. They also have root-like structures that penetrate deeper into the material on which they are eating. Their reproduction system is usually without a mate, although some molds require a mate to reproduce. Small, usually spherical objects called spores accomplish reproduction. Most spores are released from the mold cells into the air. When spores come in contact with a food source, water, and the right temperature range, mold cultures start growing often within three days.

When you see mold growing on a tomato or a piece of cheese, you are looking mostly at the cells and stems that release the spores and at the spores themselves. When you cut the mold off, you may not be cutting off the deeper roots going into the food, which you do not see.

Here is some more on spores: Another big problem with controlling spores is their miniscule size. They typically get as small as one to ten microns in size. That means a mold spore going through a hairline crack is like a pea moving through a football field! Mold on walls behind shower tiles, for example, have spores that not only come out through the front, but go through the air in the walls, get into heating ducts, attics, and everywhere.

Things that make spores release into the air include changes in light, changes in air pressure, changes in air movement, changes in humidity, physical movement and more. Spore release may come from both live mold cells or dead mold cells

Testing Molds

There are many different categories of testing. One is viable, where samples are transferred to a medium that grows and cultures for two weeks and are then analyzed. The other is non-viable, in which spores and mold cell pieces are counted in a sample under a microscope with no growth involved.

The viable type tells information about live reproducible spores and cells, whereas the non-viable gives total numbers of live and dead organisms. The viable test give better speciation and percentages of concentrations of the various genera and strains of mold, whereas the non-viable test only tell what generas are present with a lesser speciation of strains.

Testing is done in one of many collection methods. One is to take an actual piece of material with the mold on it and send it to the lab for analysis. Another method is to take a swipe of the mold on an absorbent clean material. Both of these methods are forms of "bulk" testing. With viable testing the lab transfers the sample to a Petri dish with a material in it that will offer a good home for the mold to feed on. The samples are baked for approximately two weeks and the resulting growths analyzed. Methods of collecting spores and mold material in the air are with an air impactor or spore collector.

In viable testing, results are given in several ways. First, there is a reading of the number of cultures of the mold by genera with their dominance and percentage. With air testing, the indoor samples are compared to outdoor samples for several reasons. First, to see if there are generas indoors that are not outdoors. Second, to measure the amplification of mold in the building by genera and in total. If air testing shows a problem, then the source of the molds must be found.

Although some of the indoor molds carry mycotoxins, testing should not be required just to find out which genera are present. Assume that all molds in a building are bad for you. In fact, the mold generas fight for dominance in any one spot and may be different in concentration a short time later. Also, a test taken one foot away from a mold concentration may yield different molds. The best guideline is any molds in buildings should be considered to have mycotoxins and allergens, and must be dealt with. Testing may be beneficial to help determine which areas need to be remediated which a professional can determine.

In cases where one is immune-compromised, have certain diseases, or have been medically tested to be sensitive to certain generas, testing should be done at the onset.

Non-viable testing is most utilized today due to timing and ease of testing.

Some people have an immediate reaction to molds manifested by many possible symptoms. Other people require a long-term exposure before they become sensitive. Once they have symptoms, many of them tend to be very similar. The symptoms I hear and see the most are: wheezing, coughing, headaches, eye and sinus pain, sinusitis, dizziness, balance issues, ringing in the ears, fluid in the ears, bloody noses, blood in the discharge of cough or nose, rashes and skin conditions, and more. It is also possible that long term exposure to molds may weaken the immune system and allow one to be more vulnerable to other medical problems.

Most of us can smell many of the molds when we enter a moldy area. We also may have visual sightings of some of it; In many cases we may smell it, but don't see it, or we might see it but can't smell it. Here are a number of places to look:

- Basement floors near the water heater and condensate drains
- On water storage tanks and cold pipes
- Basement walls
- Wood sub flooring under toilets
- Wood sub flooring above plumbing connections
- On walls and ceilings
- On and under basement carpeting
- The rim joist around the perimeter of the foundation
- On attic sheathing and insulation
- In refrigerator drip pans
- Behind vinyl wallpaper on exterior walls

There are many other places mold lurks, but one needs professional instruments to detect hidden moisture and mold. Some of these hidden areas include:

- The wallboard behind shower and bath surrounds
- Inside ductwork
- On insulation inside walls
- On or behind siding
- On pipe work above ceilings
- In caulk
- Under decks and outdoor carpeting
- Slow plumbing leaks from valves or junctions behind walls
- Where condensation is occurring that you cannot see
- In walls and insulation under windows

Spores attach to dust particles. Where these dust particles settle may or may not start a new colony of mold depending on moisture conditions. Spores may stay airborne almost indefinitely. Dust particles with spores attached may settle in ductwork on skin particles or the feces of dust mites. These may colonize molds with a humidifier moving high moisture air through the ducts.

HEPA air filters may filter out many spores but don't really solve the problem. Here is an example: Suppose there is a colony of mold on the wall a few feet from where you are sitting, reading this booklet. The mold is generating spores off the wall and it makes you wheeze. Even if the HEPA air filter on your furnace is collecting spores, it doesn't solve things because the spores are still coming at you from the source.

Therefore, you should be skeptical of quick fixes such as these filters. These filters are good and may help somewhat, and rid the air of other harmful particles. More recent things that have surfaced are ultra-violet light sources and ozone generators. These primarily kill bacteria, especially in the furnace areas of the air cooling drip pan and coils, but there is scant evidence of the effect on molds. I am often asked about ozone generators. I do not recommend them for the reasons above, plus ozone is a highly reactive oxidant, which can damage sensitive human tissues, and may do more harm than good. HEPA vacuums may be good for cleaning spore-laden dust from carpets and upholstery and draperies. There is only one fix known for sure and that is my two step rule.

Spores endure almost forever. From this and all the situations described above, you can see that mold is a very formidable foe!

Mycotoxins are chemical toxins that are on the surface of spores and other mold materials that may be pathogenic to humans and some animals. Pathogenic means that they can affect one's state of health. Some of these toxins may produce different types of effects, such as wheezing, dizziness, headaches, pulmonary hemorrhaging, and more. Certain toxins seem to be associated with certain species of molds. People with severely compromised immune systems are most susceptible to attacks of organs and tissue by mycotoxins.

The one most touted by the media is *Stachybotrys*, often called "Stachy" for short. Many of my past clients seem to want to know if they have Stachy in their building, as though that is their only concern. It is my belief that the media has "hung-up" on Stachy for a few reasons. First, this is a type of mold that a few years ago was associated with some infant deaths involving pulmonary hemorrhaging in both Atlanta and Cleveland. It was labeled, "the black mold." It was also the mold in the mansion in Dripping Springs, Texas, where the husband has claimed loss of brain function (USA Weekend).

They also failed to point out that these deaths were in homes with a low quality of diet and heavy smoking. Smoking multiplies the pathogenic effects by many times. I believe the second reason is that the name "Stachy", the black mold, has such an evil and mysterious sound to it.

The fact is that there are many species of mold that have very serious health effects, but any mold in a building should be given equal billing.

People tend to have one or more of several known effects from molds in the air. Some of these effects may be allergy, irritation, immune system, infection, or other. The following is an example, which was uncovered by Dr. David Sherris at the Mayo Clinic late in 1999: the offending molds lodge in the sinuses. The body's immune system senses them and directs the body to manufacture a caustic fluid to wash away and kill the offending molds. This caustic fluid itself is the cause of redness and swelling in the sinuses which is called sinusitis. His study indicated that over 93 percent of chronic sinusitis is caused by molds.

Since not everyone is sensitive to molds, it is easy for individuals to make light of what kind of health damage mold can do. I have seen enough common cold symptoms to make me a believer. Asthma growth rates have become epidemic, and air quality in buildings is a major factor of this. The fact that buildings are being built with tight insulation and not enough ventilation is a common cause of poor indoor air quality. Also, if proper methods are not used to protect building materials during the construction phase of construction, a sick building may be the outcome.

PART THREE

HOW DO WE KNOW IF WE HAVE IT?

About Ventilation

The entire design purpose of ventilation is to rid the building of moisture. In the old days, buildings and homes were ventilated better due to less insulation, no building wraps, and more gaps in construction. Newer buildings are “tighter” and have less air exchange in a given time period. Some communities are requiring better ventilation on newly constructed buildings. Some of these features utilize low speed continuous fans in bathrooms and kitchens, and some use heat or energy recovery ventilation systems which bring in fresh air and expel old air in the building while maintaining heat and moisture levels.

Kitchens and baths are primary areas requiring good ventilation. After showering or bathing, open the shower doors so air can move around both sides of the doors. Also, leave the door open and run the vent fan for at least half an hour. When cooking, even boiling water, run the vent fan. Unfortunately, many kitchen vent fans do not expel air outside, but either recycle the same air or pump it into the attic. Neither of these are good situations. Warm, moist air in the attic cools, condenses, and may form mold.

The ventilation in the attic is to keep moisture and warm air out in the winter to avoid ice dams and condensation. Sealing a crawl space must first be done when it is totally dry and includes the walls as well as the floor. Some communities are actually changing their building codes to reflect this.

We have also prepared a procedure for you to follow to set up the surface of basement concrete floors before installing carpeting to prevent condensation and mold from forming. Also, if you are doing new construction, we will be glad to consult with you about methods and materials to help make your building a healthy one.

PART TWO

DON'T LET IT START

I'm sure that there is not a building that does not have mold. In the real world nothing is built to perfection. Leaks occur, unusual weather happens, condensation occurs, ventilation does not always work well. In fact, there are newer concepts and methods in construction and potential changes in building codes that could be utilized, that often are not, that can help prevent mold growth in buildings. No level is a safe level, but keeping mold growth to a low level that does not increase or amplify is the key.

There are things one can check and do to a building to help prevent and minimize the uncontrolled growth of mold. These things fall into two categories. One is the creation of moisture and the other is proper ventilation. The primary purpose of ventilation is to rid the building of moisture in the air.

There are many sources of moisture in a building, more than most of us realize. First, one must understand a little about moisture. When water evaporates it is in a gaseous form in the air. The warmer the air is, the more moisture it can hold. Our bodies give off moisture to the air. Cooking creates moisture in the air. Running showers, baths, and plumbing add moisture to the air. When a building is wrapped and tightly sealed, as in most new construction, it is hard for the moisture to escape, and the relative humidity level rises. The common types of vent fans don't always do enough to rid the moisture. Venting should be to the outside, not into the attic where other problems will occur. More will come later about this.

I will now cover most of the ways moisture gets into a building and how to monitor, prevent and control it.

Let's start with the roof items. Some roofs are a type called "shedding" roofs, as opposed to flat or membrane type of roof. The sloped surface allows the water to bead up and roll off the edges. The steeper the roof, the better shedding quality and a longer life generally. The surface usually consists of shingles, which are made from many different possible materials, usually asphalt and fiberglass. Where roofing meets chimneys, the side wall of a building, a dormer, a plumbing vent pipe, or other vent pipes, etc. there is a material between the roofing and the penetration to stop water from getting through.

This material is usually made of galvanized steel and is called flashing. This is also under the valley areas where two rooflines meet and run down to the edge.

Wind damage to shingles, flashing, aging, and rusting are all possible reasons for leakage, as well as the wind blowing rain under the shingles. If the attic area is not vented properly, ice damming may occur at the roof edges where water builds up under the ice and will push its way under the shingles and into the walls of the building.

Gutters may be too long, not pitched properly, or may be filled with debris, and any of these factors may cause them to overflow into the eaves and attic area and exterior wall cavities. Downspouts may be undersized and typically do not run off far enough from the foundation. They should drain out three to five feet from the foundation to an area where water will run off. Downspouts often get plugged up with leaves, dead birds and other debris. They need to be cleaned and checked annually.

The most obvious thing to notice is the topography of the land around the building. Is it flat, does it run away from or toward the building. Does a swale need to be implemented to effect proper drainage away from the foundation? How about the dirt around the foundation walls? Is it pitched down to or away from the foundation?

Does the dirt touch the siding and conduct moisture into it? Are there vines growing on the siding and concrete? These hold moisture against the building. Do foundation plantings and bushes and trees rub up against the siding, which holds and transfers moisture? These should be trimmed at least one foot from the walls. Do tree branches rub on the roofing? These not only transfer moisture, but also prematurely wear down the roof surface.

An unsealed crawlspace with a dirt or gravel floor may allow many gallons of water vapor a day into the occupied space of the building. This is like adding fuel into the fire of mold growth. Even a concrete floor in a basement or crawl space will allow moisture in to the building from the ground if it is not properly sealed. An ideal seal is tough plastic sheeting material often installed by a radon mitigator that seals the walls and floor area of the crawl space.

Do not worry about venting in the crawl space. The latest testing and information is leading toward non-vented sealed crawlspaces. You also do not need to insulate the ceiling of the crawl space. If you do, make sure the paper side of the insulation is up snug against the sub-flooring. You also do not need to insulate the walls of the crawl space.

How do you control humidity in a building? This is not an exact science; however, the first thing is to buy a few humidistats at the local hardware store and put one on each level. These measure relative humidity. In the heating season, if you have a humidifier going, you can alter humidity level by adjusting your humidifier. Do not let the relative humidity go over 60%. Lower temperatures also help to lower relative humidity. In the cooling season, run the air conditioning continuously as long as the outdoor temperature is over 65 degrees F. If this doesn't work, you might consider the use of energy recovery ventilation systems or dehumidifiers where needed. Don't run the air conditioning so cool that condensation forms on the supply ductwork.