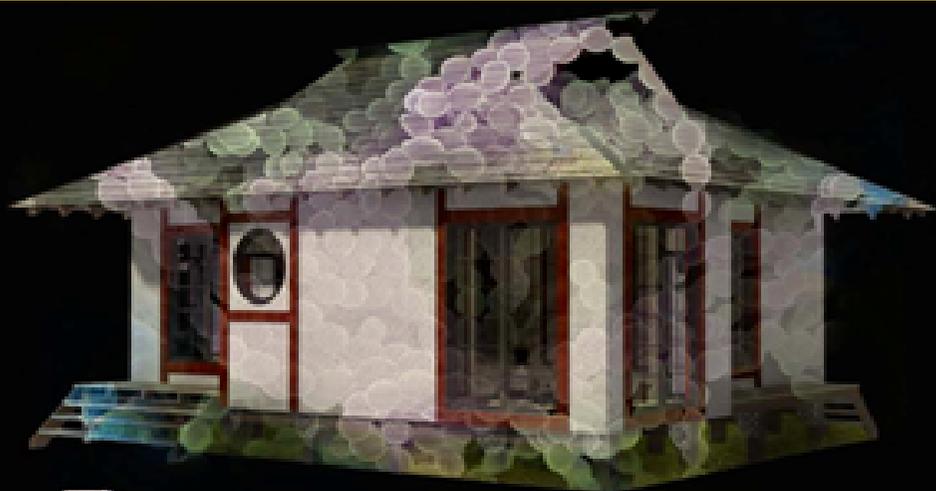


# MOLD REMOVAL SELF HELP GUIDE

When Can You Do It Yourself?  
When Do You Need Professional Help?



**Gary Rosen, PhD**

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***HIRE A FLORIDA LICENSED CONTRACTOR FOR:***

- *ROOF REPAIR*
- *MOLD ASSESSMENT*
- *MOLD REMEDIATION*
- *WATER DAMAGE MITIGATION*
- *ALL TRADES*

***CERTIFIED MOLD FREE CORP.***

*STATE LICENSED BUILDING CONTRACTOR*

*STATE LICENSED MOLD ASSESSOR/REMIADIATOR*

*STATE LICENSED INDEPENDENT INSURANCE ADJUSTER*

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## THIS IS A MOLD REMOVAL SELF HELP GUIDE

- We ask and answer the questions: When can you do it yourself? And when do you need professional help?
- Mold Removal Self Help Guide is targeted toward advising homeowners how to handle the majority of mold growth problems themselves or perhaps with the help of a handyman.
- And to aid in determining when or if a mold professional (assessor and/or remediator) should be brought in.
- You've all heard the horror stories about BAD mold contractors.
- If a professional mold investigation or professional mold remediation is desired what questions need to be asked?
- **Always check to see if any contractor you are considering is State Licensed before you hire. In Florida check them out at:**
- **[www.myfloridalicense.com/DBPR/](http://www.myfloridalicense.com/DBPR/)**

## EXECUTIVE SUMMARY

This is a *Mold Removal Self Help Guide*.

We ask and answer the questions: When can you do it yourself?  
And when do you need professional help?

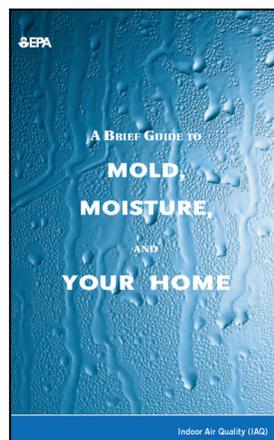
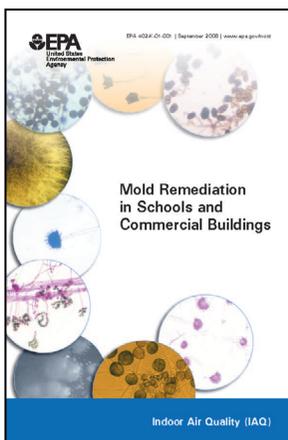
*Mold Removal Self Help Guide* is targeted toward advising homeowners how to handle the majority of relatively simple mold growth problems themselves or perhaps with the help of a handyman.

And to aid in determining when or if a mold professional (assessor and/or remediator) should be brought in.

The EPA (<https://www.epa.gov/mold>) has developed guidelines for assessing and fixing (remediating) mold and water damage targeted towards consumers and handymen. These guidelines provide excellent, practical advice for both assessment and remediation of simple to complex mold problems.

A key message of this document is that, according to EPA, OSHA and CDC (Federal) guidelines, rarely does mold testing (either air or surface) need to be performed in an initial investigation if visible mold is present.

For assessment, in a nutshell, find the moisture/ find the mold. Testing ... and professional mold assessment to determine the type of mold is not usually necessary.



## In Florida, use only FL Licensed Contractors

Every mold assessor will argue otherwise. They will tell you that you need to hire them to test the mold before you remove it.

But not at all. Resources (\$\$) are best spent removing the mold rather than characterizing the mold. Because once the mold is gone, you don't really care what kind of mold it was. Just that it is gone.

For small mold removal (remediation) jobs under 10 square feet the EPA suggest that mold removal (remediation) can be performed without professional assistance.

But whether you need professional assistance depends on what kind of mold removal one is talking about. Is this mold removal by cleaning surface mold? Or mold removal by demolition ... cutting out problem drywall?

If you cut open walls yourself (or with the help of a handyman) and the walls are heavily mold contaminated, you risk contaminating the entire home including all the content as well as the AC and ducting because removal by demolition aerosolizes mold spores. That we do not advise.

Often the best advice for mold removal/ remediation of small mold/ water damage problems (less than 10 sq ft) is to remediate only by cleaning surface mold in place. No drywall removal. No demolition.

Before you start removal/cleaning of surface mold you will need:

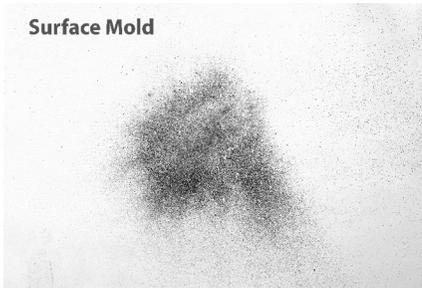


What you need to get started

**Latex gloves, N-95 respirator, goggles & spray bottle with strong bleach (1 part bleach and 2 parts water) or Tilex**

Remove surface mold less than 10 sq ft from drywall or plaster walls according to the following steps:

1. Locate the problem. Find the moisture. Find the mold.
2. Fix the moisture / leak.
3. Put on the N-95 respirator (Home Depot or Lowes). (Not a painter's/ dust mask.) Wear latex/dishwashing gloves. And glasses/ goggles.
4. Carefully pat/rub mold with wet paper towel or wet sponge or wet Swiffer to moisten the mold so that it does not puff up (become aerosolized) when sprayed.



5. Then when the surface mold is moist, spray wall surface with strong bleach (1 part bleach to 2 parts water) or Tilex. The strong bleach/Tilex not only kills the mold but also removes all mold, mold toxins ... and allergens by disintegration/oxidation. Wait 10 minutes. Follow by gently wiping with sponge and/or paper towel to remove the mold. Re-bleach surface once the majority of the mold has been removed by wiping. There may be residual staining. Not to worry because the next step is to apply stain and mold killing paint/primer.

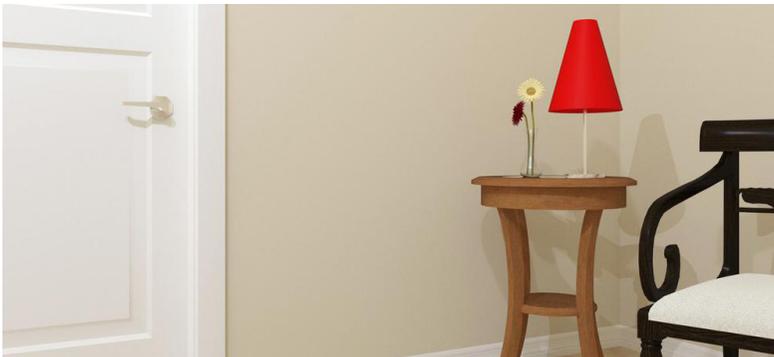




- The next day, paint/prime with a mold inhibiting primer such as with Kilz II or Zinsser Bulls Eye 123 that has a 5 year mold free warranty. Follow by final paint.



- As long as there is no longer surface mold, and the walls are sealed/intact (no openings) you will not be breathing any mold or mold spores or toxins. These will be trapped in the wall. Mold and mold toxins are not released from/ do not penetrate drywall or plaster walls.



Such advice to clean surface mold in place rather than removing the drywall is never forthcoming from professional assessors and remediators but is what is recommended by the CDC (Centers for Disease Control and Prevention). <https://www.cdc.gov/mold/mold-cleanup-bleach.html>

The CDC advice is based on three levels of mold/water damage: Major, Moderate and Minor.

If Major, call your Insurance Agent. Bring in a mold professional. Do not call a dry-out company if there is already mold. Their drying equipment will spread mold throughout the home.

## Get Rid of Mold

After a flood, mold will grow in your house. It can make you sick. You will need to clean your house.



Take things that were wet for 2 or more days outside.

Things that stayed wet for 2 days have mold growing on them even if you can't see it.

Take out stuff made of cloth, unless you can wash them in **hot** water. Also take out stuff that can't be cleaned easily (like leather, paper, wood, and carpet).

Use bleach to clean mold off hard things (like floors, stoves, sinks, certain toys, countertops, flatware, plates, and tools).

Follow these steps:

- Never mix bleach with ammonia or other cleaners.
- Wear rubber boots, rubber gloves, goggles, and N-95 mask.
- Open windows and doors to get fresh air when you use bleach.
- Mix no more than 1 cup of bleach in 1 gallon of water.
- Wash the item with the bleach and water mixture.
- If the surface of the item is rough, scrub the surface with a stiff brush.
- Rinse the item with clean water.
- Dry the item or leave it out to dry.



If Moderate or Minor mold problem make the determination if you need professional help or not. And if you choose to fix the problem yourself, follow the CDC recommendations in the Table that follows for dealing with Minor and sometimes dealing on your own with Moderate mold damage.



Home with major damage



Moderate mold damage



Minor water damage

CDC Recommended Actions	If your home has moderate mold damage, follow these steps to clean up your home:	If the inside of your home has only a little mold and minor water damage you may not need to use
Remove all moldy, water-damaged items from inside your home.	○	○
Scrub cleanable surfaces (such as wood, tile, stone) with soapy water and a bristle brush.	○	
Thoroughly clean all hard surfaces (such as flooring, molding, wood and metal furniture, countertops, and sinks) with water and dish detergent.	○	○
Use a bleach solution of no more than 1 cup (8 ounces) household laundry bleach per 1 gallon of water to kill mold on surfaces.	○	
Dry surfaces quickly and thoroughly after cleaning. If you have a fan, air conditioner or dehumidifier that wasn't affected by flooding use it to help the surfaces dry after you finish cleaning.	○	○

Clearly in all three of these pictures, the mold problem is obvious.

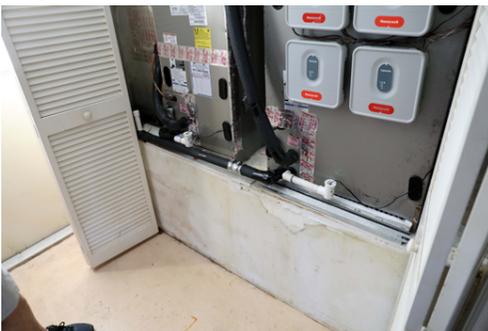
But, many times the cause, location and extent of mold is not obvious. And the issues involving mold assessment are more subtle – particularly when the cause of the mold has been humidity issues and not obvious flooding/water leaks. Or when the mold problem involves the AC system and/or ducting which is often the case when there are mold odors and/or irritation in the home that cannot be directly attributed to obvious water damage.

Keeping these issues in mind. The goals of Mold Removal Self Help Guide are four-fold:

1. To assist homeowners in performing their own investigations/assessments into the causes and severity of mold growth problems.
2. To assist homeowners in determining when the investigation work is beyond the homeowner's capability, such as when there is a problem with the AC and/or ducting, and they should bring in a mold assessor or AC contractor professional.
3. To provide a set of guidelines for the homeowner when dealing with mold assessor professionals should that be necessary.
4. How and when to attempt your own remediation vs calling in for professional remediation help.

We also offer extensive (14-hours) of free mold training for professional Mold Assessors and Remediators at our web site: [www.Free-Mold-Training.org](http://www.Free-Mold-Training.org)

We also offer extensive mold assessor training for when mold sensitive people (including people with CIRS) are involved, at our site: [www.SurvivingMold.org](http://www.SurvivingMold.org).



**Water damage below air handlers. Always means hidden mold. Call in professionals to remediate.**

## INITIAL MOLD TESTING: CAUTIONS

The guidance in this book is intended to represent “best practices” advice of a general nature for typical problems. When extensive hidden mold growth is present or when problematic contamination has spread beyond the initially identified areas, these guidelines alone may not be sufficient.

For major/severe contamination, or whenever material removal as part of an investigation may result in dispersal of mold spores, or when medical or legal issues are involved, call in a licensed and insured mold professional.

- Again, the emphasis of this document is that, according to EPA, OSHA and the CDC (Federal) guidelines, rarely does mold **testing** either air or surface need to be performed in an **initial** investigation if visible mold is present. On the other hand, post remediation testing, especially air testing is always crucial in order to make sure that any and all exposure (mold in the air) has been eliminated.
- When as a client you see a proposal from a mold assessor that requires extensive initial mold testing when visible mold is present, your first thought should be ... is this necessary?
- Briefly, the main reasons to question extensive initial testing when visible mold is present are:
  - Mold growth simply should not be tolerated – when such growth is evident, the critical cause (excess moisture/humidity) should be corrected and the mold removed as quickly as can be done in a safe and effective manner.
  - Air sampling that counts the mold spores in the air at any particular moment is not an accepted way to quantify the extent of a mold problem. The only accepted way to quantify the extent of a mold problem, in order to develop a protocol for its removal, is by visual determination/estimation of the size of the contamination (both exposed as well as hidden) for the purpose of determining how sophisticated the procedures required for mold removal are ... if you need professional assistance or not.

- How sophisticated the procedures are for a mold remediation response equate to whether a containment barrier (contamination control/ environmental control) is needed around the mold problem area during remediation work; and if a containment is needed, what kind of containment (size and complexity).
- For example, EPA guidelines stipulate the following different levels of remediation response (type of environmental control/ containment) depending on which size mold problem has been identified:
  - Small < 10 sq ft of mold. Requires no containment/ contamination control barrier per EPA.
  - Moderate 10-100 sq ft of mold. Requires simple/limited containment/ contamination control barrier per EPA.
  - Major/large 100+ sq ft of mold. Requires complex asbestos type containment per EPA.
- It should be noted that the amount of hidden mold is typically far greater than the amount of exposed/visible mold. So keep that in mind when estimating the size of the mold problem in order to classify it as small, moderate or major/large. When in doubt, a higher level of containment/ environmental control should be used.
- Generally, the size of the problem for the purpose of remediation response for visible surface mold can be determined/estimated without any mold testing.
- Generally, the key to solving a visible mold problem will always be to correct the source of excess moisture/humidity and carefully remove the mold contamination – objectives that usually can be achieved quite well



FLIR infrared camera for moisture detection

without hiring a mold assessor professional to determine the type of mold being removed.

## If A Professional Mold Investigation Is Desired

- It is critical that the investigation goals be clearly understood, achievable, and focused on identifying and solving the mold problem or problems. What are the goals of a professional mold assessment/investigation?
- Identify the cause of the growth which is always excess moisture and/or humidity. The investigator will use moisture sensing equipment such as moisture meters and Infrared Cameras (FLIRs) to help identify/ confirm active leaks.
- Determine the extent and location of the water damage and mold problem(s).
- Determine the appropriate remediation response (size and type and location of containment.)
- And after remediation, determine remediation success and rule out any cross contamination (mold that escaped from the containment) by performing Post Remediation Verification air testing (clearance testing).
- The goal of a professional mold assessment/investigation is NOT to determine the species of mold by testing. Knowing the type/ species of mold is never a concern. Once the mold is gone, what kind of mold was there before it was removed is never a concern.
- Note that most insurance carriers will require some limited mold testing by a mold professional before they will agree to coverage.



**Thermal imaging cameras detect surface moisture.**

## CONTAMINATION CONTROLS FOR PROFESSIONAL REMEDIATION: CAUTIONS

Another key message of this document is the important role contamination controls must play in a mold remediation project for more complex jobs. There are different approaches to building contamination controls. Some work better than others. The proprietary industry (IICRC) proposed approach that many mold assessors/remediators favor can cost 5X more than the EPA/OSHA/CDC recommended approach, but does not work as well.

The EPA/OSHA/CDC approach to building a contamination control is the preferred approach. A containment is erected around the work area typically using telescoping poles and 0.31 Painter's Plastic.

If under a window, an exhaust fan is installed in the window. See picture below.



**Telescoping spring loaded pole for quickly erecting containment barriers.**



**Axial fan in window okay if work is under or around window. Position fan blowing out of course to exhaust dusts and mold released by demolition outdoors.**



**If work is not under window, attach lay-flat ducting to axial fan and duct the released contaminants outdoors via the lay flat ducting.**

Or if not under or around a window, the interior of the containment is attached to the outdoors by way of an axial exhaust fan ducted to the outside ...

In either case, mold, dust ... and bleach fumes are exhausted outdoors during the demolition, keeping the air inside the containment as clean and safe as possible. For the EPA, since mold is part of the natural outdoor environment, exhausting mold to the outdoors is perfectly acceptable.

Because the air inside the EPA containment is reasonably clean (as contaminants are exhausted outside), workers need only wear N-95 masks. No special Tyvek suits or Full-Face Respirators required.

The mold professional industry standard (called IICRC S520-2015) takes a completely different approach. Their position is that mold is hazardous and you cannot exhaust mold from the workspace to the outdoor air... even though the outdoor air is full of mold. Yeh, makes no sense. There is no practical or legal reasons to consider mold as a hazard when it is all around us. But that is their position, so many assessors/remediators that are IICRC trained, treat mold as a hazardous material which means using the same remediation procedures as for removing asbestos. Minimum 5X the cost of the EPA approach.

For IICRC there is no exhausting contaminants released by the demolition to the outdoors. The mold and dusts must be collected onto filters by air filtration machines inside the work containment and then the filters bagged and discarded as toxic waste.

Due to the release of copious amounts of drywall dust during the demolition, the filters on the air filtration machines that are used to keep the air inside the containments clean, quickly clog and do not do a good job cleaning the air during demolition. Constantly changing the filters is expensive and is not done.



As a result, the air inside the IICRC containments is always filled with toxic dusts including mold, mold fragments, bacteria, mites etc that are being released from the water damaged materials during the demolition.

**This is not how you do it. When mold and dusts are not exhausted outdoors inside the containment is hazardous. And always results in cross-contamination.**

That's why IICRC requires workers to wear, unlike with EPA, extensive protection such as full-face respirators and Tyvek® suits when working inside the containment. Workers are protecting themselves from the toxic dusts released by demolition. But as the workers go in and out of the containment, these toxic dusts are always spread into the living areas (this is called cross contamination). Best to always exhaust contaminants outdoors and keep the inside of the containment as clean as possible to avoid cross-contamination.

When as a client you see a proposed mold remediation protocol or quotation that requires extensive personal protection such as full face respirators, Tyvek® suits and decontamination chambers, your first thought should be ... is this necessary?

Most likely the procedure is based on IICRC and not EPA/OSHA and they are not exhausting contaminants outdoors.

As a rule of thumb, it costs 5X more to remove moldy drywall when not exhausting the mold/dusts released during demolition outdoors (per IICRC guidelines vs the EPA/OSHA guidelines that exhaust outdoors). And yet the IICRC approach while costing so much more than the EPA/OSHA approach, always results in cross

contamination/ poor quality work unless the work is supervised by a full-time hygienist which it never is, due to cost.

**Federal standards for mold remediation (EPA/OSHA/CDC) are the gold standard. There is no good reason to use proprietary IICRC procedures unless you want to spend more money for lower quality work. Unfortunately, the goal of many mold professionals is maximizing the cost of the work even when that results in inferior results. Sad but true. Buyer beware.**



## FALSIFYING POST-REMEDIAION AIR TESTING

Post Remediation Verification (PRV) means that you have verified the mold is gone; the work area and adjacent areas have not been left contaminated; and the cause of the mold is fixed (usually moisture).

Another key message of this document is the importance of proper Post Remediation Verification (PRV) testing after more complex jobs.

Mold assessors often-times perform initial mold testing to verify obvious visible mold when this is not typically needed. On the other hand, post-remediation testing should always be performed and is often skipped leaving homes contaminated with mold.

What is proper Post-Remediation Verification (PRV) testing? People ask whether post-remediation testing should be performed by air testing or surface dust testing; inside the containment; outside the containment; with air scrubbers on; with air scrubbers off ... and any combination thereof.

The answer is simple. As a result of careful mold remediation and post-remediation cleaning, the work site **as well as adjacent areas directly outside the containment** should be free of mold and mold spores and free of other contaminants typically found in water damaged environments such as mold fragments, mold toxins, bacteria, mites etc. in both the air and settled dust.

You test however you need to test to make sure the remediated

and adjacent areas are clean, healthy places to live and work ... that they are delivered good as new.

However, more often than not, mold assessors, because they are improperly trained, will present clearance test results showing that the work has been properly performed but the house is actually contaminated. We unfortunately see this as the rule and not the exception.

What is almost always the issue, because the IICRC procedures that are commonly used do not exhaust contaminants outdoors, the home **outside** of the containment area is left cross-contaminated. But the trick that the mold assessors use after remediation, is they only test the air inside the containment with an air scrubber running inside the containment, and they do not test the indoor air in the home outside the work containment.



HEPA filtered Air Scrubber

You are probably saying that this is criminal. And yes we agree. But that is how it is almost always done. So buyer beware! You can get bitten in the butt if you are not careful!

**If a mold assessor wants to test the air inside a containment with an air scrubber running before the containment is removed ... no problem. But they must also test outside the containment to make sure that there has not been any cross contamination.**



## POST REMEDIATION VERIFICATION TESTING FOR MOLD IN SETTLED DUST

Again, Post Remediation Verification (PRV) means that you have verified the mold is gone; the work area and adjacent areas have not been left contaminated; and the cause of the mold is fixed (usually moisture).

Many mold professionals attempt to define PRV as only air sampling.

One should not overly rely on air sampling to determine if a job has been well done. We are also concerned if the remediators left the floors and content “dirty” ... covered with mold contaminated dusts. The work area and adjacent areas should be left clean. How do you measure clean?

Use “white glove” testing (we use a wet Swiffer) to visually check for the absence of settled dust either on surfaces or inside AC ducting.

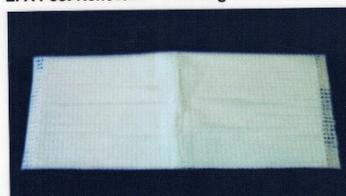
No settled dust = No mold spores in the settled dust

How is this determined “scientifically”?

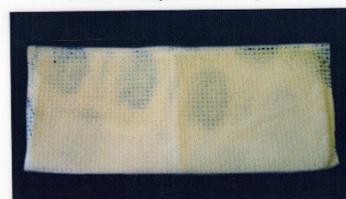
The EPA post remediation verification procedure for measuring the degree of settled dust after lead paint removal works great for mold as well.

- Wipe the surface (floor or inside ducting) with a wet Swiffer.
- And compare to picture at bottom of the EPA Post-Remediation Cleaning Verification Card.
- If darker, this is defined as elevated dust. PRV fails.
- If lighter ... PRV passes.

EPA Post-Renovation Cleaning Verification Card



Unused Wet Disposable Cleaning Cloth



Marginally Passing Wet Disposable Cleaning Cloth

## PROBLEMS CONFRONTING THE MOLD ASSESSMENT INDUSTRY TODAY

### Limited Initial Testing for Hidden Mold

In many cases, initial testing is performed in a very limited manner to screen for hidden mold. You call a few mold assessors. Compare prices. And hire the cheapest one. And that can work but ...

If elevated mold problems are measured in the indoor air but the source is not determined ... additional (more extensive/expensive) testing and investigations almost always should be performed before coming to any conclusions about the extent of hidden mold or the type of mold remediation work that should be performed.

Rarely can sampling on its own, whether limited or extensive, be relied on to make such determinations.

Testing should always be supplemented with extensive observations, along with moisture readings such as:

- Check ceilings, walls and baseboards for water staining. And with moisture meters or FLIRs check for current leaks.
- Determine history of previous leaks—roof, sink, shower, window, AC etc.
- Pull up carpets edges to look at the color of tack strips or if there is evidence of ants living in the wall. That means moisture in the wall. See picture below.



- If a mold sensitive person states that they are irritated in the home but fine outside, and there is no visible mold or active leaks, then there is likely mold hidden in the AC and/or ducting. Small amounts of mold hidden in walls and/or attics does not result in irritation because it does not represent significant exposure. But even a small amount of mold growth inside the AC, ducting or AC closet can represent significant exposure ... mold in the air. And there is always non-mold related microbial growth (bacteria, viruses and mites) in the always wet AC and ducting that are not of course found when testing for mold but can be as irritating or even more irritating than mold.



**Very dirty AC coils. AC coils, blower, ducting must be clean for mold sensitive people**

- With the help of an AC contractor, open up AC supply and return plenums and registers to visually check for mold. If there is dirt ... there will always be mold. If there is mold there will also be other microbial irritants as well.
- Check the air handler closet and return air ducts for any openings that could allow moist air to enter the AC system.
- Check the AC filters. If they are missing or they are the worthless see-through filters there will probably be dust contaminating the air handler and ducts and most likely mold growth above the air handler.
- Carefully ... pull back baseboards to visually check for mold.
- Inspect attics and basements to visually look for water damage or openings allowing mold, moist air or smells inside.

- Cut holes in the cabinets toe kicks under sinks to check for water damage.
- And sometimes using a mold professional one must cut a few holes into walls while carefully minimizing any potential spread of contaminants.

## **Problem with Inadequate Training of Mold Investigators/ Assessors**

Indoor mold growth is a result of water or moisture coming into contact with a mold food source such as the paper facing on drywall, dust in AC ducts, wood cabinets, etc. Mold assessors miss or misdiagnose mold problems 3 out of 4 times in our experience. The reason is simple ... limited to zero construction knowledge.

For example, 80 -90% of the people sick from mold are sick due to mold contamination of the AC system. And yet, mold assessors (and mold remediators) typically have no background or practical training that will allow them to properly identify, correct, or recommend corrective solutions to such problems.

Too much of the focus of training is on air sampling. To take an air sample one must put a sampling pump in place, fit a cartridge onto it, turn the pump on, remove cartridge and send to lab. No wonder typical mold assessor training is only 1-2 days!

Why their focus on sampling? Because it is easy to do and you can make money doing it.

Keep in mind that according to *American Industrial Hygiene Association Guideline* ...

- In order to assess the extent of potential damage, knowledge of how buildings operate, applicable building codes, and common sources of water intrusion from failures of building envelopes is recommended.
- Professionals should be able to recognize other factors that contribute to mold problems including failures of plumbing and HVAC systems and other unplanned sources of water and moisture.

## In Florida, use only FL Licensed Contractors

This cannot be taught in the typical 1-2 day online Mold Assessor training course. That is why we recommend if you will be having a professional mold assessment done, that the assessor is not only certified/licensed in mold but is also a Certified/Licensed Home Inspector which requires extensive training on building construction compared to only 1-2 days of training for Mold Assessors.

Again, we offer extensive (14-hours) of free mold training for professional Assessors and Remediators at our web site: [www.Free-Mold-Training.org](http://www.Free-Mold-Training.org). Anyone can download and take the training. You do not have to be a mold professional.

And, we offer extensive mold assessor training for when mold sensitive people are involved at our site: [www.SurvivingMold.org](http://www.SurvivingMold.org).

## COMMON INDOOR MOLDS CAN MAKE ONE SICK

Mycotoxins are toxins produced by mold. Mycotoxins are produced by molds to help them fend off competitors such as other molds or bacteria. Mycotoxin production is the rule rather than the exception.

Unfortunately, most people assume that if there is no *Stachybotrys* contamination (the black toxic mold that everyone talks about) then there are no serious mold toxins to worry about.

That can be a major mistake/ problem.

*Penicillium* and *Aspergillus* (Pen/Asp) molds are the two most widely found molds in water-damaged buildings. And they are not only produced by water damage but are also the molds most commonly produced by elevated indoor humidity problems, as well, they commonly colonize the AC system and ducting.

They produce toxins, including neurotoxins. The toxins are present in both the mold spores (tiny seeds) as well as the mold bodies.

The point to be noted is that serious health problems can and do occur without *Stachybotrys*. *Stachybotrys* is much less often found in water damaged homes, schools and offices than Pen/Asp.

There is always Penicillium and Aspergillus molds in water damaged homes, schools and offices.

The following results regarding the neurotoxicity of Pen/Asp are excerpted from *Damp Indoor Spaces*, The National Academy of Sciences, Institute of Medicine 2004 p 160–162.

Neurotoxic mycotoxins tend to fall into three general classes: tremorgenic toxins, paralytic toxins, and toxins that interfere with neurotransmitters or receptors either centrally or at the target organ. Many of the toxins are very potent and have immediate effects on animals exposed to a single dose by various routes.

### **Tremor**

Tremorgenic toxins are produced predominantly by *Aspergillus* and *Penicillium* species (Ciegler et al., 1976; Land et al., 1994).

The penitrem type of mycotoxins produces a neurotoxic syndrome in animals that involves sustained tremors, limb weakness, ataxia, and convulsions (Steyn and Vleggaar, 1985). Tremorgenic toxins generally initiate measurable effects in experimental animals within minutes of exposure.

### **Paralysis**

*Penicillium* species also produce neurotoxins that induce paralysis, such as Citreoviridin (produced by *P. citreo-viride* and *A. terreus*) and verrucosidin (produced by *P. verruculosum* var. *cyclopium*). (Franck and Gehrken, 1980; Hodge et al., 1988; Ueno and Ueno, 1972).

Those toxins produce a progressive, ascending paralysis and are thought to act at the level of the interneurons and motor neurons of the spinal cord and motor nerve cells of the medulla. A typical pattern of poisoning begins with paralysis of the hind legs, which is followed by a drop in body temperature and respiratory arrest (Ueno and Ueno, 1972). The tremorgenic and nontremorgenic mycotoxins from *Aspergillus* and *Penicillium* work at a functional level of the nervous system different from other mycotoxins that have more widespread targets for toxicity or work by inhibiting basic cellular functions, such as protein synthesis.

## Other Effects

Ochratoxin OTA is toxic to nephrons and is a known neurotoxicant during prenatal stages (WHO, 1990). It is produced by *Aspergillus* and *Penicillium* species.

So let's not overly focus on *Stachybotrys*. Do not overlook common molds such as *Pen/Asp* that are growing in homes.

**And where is toxic *Pen/Asp* always found? Inside dirty ACs and ducting and then continually being blown out into the indoor air.**

## THE PROBLEM WITH INVESTIGATING FOR REAL ESTATE PURCHASE AND SALES TRANSACTIONS

Investigation for real estate purchase and sales transactions is a specific class of mold growth investigation with a whole host of issues that can make the investigation problematic.

1. There may be no known history of the problem and the problem(s) may in fact be covered up / painted over by the seller.
2. If the inspection is done in the "dry season," any moisture problem from a roof leak would have long since dried up and moisture detection equipment including infrared thermographic (FLIR) analysis will not be of any help finding leaks.
3. A mold problem (elevated mold), mold odors, and mold-related irritation may only be apparent during the rainy season or hot and humid months.
4. The real estate agent may want an inspection to protect the agent, but does not recommend sufficient testing to find any problems.
5. The buyer does not want to pay for sufficient testing or for a qualified person to perform the testing because the real estate agent assures them that spending more than \$295 on an

inspection including testing is not needed.

6. A small number of samples will never rule out hidden mold growth.
7. In addition, there are no standards for comparing test results. Testing even when performed may be challenged as not scientific.

This situation may appear to be complex but it can be made simple.

**The real estate agent should be asked to make sure:**

- The mold investigator/assessor has adequate qualifications (training, license, certifications, insurance) for the task at hand.
- The mold investigator is trained in moisture related construction defects. This typically means that the mold investigator/assessor is also an ASHI/NACHI certified Home Inspector and/or state licensed if applicable.
- The investigator should be asked if he will need the help of an AC contractor to thoroughly investigate the AC and ducting.
- The investigator should be able to provide a written statement that the home was found free of significant hidden mold including mold contamination in the AC and ducting and that sufficient inspection/testing was performed to allow that conclusion to be made.
- Sometimes follow up inspections need to be made by either a second assessor or a remediator or AC contractor. The investigator needs to be clearly asked what other problems could be hidden/missed by the typical limited inspection.
- The investigator needs to be asked if it is possible that significant hidden problems were missed, do they recommend a follow up inspection to make sure the property is free of mold and water related problems?
- Be sure to carefully read the investigator disclosure when you sign the work order. If you do, you will quickly understand that

the job of a mold investigator is to not find all mold problems because if they do, the sale could be lost and the investigator would be blamed. I know that many readers will find this hard to believe. But read the disclosure statement and be prepared to be shocked.

- Ask the investigator if they will be able to give you a warranty/guarantee that there is no significant hidden mold in the walls, attics, and/or AC/ducting that can or is resulting in any detectable mold or mold fragments or odors in the indoor air.
- And if not, what would be recommended for them to provide such a warranty/guarantee? Perhaps getting the seller to allow the inspector to peek behind baseboards in potentially wet areas under windows, around bathrooms and kitchen plumbing?

## GUIDANCE ON BEST PRACTICES

The main objective of any mold investigation should be to locate sites of indoor mold growth in order to determine how to best control the underlying moisture problem and then eliminate the mold problem. OSHA, EPA, and CDC guidelines for response to mold contamination all depend on visual assessment of the extent of the mold growth in order to determine an appropriate action.

While indoor mold growth can be the cause of health problems, mold is not the cause of the building's problems. It is the moisture/humidity that is the source of the building problem. Indoor mold growth is an indicator of a moisture/humidity problem. Unless the cause of the moisture/humidity is properly solved, mold will always return.

The homeowner's general concern are odors and irritation. As mold and mold spores do not escape from sealed walls or floors or attics, one of the most important goals of an initial assessment is not only finding mold/water damage problems but determining which "problems" result in odors/exposure/irritation and which do not.

And then focus only on those that do. In houses that are not brand new there is always mold hidden in exterior walls. If the mold does

not represent exposure because it is not circulated in breathable air ... it often makes the most sense to leave it where it is and focus on mold (and bacteria) growth that always represents exposure and that is anything but a pristine AC, ducting and/or AC closet.

For an initial investigation, it is important to understand that it is best to never test for mold, unless both sampling and interpretation of the data can be done in a way that meet the investigation objectives with an acceptable degree of certainty.



**Dust in AC ducting always harbors not only mold but dust mites, bacteria and viruses. Must restore to "as new" clean for sensitive people.**

## PROCEDURE FOR MOLD/ODOR INVESTIGATION FOLLOWING A WATER EVENT

We recommend the following steps be taken during an initial response to a known or suspected mold problem.

Excess moisture is the core underlying cause of any indoor mold problem. It is critical to address any water leak as soon as possible!

Drying efforts should begin immediately and significant effort should be made to assure that materials are substantially dried within 24 to 48 hours, before mold has a chance to grow.

Mold contractors will tell you that you must remove the cabinets, flooring or walls to remediate. But once the water leak is fixed, the mold will stop growing. When the mold stops growing there will be no mold odors. When the mold stops growing it will eventually die.



**This is Stachybotrys toxic mold behind the bath vanity. Unless you hire a mold professional to properly remove, the best bet is to stop the leak and leave the mold where it is. Once dry it will no longer grow or produce odor and will eventually die.**

So most often the best approach to fixing limited mold problems is to make sure that the water source is fixed. And if there is visible mold on surfaces it can be removed using bleach as explained earlier.

Determine the need for further action once the area is dry ... may take several weeks to completely dry and for the odor to stop.

If there continues to be odor it can mean that that water source has not been completely fixed and you will need to bring in a mold professional.

## **Homeowner Investigation**

If the problem's source is not readily observable, yet it makes sense to suspect mold based upon symptoms or history/evidence of excess moisture, the suspect areas should be carefully investigated. The following activities are recommended for a homeowner investigation:

- A thorough visual check for mold growth. The appearance of mold may include many textures or colors. Growth may appear as a solid patch or discrete colonies.
- A visual check for signs of excess moisture or water damage such as leaks, warping, standing water, staining, condensation, efflorescence, corrosion of metal, or dampness to the touch.
- Then use your sense of smell to locate sources of odors. "Mold odors" are typically described as "earthy" or "musty".

- Or you may wish to purchase a low cost Moisture Meter such as this one advertised at Walmart.



When searching for hidden mold/moisture resulting in mold odor, we recommend the following approach:

- Seal off the room under investigation by closing doors.
- Put a strong fan in a window directed outside with the areas around the fan sealed off with plastic or cardboard.
- The fan causes a negative pressurization.
- Put your nose up to any cracks, crevices, electrical receptacles, light switches, and openings to determine if there is any musty mold odor escaping from wall, ceiling or floor cavities due to the negative pressurization.



**AC supply plenum (fiberglass box above the AC) is full of live mold.**

- If there is a general bad/ moldy odor that is not attributable to any particular room, the problem is almost always AC/ducting related. This will require a professional to be brought in.
- Always check in and around AC closets and supply & return vents.
- Quite often all it takes to turn a sick house into a healthy house is to remediate the lining of the AC supply air plenum (that's the fiberglass box above the air handler.)
- If there has been a AC drip/drain pan overflow because the coils get dirty, there is often resultant mold below the unit either in the return air plenum beneath the AC or AC closet.
- Other times, the air handler drain line clogs causing the drip/drain pan to overflow. Mold will result.

- In the picture below, mold is shown growing on the outside of the return air box that the air handler sits on. But inside, the box is also full of mold.
- The mold inside the box is being disbursed into the occupied space making occupants sick.



**Mold on exterior of AC return air box. Much worse mold inside!**

- A home inspector or mold assessor will be able to examine or survey suspected areas with an Infrared Thermographic Camera to determine locations of elevated moisture within materials or at surfaces in suspect areas compared to non-suspect (control) areas. Elevation is hereby defined as sufficient to cause mold growth.
- The Infrared Camera is a very powerful method for finding water damage and the subsequent mold growth but only if used immediately after a water event (rain, flood, etc.) when things are still moist. It is no help finding mold once things dry out. It does not find hidden mold inside of walls.

Non-professionals may be able to carry out the early phases of an investigation, but the skills of an indoor air quality or moisture expert may also be needed in some cases.

Visual inspection and physical assessment should routinely include all areas where moisture sources may be present such as crawl spaces and air plenums. In doing so, identify and follow safety requirements related to confined spaces. Also be sure to evaluate other areas where there is potential water/weather intrusion such as the roof, windows, doors, skylights, cool condensing surfaces with moisture accumulation.

Moldy environments do not always have visible growth on easy-to-see surfaces. Mold commonly grows hidden within enclosed spaces or other areas that are difficult to view.

Consequently, inspections may also require careful destructive or intrusive efforts to determine the source of moisture. This will require the efforts of a handyman or a professional to help.

### **Intrusive Inspections With The Help of a Handyman:**

Check the following areas with intrusive inspections:

- Behind, under, and within cabinets. The sink kitchen cabinet can typically be inspected by removing the dishwasher.
- Check behind refrigerators. The ice maker line often leaks.
- Under carpet and pad, especially when covering, or installed over, a below grade slab.
- Above ceiling tiles in offices.
- If there are ceiling stains, check the attic for roof leaks or AC ducting condensation/leaks.
- Behind wall coverings such as wallpaper and paneling especially on exterior walls.
- Inside of AC systems (remove access panel) and inside ducting (remove grills).
- And especially behind baseboards under windows.

## PROFESSIONAL INVESTIGATION

Assessment and correction of the source(s) of excess moisture are absolutely critical to solving and attempting to prevent the recurrence of an indoor mold problem. A building performance or moisture expert/consultant may be needed when moisture problems cannot be identified or resolved.

With the consultant, determine clear objectives for the moisture investigation and ensure that the goals support those of the mold investigation effort. Ask the consultant to perform the following investigative procedures.

### **Expectations for Professional Mold Investigation**

Experienced and competent investigators should be able to justify any recommended mold sampling with a clear statement of their hypothesis(es) and how the test results will be used in determining solutions to the problem.

1. Objectively educating the client about what the client really needs to have done and how to best achieve it, rather than simply responding to what the client asks for;
2. Describing the limitations of any testing method;
3. Describing the applicability of test results and the common uncertainties encountered in interpreting results; and
4. Managing the common false expectation that mold testing can reliably predict safety concerns or rule out health risks.

Clearly designate and communicate objectives of all investigation activities planned. The primary objectives are to identify/determine:

- Excess moisture accumulation and water intrusion;
- The presence of mold growth; and
- The extent of mold contamination.

- Establish, specify and follow sample collection/handling protocols appropriate to meet investigation objectives.
- Provide not only results but also detailed interpretation.
- Provide specific recommendations to:
  - Correct excess moisture sources and related problems (emphasizing the critical importance of this);
  - Thoroughly clean and remove mold growth and related contamination;
  - Rule out areas of water damage and hidden mold that do not represent exposure problems.
  - Verify that any remediation and post-remediation cleaning have been 100% effective
  - **Do not forget the importance of a clean mold free AC, ducting and clean and properly sealed AC closet.**

Fiberglass lined supply plenum made from duct board connects unit to ducting

Blower is inside here above coils

AC coils are inside down here above drain line.



## **Expectations for Professional Moisture Investigation**

In our opinion, too much effort is focused on reporting moisture readings that call out potential problem areas. In a mold growth investigation if the moisture measurements don't find mold, don't spend a lot of time discussing them and filling the report with worthless data.

The beauty of an infrared camera is that it provides a picture of a wide range of areas and can show how a problem got started or the extent of a moisture problem.

For instance ... mold forms on the wall near an AC supply vent because the vent is adjusted improperly. The report should state: Cool air from the vent made the adjacent wall cold, moisture formed on the wall, and as a result mold grew. See infrared picture attached that shows the cool surface where the mold is growing.

The report conclusion should be: 1) "Make sure you properly adjust supply vents." 2) "To get rid of the mold, simply clean the surface. Mold will not be forming inside the wall because the source of the water problem is external."

Reports should focus on results, conclusions and recommendations. They should not be collections of measurements.

The true professional writes short reports that explain the problems and how to fix them. And recommendations of what does **not** have to be fixed. He uses photographs to tell the story whenever possible and limited wording that no one wants to read.

### **Professional Mold Investigation: Ruling out mold under cabinets**

Small amounts of mold inside of sealed walls or ceilings generally is not a problem. Stop the leak. The mold will stop growing and stop producing odor. And will eventually die.

However mold under kitchen or bathroom cabinets is another story.

The cabinets are never perfectly sealed. There are always openings that allow the release of mold spores. Rather than removing cabinets to rule out mold, professional mold assessors can test

under cabinets using a cavity testing extension connected to the sampling cassette/cartridge.



**Cavity testing extension.**



**Air sampling cartridge.**

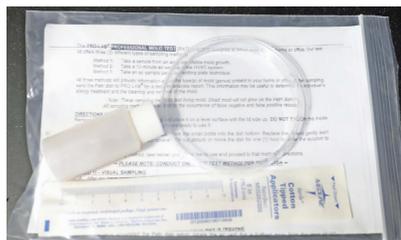


**Expect heavy mold under these cabinets. The mold assessor cannot safely remove the vanity to visually check for mold. Instead they can take an air sample underneath and so determine.**

Investors will always bleach and then paint over such problems leaving mold under and behind cabinets.

Mold professionals should always test for hidden mold under suspicious cabinets.

## HOME OWNERS OR MOLD PROFESSIONALS: TESTING FOR MOLD IN THE AC/DUCTING



Pro-Lab of Weston Florida has developed a low cost test procedure to determine if there are mold spores being released from the AC/ducting.

- Tape petri dish filled with solidified agar gel onto the AC grill.
- Run AC with FAN = ON for 10 minutes.
- Remove petri dish. Cover and send in for analysis.
- Detailed instructions comes with the kit.

Pro-Lab will do the analysis and provide you with a conclusion: Elevated or Not Elevated. If elevated, get professional help in identifying and remediating the mold problem in the AC/ducting.



**Tape petri dish to grill to check for mold spores coming from AC and ducting.**

## Summary and Conclusions

Find the moisture. Find the mold. Remove the mold. And make sure that you fix the leak so that the mold does not return.

Is it limited surface mold that you can take care of by yourself by following simple surface cleaning/bleaching procedures? Or do you need professional help?

When in doubt call in your **licensed** Pro.

After cleaning visible mold and fixing any leaks or in the event there is no visible mold or leaks ...

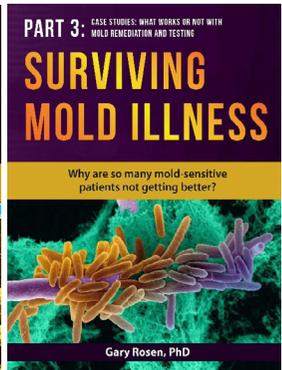
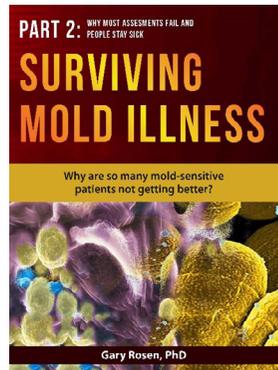
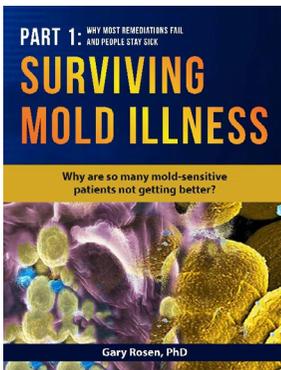
If there is indoor irritation, the cause of irritation is always **breathing** mold. Not mold trapped inside of walls, or ceiling or attics. Or not mold found in surface dusts that is known to not result in significant exposure.

And when you discuss breathing mold ... that leads to, always wet and usually quite dirty AC, ducting and problematic AC closets.

Are you suffering from what your doctor has called mold-induced environmental illness also called Chronic Inflammatory Response Syndrome (CIRS)?

And/or are you concerned about mold problems in your AC and ducting? You should be!

Then you must read our follow up 3-part series *Surviving Mold Illness* ... especially for you. [www.survivingmold.org](http://www.survivingmold.org)





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