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Home Inspectors and Mold Sampling – Hype or Help?

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When I started inspecting homes in the late 80s, mold was of no concern other than what might be growing on that two-week-old dish of leftovers in the refrigerator. In recent years, the media and lawyers have elevated mold to the status of the plague. There's been an explosion of home inspectors who hold themselves forth as mold experts. A quick Google search for "home inspectors and mold sampling" returns an astounding 124,000 results. For many home inspectors, mold is gold.

As a home inspector, I'm sorely tempted by the money involved in mold sampling. Many inspectors are adding hundreds of dollars to their fees by offering mold inspection services. Whipped into a frenzy by the irresponsible media and liability-fearing real estate community, some clients even insist on it. But I have a problem. I like to do what's right. The more I investigate the typical modus operandi of home inspectors offering mold sampling, the more I'm convinced it's the wrong thing to do. In this article, I'll share some of my research on the subject and my thinking.

Health Effects

I'm not going to get into the health effects of mold. I'm not a doctor. I'm certainly not qualified to make such determinations. The notion of home inspectors advising clients on health issues is so ridiculous as to be bizarre. I will agree that conditions conducive to the growth of mold are not conducive to good health. In its 2009 report *i* on mold and dampness in buildings, the World Health Organization says:

"Sufficient epidemiological evidence is available from studies conducted in different countries and under different climatic conditions to show that the occupants of damp or mouldy buildings, both houses and public buildings, are at increased risk of respiratory symptoms, respiratory infections and exacerbation of asthma. Some evidence suggests increased risks of allergic rhinitis and asthma. Although few intervention studies were available, their

results show that remediation of dampness can reduce adverse health outcomes.

There is clinical evidence that exposure to mould and other dampness-related microbial agents increases the risks of rare conditions, such as hypersensitivity pneumonitis, allergic alveolitis, chronic rhinosinusitis and allergic fungal sinusitis."

This, of course, is not earth-shattering news to home inspectors who have been on the front lines of the battle against moisture for decades. It is, however, a complex subject. Literature suggests that it's not just fungi alone that might cause health effects in damp buildings, but other substances such as bacterial endotoxins, protozoa and dust mites. The WHO goes on to say *ii*:

Damp indoor environments may also contain bacteria, bacterial endotoxins and other microorganisms, such as amoeba, but less information is available about these agents and further research is required. Damp building materials may increase their chemical degradation, resulting in more emissions of volatile organic compounds, including formaldehyde, further deterioration of building materials and structural integrity and subsequent use (and misuse) of potentially hazardous chemicals such as pesticides. Although it is plausible that the exposures listed above are the main causal factors of the health effects associated with damp buildings, this has not been proven.

We'll leave it at that. For those who would like to investigate further, I suggest reading Health Effects of Moulds (Mold): State of Knowledge at www.forensic-applications.com/moulds/sok.html.

Mold Inspection

I'm not opposed to home inspectors performing mold inspections. We all know that mold is a symptom of a moisture problem. Home inspectors know how buildings work, and, more importantly, where and how they are likely to not work. I can't think of any other discipline that knows more about the factors needed to determine the source and cause of abnormal moisture in buildings than home inspectors. This is something we all do on a daily basis.

I am, however, opposed to home inspectors who sell meaningless mold sampling to their clients. It's my opinion that routine sampling for mold is nothing more than a quick way to separate fools from their money.

Let's look at these questions: Is routine mold sampling justified? If so, why and when and how? If it's not, what are the consequences?

The typical "mold inspection" involves looking for signs of moisture and visible mold, perhaps using a moisture meter or IR camera to search for signs of concealed moisture, then sampling air for mold spores or perhaps taking a carpet dust sample. Two outcomes are possible: Either we saw or

smelled mold or we didn't.

If we observed mold, there's no need to sample. We know mold is present, and we know we need to advise clients to get rid of it and stop the source of moisture that allows it to grow *iii*. At this point, testing is moot. Many mold inspectors quote CDC and NY Dept. of Health documents in their reports, then blithely ignore the recommendations in those same documents.

The CDC says *iv*:

Generally, it is not necessary to identify the species of mold growing in a residence, and CDC does not recommend routine sampling for molds. Current evidence indicates that allergies are the type of diseases most often associated with molds. Since the susceptibility of individuals can vary greatly either because of the amount or type of mold, sampling and culturing are not reliable in determining your health risk. If you are susceptible to mold and mold is seen or smelled, there is a potential health risk; therefore, no matter what type of mold is present, you should arrange for its removal. Furthermore, reliable sampling for mold can be expensive, and standards for judging what is and what is not an acceptable or tolerable quantity of mold have not been established.

Standards for judging what is an acceptable, tolerable or normal quantity of mold have not been established. If you do decide to pay for environmental sampling for molds, before the work starts, you should ask the consultants who will do the work to establish criteria for interpreting the test results. They should tell you in advance what they will do or what recommendations they will make based on the sampling results. The results of samples taken in your unique situation cannot be interpreted without physical inspection of the contaminated area or without considering the building's characteristics and the factors that led to the present condition.

The EPA has this to say about sampling *v*:

Is sampling for mold needed? In most cases, if visible mold growth is present, sampling is unnecessary. In specific instances, such as cases where litigation is involved, the source(s) of the mold contamination is unclear, or health concerns are a problem, you may consider sampling as part of your site evaluation.

If it is not possible to sample properly, with a sufficient number of samples to answer the question(s) posed, it would be preferable not to sample.

Inadequate sample plans may generate misleading, confusing, and useless results.

Keep in mind that air sampling for mold provides information only for the moment in time in which the sampling occurred, much like a snapshot. Air sampling will reveal, when properly done, what was in the air at the moment when the sample was taken. For someone without experience, sampling results will be difficult to interpret. Experience in interpretation of results is essential.

The ASTM standard E2418-06, Standard Guide for Readily Observable Mold and Conditions Conducive to Mold in Commercial Buildings: Baseline Survey Process says much the same:

1.3.1 Sampling for mold growth is a non-scope consideration under this guide. As noted by EPA 402-K-01-001, sampling cannot be used to assess whether a commercial building complies with federal standards, since no EPA or other federal standards or Threshold Limit Values (TLVs) have been established for mold spores. And, sampling would only produce results reflecting a specific moment in time in the best case and could produce inaccurate or misleading results in the worst case.

If the mold inspector didn't observe visible mold, he feels compelled to prove it somehow, perhaps to justify the fee he's charging for the mold inspection by producing an official scientific-looking document from a laboratory. So, he'll take an air sample (or two) indoors and an outdoor air sample and compare those to prove that there are fewer mold spores floating around in the indoor air than outdoors, and therefore there can't be a mold problem in the house. This is the point where we enter the realm of science fiction. **Random air sampling will tell us nothing meaningful about the level of mold spores in the air unless we engage in expensive sampling over a period of time.** Even then, interpretation of the results is difficult.

The CDC Mold Work Group report vi states it this way:

Sampling for mold is not part of a routine building assessment. In most cases appropriate decisions concerning remediation and need for personal protection equipment (PPE) can be made solely on the basis of visual inspection.

Other than in a controlled, limited, research setting, sampling for biological agents in the environment cannot be meaningfully interpreted and would not significantly affect relevant decisions regarding remediation, reoccupancy, handling or disposal of waste and debris, worker protection or safety, or public health.

We can't state that a certain level of mold spores in the air is "safe" or "won't cause health effects" because there are no established normal or safe levels. Even extensive testing isn't much help because there's no way to measure how much exposure people had in the past.

Many so-called experts use the number 500 spores/cubic meter (S/M³) as an acceptable level in a dry building, but others disagree. In that same dry house in a dry climate, testing will exceed 1000 S/M³ 10 percent of the time^{vii}. A single sample in the same house may exceed 3000 S/M³. The typical mold inspector ignores the science that tells us that there are very large variations in sampling results over time and location within even a single room. Samples taken in different locations in the room will exhibit the same large variations. Simply waving a piece of paper over an active colony of mold may change the results of an air sample by a factor of 100^{viii}.

| Time | Spores/M ³ |
|-------|-----------------------|
| 9:00 | 250 |
| 10:30 | 1200 |
| 12:00 | 299 |
| 1:30 | 575 |
| 3:00 | 929 |
| 4:30 | 3578 |

Answer: They're All Correct

Figure 1

Looking at Figure 1, the uninformed mold inspector might form an entirely different conclusion at 4:30 p.m. vs. samples taken at 9:00 a.m. Also, all of this ignores the inherent variations in sampling due to particle size.

The same spatial (location) and temporal (time) variations apply to samples taken outdoors. The Wisconsin Dept. of Health has this to say about outdoor levels ^{ix}:

Outdoor counts will vary greatly and may in turn cause similar variation in indoor levels. Because of this variability, it can be difficult to differentiate true difference between outdoor and indoor samples without taking a large number of samples. Soil and plant materials are major sources of airborne mold. Studies indicate that outdoor fungal levels vary greatly by region, season, weather conditions, and air movement. According to data published by the American Academy of Asthma, Allergy and Immunology

(www.aaaai.org), outdoor mold counts for major U.S. cities regularly exceed 10,000 spores per cubic meter of air during much of the year.

Gosh, maybe we should advise our clients not to go outdoors.

The World Health Organization has this to say about sampling x:

Problems in measuring indoor exposure

Exposure to microorganisms in the indoor environment is most frequently assessed by counting culturable spores in settled dust or the air, but this approach has serious drawbacks (see section 2.4.2). Perhaps the most important problem, which has rarely been acknowledged in the literature, is that air sampling for more than 15 minutes is often not possible, since air concentrations usually vary a great deal over time. The few studies in which repeated measurements were made of fungi in air or in settled dust showed considerable temporal variation in concentrations, even over short periods (Hunter et al., 1988; Verhoeff et al., 1994b). The variation in the concentrations of isolated genera was even more substantial (Verhoeff et al., 1994b; Chew et al., 2001).

It has been suggested that in order to achieve a ratio of 3–4 for within- and between-house variation in concentration, which appears to be realistic for culturable indoor fungi (Verhoeff et al., 1994b), 27–36 samples should be taken per house. This is necessary for reliable estimates of the average concentration in an epidemiological study with less than 10% bias in the relationship between a health end-point and the exposure (Heederik, Attfield, 2000; Heederik et al., 2003).

Some justify sampling by stating that there may be concealed mold in the walls that isn't visible. The reality is that hidden mold in a wall cavity has very little, if any effect, on the number of spores in the building. There's just not enough air movement from the wall to the building to allow this to happen. If there was enough air movement, outdoor air would have to be entering the wall cavity to replace the air there, and then would be entering the house.

In some cases, sampling may be useful. If your client has been told they need to have a very expensive remediation, sampling may be useful to verify that it's really necessary, but to have any meaning, such sampling probably would have to go beyond a onetime air sample.

The EPA xi says this:

Sampling for mold should be conducted by professionals with specific experience in designing mold sampling protocols, sampling methods, and interpretation of results. Sample analysis should follow analytical methods

recommended by the American Industrial Hygiene Association (AIHA), the American Conference of Governmental Industrial Hygienists (ACGIH), or other professional guidelines.

Sampling is useful, but only when we know there is a significant problem, and it has to be performed for a reason and in a manner that's meaningful. Random air sampling is not a mold-screening tool.

Sampling may be useful to prove that something is actually mold when someone, such as a seller of a building, disputes the fact. A simple tape or bulk sample is sufficient.

Sampling is useful to prove that mold is a harmless species, such as molds commonly found on lumber such as the *Ceratocystis/Ophistoma group xii*.

In cases of illness, sampling may be helpful in identifying allergenic molds or when ordered by a doctor. Such sampling should be performed by qualified professionals, not a home inspector who took a two-day class.

Sampling also may be useful to verify that large remediation projects were completed successfully and did not contaminate other areas.

In almost all other cases, experts and authoritative sources agree that sampling is not needed and is a waste of money.

It's ludicrous for a home inspector to think that he can take a sample, send it to a lab, and let the lab interpret the results without bearing any responsibility. The inspector is promising something that is not being delivered – a reliable, technically accurate assessment of the building for the presence or absence of problematic mold.

In summary, we can conclude that in almost every case, routine sampling performed by home inspectors or so-called certified mold inspectors is completely worthless. The unscientific results lack accuracy, validity, and are not reproducible.

Here's how one expert sums it up *xiii*:

Most "certified mould inspectors" believe they are collecting a sample to assess moulds in an house. However, the "mould inspector" usually fails to meet the stated objectives in that the inspector fails to evaluate the building's fungal loading within any known degree of confidence, and usually relies on an unscientific and unfounded comparison of indoor to outdoor spore concentrations.

On the other hand, experienced home inspectors are fully qualified to inspect buildings for mold and moisture problems without any phony certification or training, which usually includes a lot of how to sell needless sampling.

Ramifications

I imagine that many inspectors feel that if the client insists on a mold test, they should sell them one. What's the harm?

If you are willing to sell your client something that you know is at best useless, and at worst, dangerously misleading, what effect does this have on your credibility as a home inspector?

If you are forced to defend your results, how would you go about it? Suppose a real estate transaction falls through because of your mold test and the seller decides to sue? Would you be on firm ground, or standing in a swamp, slowly sinking into the muck?

The other point we all should consider, is what effect does this have on the profession as a whole? Do we want to be viewed as professionals who offer legitimate, credible services, or as salesmen who are willing to compromise the truth to pursue a buck?

Lastly, I'll leave you to ponder the dictionary definition of fraud:

An act of deception carried out for the purpose of unfair, undeserved, and/or unlawful gain, especially financial gain.

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- Daniel Friedman, www.inspectapedia.com/sickhouse/inspmold.htm
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- Caoimhín P. Connell, www.forensic-applications.com

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- ii 2009 WHO guidelines for indoor air quality: dampness and mold. P 29
- iii Mold Testing, Nathan Yost, MD, Joseph Lstiburek, Ph.D, P,Eng., Terry Brennan, MS
- iv www.cdc.gov/mold/faqs.htm#test
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Control and Prevention, October 2005

vii Indoor Fungal Concentrations, <http://www.forensic-applications.com/moulds/mvue.html>,

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viii Phone conversation with Daniel Friedman, 2009

ix <http://www.dhs.wisconsin.gov/eh/hlthhaz/fs/MoldFAQs.htm>

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xi <http://www.epa.gov/mold/preventionandcontrol.html>

xii http://www.inspectapedia.com/sickhouse/Mold_Test_Reasons_1_3.htm

xiii Caoimhín P. Connell <http://forensic-applications.com/moulds/sampling.html>

Doing what's right by sampling for mold

In the spirit of promoting critical thinking, next month Barton Robertson, national manager of The ASHI School and instructor of the Mold & Moisture Damage Comprehensive course, will present the argument that sampling for mold is doing what's right.

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