

CORRECTING MOLD MISINFORMATION

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There are only three reasons to clean up mold detected in residential or commercial structures:

- Health
- Structural problems
- Aesthetic considerations.

Because structural problems and aesthetic considerations are far less dramatic (especially for the media) and less remunerative for environmental consultants, remediators, claimants and their lawyers, allegations about adverse health associated with mold exposure has become the driving force behind the frenzied movement to assess extent of mold in buildings and remediate its presence.

In support of these allegations, major misinformation has been presented to the public. Those groups that benefit most from continued distribution of such misinformation have little scientific or medically credible support for the current level of distress to which they contribute. It is important to examine this common misinformation in light of well-established scientific and medical facts.

One should be concerned about concentrations of mold detected in indoor ambient air that are greater than 100 to 200 CFU/m³ or greater than 1000 spores/m³. There are no established threshold levels at which adverse health effects are documented. Therefore, a comparison of mold concentrations commonly found in indoor ambient air and those measured in the outdoors is an appropriate beginning guideline. Unless extensive water-damage is evident, the majority of residential and commercial structures have indoor ambient air levels below those detected in the outdoors. However, this varies with time of year, location and mold genera. A recent review of the published literature indicates that average concentrations in indoor ambient varies seasonally and geographically (Shelton et al. 2002, Gots et al. in press). Indoor ambient air in 820 residences without any health complaints averaged 1,252 CFU/m³ and the associated average outdoor level is reported as 1,524 CFU/m³ (Gots et al., in press). For 85 homes with concentrations reported as total spore counts, the average ranged from 68 to 2,307 spores/m³ for the indoor air and a range of 400 to 80,000 spores/m³ in outdoor ambient air.

As measured by the National Allergy Board of the American Academy of Asthma, Allergy, and Immunology (AAAAI), mold spore levels in cities around the country show remarkable geographic and seasonal variation that must be considered when making such comparisons. Examples of outdoor seasonal variability observed in 2001 include (NAB 2001):

St. Louis, MO

395 to 24,500 spores/m³ (March to June)

5,266 to 68,855 spores/m³ (September to December)

Las Vegas, NV

8 to 673 spores/m³ (March to June)

15 to 186 spores/m³ (September to December)

Albany, NY

9 to 1,534 spores/m³ (March to June)

1,075 to 18,005 spores/m³ (September to December)

Santa Barbara, CA

544 to 33,090 spores/m³ (March to June)

767 to 555,833 spores/m³ (September to December)

Some promoters of mold misinformation encourage residential and commercial building owners to complete extensive remediation based upon marginal “elevations” of mold levels with minimal or no growth sites or gross contamination.

Exposure to mold can cause a diverse range of adverse health problems from non-specific symptoms such as fatigue to allegations of brain damage. Three types of reactions have been documented as being associated with indoor (non-occupational) mold exposure: allergic responses, e.g., hayfever, perhaps asthma and, very rarely, hypersensitivity pneumonitis, minor irritant effects and infections in individuals with impaired immune systems. Exposure to high concentrations of *Aspergillus* can lead to infection in some individuals. Also, when exposed to low to moderate levels of *Aspergillus*, immunocompromised patients (e.g., transplant patients, cystic fibrotics, chemotherapy patients) may develop infections. However, even in these individuals, the risk is low. Mold present at typical indoor environmental levels has never been shown scientifically to cause any other illness (Robbins et al. 2000).

Stachybotrys is the most dangerous of molds and has been known to cause hemorrhage in lungs. Three papers purported to show a connection between newborns with bleeding lungs and the presence of *Stachybotrys* in the indoor environment (Dearborne et al. 1997, Etzel et al. 1997, Montana et al. 1997). However, the findings of an association between this disease and exposure to *Stachybotrys* has been rescinded by the Centers of Disease Control and Prevention (CDC) because the

study design was flawed thus, data compiled in these studies were inadequate to support a hypothesis of a cause and effect relationship (CDC 2000). Moreover, no further clinical evidence of this disease has emerged, despite the increasing number of homes found to contain levels of the *Stachybotrys* mold species.

Exposure to Stachybotrys and other fungi results in brain damage. Several investigators have associated the reporting of headaches, memory loss, lack of concentration, and other similar non-specific symptoms as being evidence of brain damage caused by alleged mold exposure (e.g., Gordon et al 2001, Johanning et al. 1999). There is no scientific or medical evidence that concentrations of *Stachybotrys* or other molds detected in the indoor ambient air, or present on building materials cause brain damage (Fung et al. 1998, Page and Trout 2001, Robbins et al. 2000, Terr 2001).

Toxic molds cause adverse health problems. The term “toxic mold” is a misnomer. Thousand of different compounds are produced by molds to which we are exposed daily, both indoors and outdoors. A single mold can produce several to a hundred mycotoxins potentially toxic to animals and humans (Gots and Pirages 2002). Several different molds may produce the same toxin. For example, *Alternaria* is found outdoors on plant leaves and generally is considered by promoters of mold misinformation to be benign, i.e., not toxic. Yet, this species produces eighty different mycotoxins, some of which are demonstrated to be quite toxic (Robbins et al. 2000).

If Stachybotrys is detected anywhere in a building (i.e., in the indoor ambient air or within interstitial walls), extensive remediation is urgent. It is highly unlikely that there is a home in which some *Stachybotrys* spores (albeit low in number) could not be detected, if sufficient testing were conducted on building materials and within interstitial spaces. This mold has been detected in both indoor and outdoor ambient air in residential and commercial buildings in which occupants do not have any health complaints associated with the presence of mold (Baxter 1998, Harrison et al.1992, Hawthorne et al. 1989, Shelton et al. 2002). Thus, mere detection of *Stachybotrys* does not automatically require costly remediation. The need for remediation will depend upon the extent of mold growth, the extent of water damage, and the location of detected molds, i.e., in areas accessible to building occupants.

Self-reported symptoms are indicators of mold exposure. Many epidemiological studies of mold do not have documented concentrations present in the building of concern (e.g., Gordon et al. 1999, Johanning et al. 1999). Rather, these studies rely on self-reported symptoms as a surrogate of mold exposure. Because these self-reported symptoms are non-specific, it is not possible to identify specific chronic diseases based on these symptoms alone. Such self-reported symptoms are not valid surrogates of exposure. Symptoms are frequently over-reported when people believe their health has been threatened. A review of the scientific literature regarding self-reported symptoms indicates that these can be unreliable when perceived hazards exist as a basis for confirming health problems. Numerous authors have studied and reported upon the

unreliability of self-reported symptoms, particularly following perceived toxic exposures (Barsky and Borus, 1995 and 1999; Barsky, et al, 2001, Gots et al 1992, Hopwood and Guidotti 1988, Lees-Haley and Brown 1992, Kaye et al 1994, Lipscomb et al 1991, Lipscomb et al 1992, Logue and Fox 1986, Pennebaker 1994, Roht et al 1985). One important reason given for this unreliability is the well-known phenomenon of “reporting bias” (Last 1992, Hennekens and Buring 1987, Lipscomb et al 1991, Logue and Fox 1986, Pennebaker and Epstein 1983, Pennebaker 1994). The term “reporting bias” is a standard epidemiological term, and not meant as a pejorative. Rather, it refers to the normal human tendency to connect physical phenomenon with unrelated causes, particularly when the perceived cause is viewed as a health threat.

Toxic fungal syndrome is associated with exposure to mold in the indoor environment. Some promoters of allegations that exposure to mold has caused non-specific adverse health outcomes have coined the term “toxic fungal syndrome” or similar labels. There is no such standard or accepted medical terminology. The terms simply represent a collection of undocumented, self-reported symptoms that have no established scientific or medical causal link to mold.

Exposure to low level concentrations of mold result in adverse health problems.

As noted previously, there is no scientific or medical evidence that exposure to low concentrations of mold can result in significant adverse health outcomes. An illustration of the lack of a sound scientific basis is the extent of fungal exposure observed in occupational settings. Such occupational exposures, via handling materials of natural origin, can be extremely high. At sawmills, maximum airborne concentrations have been reported as 1,500,000 CFU/m³ (Duchaine 2000). Concentrations measured at honeybee overwintering facilities are reported as 2,200 to 13,931 CFU/m³, while workers are sweeping up dead bees, from 300 to 54,700 CFU/m³, when cleaning equipment and from 238 to 1442 CFU/m³, before disturbance by workers (Sigler et al. 1996). A study of differences in air concentrations on farms with and without disease revealed an average exposure concentration of 120,000,000 spores/m³ on the control farms (Malmberg et al. 1993). Daily spore levels associated with adverse health effects were at least ten times greater than that (1,200,000,000 spores/m³). Air concentrations in spawning sheds on mushroom farms have been reported as high as 100,000 spores/m³; even greater concentrations are detected at other areas on these farms (Lacey and Crook 1988). Fungi detected in the breathing zone of workers in a municipal waste composting facility reach levels of 8,200,000 CFU/m³ (Lacey and Crook 1988). In these highly-exposed populations, however, there are no reports of brain damage, or of many of the other “fungal diseases,” now common in current indoor mold attributions.

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