

Mold Myths and Fungal Fallacies: Legitimacy of “Toxic Mold”

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Toxic Mold

Why Has It Become Such a Big Problem?

- Emerging concerns over home, work, and school environments
- Patients seeking causes of various ailments
 - May have other legitimate diseases (e.g. lupus, tumors) with incomplete medical workups
 - Toxic mold becomes an etiology, especially when a “certified mold specialist” identifies mold in the home

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Toxic Mold

Why Has It Become Such a Big Problem?

- Media and internet coverage
 - Poor science
 - Media “hype”
- Emergence of “mold specialists”
 - Testers & Remediators
 - Take advantage of consumer fear and panic



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Toxic Mold

What is the Solution to the Big Problem?

- Lawsuits
 - Millions of dollars generated on junk science
 - Self-proclaimed medical “mold experts” testify on the same ‘science’, with unsubstantiated testing methods, and non-evidenced-based diagnostic criteria
- Results:
 - Higher homeowners insurance rates
 - Mold experts overstress their roles (\$\$\$)
 - Mold becomes more of a social/legal problem

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Could numerous health problems people experienced either in their homes, schools or in their work environments be a result of toxic mold exposure? Many doctors seem to think so, which has this toxic tort generating nationwide litigation. *Although you may not be able to see, feel or smell the dangerous mycotoxins produced by Stachybotrys mold, the affects can be hazardous to adult health and fatal to infants.*

*Toxic molds produce poisonous gases known as mycotoxins. Once the mold toxins are airborne, they can rest on clothing or skin and become trapped in mucus membranes from breathing. Exposure from toxic mold can cause severe headaches, chronic fatigue, nose and throat irritation, persistent cold-like mold allergy symptoms, and memory loss (in addition to many other health problems). People with poor immune systems, serious allergies or severe asthma are more susceptible to lung infections or upper-respiratory infections from exposure; however, the highest risk is to infants. **Babies breathing toxic gases are vulnerable to pulmonary hemorrhage, which in most cases is fatal.***

http://www.bagoliefriedman.com/toxic_mold.shtml

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Toxic illnesses: Toxic mold produces mycotoxins, which are poisonous substances that can affect the entire body of humans. Mycotoxins can be inhaled by people through the air, ingested through food, and can also come in contact with skin, resulting in many illnesses. Different molds produce different mycotoxins, which also depends on what kind of material the toxic mold is growing on. The most common illnesses that are caused due to exposure to mycotoxins are:

- 1) **Respiratory Illnesses:** Mycotoxins in toxic mold can affect the lungs and result in a host of respiratory problems. These include difficulty in breathing, stuffy noses, and are even known to cause bleeding in the lungs, which can lead to death.
- 2) **Digestive Tract Illnesses:** Toxic mold can cause liver diseases such as fibrosis and necrosis. It can also cause vomiting, diarrhea, and can even result in internal bleeding in the intestines.
- 3) **Reproductive Illnesses:** Exposure to toxic mold can cause people to become infertile and can also negatively affect the entire reproductive and hormonal cycle in people.

Highly Serious Illnesses: Toxic mold can also be responsible for a number of very serious and life-threatening illnesses, if exposure to toxic mold is continuous and prolonged. These illnesses include:

- Cancer
- Tuberculosis
- Lupus
- Sudden Infant Death Syndrome (SIDS)
- Chronic Fatigue Disorder
- Fibromyalgia
- Epstein-Barr

<http://www.cleanwaterpartners.org/mold/related-illnesses.html>

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Which is scarier?

Pollsters presented respondents with a list of 8 different fear-inducing events or phenomena and asked participants to rank their threat level in comparison with activist judges. The list, read to participants in randomized order, included such threats as North Korea, alien abduction (without probe), burial alive, burial alive with snakes, crabgrass, toxic mold, illegal aliens and the French.

In each case, respondents ranked activist judges as 'somewhat scarier' or 'significantly scarier' than the comparative threat. The categories that rated most closely to activist judges in the level of terror they induced were alien abduction, toxic mold and the French. Toxic mold was deemed far scarier than North Korea, alien abduction or crabgrass.

http://swiftreport.blogs.com/news/2005/05/new_poll_finds_.html

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How “Expert” are the “Experts?”



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What is “Mold”?

- Fungi with threadlike filaments (hyphae), massing together to form mycelia
- Can be any color: white, orange, green, brown, black
- May be found on walls, under carpets, on ceilings, in HVAC systems

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When Does Mold Grow in Indoor Environments?

- Favorable conditions for mold growth
 - Temperature
 - “Nutrition” source
 - Moisture source
- Concurrent growth
 - Mites & roaches
 - Microbes

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Mold in the Time of COVID

- Natural disasters have raised questions about increased risk of mold growth
 - Hurricane Katrina presented hypothetical risk secondary to water damage
 - No significant changes were observed
- No published evidence documenting increased risk with COVID, but hypothetical concerns loom

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Common Indoor Molds

- *Penicillium spp.*
- *Alternaria spp.*
- *Cladosporium spp.*
- *Ulocladium spp.*
- *Geomyces spp.*
- *Sistronema spp.*
- *Stachybotrys spp.* – the “Black Toxic Mold”

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The New Health Scares

- “Toxic Mold”
- “Indoor Air Sickness/Illness”
- “Organic Toxic Dust Syndrome”
- “Sick Building Syndrome”
- A serious human health issue? – “mold experts” stop short of medical advice, yet continue to push the scares

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Influence of the “Mold Specialist”



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Introduction

Medical Systems Often Implicated in Mold Exposures

- | | |
|----------------|---------------|
| • Pulmonary | • Hepatic |
| • Dermatologic | • Renal |
| • Neurologic | • Endocrine |
| • Immunologic | • Psychiatric |
| • Oncologic | |

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Mold in schools forces removal of Forks kids

Grand Forks, N.D. (AP) — About 700 children were removed from two schools here this week after officials found a black, slimy fungus in flood-damaged air tunnels and crawl spaces. Health authorities found the mold species “stachybotrys” growing in parts of Kelly and Lake Agassiz elementary schools. The buildings had been in use for child care and summer school programs. “They have relocated them to other buildings where we know the environment is safe,” said Assistant Superintendent Larry Hoberg. “We are taking every precaution possi-

inhalable mold particles and get sick. “I don’t anticipate we’re going to have a serious risk,” said Dr. Eric Lunn, the city’s maternal and child health officer. “I suspect there’s more chance of a child dying this summer from a car accident than from this fungus.” It is still best to be cautious, because stachybotrys has been known to cause bleeding in the lungs of small children, Lunn said. He said the entire community should be alert for flood-related mold dangers as summer heat and humidity set in. School officials hope to clean up

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Public Perception



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Indoor Air Illness

There is *some* precedent!

- Damp, moldy workplace conditions
 - Decent predictor of illnesses
 - Mostly respiratory illnessesEngvall et al., *Int. Arch Environ Health* 74:270-278; 2001
- Causal relationship with specific molds remains unclear
 - Different molds do like to grow together
 - *Stachybotrys* (or other mold) may be present, but other more proven contributors to illness are likely to be at play

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Indoor Air Illness

There is *some* precedent!

- Eye irritation/conjunctivitis: glass fibers
- Mucous membrane irritation: combustion products (CO, NO, NO₂)
- Epistaxis: low humidity
- Allergic/infections conditions: mites/roaches, microbes
- Headache/fatigue: CO₂, air pressure changes

Indoor Air Pollution. An Introduction for Health Professionals, Environmental Protection Agency, Washington, D.C.; 1994. *New England Journal of Medicine*; 1997

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What about Mycotoxins?

- ‘Secondary metabolites’ – a collection of 400 toxins produced by almost 400 molds, with significant cross-over
- *Stachybotrys* produces several mycotoxins – tricothecenes are the most well-described
- Well-documented veterinary effects: ‘Turkey X Disease’, ‘Poultry Hemorrhagic Syndrome’
- Aflatoxin: most toxic mycotoxin to humans

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Mycotoxins

Role in Humans?

- PRO: Airborne mycotoxins offer a primary pathway of exposure, this establishing a plausible link between presence of a toxin and presence of disease
- “CON”: Artificially introduce objectivity in mold testing:
 - Airborne “concentrations” of mycotoxins are measured, justified by “indoors compared to outdoors”
 - No documented or standardized superiority over visual inspection

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Problems with Measuring Airborne Mycotoxins

- Air sampling equipment
 - NEVER been standardized by any scientific organization
 - 1000-fold differences may be measured in *identical* samples when tested twice (same or different labs)
- Sampling process is inconsistent
 - Particles vary considerably in size – monitors may not measure them uniformly
 - Wiping a moldy surface can artificially increase air concentrations by 3,300%

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Testing, testing, and Re-Testing...



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Why the term “Toxic Mold”?

- 1930s – outbreak of sinopulmonary inflammation followed by pancytopenia, hemorrhage, stupor, blindness in horses
 - Grain contaminated with *Stachybotrys* and *Fusarium*
 - Cattle also affected, but less severely
- 1940s – a toxin was isolated from the grain, and this toxin could reproduce same illness: this was called *stachybotrytoxicosis*

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Why “Toxic Mold”?

- At the same time, animal handlers developed concurrent skin and mild respiratory complaints
 - Family members did not
 - Concluded syndrome was not infectious
- Application of isolated toxin to human skin reproduced the rash
- Why didn't humans suffer the same fate as the animals? *Route of exposure!*

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Human Cases of “Toxic Mold” Ingestion

- WWII Russia: Grain contaminated with *Fusarium spp.*
- Mucous membrane/GI inflammation, hemorrhage, mental status changes pancytopenia, vertigo, hypotension.
- High mortality rate, with opportunistic bacterial infections, and severe malnutrition

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When is “Toxic Mold” Toxic?

- Historical cases of human systemic poisoning are related to *ingestion* and *absorption* of mold
- Contact with *inhaled or aerosolized* mold causes respiratory and dermal complaints

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Toxic Mold Basis for Pulmonary Effects

- Minor complaints in historical outbreaks in farming and industry
- Cleveland series: Idiopathic Pulmonary Hemosiderosis
- Isolates of *Stachybotrys spp.* in “SBS” scenarios

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Toxic Mold Basis for Pulmonary Effects

- Published studies use subjective reporting
 - Symptoms often easily explained by known allergic and pulmonary diseases
 - Presence of mold may cloud the issue
- No Xrays, PFTs, biopsies
- Disease progression (beyond minor symptoms) is questionable

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Toxic Mold

Basis for Pulmonary Effects

- Allergy and asthma exacerbations HAVE been clearly correlated with *Stachybotrys* exposure...
- ...in fact, we have always known that *all* molds have the potential to exacerbate allergies
- Why did *Stachybotrys* get the “monopoly” on pulmonary disease?

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Toxic Mold

The Cleveland Cases

- 10 infants with Idiopathic Pulmonary Hemosiderosis (IPH) were discharged home from NICU
- 50% with recurrence of disease after discharge
- Water damage was observed in homes

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Toxic Mold

The Cleveland Cases

- Problematic epidemiologic study was performed
 - “Association” with *Stachybotrys* (by tape and Q-tip surface sampling)
 - Unmatched controls
 - “Conclusion”: *Stachybotrys* caused IPH recurrence
- A more plausible case could have been made for pesticide exposures, which *were* observed, but for unknown reasons were not investigated further

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Toxic Mold

Basis for Pulmonary Effects

- Evidence for allergic disease/asthma exacerbations – YES
- Evidence for serious or permanent lung injury – No
- The causal link to *Stachybotrys* is poorly documented

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Toxic Mold

Basis for Neurologic Effects

- Concern is based on historical cases of intimate mold exposures and ingestions
 - Seizures, spasms, hallucinations in bakers handling flour contaminated with ergots
 - *Arthrinium spp.* (cause of “Moldy Sugarcane Poisoning”)
- Subjective complaints only in routine exposures:
 - Headaches and mild subjective memory problems
 - No established scientific correlation with *Stachybotrys*

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Toxic Mold

Basis for Other Systemic Effects

- Oncologic:
 - Cyclosporin-like substance from *Stachybotrys*
 - Tricothecenes block DNA/RNA synthesis in rapidly dividing cells *in vitro*
 - Aflatoxin B: hepatocellular carcinoma (*ingestion*)
 - *Fusarium spp.*: gastric cancer in China (*ingestion*)
 - *Penicillium spp.*: renal cancer in rats (*intraperitoneal injection*)

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Toxic Mold

Basis for Other Systemic Effects

- Hepatic:
 - Aflatoxin B: acute hepatitis, coagulopathies (*ingestion*)
 - May work synergistically with rubratoxin (*Penicillium spp.*)
- *Fusarium spp*
 - Zearelenone (*Fusarium spp.*) potential estrogen analog
 - No demonstrated clinical effect

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Toxic Mold

Basis for Other Systemic Effects

- Renal:
 - Ochratoxin (*Aspergillus spp.*, *Penicillium spp.*)
 - Nephrotoxic, immunosuppressive, cholinergic, carcinogenic in animals (*ingestion*)
 - One case of mild human nephrotoxicity following massive inhalation of contaminated grain

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Cause Without Effect?



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What *Could* My Patient Do?

- At home, residents *could* perform sampling with home “kits”
- Residents *could* pay certified mold experts for home testing
- Residents *could* undergo laboratory evaluations for mold exposure

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What *Should* My Patient Do?

- Most cases of mild-to-moderate mold growth are easy to clean up
 - Molds (including *Stachybotrys*) are easily killed by bleach (1:10 solution)
 - Best approach, especially when water source is not continuous (e.g. temporary leak)
- Precautions: Dishwashing gloves, simple hardware store mask, to avoid acute pulmonary and skin effects

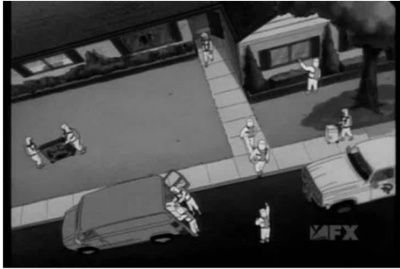
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What *Should* My Patient Do?

- Residents should remediate when water source is continuous, or if mold returns
- Cleanup should take place **ONLY** after water intrusion can be identified and fixed
- Structural repair should take place only when necessary (ie. water source cannot be found, irreversible structural deterioration)

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Fun with Remediation



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What Do I Tell My Patient?

- Minor respiratory symptoms may be attributable to mold, but may be due to other concurrent factors
- Cleanup may be necessary, and can be completed easily by the family in most cases
- Presence of mold may still require professional remediation, but should be based *structural damage and/or water intrusion*

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Mold in the Time of COVID General EPA Recommendations

- Increase ventilation with outside Air
- Improving natural ventilation
- Evaporative coolers
- Use our HVAC system and consider upgrading filters
- Use a portable air cleaner if you have one

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What Do I Tell My Patient? Testing the Home

- Air sample testing is highly variable, and does not impact plans for remediation
- Many unscrupulous organizations may charge thousands of unnecessary dollars to address a problem that may have little to do with your health

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What Do I Tell My Patient? Testing the Patient

- Allergy testing may be useful in some patients with persistent respiratory symptoms
- CLA testing: only for allergic conditions, not for “toxic exposure” evaluation
- Little evidence to support other evaluations

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What Do I Tell My Patient? Testing the Patient

1. Spirometry/FEV1/FVC/CO diffusion capacity/WBC/Tcells: non-specific for mold
2. Specific mold antibody screening: no correlations with exposure
3. Tricothecene testing: hogwash*
4. Anti-[[MBP, MAG, gangliosides, sulfatide, chondroitin sulfate, glutamate receptor, cerebellar, Purkinje cells, neuron-axon filament protein, glial fibrillary acidic protein, tubulin]]-antibodies: are you kidding me?

*Croft et al Clinical Confirmation of Tricothecene Mycotoxicosis in Patient Urine, Journal of Environmental Biology. Vol. 23 (3), 2002, pp 301-320)

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What Do I Tell My Patient?

Testing the Patient

- “Mold Antibody Screens”: not approved by the FDA; commonly misinterpreted
- No data on sensitivity, specificity, predictive value, correlation with exposure
- No control data on general population, leaving reference ranges invalid

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What Do I Tell My Patient?

The most difficult part may be telling your patient:

“You are not being poisoned by toxic mold.”

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Conclusions about “Toxic Mold”

- Not particularly toxic when inhaled
- Reasonable evidence for exacerbation of allergies/asthma and related diseases
- Real systemic diseases *are* seen in humans with mold ingestions (e.g. *Fusarium* and *Aspergillus*)

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Conclusions about “Toxic Mold”

- Little evidence to support systemic effects in chronic exposures with inhalation
- Supportive evidence for illness in the mere presence of *Stachybotrys spp.* is lacking
- Need further study to study confounding factors, which are likely more responsible for reported illnesses

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“Remember, mold is a natural part of our environment. *Salemville Amish Blue Cheese Crumbles* contain 33,000,000 spores per gram. *T. Marzetti's Chunky Blue Cheese Dressing* contains 230,000 spores per gram or 138,000,000 spores per bottle. If this bottle of dressing spilled onto a wall, most of the “mold experts” would suit up in full face respirators and full Tyvek suits to remove the entire wall under containment.”

Douglas A. Rice Ph.D., Laboratory Director, Environmental Biology and Industrial Hygiene, Colorado State University, 2002

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