

New Health Information and Assessment and Remediation Guidelines for Mold

William Geer, CIH

Senior Industrial Hygienist



Mold Topics

- IOM / ACOEM
- New Guidelines on Assessment and Remediation
 - AIHA, EPA, FEMA, IICRC
- Association guides

Brief Guideline History

- NYC Guidelines, 1993, 2000, 2002
- AIHA Field Guide, 1996 (2005)
- ACGIH Bioaerosol Assessment and Control, 1999
- EPA Mold Remediation in Schools and Commercial Buildings, 2001



General Mold Guidelines Don't Apply

- Healthcare
- Histoplasma
- Hanta virus
- E coli and sewage
- Other highly infectious agents

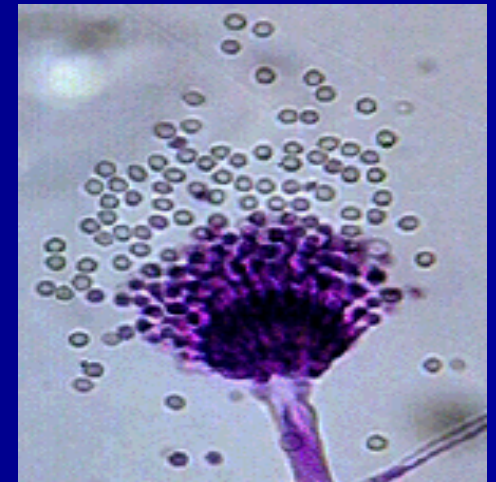
Fungi – Wood Decay



- Dry rot (misnomer)
- Brown rot
 - Eat cellulose (pulpy sugars)
 - Leave brown “cubes”
- White rot
 - Eat lignin (framework)
 - Leave white stringy mass
- Soft rot – eat both

What is mold?

- “Molds” are a kind of fungi
 - Not animal or plant
 - Not mushrooms
 - Not wood rot fungi
- Reproduce through spores
 - Cladosporium, Penicillium, Aspergillus, Alternaria
 - Basidiospores=mushrooms



Construction Dilemma

- The carpenter said: I can take out that rotten stud, but I need a remediation specialists for the gypsum wallboard with mold on it.

Sources of indoor molds?

The most significant source of mold spores indoors is **outdoor air**¹

■ Other Sources:

- Insects
- People, Pets
- Plants
- Food

¹ Solomon WR. 1975. Assessing fungus prevalence in domestic interiors. J Allergy Clin Immunol 56(3): 235-242.

What are potential adverse health effects?

- 1) Infections
- 2) Allergies
- 3) Toxic responses

American College of Occupational & Environmental Medicine Evidence Based Statement (www.acoem.org)

- Except for persons with severely impaired immune systems, indoor mold is not a source of fungal infections
- Mold is likely to sensitize and produce allergic responses in allergic individuals
- Current scientific evidence does not support the proposition that human health has been adversely affected by inhaled mycotoxins in home, school, or office environments

1) Human infection

- A few fungi cause infections in healthy persons.
 - Athletes foot
 - Cleanup of bat or pigeon droppings
- Severely immune-compromised individuals are at risk of opportunistic fungal infections
 - Hospital patients

2) Allergy

- Immediate hypersensitivity (“hay fever”)
 - Response to very low levels, but dose-response concepts apply
 - Allergic persons tend to be reactive to many allergens (animal dander, pollens, dust mites, cockroaches)

3) Toxic response (mycotoxins)

- Metabolic byproducts
- Non volatile
 - Different from MVOCs (musty odor)
- Info from massive exposures
 - Moldy hay, grain
- Various effects
 - Ingestion, lab

No such thing as “Toxic Mold”

- The dose makes the poison.
 - Example: We eat salt everyday. About ¼ cup at one sitting can be deadly, yet we do not refer to it as “toxic salt.”
- AIHA
 - Toxic mold has no scientific meaning since the mold itself is not toxic. Metabolic byproducts of some mold may be toxic (mycotoxins).

Toxic response

- Some mold spores contain tiny amounts of mycotoxins some of the time¹
 - Presence of mold \neq presence of mycotoxins
- It is virtually impossible to inhale enough spores in residential and office settings to get toxicity²

1 Calculated based on data from Sorenson et al. 1987 and Burge 1996.

2 Burge H.A. 2001. Fungi: Toxic Killers or Unavoidable Nuisances? *Ann Allergy Asthma Immunol.* 87; p. 52-6.

2 Page E.H. and Trout D.B. 2001. The Role of *Stachybotrys* Mycotoxins in Building Related Illness. *Am. Ind Hyg. Assos. J.* 62: 644-8.

2 American College of Occupational and Environmental Medicine Council on Scientific Affairs. 2003. Evidence-Based Statement. Adverse Human Health Effects Associated with Molds in the Indoor Environment. *JOEM.* P. 470-8.

Institute of Medicine (IOM) - Damp Indoor Spaces & Health

- Sufficient Evidence of a Causal Relationship
 - 0 of 21 health conditions evaluated
- Sufficient Evidence of an Association
 - 5 conditions: Asthma symptoms in sensitized persons, wheeze, cough, nose and throat symptoms, hypersensitivity pneumonitis
- Limited or Suggestive Evidence of an Association
 - 1 condition: Lower respiratory illness in otherwise healthy children

IOM Health Outcomes (Cont.)

- Inadequate or Insufficient Evidence of an Association
 - 15 conditions including acute pulmonary hemorrhage in infants, asthma, fatigue, cancer, shortness of breath, immune diseases, neuropsychiatric symptoms, gastrointestinal problems, skin symptoms, lower respiratory tract illness in otherwise healthy adults

IH Health-based goal = protection from allergenic health effects

- Like cleanup of construction dust and allergens
- Not like asbestos! (OSHA limit is 100,000 fibers/cubic meter of air)

How to Assess the Need for Remediation?

- Visible mold?
- Musty odor?
- Settled spores v. actual growth
 - What is normal or background?
- Location of mold
 - Exterior
 - Wall cavities
 - Occupied spaces

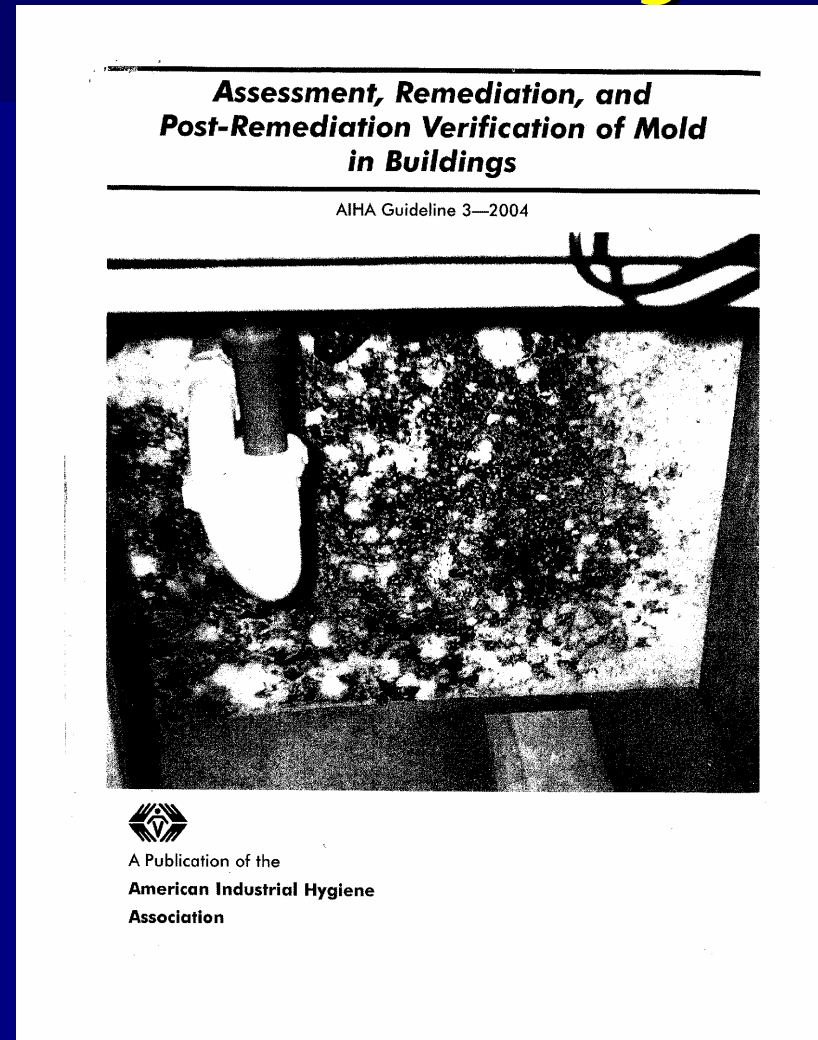
Guideline Processes

- Scientific literature
- Peer review
- Interested individuals with expertise
- Book publication
- Industry organization
- Formal regulatory rulemaking

Assess, Remediate, Verify

AIHA 2004:

- Assessment, Remediation, and Post-Remediation Verification of Mold in Buildings



Process

- Assess
 - Information, evaluation
- Remediate
 - Clean and repair
 - Verify
- Mold O&M
 - Prevent, respond

Assessment

- History
- Thorough, informed visual inspection
- Additional intrusive inspection, if needed
- Sampling, if needed, to support findings

Who assesses?

- Depends on complexity
- May be multidisciplinary
- Separate from contractor

Sampling to Assess the Need for Remediation?

- Necessary? What are we trying to prove (hypothesis)?
- Air samples
- Surface samples
- Cultured v. “direct exam”

Sampling for....?

- New study: Hicks, et al, "Fungal Types and Concentrations from Settled Dust in Normal Residences," JOEH, Sept. 2005.
 - 26 non-leak homes
 - Up to 1 million CFU/g of settled dust may be normal (10 times common rule of thumb)
 - 20 fold variation in side by side samples

Air samples

- “Snapshot” of conditions (3-5 min.)
 - Disturbance, cleaning, weather
- No exposure standards
 - No established lab norms
- Highly variable results
 - Comparison: 10 x rule of thumb
- Can't distinguish “safe” v. “unsafe”

Surface Samples

- Confirm the presence/type of mold
 - Is this dirt or mold?
 - Water needy type or wood rot fungi?
- Normal fallout or growth?
 - Detection of spores alone does not demonstrate contamination.
- **Cannot** be used to estimate exposure to airborne mold spores

Remediation

- Restore building condition
- Establish conditions acceptable to general public
- Protect remediation workers
- Protect occupants, building

Objectives

- Remove visible mold
- Dust suppression or control
- Remove waste from work area in sealed bags
- Clean work area and surroundings
- Leave clean and dry

Containment Options

- In lieu of full containment
 - Plastic sheeting at doorways
 - Isolate HVAC
 - Drop cloth
 - Slight negative or neutral pressure
 - Cleaning adjacent surfaces
 - Dust minimizing work practices

Post-remediation assessment

- Visual inspection
 - In progress, when complete
- Verify moisture source corrected
- When?
 - Post-remediation? Post-putbacks?
- Surface or air sampling
 - Interpretation with professional judgment

Post-remediation assessment

- No “clearance” criteria like asbestos
- Air sampling questionable
 - What does it tell us?
 - Highly variable
 - “Conservative” specs (1 spore Stachy)
 - Open ceilings/walls?
 - Cultured samples 1 week

FEMA / EPA / CDC

- Katrina
- CDC: Protect Yourself from Mold
- EPA: Cleaning up After a Flood:
Addressing Mold Problems
- NIOSH: Interim Recommendations...
Flood-Contaminated HVAC Systems:

Washington Department of Health (DOH)

- Landlord - tenant notification
 - WA DOH: Got Mold?
 - EPA: A Brief Guide to Mold, Moisture and Your Home
 - Two Spanish links
 - www.doh.wa.gov/ehp/ts/IAQ/mold-notification.htm

II CRC S520

- Industry group
- Standard
 - No assessment; left to others
 - Condition 1, 2, 3: fungal ecology
- Reference guide: 12 chapters
- Appendices

Association Guides

- Lumber mold
 - Western wood products
 - www.wwpa.org
 - Forintek
 - www.forintek.ca
- Wallboard
 - Northwest Wall and Ceiling Bureau
 - www.nwcb.org

Conclusions

- Mold spores are ubiquitous
- Mold is not a toxic material
- IH decisions driven by health effects
 - Allergy
 - Airborne potential
 - Exposure pathway
- Normal cleaning & construction dust controls

Thanks for the invite.

- Questions?
- Discussion...

Bill Geer and Mike Krause: 425-556-5555

