Let’s Take the Myth-stery Out of Mold

- Provide evidence that the risk of mold is often Overstated / Misstated / Misunderstood
- Learn the proven risk presented by mold
- Explore challenges of workplace mold investigations

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THE FIVE KINGDOMS OF LIFE

PLANTS

Fungi

Animals

Protists

Bacteria
1. Fungal Phobia?

Is the risk of mold exposure Overstated, Misstated or Misunderstood?
BAD & UGLY
+
DEFINITELY
DANGEROUS!!!
IS SCARY STACHY SNEAKIN’ AROUND BEHIND YOUR WALL???
Reports from Russia in the 30’s & 40’s re the effects of Stachy on livestock & farmers

Famous Cleveland “Stacy case” in the 90’s

“black toxic mold is making me sick!!”
Dangerous Mold in the Headlines

“Fatal Fungus”

“Death of Innocents”

“In Search of a Killer”

“Mold Drives Family from Home”

“Families Plagued by Home-Wrecking Mold”

*presented @ the 2004 meeting*
TIME Magazine, New York Times Magazine, and CBS News featured the story of Melinda Ballard who received $32 million from Farmers Insurance Group for mold damage to her 22-room mansion in Dripping Springs, Texas.
There are many in the general public, as well as too many M.D.’s, that hold a “belief” that mold toxins are responsible for many maladies.

This belief is not based on fact OR fiction, but rather comes from a “feeling” that mold moves in mysterious ways that we mere mortals are not privy to.
Mold Phobia?
2. Misperceptions

What are the contributors?

THE BUSINESS OF MOLD

mold ebusiness??
THE MERCHANTS OF MOLD

- Mold testing
- Mold inspection
- Mold remediation
- Mold litigation

- mold inspection equip & supplies
- mold home test kits
- IAQ equip & supplies
- mold remediation equip & supplies
Mold Schools

- Mold certification
- Mold training
- Mold inspection
- Mold remediation
- Mold testing
- Mold Career Planning
- Mold Marketing
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INTERNET MOLD WAITING ROOM

I’M DONE FER!!!
A perfect storm aggravated by:

- Community Health Standards for Mold
- Regional Health Units
- Safety Authorities
- Advisory Groups
3. Health Effects of Mold

- Allergic states
- Toxicity
- Infection
Mold Effects are mediated by

• Inhalation of fungal material contained in bioaerosols

• Ingestion of fungal material

• Dermal contact with fungal material
Disease states associated with fungi

- Allergic rhinitis
- Allergic asthma
- ABPA / ABPM
- Infection
- Toxicity
- Hypersensitivity pneumonitis
- Fungal sinusitis
- Irritant
- Dermatitis
- Organic Dust Toxic Syndrome
IS THERE MOLD IN AN ALLERGY OFFICE?

HECK YES!
MOLD WAITING ROOM

The usual suspects

ABPA

ASTHMA

HP

RHINITIS
4. Where Does Mold Reside?

99% OF MOLD EXPOSURE OCCURS OUTDOORS

Harriet Burge – Mold Webinar, January 2013
24hr outdoor air sample of pollen & mold spores
24HR BURKARD SAMPLE SLIDE

Stained & ready to count pollen & mold
MOLD COUNTS – my ABCA’s

A. Ascospores
B. Basidiospores
C. Cladosporium
A. Alternaria
P/A, rusts, smuts, etc.
Extraordinary Mold Counts during a Severe Drought

JA Anderson¹, LB Ford², ¹ Environmental Allergy Assays, London ON Canada, ² The Asthma and Allergy Center, Omaha NE

Rationale: We recorded unusually high counts of “dry” type molds at our Omaha NE station during the severe drought of 2012 which also included the St. Louis MO area.

Methods: The spore content of our Burkard samples (n=46) collected between August 1 and September 31, 2012, were analyzed and compared to the two primary spore types reported at the St. Louis NAB station (n=45) for the same time period.

Results: Cladosporium and Alternaria were the primary spore types of the twenty very high (VH) counts (>49,999 spores/M³) collected at Omaha. Seven of the VH counts were > 100,000/M³ and contained “high” (>12,999/M³) amounts of Alternaria spores. By comparison, there were nine VH counts at St. Louis, and the primary spore types were Ascospores and Cladosporium.

Conclusions: We recorded copious amounts of airborne spores of the major allergen Alternaria during the drought of 2012. The spores were particularly prominent during the week overlapping August and the first week of September.
Alternaria spores – maybe from culture. These are larger clumps than I saw on the Omaha 24hr Burkard slides.
Alternaria in culture

Dutron, ENS de Lyon
Alternaria is commonly found on outdoor vegetation
Alternaria has many homes

Alternaria has been isolated from such diverse substrates as:

leather, wood pulp, paper, textiles

building materials, stone monuments, sewage

optical instruments, cosmetics, computer disks, jet fuel

Alternaria is well-know in agriculture:

plant pathogens – blight

decomposer of foodstuffs

ubiquitous postharvest pathogens

toxic effects on livestock
Alternaria may be an allergy ROCK STAR, but it is just one example of the pervasive nature of fungi which can affect People, Plant, & Animal health.
5. MYCOTOXINS & MVOC’S
Agriculture & Molds

• Fungi infect crops prior to or after harvest

• Fungal mycotoxins in contaminated feedstock can cause decreased milk production, decreased weight gain, feed refusal, diarrhea, vomiting, reproductive failure, and death
Toxigenic fungi grow in corn, cereals, soybeans, sorghum, peanuts, silage and other food, feed crops or hay in the field, and in grain during transportation.

The most common mycotoxins are produced by fungi in the genera *Aspergillus*, *Penicillium* and *Fusarium*. Fungi in the genera *Alternaria*, *Stachybotrys*, *Claviceps* and *Epichloe* also produce common and important mycotoxins.

*Barry J. Jacobsen, Robert W. Coppock, and Michelle Mostrom*
What Are Mycotoxins?

- Toxic secondary metabolites - high molecular weight, low volatility
  - single mold type may produce multiple mycotoxins
  - many molds may produce same mycotoxin
  - mycotoxins not always produced

- Common mold types that produce mycotoxins
  - Aspergillums (A. flavus, A. parasiticus) – Aflatoxin
  - Stachybotrys atra, Memnoniella echinata, Fusarium, Trichoderma sp., etc
    - Trichothecenes (>100 compounds)
  - Alternaria - 125 secondary metabolites (e.g. Alternariol, Tenuazonic acid, Fumonisin B1, and Altertoxin I&II) approx. one-quarter are mycotoxic

Source: Bruce J. Kelman, PhD (Global Tox)
How many spores/m$^3$ are required for a human inhaled dose of mycotoxin to equal a dose of spores that had effects in animals?

Calculated… (using EPA Exposure factors – daily respiratory air intake (m$^3$ air/day))
   Infant: 1-mo = 4.5  Child: 6-yr = 10.0  Adult: 25-34 yr = 15.2
   Published “no effect levels” from animal studies

Airborne Concentration (spores/m$^3$) =
   Dose (spores/kg) x Body weight (kg)
   -----------------------------------------------
   Volume inhaled (m$^3$/day) x Duration (1 D)

NO EFFECT LEVELS (Air conc req’d to deliver same human dose)……spores/m$^3$
Stachybotrys
   (24 hr dose) – Infant: $2.1 \times 10^6$ –Child: $6.6 \times 10^6$ –Adult: $15.3 \times 10^6$
   (single bolus) – Infant: $3 \times 10^9$ –Child: $9.5 \times 10^9$ –Adult: $22 \times 10^9$

*Based on direct intratracheal and intranasal deposition in animals*
“Current scientific evidence does not support the proposition that human health has been adversely affected by inhaled mycotoxins in the home, school, or office environment.”


Mycotoxins

In a typical mold-contaminated office or residential environment it is virtually impossible to inhale sufficient mycotoxin to cause an adverse effect.

*Source: Bruce Kelman, PhD. GlobalTox (2004)*

The presence of a specific species of fungi growing in a building does not automatically equate to either the production of a mycotoxin or exposure of a building occupant.
MVOC’s
(Microbiologically derived VOC’s)

- VOCs produced by molds (MVOCs) are responsible for musty odor, but are not toxic

- MVOCs include a wide range of alcohols, ketones, aldehydes, esters, carboxylic acids, lactones, terpenes, sulfur and nitrogen compounds, and aliphatic and aromatic hydrocarbons.

- Irritant effects have been established for many VOCs. However, MVOC levels in damp buildings are usually so low (nanograms to micrograms per cubic meter) that exposure would not be expected to cause complaints of irritation in human subjects.

The medical effects of mold exposure  JACI 2006
Bush, Portnoy, Saxon, Terr, Wood
mVOC’s – relevance

- Substances with low MW that easily evaporate ie "off-gas" in air
- Common VOC exposures in the home incl. cleaning products, cooking odours, consumer products (sprays, etc)
- Produced by fungi and bacteria during “active” metabolism
- Perception of MVOCs indicates molds are growing
- Health effects are speculative
- Looking for “markers”

mVOC's – description

- low MW alcohols (ethanol), aldehydes, amines, ketones, terpenes, aromatic and chlorinated hydrocarbons, S compounds
- V. low odor threshold ie easily detectable by smell.
- Smells “musty” or “earthy”, "old cheese", dirty socks", “mushroom” assoc with mold &/or bacterial growth.
Dog sniffing out buried fungal MVOC’s
Humans inhaling fungal MVOC’s
6. MOLD CAN BE X !!!
WINE & DINE
WITH YOUR
FAVORITE FUNGI
An Ascomycete kind of fungus
A Basidiomycete kind of fungus topping
• mushrooms (see above)

• puffballs

• truffles (see above)

• yeast - used in the production of bread, vinegar, cider, wine, beer

• moldy cheeses like Camembert & Roquefort

• tofu, Soya sauce
LET’S GROW MOLD TOGETHER
what else are molds/fungi good for???

- some fungal mycotoxins are used as drugs:
  
  antibiotics
  drugs that suppress the immune system
  cancer drugs
  drugs that lower cholesterol

- production of citric acid & various enzymes

- composting
7. OVERVIEW
FUNGI & THEIR PRODUCTS EFFECT OTHER KINGDOMS

PLANTS → FUNGI → ANIMALS

FUNGI

PROTISTS

BACTERIA
Anything in the fridge?

Same mold, same mold.
Mold is just part of Life
There is no real mystery about mold

HOWEVER

MOLD MYTHOLOGY will persist
AS JAY PORTNOY STATED SO ELOQUENTLY LAST YEAR:

“WE SHOULD OWN MOLD!”
Some mold sense & sensibility can be found in various “official” Guidelines concerning mold health effects, remediation, & prevention
The CDC document “Molds in the Environment”, available @ www.cdc.gov/mold/faqs provides good basic information.

- Molds are found in virtually every environment and can be detected both indoors and outdoors year round.

- Some people are sensitive to molds.

- Current evidence indicates that allergies are the type of diseases most often associated with molds.

- Standards for judging what is an acceptable, tolerable, or normal quantity of mold have not been established.

- Consult a general health provider who may refer you to an allergist, an Infectious disease physician, or a pulmonary physician.

- Applicable codes, insurance, inspection, legal & other matter about mold fall under state & local jurisdiction.
Several factors influence the likelihood that individuals might experience health effects following exposure to mold in indoor environments. These include: the nature of the fungal material (e.g., allergenic, toxic/irritant, or infectious); the degree of exposure (amount and duration); and the susceptibility of exposed people.

Susceptibility varies with genetic predisposition, age, state of health, concurrent exposures, and previous sensitization. It is not possible to determine “safe” or “unsafe” levels of exposure for the general public because of variation of individual susceptibility, lack of standardized and validated environmental exposure sampling methods, and lack of reliable biological markers.

MVOCs are responsible for the musty odor often associated with mold growth, which may be noticeable at very low concentrations. Many of the MVOCs are common to other sources in the home. The very low levels usually found indoors have not been shown to cause health effects.
OSHA Guidelines: mold in the workplace

..these guidelines [are] intended only as a summary of basic procedures and [are] not intended, nor should [they] be used, as a detailed guide to mold remediation.

These guidelines are subject to change as more information regarding mold contamination and remediation becomes available.

Currently, there are no federal standards or recommendations, (e.g., OSHA, NIOSH, EPA) for airborne concentrations of mold or mold spores.

Scientific research on the relationship between mold exposures and health effects is ongoing.

This section provides a brief overview, but does not describe all potential health effects related to mold exposure. For more detailed information, consult a health professional or your state or local health department.
ACOEM position statement “Adverse Health Effects Associated with Molds in the Indoor Environment” issued 02/24/11 is the same as it was when previously issued as an evidence-based statement on 10/27/02

http://www.acoem.org/AdverseHumanHealthEffects_Molds.aspx

J Occup Enviro Med 2003 May;45(5): 470-8
Hardin, Kelman, Saxon
INTERNET MOLD WAITING ROOM

I’M DONE FER!!!
Discussion

Patients Presenting With Perceived Mold Issues;

Practical Set of Guidelines for MD’s