

# Potential Health Effects of Mold Exposure in Buildings

## **Objective:**

**To present information about  
health hazard concerns  
associated with mold assessment  
and remediation projects.**



# Emerging Science

- **The medical community agrees that allergic reactions to mold in buildings occur, particularly for sensitized persons.**
- **In the present peer-reviewed medical literature, there is no conclusive evidence that mold toxins in buildings cause any human health illness.**
  - There are many case reports of symptoms thought to be caused by mold toxins, but evidence that mold causes these effects is inconclusive.
  - There is agreement that more research is needed.
- **Recognizing and understanding the health impact of mold-related exposures is a complex and emerging challenge.**

# Introduction

**Hazardous substances enter the body through:**

- inhalation (breathing)
- skin absorption
- ingestion (eating)

**The effects of hazardous substances depend on:**

- the chemical or material (what)
- the concentration (how much)
- the route of entry (how taken into the body)
- the duration of exposure (how long the exposure lasts)

# Personal Factors and Hygiene

- **Personal factors can influence the effects of exposure to hazardous substances:**
  - smoking
  - alcohol consumption
  - medication use
  - gender
  - existing allergies or asthma
- **Personal cleanliness and habits are crucial to reducing exposure for remediation workers.**



# Acute vs. Chronic Effects

- **Acute (short-term) effects**
  - are severe, immediate reactions
  - usually occur after a single large exposure
- **Chronic (long-term) effects**
  - might take days, months, or years to appear (i.e., have latency periods)
  - usually result from repeated small exposures

# Effects of Chemicals on the Body

- **Local - at the point of contact**
- **Systemic - inside the body at one or more organs**



# Concerns About Exposure to Mold



# Most Common Routes of Exposure to Mold during Assessment/Remediation

- **Inhalation**
- **Skin**



# Potential Health Effects of Mold

- **Allergic reactions/disease**
- **Irritant effects**
- **Infections**
- **Toxic effects**

# Allergic Responses

- **About 10% of the population has allergic antibodies to fungal allergens.<sup>3</sup>**
- **Half of those (5%) would be expected to show clinical illness.<sup>3</sup>**
- **Mold-induced allergic illnesses predominately result from outdoor exposures to naturally-occurring molds.<sup>3</sup> Normal indoor environments do not promote exposure to molds.**



# Allergic Responses

- **Allergic responses are most commonly experienced as**
  - Allergic asthma
  - Allergic rhinitis (“hay fever”)

# Allergic Responses

- **Reactions can be immediate or delayed.**
- **Reactions can result from inhaling or touching mold or mold spores.**
- **Mold spores and fragments, whether dead or alive, can produce allergic reaction in sensitive individuals.**
- **Repeated or single exposure may cause previously non-sensitive individuals to become sensitive.**
- **Repeated exposure has the potential to increase sensitivity.**



# Allergic Responses

- **Hay fever-type symptoms**
  - Sneezing
  - Runny nose
  - Red eyes
  - Skin rash (dermatitis)

# Allergic Responses

- **Asthma**
  - Molds can trigger asthma attacks in persons allergic (sensitized) to molds.<sup>1</sup>

# Allergic Responses

- **Hypersensitivity pneumonitis (HP)**
  - Rare, but serious, immune-related condition resembling bacterial pneumonia
  - May develop after either acute or chronic exposure (via inhalation) to molds
  - Usually related to occupational exposure
  - Can also be caused by bacteria

# Uncommon Allergic Syndromes

- **Allergic bronchopulmonary aspergillosis**
- **Allergic fungal sinusitis**

Note: There is no evidence to link exposures to fungi in home, school, or office settings to these particular conditions.





# Important Indoor Allergenic Molds

- *Penicillium*
- *Aspergillus*
- *Cladosporium*
- *Alternaria*

Prevalent outdoor molds that often can be found at high levels indoors if windows are open.

# Irritant Effects

- **Irritation of:**
  - Eyes
  - Skin
  - Nose
  - Throat
  - Lungs



# Infections

# Fungal Infections

- **Serious fungal infections that can affect healthy people can be caused by a few pathogenic fungi, that are not typically encountered indoors:<sup>3</sup>**
  - *Blastomyces* – inhabits decaying wood
  - *Coccidioides* – common in soil in SW U.S.
  - *Cryptococcus* – associated w/bird droppings
  - *Histoplasma* – associated w/bat droppings
- **Workers cleaning very dirty areas, such as attics where birds or bats have roosted, could be at risk if not adequately protected.**

# Opportunistic Fungal Infections

- **Of concern to people who are severely immune-compromised or immune suppressed**
- **Example**
  - Aspergillosis

# Toxic Reactions

- **Some molds can produce toxic substances called mycotoxins.**
- **Some mycotoxins are on the surface of mold spores; others are within the spore.**
- **Over 200 mycotoxins have been identified from common molds.**

# Mycotoxins

- **A wide range of adverse health effects has been reported following ingestion of moldy foods.<sup>1</sup>**
  - **Liver damage**
  - **Nervous system damage**
  - **Immunological effects**
- **Limited information on human health effects of inhalation exposure to mycotoxins has come from studies in the workplace and some case studies or case reports.<sup>1</sup>**

# Mycotoxins

- **Medical evidence of whether mold growing in homes or offices causes health effects in occupants due to mold toxins is lacking.**
- **Research is needed.**



# Common Toxigenic Molds

**Certain species of**

- *Stachybotrys*
- *Aspergillus*
- *Penicillium*
- *Fusarium*

**are known to produce mycotoxins at times.**



# Common-Sense Approach

- **Small amounts of mold growth in homes and buildings are common occurrences, that for the majority of people present minimal health risks.**
  - The solution is to fix the moisture problem and clean up the mold quickly.
- **Large areas of mold growth present a more likely risk of exposure and adverse health effects for some people.**
  - Large areas of mold growth indicate more extensive water damage/moisture intrusion in the building.
  - Additional and more extensive measures should be used during remediation to protect both workers and occupants of the building.

# Microbial Volatile Organic Compounds (mVOCs)<sup>1</sup>

- **Produced by molds and released into air**
- **Often have strong and/or unpleasant odors**
- **Exposure linked to symptoms such as headaches, nasal irritation, dizziness, fatigue, nausea**
- **Health effects research in early stages**



# Glucans or Fungal Cell Wall Components<sup>1</sup>

- **Small pieces of cell walls of molds which may cause inflammatory lung and airway reactions**
- **Can affect immune system when inhaled**
- **Exposure to high levels of glucans in dust may cause a flu-like illness: Organic Dust Toxic Syndrome (ODTS)**
- **ODTS noted mainly in agricultural & manufacturing settings (no data on mold remediation workers)**

# Degrees of Exposure

- **The presence of mold growth does not necessarily equate to exposure. There must be a pathway for exposure to occur.**
- **Exposure to mold does not always result in a health problem.<sup>2</sup>**
- **Occupants or remediation workers disturbing large areas of mold growth face greater exposure potential, and thus, greater potential for adverse health effects.**



# Damp Indoor Spaces and Health Report 2004<sup>4</sup>

- **This report is a review of the scientific literature conducted by the Committee on Damp Indoor Spaces and Health of the Institute of Medicine.**
- **The committee concluded that the evidence reviewed did not meet the strict scientific standards needed to prove a clear, causal relationship between health outcomes and the presence of mold or other agents in damp indoor environments.**

# Damp Indoor Spaces and Health Report 2004<sup>4</sup>

- **The findings indicated an association\* between some health outcomes and the presence of mold or other agents in damp indoor environments.**

\* An association is a “link” or “connection.”

# Sufficient Evidence of an Association<sup>4</sup>

- **Upper respiratory tract (nasal & throat) symptoms**
- **Cough**
- **Hypersensitivity pneumonitis (HP) in susceptible persons**
- **Wheeze**
- **Asthma symptoms in sensitized persons**



# Limited or Suggestive Evidence of an Association<sup>4</sup>

- **Lower respiratory illness in otherwise healthy children**

# Inadequate or Insufficient Evidence to Determine Whether an Association Exists<sup>4</sup>

- Dyspnea (shortness of breath)
- Asthma development
- Airflow obstruction
- Mucous membrane irritation syndrome
- Chronic obstructive pulmonary disease
- Inhalation fevers (nonoccupational exposures)
- Lower respiratory illness in otherwise healthy adults
- Acute idiopathic pulmonary hemorrhage in infants
- Skin symptoms
- Gastrointestinal tract problems
- Fatigue
- Neuropsychiatric symptoms
- Cancer
- Reproductive effects
- Rheumatologic and other immune diseases

# Damp Indoor Spaces and Health Report 2004<sup>4</sup>

- **The conclusions are not applicable to persons with compromised immune systems, who are at risk for fungal colonization and opportunistic infections.**
- **The findings do not mean that a cause or an association does not exist for some health outcomes, only that the available evidence does not allow us to determine whether it exists.**

# UNKNOWNNS

- **There are insufficient data to determine if molds cause other adverse health effects, such as pulmonary hemorrhage, memory loss, or lethargy.<sup>2</sup>**
- **We do not know if the occurrence of mold-related illnesses is increasing.<sup>2</sup>**
- **Other than surveillance for hospital-acquired infections, there is no system to track the public's exposure to and the possible health effects of mold.<sup>2</sup>**



# Health Issues for Workers

- **Mold assessment and remediation employees with persistent health problems that appear related to mold should see a physician.**
- **Referrals to physicians trained in occupational, environmental or allergy medicine may be needed.**



# Health Issues for Workers

- **During mold remediation projects, workers could be exposed to other substances or hazardous materials that could cause adverse health effects:**
  - Asbestos
  - Lead-based paint
  - High levels of particulates
  - Bacteria (associated with water-damaged materials, floods, sewage backups)
  - Cleaning products/biocides used as part of the projects



# Golden Rule for Mold Exposure Safety

- **Minimizing mold-related exposures will reduce the possibility of health impacts on occupants and workers.**
  - As the potential for exposure increases, the need for protective measures increases.
  - Workers can reduce exposure potential by proper use of personal protective equipment (PPE).
    - Respirators (Minimum N-95)
    - Gloves
    - Protective clothing
    - Goggles



# Dealing with the Public

- **Do not give medical advice to customers.**
- **Tell them to consult a health care provider regarding any health effects they might be experiencing.**





# Code of Ethics

## (Section 295.304 of Texas Mold Assessment and Remediation Rules)

**(b) All credentialed persons or approved instructors shall, as applicable to their area of credentialing or approval:**

**(11) not make any false, misleading, or deceptive claims, or claims that are not readily subject to verification, in any advertising, announcement, presentation, or competitive bidding;**

**(12) not make a representation that is designed to take advantage of the fears or emotions of the public or a customer;**



# Terms

- **Allergen** – A substance, such as mold, that can cause an allergic reaction.<sup>1</sup>
- **Glucans** – Small pieces of cell walls of molds that might cause inflammatory lung and airway reactions. <sup>1</sup>
- **Hypersensitivity** – Great or excessive sensitivity. <sup>1</sup>
- **mVOC** – “Microbial volatile organic compound” - A chemical made by a mold or a bacterium. MVOCs can have a moldy or musty odor. <sup>1</sup>
- **Mycotoxin** – a poisonous substance produced by a fungus and especially a mold.<sup>5</sup>
- **Pathogenic** – Causing or capable of causing disease. <sup>5</sup>
- **Sensitization** – Single or repeated exposure to an allergen that results in the exposed individual becoming hypersensitive to the allergen.<sup>1</sup>
- **Toxic** – Poisonous. <sup>5</sup>
- **Toxigenic** – Organism that is able to produce a toxin or toxins. <sup>5</sup>



# References

1. **“Mold Remediation in Schools and Commercial Buildings.” U.S. Environmental Protection Agency, March 2001.**
2. **“State of the Science on Mold and Human Health.” Testimony of Stephen C. Redd, M.D., Centers for Disease Control and Prevention, to U.S. Congress, July 2002.**
3. **“Adverse Human Health Effects Associated with Molds in the Indoor Environment.” American College of Occupational and Environmental Medicine. 2002.**
4. **“Damp Indoor Spaces and Health.” Institute of Medicine of the National Academies. 2004.**
5. **MedlinePlus. Medical Dictionary.**  
[www.nlm.nih.gov/medlineplus/mplusdictionary.html](http://www.nlm.nih.gov/medlineplus/mplusdictionary.html)



# Additional Information

- **U.S. Department of Labor, Occupational Health and Safety Administration. A Brief Guide to Mold in the Workplace.**
  - [www.osha.gov/dts/shib/shib101003.html](http://www.osha.gov/dts/shib/shib101003.html)
- **Centers for Disease Control and Prevention (CDC)**
  - [www.cdc.gov/mold](http://www.cdc.gov/mold)
- **U.S. Environmental Protection Agency**
  - [www.epa.gov/iaq/molds/moldresources.html](http://www.epa.gov/iaq/molds/moldresources.html)



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