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
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.\(^3\)

• Half of those (5%) would be expected to show clinical illness.\(^3\)

• Mold-induced allergic illnesses predominately result from outdoor exposures to naturally-occurring molds.\(^3\) 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.\textsuperscript{1}
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:
  – *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.\textsuperscript{1}
  – 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.\textsuperscript{1}
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)\textsuperscript{1}

- 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

- 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.²
• Occupants or remediation workers disturbing large areas of mold growth face greater exposure potential, and thus, greater potential for adverse health effects.
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.
• 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

- 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

- Lower respiratory illness in otherwise healthy children
Inadequate or Insufficient Evidence to Determine Whether an Association Exists

- 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

• 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.
UNKNOWN

• There are insufficient data to determine if molds cause other adverse health effects, such as pulmonary hemorrhage, memory loss, or lethargy.²

• We do not know if the occurrence of mold-related illnesses is increasing.²

• 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.²
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.¹
• Glucans – Small pieces of cell walls of molds that might cause inflammatory lung and airway reactions.¹
• Hypersensitivity – Great or excessive sensitivity.¹
• mVOC – “Microbial volatile organic compound” - A chemical made by a mold or a bacterium. MVOCs can have a moldy or musty odor.¹
• Mycotoxin – a poisonous substance produced by a fungus and especially a mold.⁵
• Pathogenic – Causing or capable of causing disease.⁵
• Sensitization – Single or repeated exposure to an allergen that results in the exposed individual becoming hypersensitive to the allergen.¹
• Toxic – Poisonous.⁵
• Toxigenic – Organism that is able to produce a toxin or toxins.⁵
References


Additional Information


• Centers for Disease Control and Prevention (CDC)
  – www.cdc.gov/mold

• U.S. Environmental Protection Agency
  – www.epa.gov/iaq/molds/moldresources.html
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