Clearing the Air: Mold and IAQ in Healthcare Facilities

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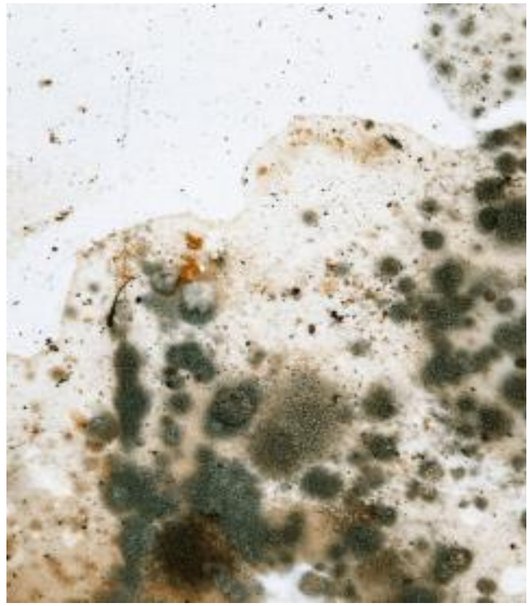
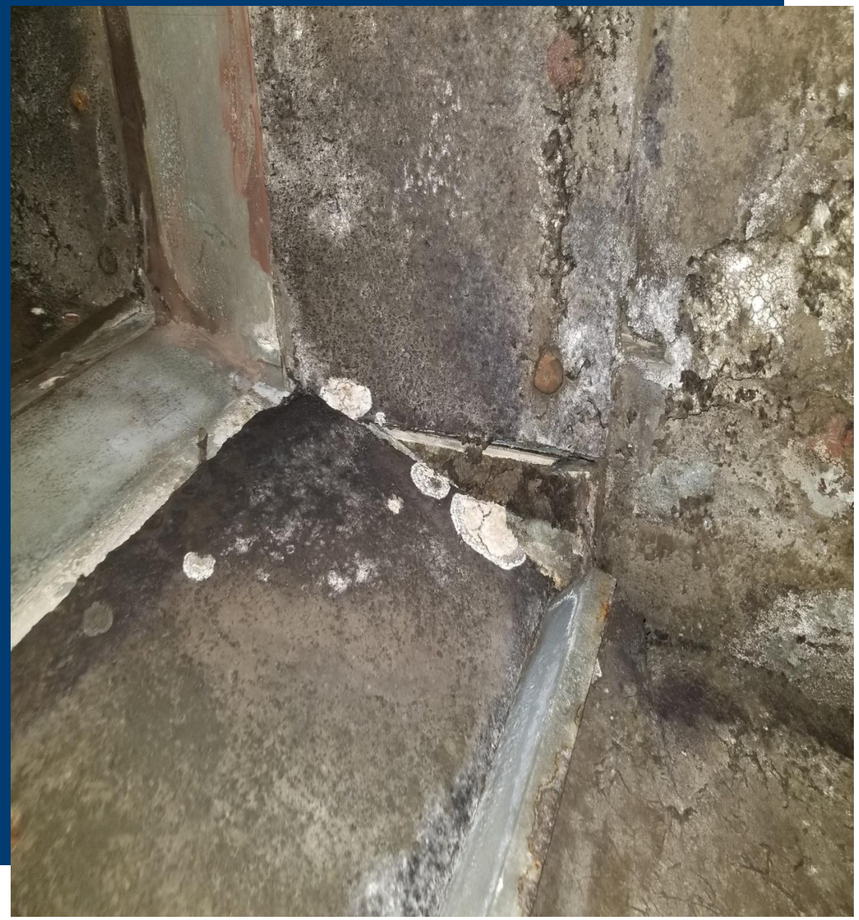
CSHE

What is Mold?



- Fungi that occur naturally in the environment
- Mold spores are ubiquitous – they are everywhere
- Fungal (mold) spores are one of the oldest forms of complex life on Earth
- We are concerned not with its existence, but with its growth in occupied areas and why it is growing
- Wide variety of molds that may be present in building materials
- Common ones are:
  - Alternaria
  - Aspergillus
  - Cladosporium
  - Stachybotrys



Factors for Mold Growth

- **Temperature**
  - Optimal range for growth 59°F - 86°F
- **Relative Humidity**
  - Greater than 60% RH
- **Light**
  - Daylight, Darkness or Alternating for Spore Production
- **Food Source**
- **Water Activity**
- **Aeration**
  - Air Flow/Movement

Moisture's Role

- **Excessive moisture is a key ingredient that causes molds to grow**
- **Moisture can be actual moisture content on the surface or relative humidity levels**
  - Moisture content readings on substrate
  - Relative Humidity greater than 60%
- **Sources of excess moisture may be:**
  - Plumbing leaks
  - Leaking roofs or windows
  - High humidity
  - Flooding, or
  - Condensation inside walls due to poor insulation.

WATER SOURCES

- **Construction Defect**
  - Roofing
  - Plumbing
  - Foundation
  - HVAC
    - Design, installation, warranty maintenance
- **Weather/Storms/Floods**
- **Fire**
- **Loss of Power**
- **Vandalism**

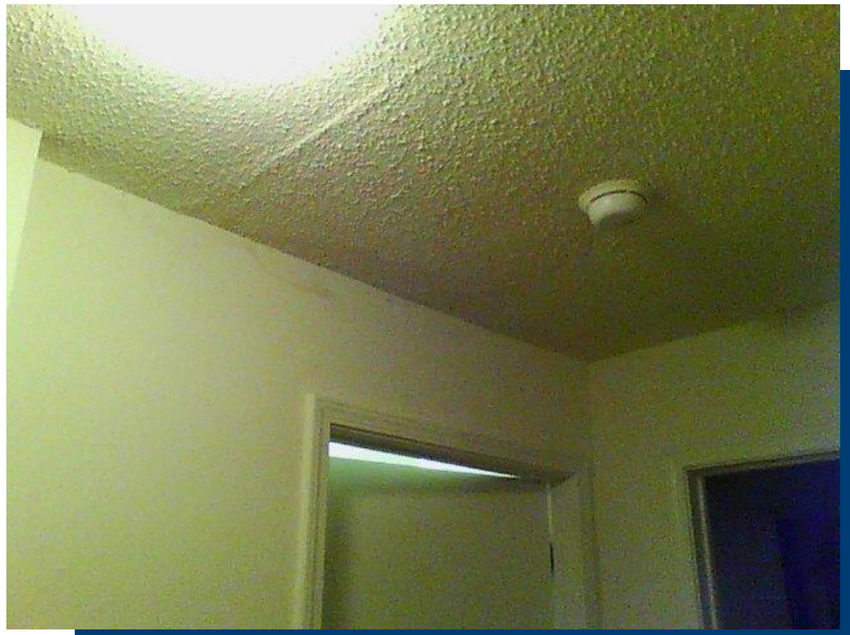
WATER SOURCES

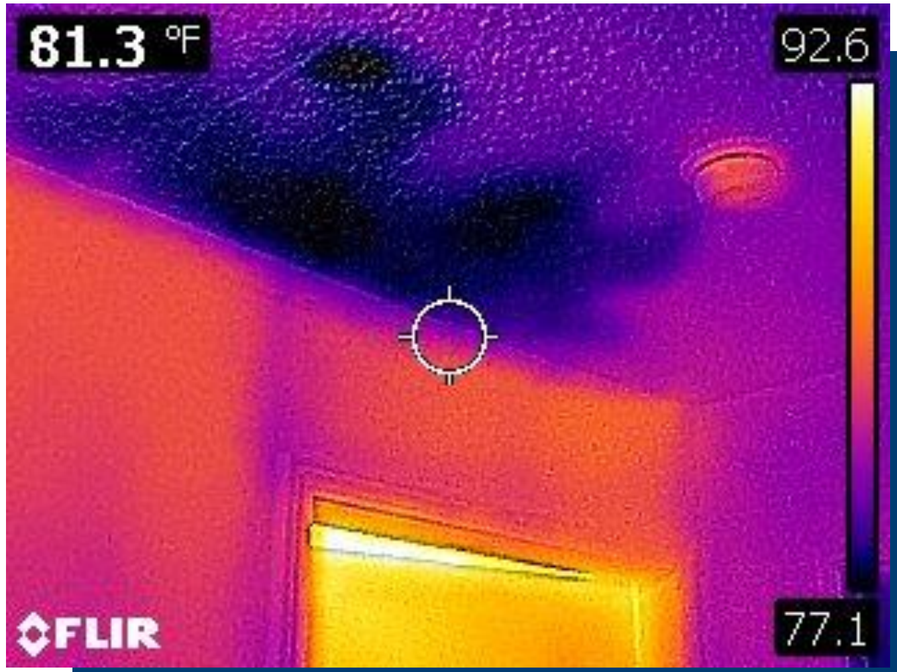
- **Category 1-2-3**
  - Clean / Gray / Black
  - Cat 1, Clean – domestic water
  - Cat 2, Gray – exterior intrusion, chilled water
  - Cat 3, Black – septic line, sprinkler line, sewage (bacteria may be more important than mold issues here)

WHAT DOES WATER DAMAGE LOOK LIKE?

- **Obvious Signs**
  - Puddles
  - Overflows
  - Pipe leaks
  - Staining (ceiling tiles or around windows or vents)
- **Inconspicuous Signs**
  - Peeling, bubbling paint
  - Slight odors

DAMAGED BUILDING MATERIALS





DAMAGED BUILDING MATERIALS

WATER LOSS MANAGEMENT

- **Response Time is Key**
  - ➢Moisture Control
- **Know Source/Category of Water**
- **Ensure safety of Occupants & Personnel**
- **Drying/Dehumidifying the space**
  - ➢Extract Excess Moisture
  - ➢Removal/Drying Process
  - ➢Monitoring Moisture Conditions
- **May Initiate Insurance Claim**
  - ➢Call your consultant and loss manager

Water Loss Management: Initial Controls

- **Ensure Contracts are in Place**
  - Indemnification
  - Additional Insured
  - Confirm required licenses, certifications, and training before work begins

- **Hire Environmental Consultant and Remediation Contractor**
  - The consultant and contractor act as third parties and should not be hired by one another
  - The consultant and contractor should be two separate entities

- **Environmental Consultant performs an initial assessment**
  - Reviews environmental conditions and works with the facility's infection prevention team to determine ICRA requirements
- **Remediation contractor begins emergency response work to contain loss**

- **Recordkeeping!**

Contractor Requirements & ICRA Documentation

- **Confirm remediation contractor qualifications before work begins**
  - ICRA 2.0 training/certification
  - Confirm required licenses, certifications, and training before work begins
  - IICRC certification
  - OSHA 10- or 30-hour training
  - Applicable general contractor license
- **Work should be performed under ICRA**
  - Follow required containment controls
  - Coordinate with facility infection-control procedures
  - Document changes to containment or work scope
- **Maintain project documentation**
  - Contracts and insurance certificates
  - Licenses, certifications, and training records
  - ICRA documentation
  - Daily logs, photos, and clearance documentation

Infection Control Risk Assessment (ICRA) Guidelines

Low Risk Non-patient care areas such as:	Medium Risk Patient care support areas such as:	High Risk Patient care areas such as:	Highest Risk Procedural, invasive, sterile support and highly compromised patient care areas such as:
• Public hallways and gathering areas not on clinical units. • Office areas not on clinical units. • Breakrooms not on clinical units. • Bathrooms or locker rooms not on clinical units. • Mechanical rooms not on clinical units. • EVS closets not on clinical units.	• Waiting areas. • Clinical engineering. • Materials management. • Sterile processing department - dirty side. • Kitchen, cafeteria, gift shop, coffee shop, and food kiosks.	• Patient care rooms and areas • All acute care units • Emergency department • Employee health • Pharmacy - general work zone • Medication rooms and clean utility rooms • Imaging suites: diagnostic imaging • Laboratory.	• All transplant and intensive care units. • All oncology units. • OR theaters and restricted areas. • Procedural suites. • Pharmacy compounding. • Sterile processing department - clean side. • Transfusion services. • Dedicated isolation wards/units. • Imaging suites: invasive imaging.

MOISTURE TIMELINE

- **When is it too late?**
  - ➢Mold growth typically begins within 48 – 72 hours following saturation of building material
    - ➢Increased humidity can accelerate mold growth
    - ➢Ongoing inspections are needed to assess moisture levels and material condition
    - Removal vs. drying depends on water category and material type
      - –Category 1 or 2 water: drying may be appropriate if materials are cleanable, structurally sound, and drying is promptly effective
      - –Category 3 water: impacted porous materials should be removed and remediated
- **What to do?**
  - ➢Take immediate action (dehumidification, drying, inspection, etc.) to control mold growth
  - ➢If growth is prevalent, remediation is warranted

WHEN TO INITIATE AN INVESTIGATION

- Characteristic Mold odor observed
- Water intrusion, damp materials, or elevated moisture readings are identified
- Occupant complaints or reporting health effects
- Visible Mold growth observed on exposed or hidden surfaces
- Legal action is threatened

THE INVESTIGATION

- Identifies mold, moisture, or water-damage conditions requiring correction
- Characterizes location, extent, and likely cause of mold growth, distribution of atypical spores
- Relies on an informed physical inspection using a light source, moisture meter, thermo imaging camera and hygrometer
- Supports ICRA determination, including containment, engineering controls, work practices, and infection prevention coordination
- May include samples to verify physical findings or to test hypotheses related to the presence of growth, distribution of spores, and source

WHEN MOLD REMEDIATION IS WARRANTED

- Visible mold growth is present on building materials or contents
- Mold growth is suspected on hidden surfaces based on odor, moisture history, or investigation findings
- Atypical concentrations of mold particles in samples are considered “unacceptable”
- Mold conditions affect high-risk patient care areas or sensitive/immunocompromised populations
- Disinfection or encapsulation alone is not an accepted substitute for removal or proper remediation of mold-contaminated porous materials

MOLD RESPONSE PRIORITIES

- **Highest priorities:**
  - Protect building occupants/patients
  - Identify and control water sources
  - Remove water
  - Begin drying of impacted materials
  - Liability/Lawsuit
- **Secondary priorities:**
  - Define scope of cleanup
  - Remove moldy materials

Airborne Sampling within Medical Facilities

- **Airborne fungal sampling within medical facilities needs to be addressed with a prudent means as compared to typical areas where immunocompromised individuals are not anticipated to reside.**

- **Immunocompromised individuals within a medical setting are those patients whose immune mechanisms are deficient.**

Individuals at Highest Risk

- **Pre-existing conditions**
  - Allergies; Asthma; Emphysema
- **Immunocompromised**
  - HIV; Cancer; bone marrow transplant patients; transplant patients
- **Immunosuppressive Therapy**
  - Radiation; chemotherapy
- **High Risk Clinical Populations**
  - Burn Patients; Infants; Elderly

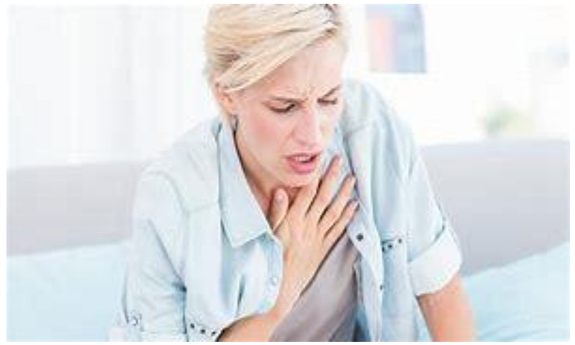
Annual Review: Coordinate with Infection Prevention / Infection Control to identify highest-risk areas at least annually.

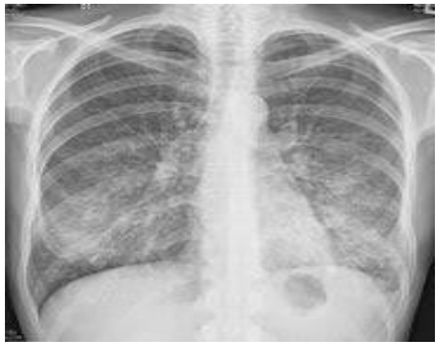
Health Effects

- **Fungi can be**
  - ➢ Toxigenic
  - ➢ Allergenic
  - ➢ Irritant
- **Some Fungi are beneficial and required for good health**
- **Fungi affect individuals differently**

Health Effects

- **Common Health Effects:**
  - ➢ Allergic Reactions- Sneezing, Nasal Congestion
  - ➢ Irritation to the Nose, Throat and Respiratory Tract
  - ➢ Asthma Attacks
  - ➢ Hypersensitivity Pneumonitis





Recommended Air Sampling Protocols

- **Use airborne fungal spore trap sampling for initial assessment**
  - Collect samples in the affected area and compare results to outdoor/background levels
  - Results are often available same-day, depending on laboratory arrangements
  - Supports timely decisions regarding containment, remediation, cleaning, and re-occupancy

- **Use polymerase chain reaction PCR when additional identification is needed**
  - Consider PCR if spore trap results are elevated, unusual, or inconclusive
  - PCR may help further identify specific fungal groups, such as Penicillium/Aspergillus
  - PCR may have longer turnaround times and is generally not the preferred first step when immediate decisions are needed

Recommended Air Sampling Protocols

- **Multiple PCR panels are available. Typically samples analyzed for the Aspergillus Common 10 panel include the following:**

Invasive Species List	Non-Invasive Species List
Aspergillus fumigatus	*Aspergillus versicolor*
Aspergillus flavus	*Aspergillus ochraceus*
Aspergillus sydowii	*Aspergillus nidulans*
Aspergillus parasiticus	*Aspergillus ustus*
Aspergillus niger	*Eurotium (A.) amstelodami*

Invasive *Aspergillus* Species

- **Aspergillus fumigatus -** This species is known for its growth at a wide temperature range and for causing most cases (80%) of aspergillosis. Because of its importance in causing aspergillosis in immune deficient people, it is included in most packages of PCR testing in our laboratory. Although it does not commonly grow in the indoor environment, we have found a few cases where the fungus actively grows indoors. It likes to grow in damp (very high humidity) and warm (98.6°F) conditions, or in places where wet organics are piled and stored.

Invasive *Aspergillus* Species

- **Aspergillus flavus -** A. flavus is a common contaminant of grains, nuts, and corn. It is not common on building materials. Aspergillus flavus may produce aflatoxins, which are carcinogens, causing liver cancer. In addition, it has been reported to cause aspergillosis, an infection of sinus cavities.

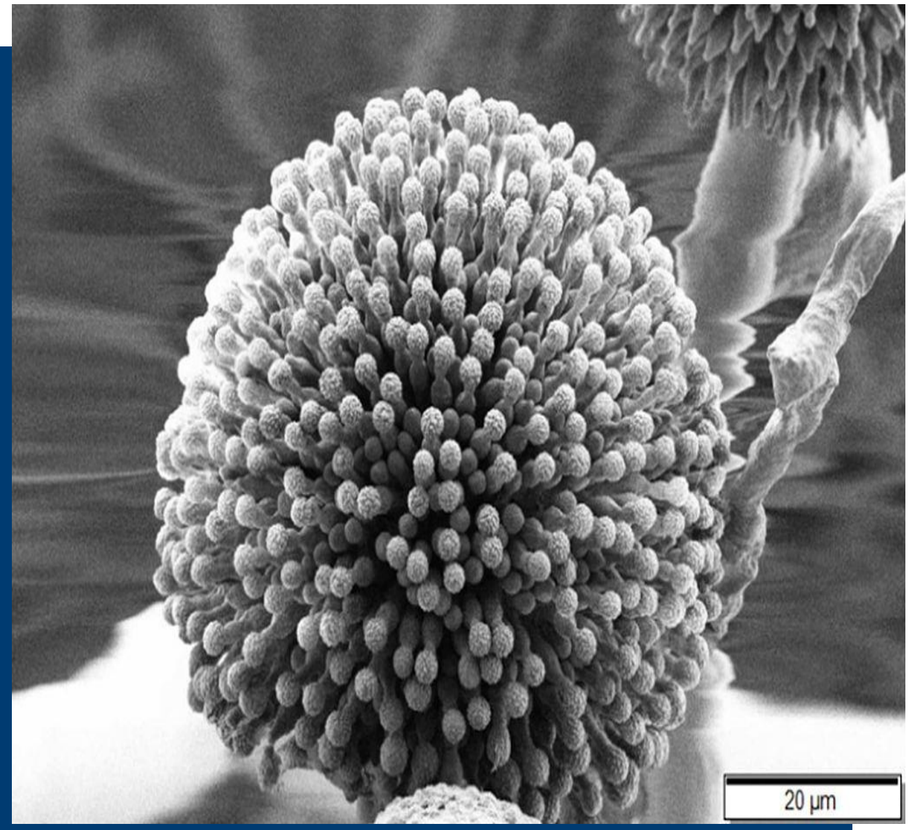
Invasive *Aspergillus* Species

- **Aspergillus sydowii -** This fungus is a common aspergillus associated with water-damaged wallboard and wallpaper. It is more common in the south than A. versicolor. Aspergillus versicolor is much more common in the north. Both can be in a mixture from water-damaged materials. Although this fungus is not known to produce mycotoxins, cases of invasive aspergillosis caused by this fungus are known.

Invasive *Aspergillus* Species

- **Aspergillus parasiticus -** is a mold known to produce aflatoxins (a potent liver carcinogen), although strains of it that do not produce this carcinogen exist. It is closely related to but separable to Aspergillus flavus. A. parasiticus produces aflatoxins B1, B2, G1 and G2, unlike A. flavus which only produces B1.

Invasive *Aspergillus* Species



- **Aspergillus niger -** Spores of this species are relatively common in soil, plant litter, spices, and sun-dried plant products. It is found in floor, carpet, and mattress dust. Growth of this fungus on water-damaged paper products (such as newspaper, books, etc.) is not uncommon. It has been associated with aspergillosis and can cause infections in immune deficient people.

Preventative Actions

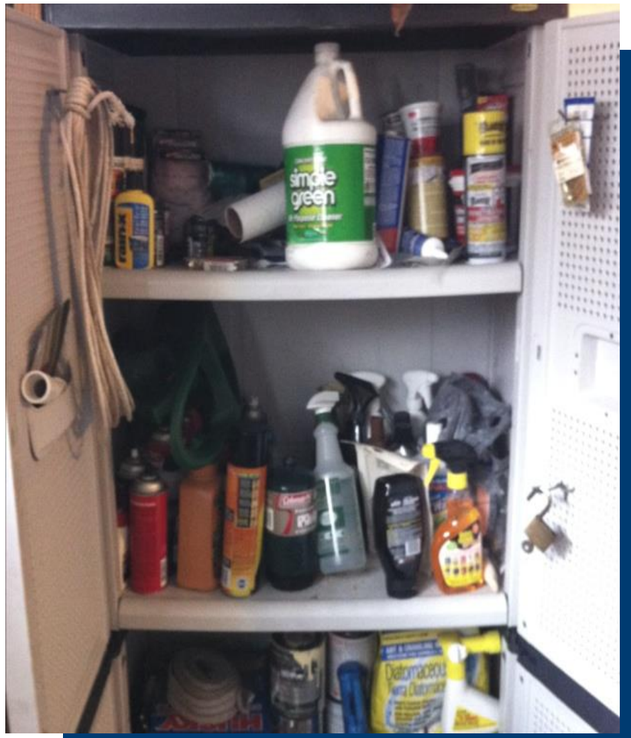
- **Control Moisture**
- **Develop Moisture Control Program**
  - Written Program
  - Moisture Monitoring
  - Train staff to recognize and report leaks, water stains, damp materials, odors, or visible mold
- **Water Intrusion Management**
  - Defined Response Actions
  - Prompt Response
  - Ensure Contracts are in Place

Preventative Actions

- **Critical Area IAQ Monitoring & Management**
  - ➢ Room inspections
  - ➢ HVAC maintenance
    - System component inspection
    - Inspect coils, drip pans, vents & ducts, intakes & diffusers, and piping
    - Maintain filters and replace on schedule
    - Verify filter MERV ratings meet CA Mechanical Code and facility design requirements
    - Use UV lights at AHUs/coil areas
- **Temperature and relative humidity monitoring**
  - Monitor and forecast Temp/RH conditions
- **Renovation controls**
- **Fresh air intakes**

Preventative Actions

- **Building Staff Training**
  - ➢ Critical Information
    - Visible condensate
    - Signs of an active water intrusion
    - Visible mold growth (where to look)
    - Proper housekeeping
- **Periodic Inspection Schedule**



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- May include samples to verify physical findings or to test hypotheses related to the presence of growth, distribution of spores, and source

WHEN MUST MOLD BE REMEDIATED?

- **All mold species, living or dead, represent potential health risks (allergy, asthma, toxins)**
- **Atypical concentrations of mold particles in samples are considered “unacceptable”**
- **Visible mold growth**
- **Disinfection and/or encapsulation of mold on porous surfaces are not accepted practices**

MOLD RESPONSE PRIORITIES

- **Highest priorities:**
  - Protect building occupants/patients
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  - Remove water
  - Begin drying of impacted materials
  - Liability/Lawsuit
- **Secondary priorities:**
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Mold in the News

- **The 1976 Aspergillus Construction Outbreak**
  (often cited as the “first major recognized case”)

  - **Established the connection between renovation dust and invasive aspergillosis**
  - **Triggered decades of research into environmental infection prevention**
  - **Became part of the historical basis for modern ICRA programs**

Mold in the News

- **Pediatric Oncology Hospital Deaths** (Florida, 2008)
  - **Established the connection between renovation dust and invasive aspergillosis**
  - **Triggered decades of research into environmental infection prevention**
  - **Became part of the historical basis for modern ICRA programs**

Mold in the News

- **A Children's Hospital** (Washington, 2019)
  - **Fourteen infections and six deaths over 20 years**
  - **Previously thought to be isolated incidents**
  - **Investigation identified to be linked to the HVAC servicing the operating rooms**
  - **Infections triggered by the Aspergillus genera**
  - **One lawsuit filed in 2005; settled in 2008**
  - **Two lawsuits currently filed**

Question & Answer

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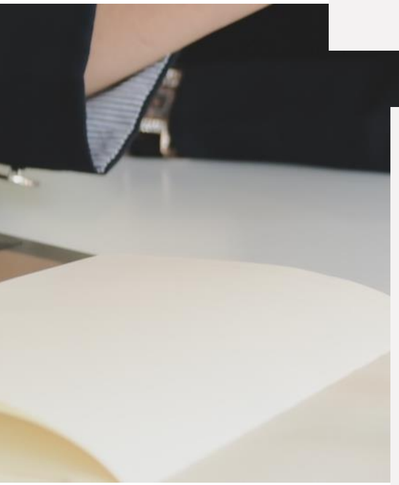

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