

DRAFT



UNR
Fungi Assessment &
Remediation Program

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SCOPE AND APPLICATION

The procedures outlined in this program are based on critical review of literature regarding associated health effects of potential fungi exposure and accepted assessment/remediation techniques. This program applies to the assessment and remediation of fungi in indoor environments of University of Nevada, Reno facilities.

ROLES AND RESPONSIBILITIES

Buildings and Grounds / Facilities Management

1. Notifies EH&S of flooded areas, water damage, potentially contaminated areas, and/or of visible fungi surface growth.
2. Implements remediation practices as outlined in this program.

Environmental Health and Safety Department (EH&S)

1. Assesses flooded areas, water damage, potentially contaminated areas, and visible fungi surface growth.
2. Establishes risk-based remediation levels and specific recommendations to prevent and/or remediate biological growth.

Contractors

1. Notifies Buildings and Grounds/Facilities Management before performing work in areas with visible fungi surface growth.

ASSESSMENT

The presence of fungi as identified by visual assessment, bulk sampling, or air sampling does not indicate that exposure or health effects have occurred. A complete assessment by qualified personnel is required to determine the potential for exposure and health effects.

Exposure is dependent on:

- ability of fungi to produce and release airborne metabolites, fungal spores, or fragments
- potential for these agents to be inhaled, physically contacted, or ingested.

Health effects are dependent on:

- type of fungi and its capability to cause fungal infection, hypersensitivity, or irritant effects
- amount and frequency of exposure
- susceptibility of exposed persons.

Visual Assessment

Potentially contaminated or water damaged areas are visually inspected by qualified EH&S personnel. Primary areas of concern may include:

- HVAC system (including air filters, cooling coils, drain pans, humidifiers, dehumidifiers, cooling towers, and ducting)
- ceiling tiles
- sheetrock
- cardboard
- carpet
- other materials known to promote biological growth.

Sampling

Bulk or surface sampling is not part of routine assessment and is not required for remediation recommendations. Bulk sampling *may* be conducted when:

- evidence of growth is not observed during visual inspection and unexplained occupant complaints exist that are associated with fungal exposure
- visual assessment is not adequate (i.e. visible growth is not detected but significant water staining and or damage has occurred and conditions have been favorable for growth)
- identification of specific fungal contaminant(s) is required as part of a medical evaluation

Air sampling is not part of routine assessment. If necessary, air samples are collected in the area of concern and compared to un-contaminated area(s) within the facility and outdoors, preferably near the facility air intake. Air sampling *may* be conducted when:

- evidence from visual assessment and/or bulk sampling indicates contamination of HVAC/air handling systems
- presence of mold is highly suspected but cannot be confirmed through visual inspection or bulk sampling

Analysis

Analysis of bulk/surface and air samples is conducted by a qualified lab specializing in microscopic analysis of microbial samples. The presence of trace fungal spores in samples is considered background. Although exposure criteria do not exist, large differences in fungal types or levels as compared to uncontaminated outdoor air may indicate sources of indoor amplification or contamination.

REMEDIATION

Sources of water infiltration including leaks, seepage, high humidity, and other underlying causes of fungal growth should be promptly rectified prior to commencement of remediation activities. Where high humidity is a contributing factor, humidity levels should be maintained below 60%.

Remediation response including clean up, drying, and removal of water damaged materials should be conducted within at least 24-48 hours. Remediation should be conducted in a manner to minimize emission of fungi and dust while preventing exposure to building occupants. The use of ozone or gaseous disinfectants has not shown to be an effective remediation measure and is not recommended.

Remediation levels and specific recommendations are established by EH&S on a case-by-case basis.

Level 1 – Minimal Surface Contamination

Criteria

- small isolated area (e.g., ceiling tile replacement, small areas on non-porous materials)

Personnel

- UNR maintenance personnel including custodial staff

Minimum Training Requirements

- job specific recommendations from EH&S staff

Minimum Work Practices

- gloves

- contaminated materials removed from facility in sealed plastic bags.

Level 2 – Moderate Contamination

Criteria

- moderate isolated area (e.g., sheetrock panels, removal of small carpeted areas)

Personnel

- trained UNR Operations & Maintenance personnel or Qualified Outside Contractor

Minimum Training Requirements

- job specific recommendations from EH&S staff
- 16 hour operations & maintenance asbestos or equivalent

Minimum Work Practices

- work area unoccupied
- gloves & eye protection
- respiratory protection with HEPA cartridges
- plastic sheeting covering work area to contain dust/debris
- dust suppression methods such as water misting
- contaminated materials removed from facility in sealed plastic bags
- work area and surrounding areas HEPA vacuumed or cleaned with damp cloth and/or mop using detergent solution

Level 3 – Extensive Contamination

Criteria

- large, multiple contaminated areas or building wide contamination (e.g., extensive portions of building contaminated or extensive HVAC contamination)

Personnel

- qualified outside contractor

Minimum Training Requirements

- job specific recommendations from EH&S staff and/or oversight by competent environmental health & safety professional with experience in performing microbial investigations
- licensed asbestos abatement contractor or equivalent
- previous experience in fungal remediation

Minimum Work Practices

- gloves & eye protection

- full-face respiratory protection with HEPA cartridges
- disposable protective clothing
- complete isolation of work area from occupied spaces using critical barriers (including air supply/exhaust openings, entrances/exits, fixtures)
- airlocks & decontamination room
- dust suppression methods such as water misting
- contaminated materials removed from facility in sealed plastic bags; outside of bags HEPA vacuumed or cleaned with damp cloth and/or mop using detergent solution in the decontamination room
- contaminated area and decontamination room HEPA vacuumed and/or cleaned with damp cloth and/or mop using detergent solution
- air monitoring prior to re-occupancy

DEFINITIONS

Assessment: The process of evaluating presence and risk of microbial contamination through visual evaluation, bulk sampling, and/or air sampling by qualified individuals

Fungi: A broad class of eukaryotic microorganisms including molds, yeasts, and mushrooms. Most fungi are not able to directly cause infectious disease in humans unless the host is immunocompromised. However, fungi *may* cause human health effects through production of: allergenic proteins or glycoproteins which can lead to hypersensitivity; glucans which may cause irritant effects; volatile and non-volatile organic compounds; and spores released during the fungi life cycle.

Glucans: Glucose polymers that are structural components of most fungal cell walls.

HEPA: A pleated filter media (high efficiency particulate arrestor) capable of filtering 99.97% of particulates 0.3 um in size.

HVAC: Heating, ventilating, and air conditioning systems that provide fresh tempered air to occupants of indoor environments.

Hypersensitivity: Hypersensitivity may occur upon exposure to an antigen that stimulates an immunologic response. Effects may include: eye itching, soreness, or discharge (conjunctivitis); itchy, sneezing, or running nose (rhinitis); external/internal ear pressure causing pain and impairing hearing (otitis); and pain or fullness in face with accompanying headache (sinusitis). More serious and chronic effects may result with recurrent exposure to high levels of airborne fungi including hypersensitivity pneumonitis that is characterized by recurrent pneumonia, fever, cough, chest tightness, and a pattern of acute and chronic lung disease.

Mold: Indoor growth of fungi, which is often referred to as mold.

Mildew: A term used to describe indoor growth of fungi.

Mycotoxin: Non-volatile, relatively low molecular weight secondary metabolic products of fungi. Mycotoxins have diverse chemical structures that can include polyketides, terpenes, and indoles.

Remediation: Removing or cleaning contaminated materials in a manner that prevents emission of fungi and dust contaminated with fungi from leaving a work area and entering an occupied or non-abatement area, while protecting the health of workers performing the abatement.

Spores: Small, lightweight, reproductive cell produced by fungi. Spores have thick cell walls and are able to withstand large temperature extremes, humidity, and other unfavorable conditions.

REFERENCES

American Conference of Industrial Hygienists (ACGIH): Bioaerosols Assessment and Control: (1999).

American Industrial Hygiene Association (AIHA): Field Guide for the Determination of Biological Contaminants in Environmental Samples (1996)

New York City Department of Health, Bureau of Environmental & Occupational Disease Epidemiology: Guidelines on Assessment and Remediation of Fungi Indoor Environments: (2000)