



Center for Indoor Environments and Health

# Protecting your and others' health when you work in moldy places

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# What Will You Encounter?



Courtesy of FEMA

# What Will You Encounter (cont)?



Courtesy of FEMA

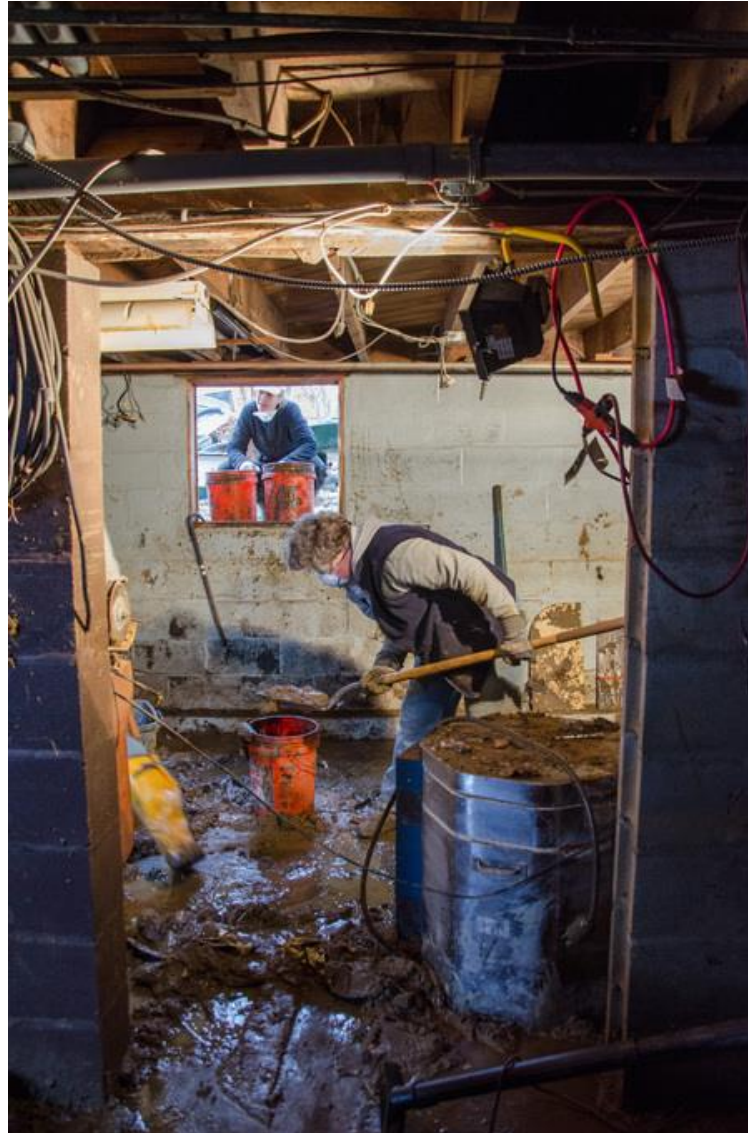


# What Will You Encounter (cont)?



Courtesy of FEMA

# What Will You Encounter (cont)?



Courtesy of FEMA

# Single Most Important Piece of Equipment to Protect Health

## *Respirator*



Good

\$



Better

\$\$



Best

\$\$\$

# GOAL





- Avoid health effects caused by:
  - breathing particles (mold and other biological materials)
  - contact of these particles with skin and mucous membranes (eyes, mouth, nose)



Courtesy of NIOSH

# What Determines the Best Way to Protect Yourself?

## Assess

-  Your health status
-  Extent of contamination
-  Length of exposure time
-  Work activities (dust generation)



# N95 Respirator

- Minimum protection
- Tight-fitting
- Air-purifying
  - 95% efficient when properly worn
- Protects against particles (e.g.mold)
- Commonly used and readily available
- Disposable

## NIOSH-Approved Respirator



Obtained from OSHA  
Courtesy of 3M

# A Respirator is the... Most Important PPE (Personal Protective Equipment)

N95 Respirator is *not* a surgical mask



- Check with your health provider to determine your personal risk - both from exposure AND respirator use.
- Fit test if possible, and learn how to do a self-check.
- Depending on work activities, you may need a more protective respirator or need to hire a professional who has training and PPE!!

Surgical masks *do not* provide protection to the user; they are designed to protect a patient from a health provider's infectious illness.



Obtained from NIOSH  
Courtesy of 3M



Obtained from NIOSH  
Courtesy of Newton  
Safety/Sanax

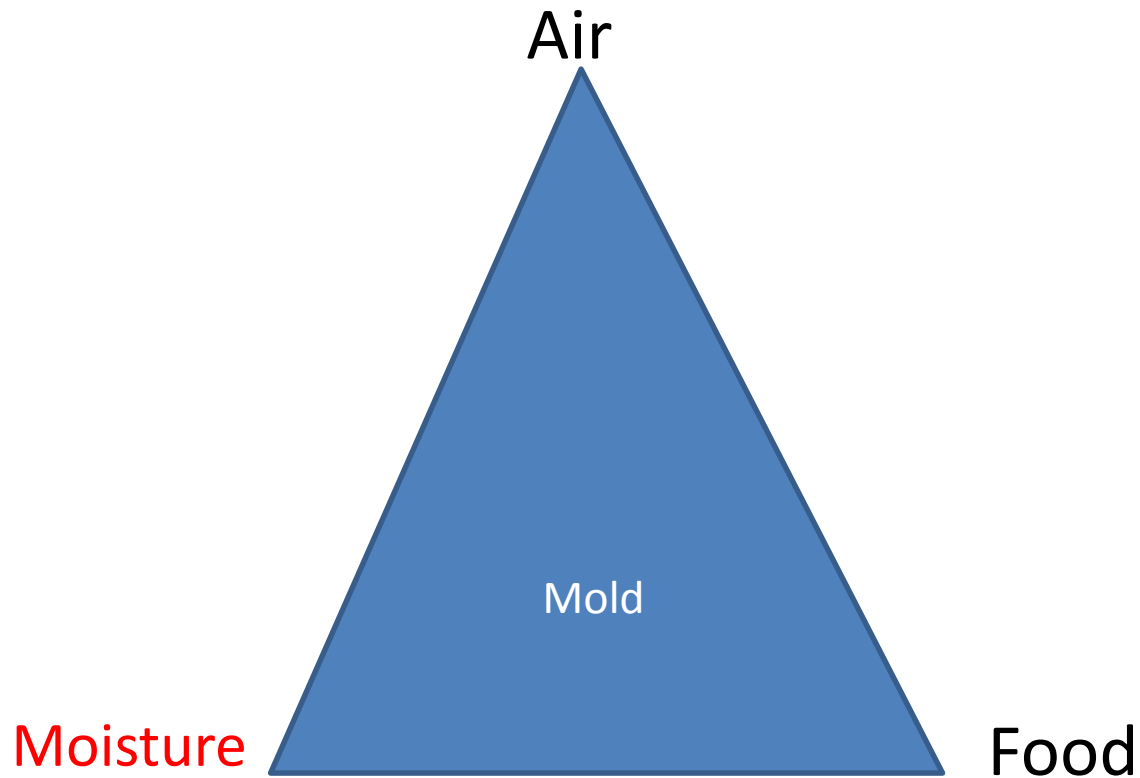
# What is Mold?

- Very small biological particles
  - requires food, air & moisture to grow
  - reproduces
  - airborne (inhalable), or present in dust
- Food
  - drywall, ceiling tile, glue, dust, wallpaper, paneling, carpeting, furniture, paint, ductwork, roofing, wood
  - Anything organic



Courtesy of EPA

# Mold Triangle





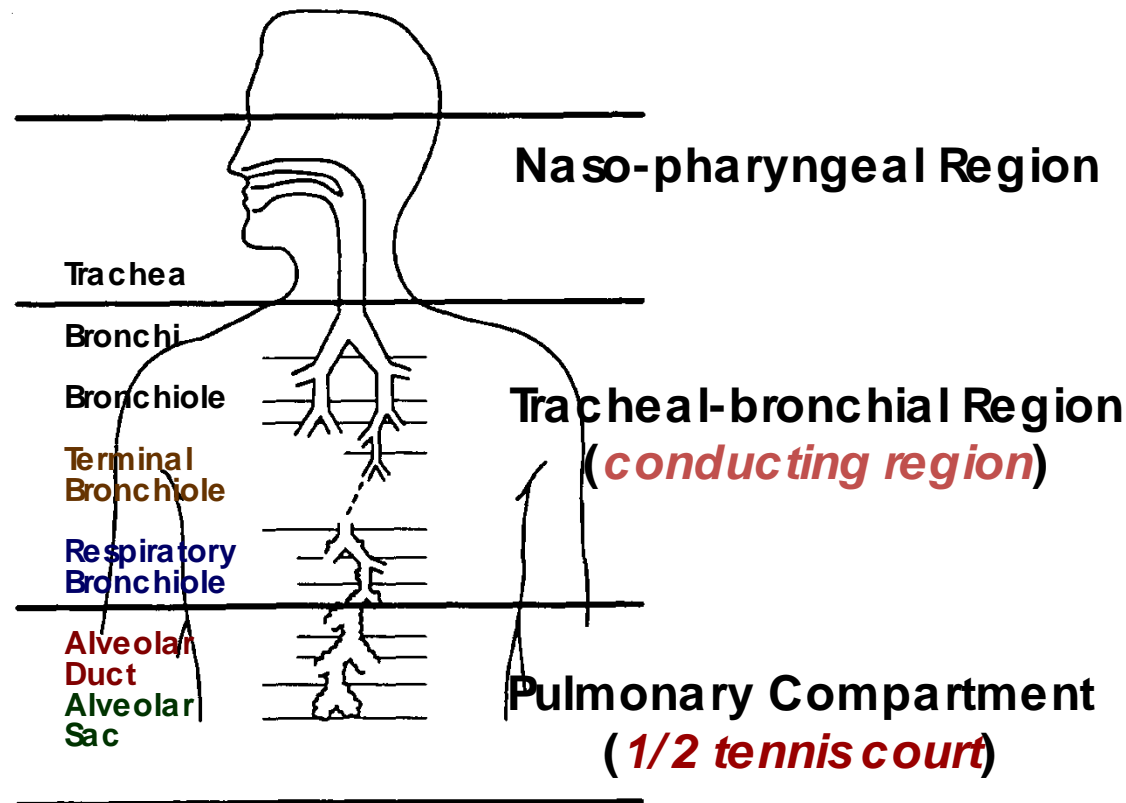
# What is Mold? (cont)

- Present indoors and outdoors
- # of particles in outdoor and indoor air varies by season, day, hour
- Also present in settled dust
- All mold should be treated as a health risk when in the presence of mold clean up activities.

# Release of Mold Spores

- <http://www.youtube.com/watch?v=mjD4uAQvmk0>

# Where do Inhaled Mold Particles Settle in the Respiratory Tract?



The major divisions of the respiratory tract (adapted from J.B. West, *Respiratory Physiology*, 4th ed. Baltimore, MD: Williams and Wilkins, 1990).

# Building Materials That Support Mold Growth

Dry wall, wood trim



Courtesy of EPA



# Building Materials That Support Mold Growth (cont)

## Painted Ceiling



Courtesy of EPA

# Building Materials That Support Mold Growth (cont)

## Wallboard Under Sink



Courtesy of EPA

# Building Materials That Support Mold Growth (cont)

## Suitcases



Courtesy of EPA

# Building Materials That Support Mold Growth (cont)

## Inside Ventilation Ductwork



Courtesy of EPA



# Building Materials That Support Mold Growth (cont)

## Inside Wall Cavity



Courtesy of EPA

# Building Materials That Support Mold Growth (cont)

## Concrete Ceiling



Courtesy of EPA

# Building Materials That Support Mold Growth (cont)

## Wood Subflooring Adjacent to Plumbing



Courtesy of EPA

# Building Materials That Support Mold Growth (cont)

Ceiling/wall with heavy mold growth



(photo courtesy of Terry Brennan)

<http://www.epa.gov/mold/moldcourse/imagegallery5.html>



# Building Materials That Support Mold Growth (cont)

## Moldy Wallboard



Photo courtesy of OSHA.  
This picture shows actual disaster site work conditions and may not illustrate proper safety and health procedures.

# Building Materials That Support Mold Growth (cont)

## Mold Growth Behind Wallpaper




Courtesy of EPA

# GOAL

## During Mold Cleanup Activities

- Avoid health effects caused by breathing particles (mold and other biological materials) *and* avoid contact of these particles with skin and mucous membranes (eyes, mouth, nose)

How?

- Assess
  - Protect
  - Reassess
- 
- APR

# Before You Enter a Moldy Environment

## Assess

### 1. Your Medical Condition\*

- Immunocompromised
- Obstructive lung disease
- Allergic
- Asthma
- Hypersensitivity pneumonitis
- Pregnant, Elderly, Young
- No Known Risk factors

### 2. Planned Work Activities

- Size of Mold Impacted Materials (ft<sup>2</sup>)
  - Some mold growth likely hidden
- Expected Dust Generation
  - Will moldy materials be disturbed, and to what extent?

\*Consult with your medical provider to assess your individual condition(s).

# Protect

- Use Personal Protective Equipment (PPE) as appropriate
  - Respirator (N95 minimum)
  - *Unvented* goggles
  - Gloves
  - Skin protection
- Implement Work Practices
  - Minimize airborne dust/mold particles
  - Maintain good housekeeping

# Reassess

## 1. Medical Condition

- Signs/symptoms during work, and after work

## 2. Size of Mold-Impacted Materials (ft<sup>2</sup>)

- Daily
- Newly discovered materials
  - behind walls, in ductwork, under carpeting, etc.
- May require upgrading PPE especially respiratory protection

## 3. Dust-generating Activities



# PPE: Removing Mold with Detergent and Water

- Skin and **mucous membranes** covered
  - Eyes, nose, mouth
- Unvented goggles, N95 respirator, gloves, clothing



# PPE: Scraping Mold from Wall

- Upgraded respirator
- Coveralls with hood
- Gloves
- Unvented goggles (not being worn)



# Work Practices

- Use of HEPA vacuum to remove mold/dust
  - HEPA vacuum is 99.97% efficient
- Do not use non-HEPA vacuum
  - Non-HEPA vacuum will cause captured mold particles to become airborne



Courtesy of EPA

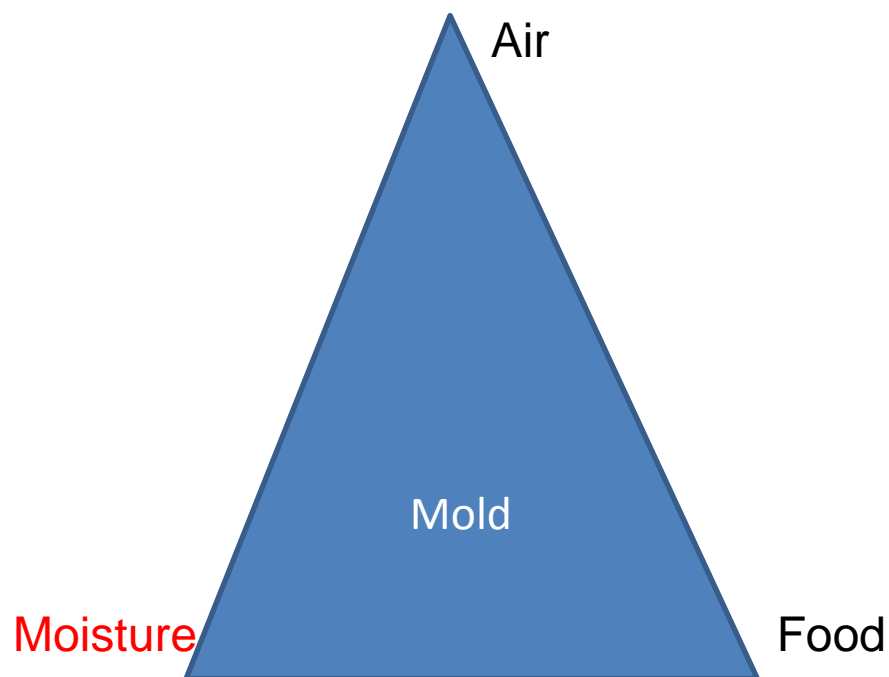
# Work Practices (cont)

## **Porous vs Non-Porous Surfaces**

- Non-porous surfaces can be cleaned with detergent and warm water
  - Wood tables, dressers, counter tops, hard flooring, appliances, windows, etc.
- Porous surfaces are difficult to clean
  - Soft chairs, couches, pillows, drapes, carpeting, drywall, ceiling tiles, etc.
  - Many will require removal, bagging and disposal

# Work Practices (cont)

- Use of fans to dry wetted materials
  - Removal of *moisture* to prevent mold growth



Courtesy of EPA

# Full Containment of Cleanup Space



Courtesy of EPA

- Significant mold present
- Large area impacted
- High dust-generating activities
- Containment air exhausted to outside
- Upgraded respirator



# Mold Cleanup Activities

## Debris Removal From Residence



Photo courtesy of FEMA.

This picture shows actual disaster site work conditions and may not illustrate proper safety and health procedures.

# Mold Cleanup Activities

## Salvaging Items



Photo courtesy of FEMA.

This picture shows actual disaster site work conditions and may not illustrate proper safety and health procedures.

# Mold Cleanup Activities

## Donning PPE Before Entry



Photo courtesy of FEMA.

This picture shows actual disaster site work conditions and may not illustrate proper safety and health procedures.

# Mold Cleanup Activities

## Shoveling Drywall Debris



Photo courtesy of FEMA.  
This picture shows disaster site work conditions  
and may not illustrate proper safety and  
health procedures.



# Mold Cleanup Activities

## Bagging Mold-Impacted Cushions



Photo courtesy of FEMA.

This picture shows actual disaster site work conditions and may not illustrate proper safety and health procedures.

# Mold Cleanup Activities



Photo courtesy of Jaime Robledo.  
This picture shows actual disaster site work conditions and may not illustrate proper safety and health procedures.



# Mold Cleanup Activities

## Bagging Mold-Impacted Debris



Photo courtesy of Jaime Robledo.  
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# What Impacts the Health Risk of Mold Exposure?

## Mold Exposure

– *Duration of Exposure*  
(Time) x *Absorbed Concentration* (air, mucous membranes, skin)

the greater the exposure,  
the greater the health risk

- The greater the exposure, the greater the health risk
- Goal is to minimize exposure

# Sun Exposure and Mold Exposure: A Comparison

## Ultraviolet Rays

- Cover skin
- Apply sunscreen
- Use umbrella/hat
- Reduce time in sun
  
- Some individuals are more sensitive than others

## Mold Particles

- Cover skin
- Cover eyes, nose, mouth
- Reduce time in moldy environment
  
- Some individuals are more sensitive than others

# Factors that Affect Exposure

## TIME

- *Minimize* time in indoor environments that contain mold



# Factors that Affect Exposure (cont)

## **Amount of Mold Present**

- How Much Mold is Present?
  - Visible
  - Not Visible (?)
- Assess by Estimating the Size of Materials (building, furnishings, etc.) Impacted by Mold
  - Square footage (ft<sup>2</sup>) of impacted materials

# Factors that Affect Exposure (cont)

## **Type of Cleanup Activity**

- *Disturbance* of mold-impacted materials increases # of mold particles in the air, in dust, and on surfaces including clothing.
  - Wiping with damp rag and detergent
  - vs.
  - Use of sledge hammer to remove drywall



# Factors that Affect Exposure (cont)

- Select cleanup activity that gets job done but generates *least* amount of airborne dust

Remove whole/large section of moldy drywall



vs.

Sledge-hammering drywall into smaller pieces

Mist mold and remove with green pad



vs.

Using dry sandpaper

# Factors that Affect Exposure (cont)

## Work Practices

- Mist mold with water/detergent
  - Reduces airborne mold particles
- HEPA vacuum
  - Reduces airborne mold particles
- Ventilation
  - Reduces # mold particles in indoor air
- Plastic bags/sheeting to contain debris
  - Minimizes secondary generation of dust
- Dry wet materials



Photo courtesy of Jaime Robledo.  
This picture shows actual disaster site work conditions and may not illustrate proper safety and health procedures.

# Factors that Affect Exposure (cont)

## Personal Protective Equipment (PPE)

- Respirator – minimum N95
- Unvented goggles
- Full clothing/coveralls



- Gloves



- Rubber gloves if no chemical cleaners used
- Nitrile or vinyl gloves if chemical cleaners used

# The Critical Importance of Respiratory Protection

- N95 respirators filter at least 95% of airborne particles when worn properly.
- Minimum respiratory protection against mold particles
- Disposable respirator
  - Reusable
  - Replace when breathing resistance noted
- Leave work area if breathing becomes difficult and consult a healthcare provider.



# Do's and Don'ts of N95 Respirators

## Do

- Protect against other airborne particulates
  - lead, asbestos
- Store in a sealed plastic bag when not in use
- Seal-check each time it is worn

## Don't

- Protect against vapors and gases!
  - carbon monoxide, chemical cleaners
- Protect against oxygen-deficiency
- Share respirators

# Types of Disposable Respirators

Filter Resistance to Airborne Oil	Filter Efficiency %		
	95	99	100
<b>N</b>	✓	✓+	✓+
<b>R</b>		✓+	✓+
<b>P</b>		✓+	✓+

**N** = no resistance

**R** = somewhat resistant

**P** = strongly resistant

✓ = minimum disposable  
respirator to be used



# Seal of Respirator to Face Determines Protection

- User seal-check (fit check) maximizes protection of respiratory system
  - Maximize seal of respirator to face
  - Performed each time a respirator is worn
- User seal check is **NOT** a fit test



Courtesy of NIOSH

# What Prevents a Good Respirator-to- Face Seal?

- Anything in between the face and the respirator
  - Facial hair, body piercing, handkerchief, etc.
- Young children can not get a good seal
  - Respirator size issue
- Not performing a user seal check each time a respirator is put on
- Incorrect respirator size (small, medium, large)

# N95 User Seal Check

- <http://www.youtube.com/watch?v=pGXiUyAoEd8>

Have class perform a user seal check with  
N95 respirators

# Is There a Tool to Help Me Make Wise Decisions for Myself and Others?

Yes!

- Remember the 3 Actions to Take When Considering to Enter a Moldy Indoor Environment

1. **ASSESS** Medical Condition and Cleanup Work
2. **PROTECT** Health by Selecting Work Practices and PPE to Reduce Mold Exposure
3. **REASSESS** Medical and Working Conditions

A  
P  
R

# Volunteers/Homeowners/Workers

## Decision Tree

- Review the Decision Tree Tool (**APR**) to Guide Individuals in the Protection of Health When Considering Entry Into Mold-Impacted Indoor Environments