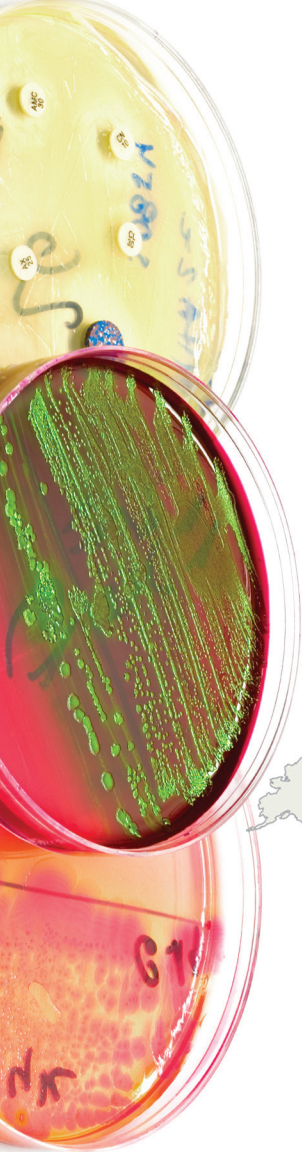


Mold

POCKET GUIDE



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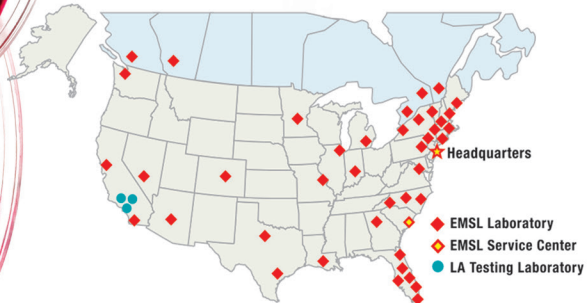
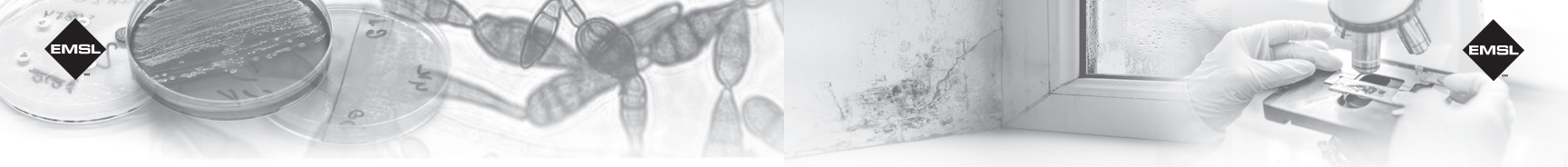


Table of Contents



What is mold?

The key to mold control is moisture control

- If mold is a problem in your home, you should clean up the mold promptly and fix the water problem.
- It is important to dry water-damaged areas and items within 24-48 hours to prevent mold growth.

Molds produce tiny spores to reproduce. Mold spores waft through the indoor and outdoor air continually. When mold spores land on a damp spot indoors, they may begin growing and digesting whatever they are growing on in order to survive. There are molds that can grow on wood, paper, carpet, and foods. When excessive moisture or water accumulates indoors, mold growth will often occur, particularly if the moisture problem remains undiscovered or un-addressed. There is no practical way to eliminate all mold and mold spores in the indoor environment; the way to control indoor mold growth is to control moisture.

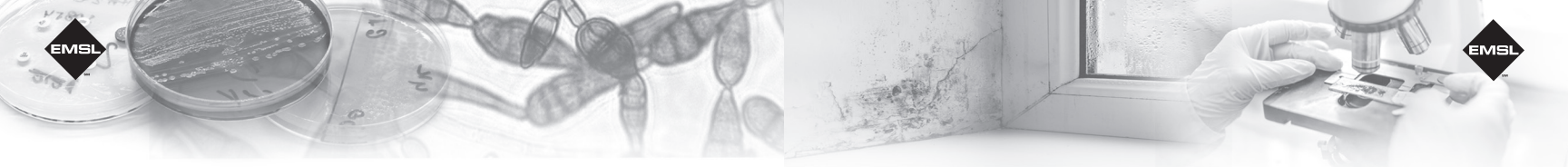
Read the publication, “A Brief Guide to Mold, Moisture, and Your Home” at <https://www.epa.gov/mold/brief-guide-mold-moisture-and-your-home> [EPA 402-K-02-003]

How can I tell if I have a mold problem?

Molds are usually not a problem indoors, unless mold spores land on a wet or damp spot and begin growing.

Molds are part of the natural environment. Outdoors, molds play a part in nature by breaking down dead organic matter such as fallen leaves and dead trees, but indoors, mold growth should be avoided. Molds reproduce by means of tiny spores; the spores are invisible to the naked eye and float through outdoor and indoor air. Mold may begin growing indoors when mold spores land on surfaces that are wet. There are many types of mold, and none of them will grow without water or moisture.

It is impossible to get rid of all mold and mold spores indoors; some mold spores will be found floating through the air and in house dust. The mold spores will not grow if moisture is not present. Indoor mold growth can and should be prevented or controlled by controlling moisture indoors. If there is mold growth in your home, you must clean up the mold and fix the water problem. If you clean up the mold, but don't fix the water problem, most likely, the mold problem will come back.



Why is mold growing in my home?

Molds are part of the natural environment. Outdoors, molds play a part in nature by breaking down dead organic matter such as fallen leaves and dead trees, but indoors, mold growth should be avoided. Molds reproduce by means of tiny spores; the spores are invisible to the naked eye and float through outdoor and indoor air. Mold may begin growing indoors when mold spores land on surfaces that are wet. There are many types of mold, and none of them will grow without water or moisture.

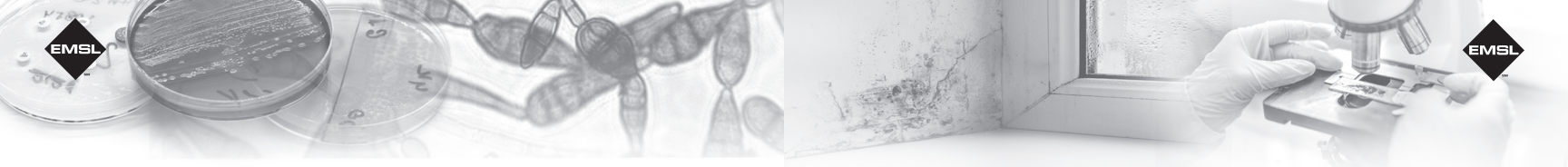
Key points to keep in mind

- The key to mold control is moisture control.
- If mold is a problem in your home, you should clean up the mold promptly and fix the water problem.
- It is important to dry water-damaged areas and items within 24-48 hours to prevent mold growth.

What is the difference between Mold and Mildew?

Mildew refers to certain kinds of mold or fungus. The term mildew is often used generically to refer to mold growth, usually with a flat growth habit.

Molds include all species of microscopic fungi that grow in the form of multicellular filaments, called hyphae. Molds can thrive on any organic matter, including clothing, leather, paper, and the ceilings, walls and floors of homes with moisture management problems. Mildew often lives on shower walls, windowsills, and other places where moisture levels are high. There are many species of molds. In unaired places, such as basements, they can produce a strong musty odor.



What does mold smell like?

Some compounds produced by molds have strong smells and are volatile and quickly released into the air. These compounds are known as microbial volatile organic compounds (mVOCs). Because mVOCs often have strong or unpleasant odors, they can be the source of the “moldy odor” or musty smell frequently associated with mold growth. A moldy odor suggests that mold is growing in the building and should be investigated.

The health effects of inhaling mVOCs are largely unknown, although exposure to mVOCs has been linked to symptoms such as headaches, nasal irritation, dizziness, fatigue, and nausea. More research is needed to determine whether there are any human health effects from non-occupational indoor exposures to mVOCs.

The Key to Mold Control is Moisture Control

It is important to dry water damaged areas and items within 24-48 hours to prevent mold growth. If mold is a problem in your home, clean up the mold and get rid of the excess water or moisture. Fix leaky plumbing or other sources of water. Wash mold off hard surfaces with detergent and water, and dry completely. Absorbent materials (such as ceiling tiles & carpet) that become moldy may have to be replaced.

Basic Mold Cleanup

The key to mold control is moisture control. It is important to dry water damaged areas and items within 24-48 hours to prevent mold growth. If mold is a problem in your home, clean up the mold and get rid of the excess water or moisture. Fix leaky plumbing or other sources of water. Wash mold off hard surfaces with detergent and water, and dry completely. Absorbent materials (such as ceiling tiles & carpet) that become moldy may have to be replaced.

(Source: EPA <http://www.epa.gov/mold/moldresources.html>)

What about mold in large buildings?

EPA has a number of resources available:

Building Air Quality: A Guide for Building Owners and Facility Managers – visit <https://www.epa.gov/indoor-air-quality-iaq/building-air-quality-guide-guide-build-ing-owners-and-facility-managers>

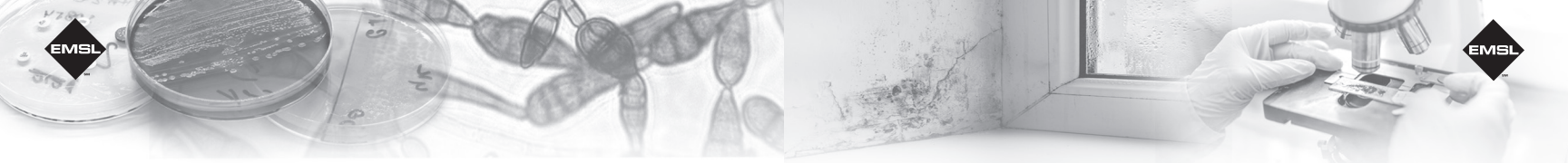
Building Air Quality: A Guide for Building Owners and Facility Managers: Appendix C - Moisture, Mold and Mildew – visit <https://www.epa.gov/mold/appendix-c-building-air-quality-guide-moisture-mold-and-mildew>

Read the publication “Mold Remediation in Schools and Commercial Buildings” at <https://www.epa.gov/mold/mold-remediation-schools-and-commercial-build-ings-guide> [EPA 402-K-01-001, March 2001]

Read the publication, “A Brief Guide to Mold, Moisture, and Your Home” at <https://www.epa.gov/mold/brief-guide-mold-moisture-and-your-home> [EPA 402-K-02-003]

Are there Federal regulations or standards regarding mold?

Standards or Threshold Limit Values (TLVs) for airborne concentrations of mold, or mold spores, have not been set. Currently, there are no EPA regulations or standards for airborne mold contaminants.



What are the main ways to control moisture in your home?

Water in your home can come from many sources. Water can enter your home by leaking or by seeping through basement floors. Showers or even cooking can add moisture to the air in your home. The amount of moisture that the air in your home can hold depends on the temperature of the air. As the temperature goes down, the air is able to hold less moisture. This is why, in cold weather, moisture condenses on cold surfaces (for example, drops of water form on the inside of a window). This moisture can encourage biological pollutants to grow.

There are many ways to control moisture in your home

- Fix leaks and seepage. If water is entering the house from the outside, your options range from simple landscaping to extensive excavation and waterproofing. (The ground should slope away from the house.) Water in the basement can result from the lack of gutters or a water flow toward the house. Water leaks in pipes or around tubs and sinks can provide a place for biological pollutants to grow.
- Put a plastic cover over dirt in crawlspaces to prevent moisture from coming in from the ground. Be sure crawlspaces are well-ventilated.
- Use exhaust fans in bathrooms and kitchens to remove moisture to the outside (not into the attic). Vent your clothes dryer to the outside.
- Turn off certain appliances (such as humidifiers or kerosene heaters) if you notice moisture on windows and other surfaces.
- Use dehumidifiers and air conditioners, especially in hot, humid climates, to reduce moisture in the air, but be sure that the appliances themselves don't become sources of biological pollutants.

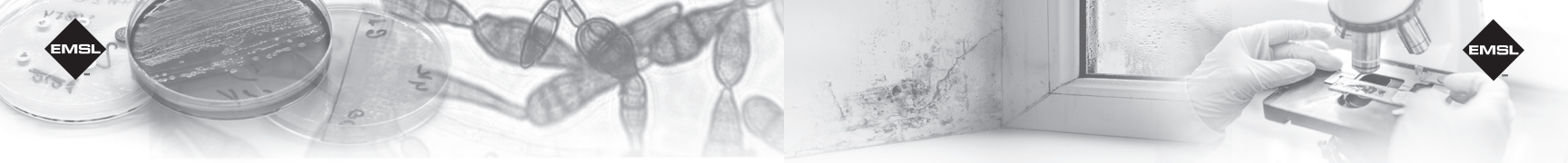
- Raise the temperature of cold surfaces where moisture condenses. Use insulation or storm windows. (A storm window installed on the inside works better than one installed on the outside.) Open doors between rooms (especially doors to closets which may be colder than the rooms) to increase circulation. Circulation carries heat to the cold surfaces. Increase air circulation by using fans and by moving furniture from wall corners to promote air and heat circulation. Be sure that your house has a source of fresh air and can expel excessive moisture from the home.

- Pay special attention to carpet on concrete floors. Carpet can absorb moisture and serve as a place for biological pollutants to grow. Use area rugs which can be taken up and washed often. In certain climates, if carpet is to be installed over a concrete floor, it may be necessary to use a vapor barrier (plastic sheeting) over the concrete and cover that with sub-flooring (insulation covered with plywood) to prevent a moisture problem.

- Moisture problems and their solutions differ from one climate to another. The Northeast is cold and wet; the Southwest is hot and dry; the South is hot and wet; and the Western Mountain states are cold and dry. All of these regions can have moisture problems. For example, evaporative coolers used in the Southwest can encourage the growth of biological pollutants. In other hot regions, the use of air conditioners which cool the air too quickly may prevent the air conditioners from running long enough to remove excess moisture from the air. The types of construction and weatherization for the different climates can lead to different problems and solutions.

Media Recommendations For Air Sampling of Culturable Fungi and Bacteria

Fungal sampling in general, we recommend MEA. Malt Extract Agar is a general isolating media for culturing a wide-spectrum of fungi. A good media for most of your IAQ projects. Sampling for cellulose degrading microfungi in water damaged buildings (e.g. *Stachybotrys* sp.) either Cellulose agar or Corn Meal Agar. Bacterial sampling in general, we recommend TSA or TSA w 5% Blood. Sampling for Gram negative bacteria, we recommend MacConkey Agar. All other situations, the Microbiology Department will be happy to make recommendation based on your individual sampling situation or project.



Moisture on Windows

Your humidistat is set too high if excessive moisture collects on windows and other cold surfaces. Excess humidity for a prolonged time can damage walls especially when outdoor air temperatures are very low. Excess moisture condenses on window glass because the glass is cold. Other sources of excess moisture besides overuse of a humidifier may be long showers, running water for other uses, boiling or steaming in cooking, plants, and drying clothes indoors. A tight, energy efficient house holds more moisture inside; you may need to run a kitchen or bath ventilating fan sometimes, or open a window briefly. Storm windows and caulking around windows keep the interior glass warmer and reduce condensation of moisture there.

Humidifiers are not recommended for use in buildings without proper vapor barriers because of potential damage from moisture buildup. Consult a building contractor to determine the adequacy of the vapor barrier in your house. Use a humidity indicator to measure the relative humidity in your house. The American Society of Heating and Air Conditioning Engineers (ASHRAE) recommends these maximum indoor humidity levels.

Outdoor Recommended Indoor Temperature Relative Humidity:

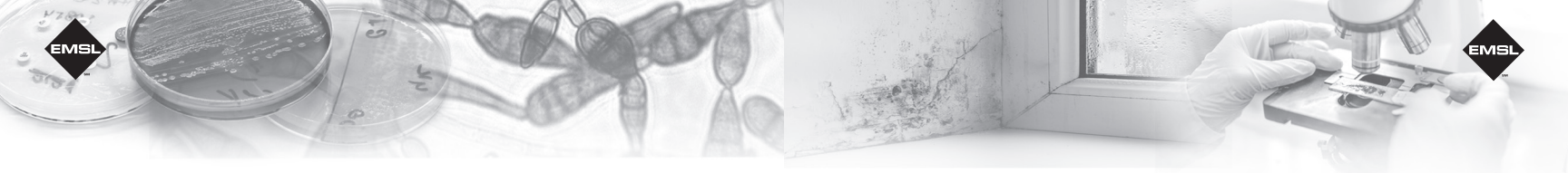
Temperature	Humidity
+20o F.	35%
+10o F.	30%
0o F.	25%
-10o F.	20%
-20o F.	15%

Source: Anne Field, Extension Specialist, Emeritus, with reference from the Association for Home Appliance Manufacturers (www.abam.org).

For more information on mold, Read the publication “Mold Remediation in Schools and Commercial Buildings at <https://www.epa.gov/mold/mold-remediation-schools-and-commercial-buildings-guide> [EPA 402-K-01-001, March 2001] Read the publication, “A Brief Guide to Mold, Moisture, and Your Home” at <https://www.epa.gov/mold/brief-guide-mold-moisture-and-your-home> [EPA 402-K-02-003]

Does ultraviolet (UV) radiation from UV lamps kill mold?

If properly designed, ultraviolet germicidal irradiation (UVGI) cleaners that use ultraviolet radiation from UV lamps may destroy indoor biological pollutants such as viruses, bacteria, and some molds that are growing on the moist interiors of HVAC surfaces (e.g., cooling coils, drain pans, or ductwork). But typical UVGI cleaners used in homes have limited effectiveness in killing bacteria and molds. Effective destruction of some viruses and most mold and bacterial spores usually requires much higher UV exposure than is provided in a typical home unit. Furthermore, dead mold spores can still produce allergic reactions, so UVGI cleaners may not be effective in reducing allergy and asthma symptoms.



Should I use bleach to clean up mold?

Biocides are substances that can destroy living organisms. The use of a chemical or biocide that kills organisms such as mold (chlorine bleach, for example) is not recommended as a routine practice during mold cleanup. There may be instances, however, when professional judgment may indicate its use (for example, when immune-compromised individuals are present). In most cases, it is not possible or desirable to sterilize an area; a background level of mold spores will remain - these spores will not grow if the moisture problem has been resolved. If you choose to use disinfectants or biocides, always ventilate the area and exhaust the air to the outdoors. Never mix chlorine bleach solution with other cleaning solutions or detergents that contain ammonia because toxic fumes could be produced.

Please note: Dead mold may still cause allergic reactions in some people, so it is not enough to simply kill the mold, it must also be removed.

For more information on mold:

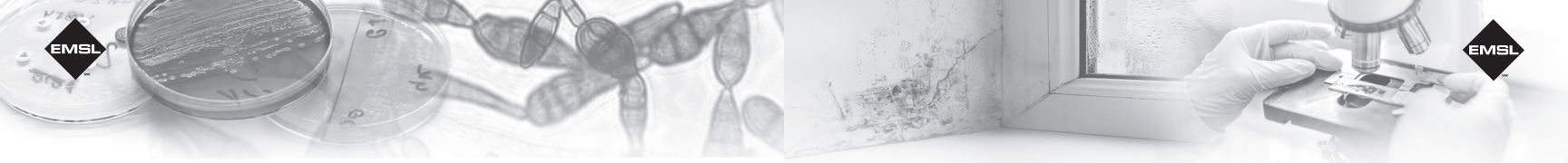
Read: What are the Basic Mold Cleanup Steps? at <https://www.epa.gov/mold/what-are-basic-mold-cleanup-steps>

Read the publication “Mold Remediation in Schools and Commercial Buildings at <https://www.epa.gov/mold/mold-remediation-schools-and-commercial-buildings-guide> [EPA 402-K-01-001, March 2001]

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Ten Things You Should Know about Mold

1. Potential health effects and symptoms associated with mold exposures include allergic reactions, asthma and other respiratory complaints.
2. There is no practical way to eliminate all mold and mold spores in the indoor environment; the way to control indoor mold growth is to control moisture.
3. If mold is a problem in your home or school, you must clean up the mold and eliminate sources of moisture.
4. Fix the source of the water problem or leak to prevent mold growth.
5. Reduce indoor humidity (to 30-60%) to decrease mold growth by:
 - Venting bathrooms, dryers and other moisture-generating sources to the outside
 - Using air conditioners and de-humidifiers
 - Increasing ventilation
 - Using exhaust fans whenever cooking, dishwashing and cleaning
6. Clean and dry any damp or wet building materials and furnishings within 24-48 hours to prevent mold growth.
7. Clean mold off hard surfaces with water and detergent, and dry completely. Absorbent materials such as ceiling tiles, that are moldy, may need to be replaced.
8. Prevent condensation: Reduce the potential for condensation on cold surfaces (i.e., windows, piping, exterior walls, roof, or floors) by adding insulation.
9. In areas where there is a perpetual moisture problem, do not install carpeting (i.e., by drinking fountains, by classroom sinks, or on concrete floors with leaks or frequent condensation).
10. Molds can be found almost anywhere; they can grow on virtually any substance, providing moisture is present. There are molds that can grow on wood, paper, carpet, and foods.



Mold and Health

How do molds affect people?

Molds are usually not a problem indoors, unless mold spores land on a wet or damp spot and begin growing. Molds have the potential to cause health problems. Molds produce allergens (substances that can cause allergic reactions) and irritants. Inhaling or touching mold or mold spores may cause allergic reactions in sensitive individuals. Allergic responses include hay fever-type symptoms, such as sneezing, runny nose, red eyes, and skin rash.

Allergic reactions to mold are common. They can be immediate or delayed. Molds can also cause asthma attacks in people with asthma who are allergic to mold. In addition, mold exposure can irritate the eyes, skin, nose, throat, and lungs of both mold-allergic and non-allergic people. Symptoms other than the allergic and irritant types are not commonly reported as a result of inhaling mold. Research on mold and health effects is ongoing.

The above does not describe all potential health effects related to mold exposure. For more detailed information consult a health professional, your state or local health department, or the Centers for Disease Control and Prevention mold website at <https://www.cdc.gov/mold/default.htm>

Asthma and Mold

Molds can trigger asthma episodes in sensitive individuals with asthma. People with asthma should avoid contact with or exposure to molds. Read more about asthma triggers on EPA's at <https://www.epa.gov/asthma>

Additional Asthma Resources:

Allergy & Asthma Network/Mothers of Asthmatics (AAN/MA)
<https://allergyasthmanetwork.org/>
(800) 878-4403

American Academy of Allergy, Asthma & Immunology (AAAAI)
[https:// www.aaaai.org](https://www.aaaai.org)

American Lung Association
<https://www.lung.org/>
(800) LUNG-USA (586-4872)

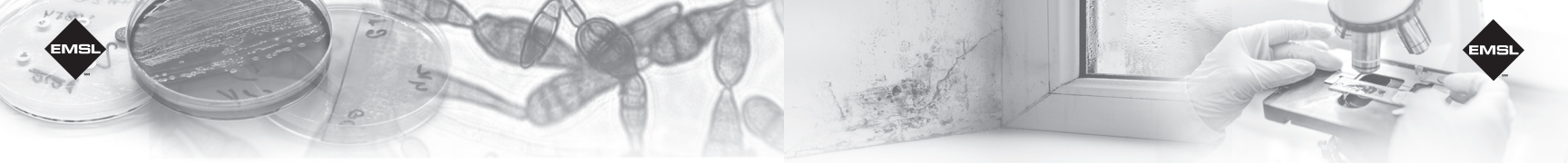
See also their Healthy Air Site - <https://www.lung.org/clean-air>

Asthma & Allergy Foundation of America
<https://www.aafa.org/>
(800) 7ASTHMA (727-8462)

Canada Mortgage & Housing Corporation "Fighting Mold - The Homeowner's Guide" [http://www.ncdhd.org/files/PDFs/Fighting%2BMold%2B-%2BThe%2B-Homeowners%2BGuide%2B%2528CMHC%2529\(1\).pdf](http://www.ncdhd.org/files/PDFs/Fighting%2BMold%2B-%2BThe%2B-Homeowners%2BGuide%2B%2528CMHC%2529(1).pdf)

U.S. Dept. of Health and Human Services, National Institute of Health, National Institute of Allergy and Infectious Diseases
<https://www.niaid.nih.gov/>
(866) 284-4107/(301) 496-5717

National Jewish Medical and Research Center
<https://www.nationaljewish.org/home>
(800) 222-LUNG (5864)



What are the basic mold cleanup steps?

1. The key to mold control is moisture control.
2. Scrub mold off hard surfaces with detergent and water, and dry completely.
3. Fix plumbing leaks and other water problems as soon as possible. Dry all items completely.
4. Absorbent or porous materials, such as ceiling tiles and carpet, may have to be thrown away if they become moldy. Mold can grow on or fill in the empty spaces and crevices of porous materials, so the mold may be difficult or impossible to remove completely.
5. Avoid exposing yourself or others to mold (see discussions: **What to Wear When Cleaning Moldy Areas** (<https://www.epa.gov/mold/brief-guide-mold-moisture-and-your-home#tab-4>) and **Hidden Mold** (<https://www.epa.gov/mold/brief-guide-mold-moisture-and-your-home#tab-7>)).
6. Do not paint or caulk moldy surfaces. Clean up the mold and dry the surfaces before painting. Paint applied over moldy surfaces is likely to peel.
7. If you are unsure about how to clean an item, or if the item is expensive or of sentimental value, you may wish to consult a specialist. Specialists in furniture repair, restoration, painting, art restoration and conservation, carpet and rug cleaning, water damage, and fire or water restoration are commonly listed in phone books. Be sure to ask for and check references. Look for specialists who are affiliated with professional organizations.

For more information on mold cleanup, see:

- **Mold Cleanup in Your Home** – visit <https://www.epa.gov/mold/mold-cleanup-your-home>
- **What to Wear When Cleaning Moldy Areas** – visit <https://www.epa.gov/mold/brief-guide-mold-moisture-and-your-home>
- **A Brief Guide to Mold, Moisture, and Your Home** – visit <https://www.epa.gov/mold/brief-guide-mold-moisture-and-your-home> [EPA 402-K-02-003]
- **Mold Remediation in Schools and Commercial Buildings** – visit <https://www.epa.gov/mold/mold-remediation-schools-and-commercial-buildings-guide> [EPA 402-K-01-001, March 2001]

How do I get rid of mold?

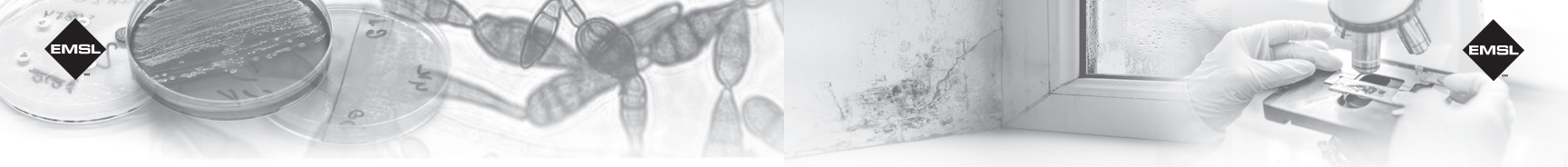
It is impossible to get rid of all mold and mold spores indoors; some mold spores will be found floating through the air and in house dust. The mold spores will not grow if moisture is not present. Indoor mold growth can and should be prevented or controlled by controlling moisture indoors. If there is mold growth in your home, you must clean up the mold and fix the water problem. If you clean up the mold, but don't fix the water problem, then, most likely, the mold problem will come back.

It's important to remember

1. The key to mold control is moisture control.
2. If mold is a problem in your home, you should clean up the mold promptly and fix the water problem.
3. It is important to dry water-damaged areas and items within 24-48 hours to prevent mold growth.

For more information:

- **What are the Basic Mold Cleanup Steps?** – visit <https://www.epa.gov/mold/what-are-basic-mold-cleanup-steps>
- **“A Brief Guide to Mold, Moisture, and Your Home”** – visit <https://www.epa.gov/mold/brief-guide-mold-moisture-and-your-home> [EPA 402-K-02-003]



How do molds affect people?

Molds are usually not a problem indoors, unless mold spores land on a wet or damp spot and begin growing. Molds have the potential to cause health problems. Molds produce allergens (substances that can cause allergic reactions), irritants, and in some cases, potentially toxic substances (mycotoxins). Inhaling or touching mold or mold spores may cause allergic reactions in sensitive individuals. Allergic responses include hay fever-type symptoms, such as sneezing, runny nose, red eyes, and skin rash (dermatitis). Allergic reactions to mold are common. They can be immediate or delayed. Molds can also cause asthma attacks in people with asthma who are allergic to mold. In addition, mold exposure can irritate the eyes, skin, nose, throat, and lungs of both mold-allergic and non-allergic people. Symptoms other than the allergic and irritant types are not commonly reported as a result of inhaling mold. Research on mold and health effects is ongoing. For more detailed information consult a health professional. You may also wish to consult your state or local health department.

Damp Buildings and Health

For information on damp buildings and health effects, see the 2004 Institute of Medicine Report, Damp Indoor Spaces and Health, published by The National Academies Press in Washington, DC. You can read a description of the report and download a free copy at <https://www.nap.edu/catalog/11011/damp-indoor-spaces-and-health>.

For more information on mold:

Read the publication “Mold Remediation in Schools and Commercial Buildings” at <https://www.epa.gov/mold/mold-remediation-schools-and-commercial-buildings-guide> [EPA 402-K-01-001, March 2001]

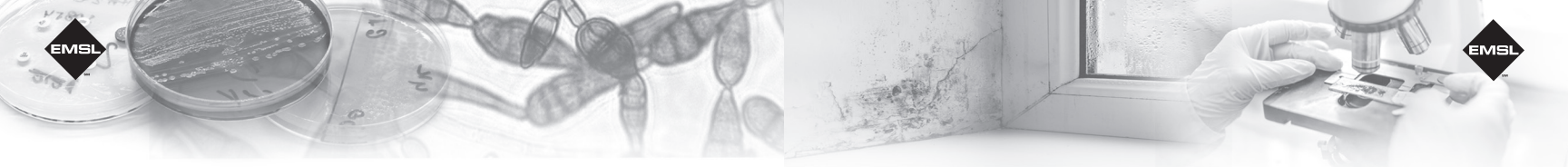
Read the publication, “A Brief Guide to Mold, Moisture, and Your Home” at <https://www.epa.gov/mold/brief-guide-mold-moisture-and-your-home> [EPA 402-K-02-003]

How does mold affect asthma?

Molds can trigger asthma episodes in sensitive individuals with asthma. People with asthma should avoid contact with exposure to molds.

Molds are microscopic fungi that live on plant and animal matter. Molds can be found almost anywhere, and grow best in damp places such as kitchens, bathrooms, and basements.

For information on mold and asthma, visit <https://www.epa.gov/asthma/asthma-triggers-gain-control> and <https://www.epa.gov/asthma>



Can mold cause health problems?

Molds are usually not a problem indoors, unless mold spores land on a wet or damp spot and begin growing. Molds have the potential to cause health problems. Molds produce allergens (substances that can cause allergic reactions), irritants, and in some cases, potentially toxic substances (mycotoxins). Inhaling or touching mold or mold spores may cause allergic reactions in sensitive individuals. Allergic responses include hay fever-type symptoms, such as sneezing, runny nose, red eyes, and skin rash (dermatitis). Allergic reactions to mold are common. They can be immediate or delayed. Molds can also cause asthma attacks in people with asthma who are allergic to mold. In addition, mold exposure can irritate the eyes, skin, nose, throat, and lungs of both mold-allergic and non-allergic people. Symptoms other than the allergic and irritant types are not commonly reported as a result of inhaling mold. Research on mold and health effects is ongoing. This brochure provides a brief overview; it does not describe all potential health effects related to mold exposure. For more detailed information consult a health professional. You may also wish to consult your state or local health department.

Keep in mind that:

1. The key to mold control is moisture control.
2. If mold is a problem in your home, you should clean up the mold promptly and fix the water problem.
3. It is important to dry water-damaged areas and items within 24-48 hours to prevent mold growth.

Who can test my home or clean, fix and remediate my home for mold?

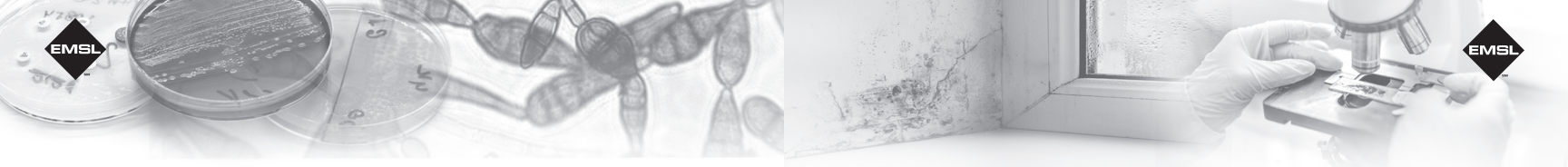
EPA does not have a certification program for mold inspectors or mold remediation firms. EPA does not maintain a list of mold inspectors or mold remediation firms, though some states might.

Some states and organizations may require certification, trainings, or examinations for practitioners in the indoor air quality industry. Sometimes companies that provide radon, lead or asbestos inspection services provide mold assessment services as another part of their business. Ask about qualifications, training and experience and check references for professionals you are considering. See our list of state contacts at <https://www.epa.gov/indoor-air-quality-iaq/epa-regional-office-and-state-indoor-air-quality-information>.

The key to mold growth is moisture so part of assessing mold problems is looking for existing or potential moisture problems. Companies that provide water damage inspection services may help look for moisture and some may be familiar with mold problems as well.

There are no established safe levels or regulatory standards for mold, so, although testing can be done, it may be of limited use in helping to understand the problem. Mold assessment is mainly done through visual inspection of areas where there have been moisture problems or water damage

The basics of mold, moisture control and cleanup are in the EPA publication “A Brief Guide to Mold and Moisture in Your Home” by visiting <https://www.epa.gov/mold/brief-guide-mold-moisture-and-your-home>.



Mold Cleanup in Your Home

Mold Cleanup – visit <https://www.epa.gov/mold/mold-cleanup-your-home#moldcleanup>

Tips and Techniques – visit <https://www.epa.gov/mold/mold-cleanup-your-home#TipsandTechniques>

Floods and Flooding – visit <https://www.epa.gov/mold/mold-cleanup-your-home#FloodsandFlooding>

Who should do the cleanup depends on a number of factors. One consideration is the size of the mold problem. If the moldy area is less than about 10 square feet (less than roughly a 3 ft. by 3 ft. patch), in most cases, you can handle the job yourself, follow the Mold Cleanup Tips and Techniques at the links above. However:

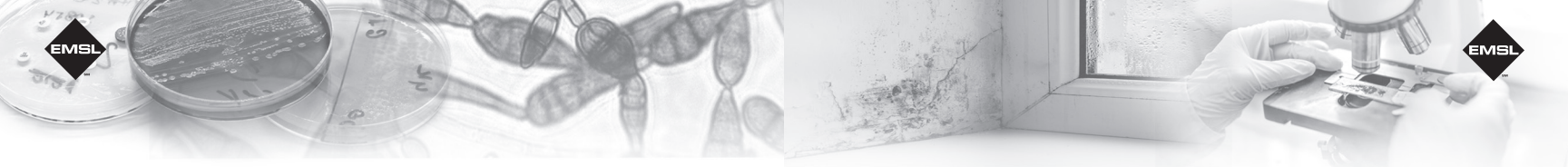
If there has been a lot of water damage, and/or mold growth covers more than 10 square feet, consult EPA guide Mold Remediation in Schools and Commercial Buildings (<https://www.epa.gov/mold/mold-remediation-schools-and-commercial-buildings-guide-chapter-1>). Although focused on schools and commercial buildings, this document is applicable to other building types.

If you choose to hire a contractor (or other professional service provider) to do the cleanup, make sure the contractor has experience cleaning up mold. Check references and ask the contractor to follow the recommendations in EPA guide Mold Remediation in Schools and Commercial Buildings (<https://www.epa.gov/mold/mold-remediation-schools-and-commercial-buildings-guide-chapter-1>), the guidelines of the American Conference of Governmental Industrial Hygienists (ACGIH), or other guidelines from professional or government organizations.

If you suspect that the heating/ventilation/air conditioning (HVAC) system may be contaminated with mold (it is part of an identified moisture problem, for instance, or there is mold near the intake to the system), consult EPA guide Should You Have the Air Ducts in Your Home Cleaned? (<https://www.epa.gov/indoor-air-quality-iaq/publications-about-indoor-air-quality#should-you-have>) before taking further action. Do not run the HVAC system if you know or suspect that it is contaminated with mold - it could spread mold throughout the building.

If the water and/or mold damage was caused by sewage or other contaminated water, then call in a professional who has experience cleaning and fixing buildings damaged by contaminated water.

If you have health concerns, consult a health professional before starting cleanup.*

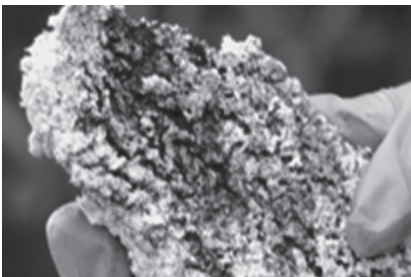


Tips and Techniques

The tips and techniques presented in this section will help you clean up your mold problem. Professional cleaners or remediators may use methods not covered in this publication. Please note that mold may cause staining and cosmetic damage. It may not be possible to clean an item so that its original appearance is restored.

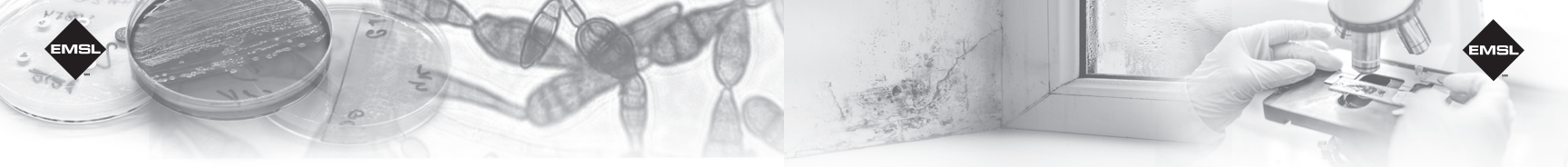


Mold growing on the underside of a plastic lawn chair in an area where rainwater drips through and deposits organic material.



Mold growing on a piece of ceiling tile.

- Fix plumbing leaks and other water problems as soon as possible. Dry all items completely.
- Scrub mold off hard surfaces with detergent and water, and dry completely.
- Absorbent or porous materials, such as ceiling tiles and carpet, may have to be thrown away if they become moldy. Mold can grow on or fill in the empty spaces and crevices of porous materials, so the mold may be difficult or impossible to remove completely.
- Avoid exposing yourself or others to mold. See discussions:
 - What to Wear When Cleaning Moldy Areas, visit <https://www.epa.gov/mold/brief-guide-mold-moisture-and-your-home#tab-4> Hidden Mold, visit <https://www.epa.gov/mold/brief-guide-mold-moisture-and-your-home#tab-7>
- Do not paint or caulk moldy surfaces. Clean up the mold and dry the surfaces before painting. Paint applied over moldy surfaces is likely to peel.
- If you are unsure about how to clean an item, or if the item is expensive or of sentimental value, you may wish to consult a specialist. Specialists in furniture repair, restoration, painting, art restoration and conservation, carpet and rug cleaning, water damage, and fire or water restoration are commonly listed in phone books. Be sure to ask for and check references. Look for specialists who are affiliated with professional organizations.



Bathroom Tip

Places that are often or always damp can be hard to maintain completely free of mold. If there's some mold in the shower or elsewhere in the bathroom that seems to reappear, increasing ventilation (running a fan or opening a window) and cleaning more frequently will usually prevent mold from recurring, or at least keep the mold to a minimum. Picture of running water

Floods and Flooding Tip

During a flood cleanup, the indoor air quality in your home or office may appear to be the least of your problems. However, failure to remove contaminated materials and to reduce moisture and humidity can present serious long-term health risks. Standing water and wet materials are a breeding ground for microorganisms, such as viruses, bacteria, and mold. They can cause disease, trigger allergic reactions, and continue to damage materials long after the flood.

To learn more about flood clean up and indoor air quality, visit: Flood Cleanup and Effects on Indoor Air Quality at https://19january2017snapshot.epa.gov/indoor-air-quality-iaq/flood-cleanup-protect-indoor-air-quality_.html

Air-O-Cell Test Code M001

- The Air-O-Cell™ cassette (Product ID 8715301B) is a single-use sampling device designed for the rapid collection and analysis of a wide range of airborne particles. These include fungal spores, pollen, insect parts, skin cell fragments, fibers, and other inorganic particulates.
- The cassette is designed to operate at a flow rate of 15 LPM. Lower flow rates may result in a collection loss of some spores and the accumulation of others in a non-uniform manner. Therefore, it is critical to run the sampling pumps at the manufacturer's recommended air flow rate.

Benefits

- Useful for initial site testing, especially if fungal growth is not visible.
- Quick and simple procedure.
- Fast turn around times available.
- Low chance of sample contamination.
- Necessary for determining allergic mold spore potential. Mold spores can cause allergies whether they are viable or non-viable.

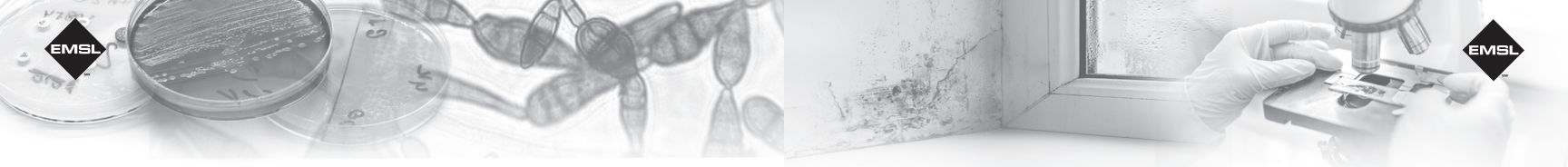


Air-O-Cell
50 Pack, #8715301B
10 Pack, #8715302

Disadvantages

- Fungi cannot be identified to species with this method.
- Due to the similarities in spore morphology, some spores will be grouped together, i.e., *Aspergillus* sp. and *Penicillium* sp.
- Spore viability cannot be assessed.

Contact for Sampling Supplies and Cassettes, www.emsl.com, 1-800-220-3675
Air-O-Cell™ is a registered trademark of Zefon International.



Sampling Procedure

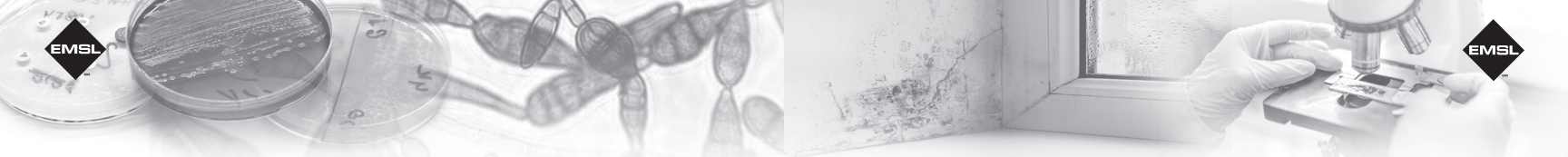
1. Prior to sampling, calibrate your pump to 15 liters per minute via a rotameter. It is also recommended that the rotameter or sampling pump be periodically calibrated to a NIST primary standard. If using the Zefon Bio-Pump (Product ID 8706002) use the specifically designed Air-O-Cell flow indicator. It cannot be used with any other type of pump.
2. Remove and retain tape seal covering inlet and outlet on the cassette.
3. Attach the outlet (round hole) to a standard 1/2" PVC tubing (for use with high volume pumps only).
4. Start the sampling pump and sample for an appropriate period of time (see recommendations below).
5. Remove Air-O-Cell from tubing and reseal with the original seals. Label sample.
6. Complete an EMSL Chain of Custody (COC), available at www.emsl.com, detailing client name and information, project name or number, sample #, description of sampling area, and volume of air collected.
7. To reduce shipping damage, it is recommended that the Air-O-Cell be placed in a corrugated box with padding to ensure safe arrival at the laboratory.

Sampling Duration

- The sampling time is dependent on the density of particulate in the environment. It is important not to overload the sample, otherwise it will be impossible to accurately count the types of spores, pollen or other particulates that are present. The following list represents typical sample times to attain a sharply defined trace with good dispersion of the spores:
 1. Clean "office" or outdoors (no visible dust) = 10 minutes
 2. Indoor environment, high activity & personnel = 5 minutes
 3. Indoor environment, drywall renovation or heavy industrial dust = 1 minute.

Quality Control Recommendations

- An effective interpretation is based on the comparison of indoor and outdoor samples. Outdoor samples will help determine whether spore amplification is occurring indoors.
- Obtain a control sample from a non-complaint area for comparison.
- Sending a blank cassette for analysis per project is a good practice.
- Flow rate is critical for accurate results. Remember to calibrate and recalibrate the pump prior to all sampling. (15 liters/minute)
- Never use cassettes that are damaged or expired.



MoldSnap Test Code M174 **Micro5** Test Code M030

- The Zefon MoldSnap (Product ID 8715304) and the Micro5 MicroCell (Product ID 8715306) were designed to operate at a flow rate of 5 liters per minute for optimal collection efficiency. Cassettes should be stored at 50° - 80° F.
- Do not use in temperatures below 37° F!

Sampling Procedure

1. Remove pin from the bottom of the MoldSnap or Micro5.
2. If using a conventional high volume pump: Simply connect one end of tubing (5 feet or less) to the bottom of the cassette.
3. If using a low volume pump such as a GilAir5: Simply attach a 1” piece of tubing to the bottom of the cassette.
4. Connect the other end of tubing to a pump pre-calibrated to a flow rate of 5LPM.
5. Remove cap from the top of the cassette.
6. Turn pump on and take a sample for an appropriate amount of time depending on environment. (See “Sampling Duration” below.)
7. When sampling is completed, replace the pin & cap to the bottom and top of the cassette.

Sampling Duration

- Outdoor / Indoor Clean Environments = 8-10 minutes
- Indoor (Normal Activity) = 5 minutes
- Indoor (Heavy Particulates) = 1-3 minutes
- Inner wall cavity using the Micro5 only (with optional Inner Wall Adapter, Product ID 8715901) = 1-2 minutes



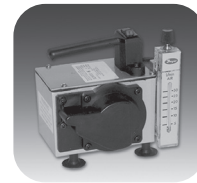
Mold Snap
50 Pack, #8715304B



Gilian GilAir5R
#8706209



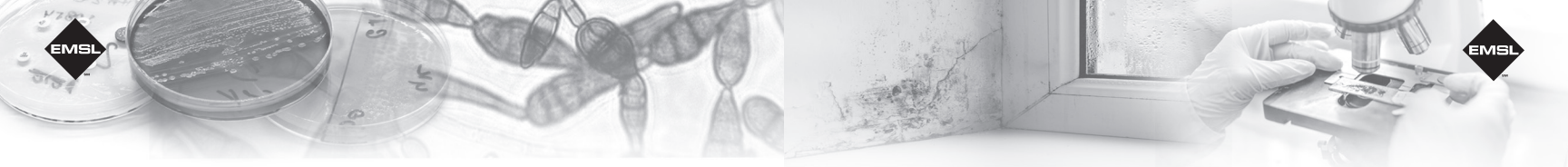
Bio-Pump Plus
#8706002



E-Lite Pump w/Rotameter
Adjustable Rotameter flow control
3 - 30 L/min, #8706004



EMSL VP-400 Basic Kit
w/E-Lite Pump #8709003



Allergenco-D Test Code M032

- The Allergenco-D (Product ID 8715307) was designed to operate at a flow rate of 15 liters per minute for optimal collection efficiency.

Sampling Procedure

1. Remove seal from the bottom of the Allergenco-D.
2. Simply connect one end of tubing (5 feet or less) to the bottom of the Allergenco-D.
3. Connect the other end of tubing to a pump pre-calibrated to a flow rate of 15 LPM.
4. Remove seal from the top of the Allergenco-D.
5. Turn pump on and collect a sample for up to 10 minutes, depending on environment (See “Sampling Duration”).
6. When sampling is complete, replace seals to the bottom and top of the cassette.

Sampling Duration

- Outdoor sample 1-10 minutes
- Dust-free environment (clean office) 5-8 minutes
- Indoor environment (occupied space) 3-5 minutes
- Indoor environment (excess visible dust) 1-3 minutes
- Inner wall sample 1-5 minutes (using optional wall adapter, Product ID 8715908)



TSI 4146 Primary Calibrator
.01 - 20 L/min
#8703915

Culturable Air Sampling (Fungi or Bacteria)

Test Code M005 - Fungi Genus ID

Test Code M006 - Fungi Species ID

Test Code M433 - Aspergillus Nosocomial Panel

Test Code M434 - Aspergillus Comprehensive Panel

Test Code M009 - Bacteria Gram Stain

Test Code M010 - Bacteria 3 MPT

Test Code M011 - Bacterial 5 MPT

Particle Impactors (Andersen-type Samplers)

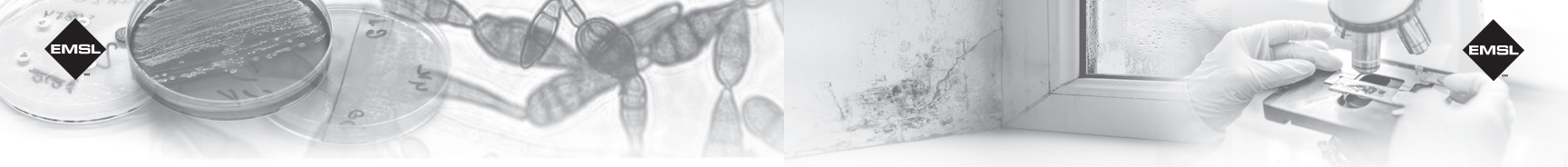
- This method of air sampling involves drawing a measured volume of air over culture media in Petri dishes. The Petri dishes are incubated in the laboratory so the organisms impacted on the plate can grow. The fungi or bacteria are counted and identified. This method commonly uses an Andersen N-6 type impactor (e.g. EMSL VP-400 Microbial Sampler Product ID 8709001). Different agar plates are available from EMSL Analytical, Inc., depending on the types of fungi or bacteria to be identified.

Benefits

- Fungal cultures can determine whether the fungus is viable (alive), and allows for genus and species identification.
- Bacterial cultures provide enumeration and identification of culturable bacteria present in the air.



EMSL VP-400 Single Stage Microbial Sampler #8709001



Disadvantages

- Cultures take 6-10 days for the microorganisms to grow and be identified.
- Since most environmental samples contain a large number of organisms, each has to compete with others to grow on the media. As a result, fungi and bacteria present in the air may not be as well represented in culture.
- Some microbes do not grow well or at all on the culture media (viable but non-culturable, VBNC).
- Some microorganisms are unable to be identified, as they fail to produce key characteristics such as spores or they may not be described in the scientific literature.

General Media Recommendations Fungi and Bacteria

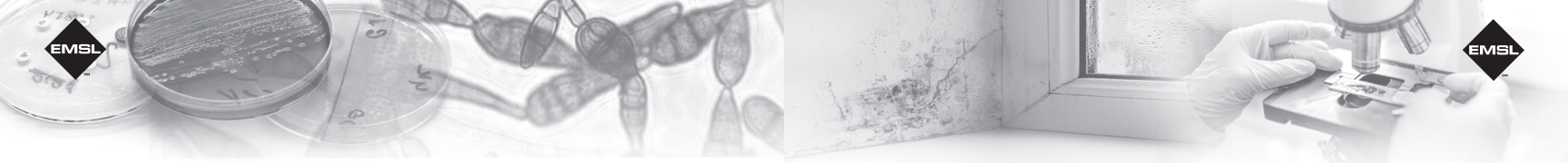
- For fungal sampling, in general, we recommend Malt Extract Agar (MEA).
- If you are sampling in dry areas, the use of DG18 will help select for the growth of dry-loving fungi that may not grow on MEA agar.
- Sampling specifically for *Stachybotrys* sp. can be achieved with either Cellulose Agar (CA) or Cornmeal Agar (CMA).
- For bacterial sampling, in general, we recommend Tryptic Soy Agar (TSA) or TSA w 5% blood.
- For sampling Gram negative bacteria, we recommend MacConkey Agar (MAC).
- For all other situations, the Microbiology Department will be happy to make recommendations based on your individual sampling situation.
- Sampling supplies may be ordered at www.emsl.com or by calling Customer Service: 800-220-3675.

How to Handle Microbiological Media (Agar plates)

- Agar plates must be kept refrigerated or on freezer packs until ready to use.
- The plates must be allowed to warm up to room temperature before taking a sample (approx. 15 minutes).
- Do not remove the lid from the plate at anytime except during sampling.
- Seal the lid to the plate after sample collection with Parafilm or tape.
- The plates must be shipped back to EMSL with freezer packs by OVERNIGHT PRIORITY. Refreeze and reuse the original freezer pack (this type of freezer pack is stable for 24 hours).
- Adequate packing material must be sent to protect the plates.
- Plates must not come into direct contact with the freezer pack, as the media may freeze, invalidating the tests.
- If there is any delay in sending the agar plates to EMSL, they should be refrigerated until ready for overnight delivery.

Recommendations

- Wear latex or nitrile gloves during sampling.
- Use 70% isopropyl alcohol to disinfect sampling device between each sample.
- Place Petri dish lid in a clean bag during sampling to reduce any cross contamination.
- Include outside samples and a field blank for control.



Sampling Procedure

1. Allow agar plates to reach room temperature before use.
2. Attach one end of tubing to the intake of the vacuum pump and the other end to the inlet of the sampler.
3. Calibrate the flow rate of the vacuum pump:
 - A. Place an uncovered Petri dish into sampler (Do not submit this dish as a sample, discard after calibration).
 - B. Turn on pump and adjust flow until the rotameter is at 28.3 LPM (flow rate is read from the middle of bearing on the rotameter).
4. Wipe all exposed surfaces of sampler with a 70% isopropyl alcohol pad and allow to air dry.
5. Place the agar plate on the sampler base so that the Petri dish rests on the three raised metal pins.
6. Remove the cover of the Petri dish and place into a clean sample bag to minimize contamination (available upon request).
7. Assemble the jet classification stage on the sampler and secure the inlet cone with the three attached clips.
8. Set timer to appropriate time depending on environmental conditions (sampling time is usually between 2-5 minutes).
9. Turn on the pump and start the timer simultaneously.
10. When the time is up, turn off the pump and disassemble sampler and place cover back onto agar plate.
11. Secure lid onto Petri dish with masking tape or Parafilm (avoid using electrical, packing, transparent and duct tape).
12. Write the sample number on the bottom of the Petri dish.
13. Record all appropriate information on the Chain of Custody.
14. Return samples with an ice pack to EMSL Analytical for analysis.

Surface Sampling Test Code M041

Direct Examination (Tape Lift, Bulk, Swab)

- A direct exam allows for the rapid determination of the presence of fungal spores as well as identifies the types of fungi.
- Direct examinations should only be used to sample visible mold growth in a contaminated area since most surfaces will have a deposit of fungal spores that are normally present in the environment.



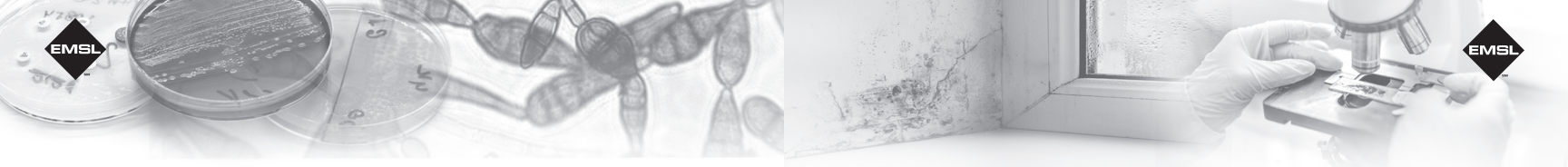
Bio-Tape
25 Pack, #8708325

Benefits

- The direct exam is inexpensive and can be performed quickly.
- A useful test for determining if there is mold amplification.
- Direct sampling may reveal indoor reservoirs of spores that have not become airborne yet.

Disadvantages

- Areas of fungal growth are often small and scattered, so they may not all be picked up. Choosing multiple sampling locations will help overcome this problem.
- Health problems related to indoor microbial growth are generally caused by the inhalation of substantial numbers of airborne spores, sometimes over a long period of time. The presence of biological materials on a particular surface may not be a direct indication of what is in the air.
- This method detects both viable and non-viable spores but cannot distinguish between them. It is advisable to combine direct exam samples with culture methods if knowing viability is important to your project.
- Tape lifts are not able to be cultured.
- If a direct examination of a swab sample is taken, a follow up by culture is possible.



- Direct examinations of dirt/soil and dust samples cannot be performed reliably because of preparation limitations.
- Fungi usually cannot be identified to species and sometimes not even to genus with this method. For example, *Aspergillus* sp. and *Penicillium* sp. are normally reported together due to the similarities in spore morphology, unless fruiting structures are present that allows for a better identification.

Materials

For Tape Lift

- We recommend using EMSL Tape kits or Bio-Tapes (Zefon Intl) otherwise clear (transparent) Scotch or other brand tape (frosted tape obscures the spores).
- New plastic bag to hold sample(s) (provided in a tape lift kit available from EMSL).
- Only use tape lifts on hard, dry, flat surfaces

For Bulk

- Sterile container or new Ziplock-type plastic bag (provided by EMSL) to hold and transport samples.

For Swab

- Sterile TransPorter swab to collect and transport samples (provided by EMSL).

For all Matrices

- Latex/nitrile gloves (also can be provided at your request).

Sampling Procedure

Tape-lift

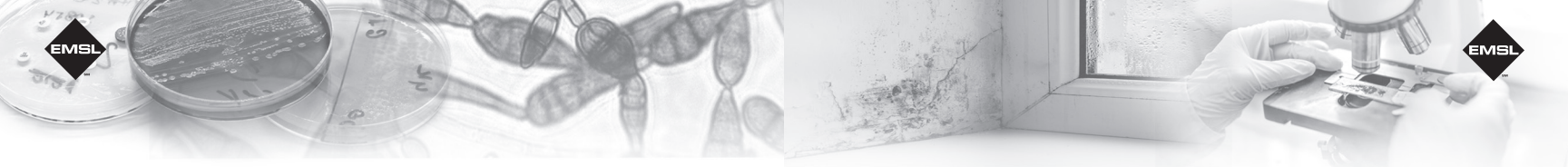
1. Take a few inches of clear tape. Avoid touching the sticky side, especially the part to be used to collect the mold.
2. Wearing gloves, apply the central inch of tape to the suspect area (choose one that is free of extraneous debris). Apply light pressure to the non-adhesive side.
3. Pull tape off surface with slow, steady pressure, holding the tape edges only.
4. Apply sticky side of tape to the inside of the plastic bag (ziplock).
5. Ensure there are no folds or creases in the tape.
6. Close bag and label appropriately. (Put only one sample in each bag.)

Bulk

1. Wearing latex gloves remove a small piece of the suspect material (1 x 1 inch piece is more than sufficient).
2. Place piece inside clean sterile container or new plastic bag (ziplock).
3. Close bag or cap container and label appropriately.

Swab

1. Wearing gloves, remove swab from packaging material.
2. Remove plug from media tube.
3. Swab the area thoroughly, roll the swab lightly back and forth over sampling area.
4. Insert the swab in the tube, firmly close cap, and label appropriately.
5. Complete an EMSL Chain of Custody (COC), available on our website (www.emsl.com), detailing client name and information, project name or number, sample #, and a description of the area.



Quality Control Recommendations

For Tape Lift

- Use clear tape--not frosted, electrical, duct, or packing tape.
- Do not fold tape onto itself. Stick tape on the inside of the plastic bag only.
- Please do not send tape on slides or cover slips. They may arrive broken making the sample difficult to analyze.

For Bulk

- Send a representative portion of the sample, if large. This prevents over-handling of the sample and contamination. If analysis of a specific portion of sample is required, please note area(s) or take a tape lift of the area.

For Swab

- For quantitative culture reporting, the area swabbed needs to be entered on the chain of custody.

Culturable Surface Sampling (Bulk or Swab)

Test Code M007 - Fungi Genus ID

Test Code M008 - Fungi Species ID

Test Code M009 - Bacteria Gram Stain

Test Code M010 - Bacteria 3 MPT

Test Code M011 - Bacteria 5 MPT

Test Code M028 - Cryptococcus neoformans

Benefits

- The sampling method is inexpensive and surfaces can be quickly sampled.
- A useful test for initial site sampling.
- Species level identification possible.
- Viability of fungi is determined.

Disadvantages

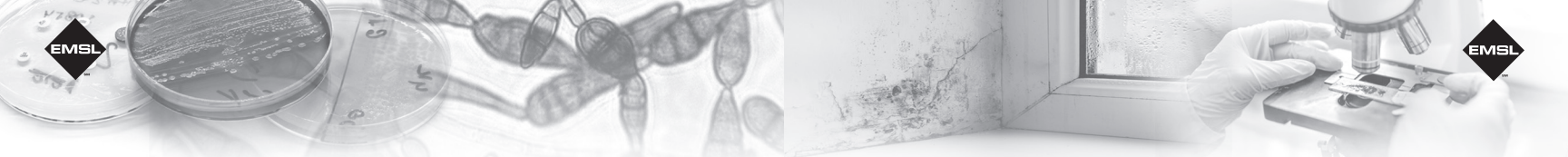
- Areas of fungal growth are often small and scattered, so they may not all be picked up. Multiple sample locations will help overcome this problem.
- Health problems related to indoor microbial growth are generally caused by the inhalation of substantial numbers of airborne spores, sometimes over a long period of time. The presence of biological materials on a particular surface may not be a direct indication of what is in the air.
- This method detects only viable spores and hyphae but cannot detect nonviable or difficult to culture fungi. It is advisable to combine direct exam samples with culture methods if knowing the presence of non-viable fungi is important to your project.
- Cultures cannot distinguish between spores, hyphae and other fungal cells; the results are reported as colony forming units.

Materials Required

- Latex/nitrile gloves



Nitrile Gloves
Small #8705400
Medium #8705401
Large #8705402
X-Large #8705403



Sampling Procedure

Swab Sampling

1. Obtain sterile 1 mL Butterfield's Solution swab to collect and transport samples (provided by EMSL).
2. Wearing gloves, remove swab from packaging material.
3. Remove plug from media tube.
4. Swab the desired area thoroughly, rolling the swab lightly back and forth over sampling area.
5. Insert the swab in the tube, firmly close cap, and label appropriately.
6. For quantitative culture reporting, the area swabbed needs to be entered on the chain of custody.



Sterile Swab
#8708301
FREE to EMSL Customers
Call for Details

Bulk Sampling

1. Obtain sterile sampling bags (Ziplock-type) to collect and transport samples (provided at your request by EMSL).
2. Wearing gloves and using clean tools remove a representative area of growth along with the building material (sheetrock, wood, etc). 1 inch square is sufficient.
3. Place bulk material into sampling bag and label the outside of the bag with sampling location or description.

Sample Shipment

- Complete an EMSL Chain of Custody (COC), available on our website (www.emsl.com), detailing client name and information, project name or number, sample #, and a description of the area.
- Place samples in a cooler with reusable freezer packs.
- Overnight shipping recommended.

USP <797> Environmental Sampling

Test Code M403 - Bacterial Count

Test Code M401 - Fungal Count

Test Code M406 - Microbial Identification

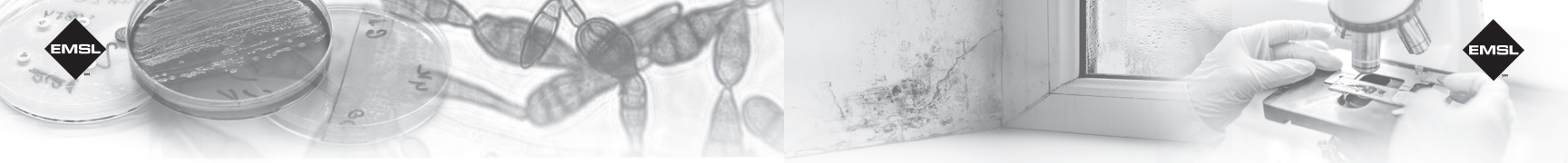
Test Code M407 - Microbial Counts

USP <797> provides minimum practice and quality standards for compounded sterile preparations (CSPs) of drugs and nutrients based on current scientific information and best sterile compounding practices. Environmental sampling in compounding facilities includes viable airborne particle testing, contact plate or surface swab testing, and compounding personnel gloved fingertip testing. Regardless of the number of colony forming units (CFUs) observed within these samples, immediate corrective actions are required if any highly pathogenic organisms are identified. The following sampling guidelines are offered as per USP <797> official from May 1, 2018.

Viable Airborne Particle Sampling

As per USP <797>, an appropriate sampling plan shall be developed for viable airborne particles. Review of the viable airborne particle data may detect elevated amounts of viable airborne particles and these changes may be indicative of adverse changes within the same environment. See Culturable Air Sampling on page 8 as the sampling protocol is similar with the following changes:

- This sampling method commonly uses a high volume air impactor (e.g. EMSL SAS 100 Sampler Product ID 8709100; also available for rent Product ID 87RD021).
- Collect 400-1000 Liters of air sampled on 100 mm or 60 mm sized agar plates, depending upon the sampling equipment used.
- For fungi use Sabouraud Dextrose (SAB DEX) agar with lecithin & tween (EMSL Product # 8714103), for bacteria use Tryptic Soy Agar (TSA) with lecithin and tween (EMSL Product # 8714101).



Surface Sampling with Contact Plate

Surface sampling is useful for evaluating facility and work surface cleaning and disinfecting procedures as well as employee competency in cleaning and disinfection activities. Contact plates can be used on regular or flat surfaces to establish and monitor the efficacy of disinfectants, cleaning techniques, and microbial bioburden on hard surfaces. Obtain sterile 60 mm contact plates also known as RODAC plates; for bacteria use TSA with Lecithin & Tween (EMSL Product # 8714100) and for fungi use SAB DEX (EMSL Product # 8714102).

1. Wearing gloves, remove contact plate from packaging.
2. Remove the lid and gently roll the agar surface across the area to be sampled.
This will transfer microbes on the sampled surface to the agar.
3. Replace the lid and clean the sampled area with an alcohol wipe in order to remove any agar residue left by the contact plate.
4. Label the plate and return to EMSL for incubation.

Surface Sampling with Swab

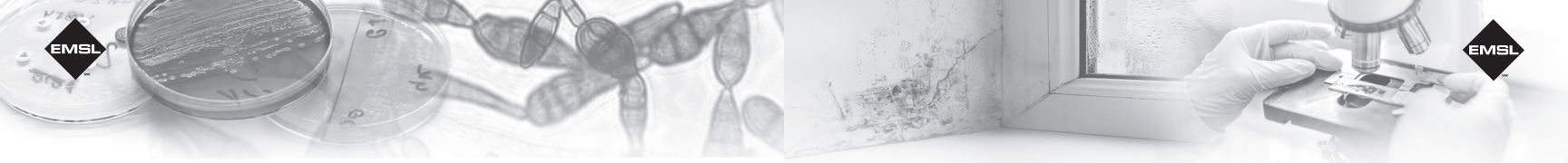
Swabs are best suited for sampling on irregular surfaces or equipment such as switches and dials, where contact plates cannot be used effectively. If an area is sampled using the swab method, use appropriate procedures that will result in the surface location equivalent to that of a contact plate.

1. Obtain sterile 1 mL HiCap Neutralizing Broth swab to collect and transport samples (EMSL Product # 8708942).
2. Wearing gloves, remove swab while allowing excess liquid to remain in the tube.
3. Swab the desired area thoroughly, rolling the swab lightly back and forth over sampling area.
4. Insert the swab back into the tube, firmly closing cap, then label appropriately.
5. For quantitative culture reporting, the area swabbed needs to be entered on the chain of custody.

Gloved Fingertip Sampling

As per USP <797>, the sampling of compounding personnel glove fingertips shall be performed for all CSP risk level compounding because direct touch contamination is the most likely source of introducing contaminants into CSPs prepared by humans.

1. Operators should exit the ISO Class 5 area to complete this sampling and do not disinfect gloves before sampling.
2. Aseptically remove the lid from two TSA with lecithin & tween plates (EMSL Product #8714100 or #8714101).
3. Lightly press the four fingers and thumb for each hand on separate plates (one plates is to be used to sample each hand). When done correctly a visible impression of each finger will be seen on the agar surface.
4. Carefully replace each lid when finished.
5. Label each plate and submit to EMSL for incubation.



ERMI Dust Sampling Test Code M180

- The ERMI® is an acronym for Environmental Relative Moldiness Index.
- It was developed by scientists at the Environmental Protection Agency (EPA) to provide a straightforward, objective, and standardized way to obtain results for indoor air quality investigations.
- The EPA has developed an ERMI ranking system based on dust samples collected from homes across the United States.
- The ERMI helps predict the moldiness of homes. Homes with high ERMI values have a greater chance of having a mold problem than homes with a low ERMI.
- 36 different fungi make up the ERMI and are designated as Group I (those found in a typical, water damaged homes) and Group II (those commonly found in all homes).

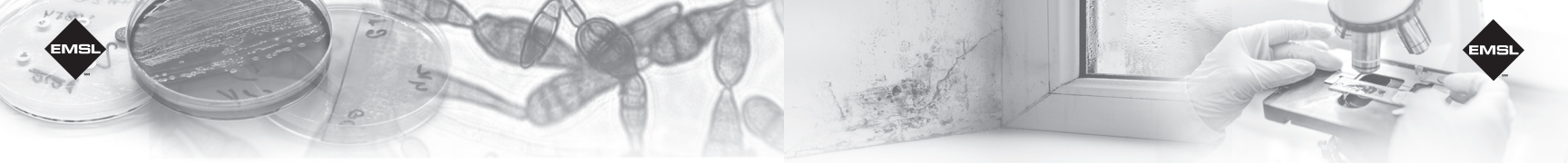
Sampling Locations

- For residential sampling, EPA recommends taking a living room and bedroom sample as a composite using the same vacuum dust collector for both rooms. Other areas should be sampled separately.
- In the Common Living Area (family room or living room), select the sofa. In the absence of a sofa, select another commonly used chair.
- Using the tape measure and the roll of tape, mark the corners of a 3 foot x 6 foot rectangular sampling area on the floor immediately against the sofa. Place the long side of the rectangle against the long side of the sofa. If the area cannot accommodate the recommended sampling area, adjust the dimensions accordingly. Sample a total of 18 square feet.

- For the bedroom, select the most frequently used bedroom. Using the tape measure and the roll of tape, mark the corners of a 3 foot x 6 foot rectangular sampling area on the floor immediately against the side of the bed where the resident is most likely to get in and out of the bed. If possible try to have the rectangular sampling area extend under the bed by 3 or 4 inches so that part of the sample goes under the bed. Place the long side of the rectangle against the long side of the bed. If the area cannot accommodate the recommended sampling area, adjust the dimensions accordingly. Sample a total of 18 square feet.
- Record the final sampling area you marked with tape on the lines next to the bedroom you sampled on this data sheet.
- Areas other than the Living Room, Family Rooms, or Bedrooms may be sampled. If you choose to sample other areas, a separate vacuum dust collector should be used for each area. Please call the lab if you have any questions.

Sampling Procedure

1. Make sure the hose attachment is connected to your vacuum cleaner properly. Turn on the vacuum cleaner to make sure the hose attachment is pulling air, and then turn off the vacuum cleaner. Sometimes the dust collection device will not fit correctly onto the hose attachment. If this is the case, you may use duct tape or electrical tape to tape the dust collector to the hose attachment.
2. Use the extension cord as needed to reach the marked area with the vacuum hose.
3. Remove both caps from sampling device. Place the caps in a location so you can find them after the test is completed. Attach the flat, round end of the sampler device to the end of the hose attachment of your vacuum cleaner.
4. Use the slanted end of the sampling device to collect your sample. Keep the slant end of the sampling device flush with the surface to be sampled.



5. Turn on the vacuum cleaner and start the watch or timer. Start timing the vacuuming procedure using the stopwatch. Try not to disturb the tape. Do not exceed the 5 minute sampling period.
6. Vacuum the area contained within the duct or electrical tape. Do this by passing the sampling device over slightly overlapping, imaginary parallel lines within the sampling area for about 5 minutes. If necessary, adjust your rate of movement so that a total of 5 minutes is used to vacuum the entire 18 square foot sampling area.
7. Move to the second room and repeat the vacuuming of the target area. After the sampling is completed, hold the sampling device upward toward the ceiling and turn off the vacuum cleaner. Re-cap the slant end of the sampling device so as not to lose the dust collected.
8. Avoid vacuuming up any large debris that is not dust. If you accidentally suck up the tape, point the sampling device toward the ceiling and turn off the vacuum cleaner. Pick the tape out of the sampling device. Turn the vacuum cleaner back on and return to vacuuming the sampling area. Be sure to account for lost sample time when you do this so you get a total of 5 minutes of sampling time.
9. Separate the sampling device from the hose of the vacuum cleaner and re-cap the flat end of the device.
10. After the small caps are secured on the dust sampling device, make sure there is dust in the sampling container before you send it to the lab. If no visible dust is noticed, repeat the sampling procedure in both rooms in different locations until visible dust is present in the device.
11. If you lose the small caps, seal the openings completely and securely with duct or electrical tape.

Real-Time PCR

Test Code M233 - EPA 36 Panel

Test Code M181 - Water Damage 20 Panel

Test Code M186 - Aspergillus 15 Panel

Test Code M189 - Penicillium 13 Panel

Test Code M208 - Histoplasma capsulatum (swab or air)

Test Code M143 - Cryptococcus neoformans (swab or air)

Test Code M236 - Raccoon Roundworms (swab, dust, bulk)

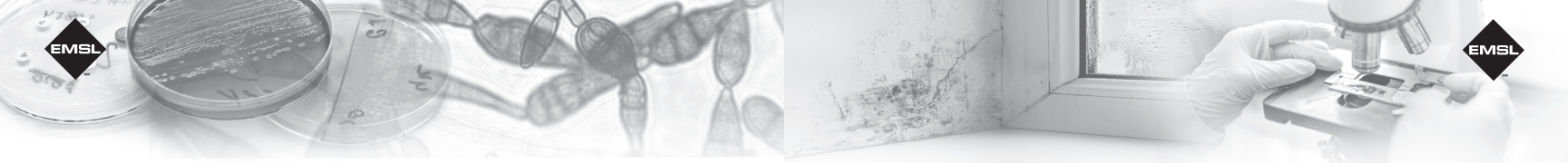
Test Code M146 - Bed Bug (swab)

- EMSL offers state-of-the-art fungal detection and enumeration using US EPA-licensed PCR technology. Real-Time PCR is an excellent complement to your current sampling strategies.
- Use PCR testing to rapidly detect microorganisms of interest.

Sampling Procedure

Air Samples

1. Obtain a 3-piece PCR air/dust-sampling cassette from EMSL.
2. Remove the upper (blue) and lower (red) plugs of the cassette.
3. Attach a vacuum pump to the cassette through the lower opening.
4. Sample as much air as desired through the upper opening. There is no upper limit to sampling time.
5. Record the VOLUME of air sampled and ship the cassette to EMSL. No refrigeration is needed.



Dust Samples

1. Obtain a 3-piece PCR air/dust-sampling cassette from EMSL.
2. Remove the upper (blue) and lower (red) plugs of the cassette.
3. Attach a small piece of tubing to the upper opening. Cut a 45-degree angle at the end of the tubing.
4. Attach a vacuum pump to the cassette through the lower opening.
5. Begin collecting dust through the upper tubing. There is no upper limit to sampling time.
6. Ship the cassette to EMSL. No refrigeration is needed.

Swab Sampling

1. Obtain sterile 1 mL Butterfield's Solution swab to collect and transport samples (provided by EMSL).
2. Wearing gloves, remove swab from packaging material.
3. Remove plug from media tube.
4. Swab the desired area thoroughly where there is suspected contaminant.
5. Insert the swab in the tube, firmly close cap, and label appropriately.



**PCR Analysis
Individual Cassette**
#8715309



EMSL Rotary Vane Pump
(Stand not included)
#8706102



Water Testing Bottles
FREE to EMSL Customers
Call for Details

Allergen Sampling

Sampling Procedure

Dust Sampling with a Dust Collector Kit

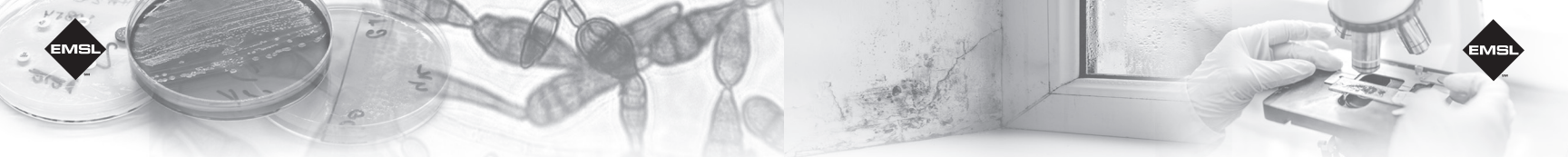
(Kit available from EMSL, Product ID 8715600)

1. Insert the white filter tube securely into the dust collector, through the opening at the angled end.
2. Attach the dust collector to the vacuum cleaner hose or tube.
3. Turn on the vacuum cleaner and vacuum four separate areas for 30 seconds each, where each area is about 1/4 square meter. Total sampling time is 2 minutes and total area sampled is about 1 square meter.
4. A minimum of 100 mg of dust is required for allergen analysis.
5. Remove the filter tube containing the dust sample and place it in a small Ziploc-type bag or equivalent. Place entire device in the bag.
6. Label the bag with your sample name or code and ship to EMSL Analytical, Inc. for allergen analysis.

Dust Sampling with a Filter Cassette

(Cassettes available from EMSL, Product ID 8715313)

1. 25mm 0.45m MCE filter cassettes can be attached to a vacuum pump using PVC tubing.
2. A flow rate of 5-10 LPM is sufficient to collect dust into the cassette.
3. We recommend using a template to establish and standardize sampling areas (carpet, furniture, bedding, etc.).
4. Check clear window at inlet end of cassette to determine that an appreciable amount of dust has collected.
5. A minimum of 100 mg of dust is required for allergen analysis.



Indoor Allergen Analyses Available

Test Code and Description:

- M034 Cat Dander (Fel d 1) by MARIA
- M035 Dog Dander (Can f 1) by MARIA
- M036 Cockroach (Bla g 1) by MARIA
- M037 Dust Mites (Der p 1 & Der f 1) by MARIA
- M038 Mouse (Mus m 1) by MARIA
- M039 Rat (Rat n 1) by MARIA
- M044 Indoor Allergen Group: Cat, Dog, Cockroach, and Dust Mites by MARIA (Multiplex Array for Indoor Allergens)
- M254 Rat & Mouse Combo by MARIA



Dust Mite

Note: Multiple allergens can be analyzed from a single dust sample.



EMSL Carpet Sampling Kit
25mm Kit, #8715314



Allergen Sampler
#8715600

Sampling Products and Supplies



Air-O-Cell
50 Pack #8715301B
10 Pack #8715302



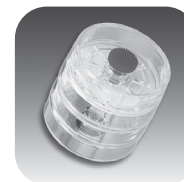
Mold Snap
50 Pack #8715304B



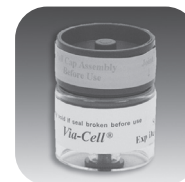
Micro 5 Cassette
50 Pack #8715306B



Allergenco D Cassette
50 Pack #8715307B



Mold/PCR Analysis Cassette
Single #8715309



Via Cell Cassette
10 Pack #8715310B



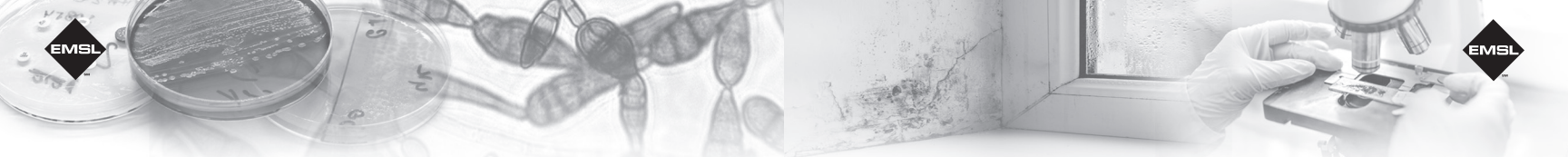
EMSL Tape Lift
#8708315



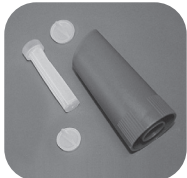
Sterile Swabs
#8708301



Bio-Tape Slides
25 Pack #8708325



EMSL 25MM Carpet Sampling Kit Microvac
25mm Kit, #8715314



Allergen Sampler
#8715600



TSI 4146 Primary Calibrator .01-20 LPM
#8703915



Lighthouse Aerosol Particle Counter 0.3-10 um
#8710001



FLIR E6 IR Camera
#8701022



FLIR ONE PRO for iPhone or Android
#8701518



Bio-Pump Plus
#8706002



Buck BioAir IAQ Pump
#8706003



E-Lite Pump with Rotameter
#8706004



Protimeter Surveymaster Moisture Meter
#8703002



Delmhorst Moisture Meter BD2100
#8703005



Tramex Moisture Encounter Plus Moisture Meter
#8703011



PCR Pump Kit
#8706107



Basic Mold Sampling Basic Kit
#8706301



Particle Plus 8306 Particle Counter
#8706014



Protimeter Hygromaster 2 Hygrometer
#8703004



Humidity and Temperature Pen
#8703553



Precision Psychrometer
#8703554



EMSL



TSI IAQ-CALC 7545 CO₂ Air Quality Meter w/ Case #8703701



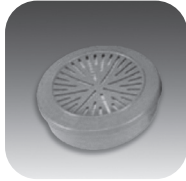
Extetch Video Borescope #8707007



North Half Face Mask Respirator (Med) #8705002



North Full Face Mask Respirator (Med/Lg) #8705005



North Hepa Filters - 2 Pk for North Full and Half Face Masks #8705006



Nitrile Gloves
Small #8705400
Medium #8705401
Large #8705402
X-Large #8705403



North OV/P100 Filters - 2Pk for North Full and Half Face Masks #8705008



Sundstrom SR100 Half Mask (Med/Lg) #8705152



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Laboratory Services Include:

Asbestos, Mold, Bacteria, Industrial Hygiene,
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Reaction (DNA), Silica, Volatiles Scan,
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