

## USING OZONE FOR MOLD REMEDIATION

### What is Ozone?

Ozone is a molecule composed of three atoms of oxygen. Two atoms of oxygen form the basic oxygen molecule--the oxygen we breathe that is essential to life. The third oxygen atom can detach from the ozone molecule, and re-attach to molecules of other substances, thereby altering their chemical composition. It is this ability to react with other substances that forms the basis of manufacturers' claims (Environmental Protection Agency [EPA], n.d.).

### Should I use an ozone generator to address an existing mold problem?

No. Ozone irritates lungs and is not likely to be effective at addressing an indoor mold problem. No one should expose themselves or others to ozone on purpose. Address the cause of the mold (usually moisture) and then remove the mold by cleaning surfaces or removing moldy materials (Florida Health, n.d.).

According to the American Conference of Governmental Industrial Hygienist (ACGIH), "No Gas- or vapor- phase biocides (Ozone) can effectively and safely remediate a microbially contaminated building because of problems with biocide delivery, efficacy and toxicity." (ACGIH Bioaerosols 16.2.5) Studies have shown that ozone cannot be generated in sufficient concentration to kill or even suppress microbials on most structural materials, including wood and drywall.

Ozone is like air, if air can reach the mold, ozone can reach the mold, and kill it, permanently. Neither air nor ozone can penetrate dry wall, wood, or other non-porous building products. It is difficult for Ozone to get into the padding under carpets, or inside stuffed furniture (Jenesco, Inc. (n.d.))

Please note: Dead mold is allergenic and may cause allergic reactions and other health effects in some individuals, so it is not enough to simply kill the mold. It must also be removed (EPA mold course)

### REFERENCES

**Environmental Protection Agency.** (n.d.) *Ozone Generators that are Sold as Air Cleaners.*  
<https://www.epa.gov/indoor-air-quality-iaq/ozone-generators-are-sold-air-cleaners>

**Florida Health** (n.d.). *Mold and Moisture, Indoor Mold and Your Health.*  
<https://www.floridahealth.gov/environmental-health/mold/index.html#ozone%20generator>

### ENVIRONMENT PROTECTION AGENCY (EPA), MOLD COURSE

<https://www.epa.gov/mold/mold-course-chapter-1#:~:text=Please%20note%3A%20Dead%20mold%20is,it%20must%20also%20be%20removed.>

**Jenesco, Inc.** (Manufacturer of ozone machines). *The Safe Way to Use Ozone Generators*  
<https://jenesco.com/ozone-generator-safe-use/>

### DEFINITIONS

#### Biocide

A substance that destroys living things, especially a pesticide, fungicide, or herbicide.

#### Efficacy

The ability to produce a desired or intended result.

"there is little information on the efficacy of this treatment"

#### Toxicity

The quality of being toxic or poisonous.

"the toxicity of a drug depends on its dosage"

#### Mycotoxins

Potentially toxic byproducts produced by mold

# DEAD MOLD, ALLERGIES, AND REMEDIATION

The IICRC emphasizes that even dead mold remains toxigenic and allergic. So, why would you want to leave dead mold in place? [By Doug Hoffman](#)

People often ask, "Will 'dead mold' hurt me?" This is a great question because there are some processes in the marketplace that make claims about killing mold "in place" and suggest that the resulting mold debris does not need to be removed. This is incorrect.

Most often, this position is taken by "mold" companies that utilize a style of fogging or airless spraying that delivers chemicals to the surface and claim to be able to access mold wherever it is and kill it, either under pressure or not. The assumption is made that once the mold is killed, it does not need to be removed. This process is cheaper and faster than traditional mold removal. Though cheaper and faster isn't necessarily effective. In this case, it isn't effective unless the process also includes removing the mold debris from the surfaces and air.

For many years, people have been tested by doctors for allergies and, through the testing process, find they are allergic to mold. The process is called "prick-testing," and in it, a mold spore is injected just under the skin, and if the patient reacts to mold with a rash or itching, it is determined that he or she is sensitive to mold and probably has developed, or will develop, mold allergies.

The spore in allergy testing is a dead, not viable, mold spore. What that simply means is that people react to mold whether it is dead or alive. So, why would you want to leave dead mold in place?

The Industrial Hygiene Field Operations Manual (IHFOM) produced a mold-removal guideline document for the Navy, which says "killing mold is not sufficient because residual biomass can still elicit allergenic responses from sensitive individuals [and] mold must be removed."\*

The IICRC emphasizes that even dead mold remains toxigenic and allergic. Further, research has shown that the mycotoxins (mold poisons) produced by some molds are being produced on the surface of the spore and continue to move into the air even if the mold is non-viable (dead). Why would you want to leave the debris?

Mold, when dead, can also become a food source for other microbes. And, if it becomes aerosolized (suspended in air), it can become problematic for the person who is sensitive to molds. Most of the clients who seek information from the NORMI\*\* website are already sensitive to environmental issues, so why would you leave a potential allergen in the environment? You wouldn't.

NORMI believes the evidence is clear that any purported "solution" to kill mold in place is not a solution at all unless it also includes removal of the residual mold debris.

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\*\*NORMI, the National Organization of Remediators and Mold Inspectors, trains remediation professionals in the proper techniques and procedures needed to create a cleaner, healthier living environment by removing mold and other IAQ contaminants from the air and surfaces.

Cleanfax Magazine (n.d.) *Dead mold, allergies, and remediation*  
<https://cleanfax.com/restoration/dead-mold-allergies-remediation/>

**ENVIRONMENTAL PROTECTION AGENCY (EPA): Four Methods of Remediating Mold Damage**  
**Mold Remediation in Schools and Commercial Buildings Guide**  
***Investigating, Evaluating and Remediating Moisture and Mold Problems***

**Four cleanup methods for remediating damage to building materials and furnishings caused by mold growth. The next page indicates which method to use based on the building material and the level of affected materials.**

### **Method 1: Wet Vacuum**

Wet vacuums are vacuum cleaners designed to collect water. They can be used to remove water from floors, carpets and hard surfaces where water has accumulated. They should not be used to vacuum porous materials, such as gypsum board. They should be used only when materials are still wet — wet vacuums may spread spores if sufficient liquid is not present. The tanks, hoses and attachments of these vacuums should be thoroughly cleaned and dried after use since mold and mold spores may stick to the surfaces.

### **Method 2: Damp Wipe**

Whether dead or alive, mold is allergenic, and some molds may be toxic. Mold can generally be removed from nonporous (hard) surfaces by wiping or scrubbing with water, or water and detergent. It is important to dry these surfaces quickly and thoroughly to discourage further mold growth. Instructions for cleaning surfaces, as listed on product labels, should always be read and followed. Porous materials that are wet and have mold growing on them may have to be discarded. Since molds will infiltrate porous substances and grow on or fill in empty spaces or crevices, the mold can be difficult or impossible to remove completely.

### **Method 3: HEPA Vacuum**

HEPA (High-Efficiency Particulate Air) vacuums are recommended for final cleanup of remediation areas after materials have been thoroughly dried and contaminated materials removed. HEPA vacuums are also recommended for cleanup of dust that may have settled on surfaces outside the remediation area. Care must be taken to assure that the filter is properly seated in the vacuum so that all the air must pass through the filter. When changing the vacuum filter, remediators should wear PPE to prevent exposure to the mold that has been captured. The filter and contents of the HEPA vacuum must be disposed of in well-sealed plastic bags.

### **Method 4: Discard — Remove Damaged Materials and Seal in Plastic Bags**

Building materials and furnishings that are contaminated with mold growth and are not salvageable should be double-bagged using 6-mil polyethylene sheeting. These materials can then usually be discarded as ordinary construction waste. It is important to package mold-contaminated materials in sealed bags before removal from the containment area to minimize the dispersion of mold spores throughout the building. Large items that have heavy mold growth should be covered with polyethylene sheeting and sealed with duct tape before they are removed from the containment area.

**Table 2: Guidelines for Remediating Building Materials with Mold Growth Caused by Clean Water**

Material or Furnishing Affected	Cleanup Methods†	Personal Protective Equipment	Containment
<b>SMALL - Total Surface Area Affected Less Than 10 square feet (ft<sup>2</sup>)</b>			
Books and papers	3	Minimum  N-95 respirator, gloves, and goggles	None required
Carpet and backing	1, 3		
Concrete or cinder block	1, 3		
Hard surface, porous flooring (Linoleum, ceramic tile, vinyl)	1, 2, 3		
Non-porous, hard surfaces (Plastics, metals)	1, 2, 3		
Upholstered furniture & drapes	1, 3		
Wallboard (Drywall and gypsum board)	3		
Wood surfaces	1, 2, 3		
<b>MEDIUM - Total Surface Area Affected Between 10 and 100 (ft<sup>2</sup>)</b>			
Books and papers	3	Limited or Full  Use professional judgment, consider potential for remediator exposure and size of contaminated area	Limited  Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area
Carpet and backing	1, 3, 4		
Concrete or cinder block	1, 3		
Hard surface, porous flooring (Linoleum, ceramic tile, vinyl)	1, 2, 3		
Non-porous, hard surfaces (Plastics, metals)	1, 2, 3		
Upholstered furniture & drapes	1, 3, 4		
Wallboard (Drywall and gypsum board)	3, 4		
Wood surfaces	1, 2, 3		
<b>LARGE - Total Surface Area Affected Greater Than 100 (ft<sup>2</sup>) or Potential for Increased Occupant or Remediator Exposure During Remediation Estimated to be Significant</b>			
Books and papers	3	Full  Use professional judgment, consider potential for remediator exposure and size of contaminated area	Full  Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area
Carpet and backing	1, 3, 4		
Concrete or cinder block	1, 3		
Hard surface, porous flooring (Linoleum, ceramic tile, vinyl)	1, 2, 3, 4		
Non-porous, hard surfaces (Plastics, metals)	1, 2, 3		
Upholstered furniture & drapes	1, 3, 4		
Wallboard (Drywall and gypsum board)	3, 4		
Wood surfaces	1, 2, 3, 4		