

# Healthy Environment

All about mold



# Preservation of Assets. How to deal with mold?

## Getting to know Mold

Mold is a type of fungus. It usually appears as a stain that grows on the surface of organic material. Mold develops through spores that are invisible to the naked eye. Whenever spores are present on surface, mildew will develop if favorable conditions for their growth are in place. Fungus can enter internal environments through doors, windows, refrigeration devices, and previously contaminated material<sup>4</sup>.

## The presence of mold in libraries and its effects

**Collections:** Fungus feed on the material substratum from where they settle on, in this case, the collections. The first visual effect is usually the appearance of stains. Within time, the weakening of paper fibers<sup>2</sup>, leather, fabrics, or films will occur

**Health:** Allergic people may have allergy symptoms, and infections may occur in individuals who have immunological system deficiency<sup>1,4</sup>. These are among the most common health consequences of mold some mildew species can also produce toxin. Studies regarding this issue are still in process, however they suggest that toxins may be related to cases of lung hemorrhage, reactions on the immune system (reducing our ability to fight diseases), neurotoxic effects (such as fatigue, headaches, loss of memory, depression, mood swings, convulsions and trembling), and carcinogenic effects (that cause cancer)<sup>4</sup>. Therefore, it is unquestionable that mold can pose health risk.

## Dealing with mold in libraries

### Conditions for mold growth

**Humidity:** over 55%

**Temperature:** over 69.8°F

**Nutrients:** mainly the cellulose found in documents.

Other than those conditions, bad ventilation, deficient lighting, and dust accumulation contribute to mold growth



## Preventive steps<sup>2</sup>

- Use Airfree units for your local air treatment
- If necessary, use dehumidifiers
- Keep temperatures below 69.8°F

In general, humidity and temperature control should follow the above parameters, however each material in the library responds differently to these conditions. Therefore, the acceptable levels for temperature and humidity for each material are listed below.

Material	Relative Humidity	Temperature
Paper	40% to 50%	67.94°F to 69.8°F
Film	30% to 40%	55 °F to 67.94 °F
Leather	50% to 55%	_____
Parchment	40% to 45%	_____

- Avoid stagnant air spots because they allow spores to deposit. Ideally the environment should have good air circulation and if possible through an air conditioning system.
- Ventilation and dehumidifier systems should have constant cleaning and maintenance, as they can become sources of contamination whenever they are not cleaned correctly<sup>2,3</sup>.
- Keep rare pieces in a separated room, with constant temperature and humidity. Access to this area should be restricted.
- Use vacuum cleaners with at least 50% filtering capacity, however if possible use vacuum cleaners with HEPA filters (99,9% efficiency).
- To clean the floor use a moderated humid cloth. The simple action of walking is responsible for the dispersion of spores throughout the air. Never use brooms.
- Never allow plants to be placed near collections or assets, as these are predominate places for fungus to grow<sup>2,3</sup>.
- New acquisitions should be placed in quarantine for verification of mold<sup>2,3</sup> development and possible disinfection. Make a plan against disasters (floods for instance).

## Cleaning mold

**Find mold source**<sup>1,2,3</sup> Search for possible leaking spots, gutters or other sources of humidity such as ventilation systems and verify that shelves leaning against walls have no mold accumulation.

**Protect yourself.**<sup>1,3</sup> Use high efficiency filter masks, latex gloves, apron, shoes, eyeglasses and protective hats (in the case that there is too much dirt). People who are asthmatic, who have cardiovascular problems or pregnant women may have difficulty breathing while using masks. Consult with a physician before using a mask.

**Isolate contaminated items.** Place them in plastic bags, and move them to an area with no humidity and follow the cleaning instructions below. Do not leave the material in the plastic bags for too long, because the interior of the bags can generate a friendly environment for mold growth<sup>1,3</sup>. The cleaning should be done within 48 hours which is the average time taken for mold to develop.

**Start drying the material.** The cleaning should take place in cold, dry, and ventilated environments and, if possible, use an exhauster.

- Apply paper towels or printing paper over the wet surface so that they can absorb the humidity. Do this procedure several times

- Special attention should be given to book frames. Because they are generally dark and retain humidity, they become propitious spots for mold development. During the cleaning process, take out the frames and follow the instructions above.

**If you cannot dry it, freeze it.** If damages are severe and you know that you will not be able to dry all the material within 48 hours, the best thing to do is<sup>3</sup> to wrap the material and put it in the freezer. This procedure will not eliminate the mold but will reduce its growth.

**Cleaning the affected items.** Attention! Do not clean rare pieces by yourself. Hire a professional in this situation.

- Use HEPA filter vacuum cleaners, which are able to retain spores. "Wet-dry" commercial vacuum cleaners may also be used, with non toxic fungicide in the interior. To delicate items, use the brush attached to the vacuum cleaner, with either cotton gauze or screens to avoid further damages. The careful use of brushes is also acceptable if done carefully to avoid mold from fixing itself even further in the<sup>3</sup> paper's fiber.

- When disposing the vacuum cleaner filter, put it in a plastic bag and take it out of the building.

**Clean up the affected area.** Not only collections should be cleaned, but also the whole affected room. If it is a large area, contact a qualified professional. Clean up shelves and floors using commercial "wet-dry" vacuum cleaners that contain non toxic fungicide in their interior.

- Clean the air conditioning system before bringing back the cleaned material.

## Airfree<sup>®</sup> to fight mold in libraries

Fungus spores can be found in different places and indoor environments are never spore free even after cleaning<sup>4</sup>. Airfree, the high efficiency air purifier, operates by eliminating environmental fungus and bacteria with 99% tested efficiency. Airfree greatest difference with other technologies is the variety of efficiency independent tests performed by independent ISO 17025 certified laboratories.

## Airfree<sup>®</sup> Products

**Efficient:** Airfree is tested in real working environments with people circulating in them by credible ISO 17025 independent laboratories and universities in several countries. Airfree destroys any microorganism such as mold spores, bacteria, viruses, and dust mite allergens when passing through its patented high efficiency thermodynamic sterilizing system known as TSS™ technology regardless of how hazardous and small they might be.

**Faster performance:** Microorganism reduction starts in 15 minutes.

**Silent:** No sound emission.

**Exclusive:** Airfree uses just heat TSS™ technology to destroy and incinerate airborne microorganisms. No fiber glass filters, triclosan coated paper or any kind of material that can be harmful to those operating or disposing of it.

**Ozone Reduction:** Airfree exclusive TSS™ technology is the only one reducing ozone while destroying microorganisms.

**Economic:** Airfree's electric consumption is lower than a 50W light bulb. No replacement parts required like filters that may cost hundreds of dollars a year.

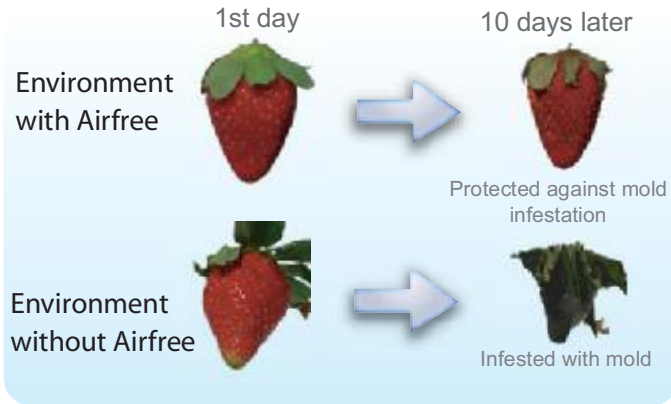
**Easy Installation:** Just place Airfree on the floor and plug it into the nearest electric outlet. No need maintenance or special cleaning.



## Bibliographical References:

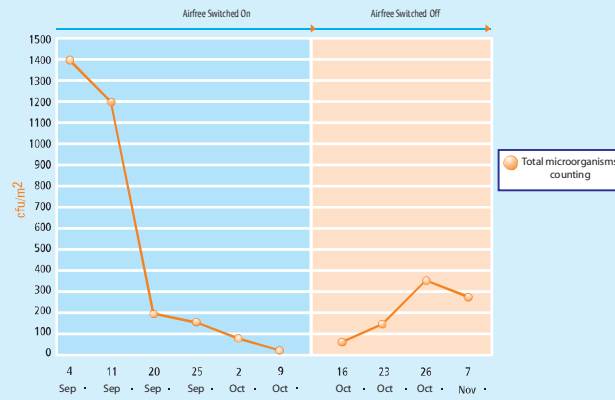
- 1- [http://www.ccaha.org/mold\\_eng.html](http://www.ccaha.org/mold_eng.html)
- 2- [siarq02.siarq.unicamp.br/cpba/pdf\\_cadtec/38.pdf](http://siarq02.siarq.unicamp.br/cpba/pdf_cadtec/38.pdf)
- 3- <http://www.nedcc.org/plam3/leaf39.htm>
- 4- Guia de "Umidade em ambientes internos e saúde" elaborado pelo Instituto de Medicina da Academia Nacional dos Estados Unidos, fornecido pela Universidade de Harvard.

## See the strawberries 10 day test\*:



\*test made in two separated closed chambers

## Efficiency Test: microorganism reduction



Test realized by SGS Natec - Germany - Test M00-4990  
Independent Laboratory ISO 17025

See the complete list of test reports at:  
[www.airfree.com](http://www.airfree.com)

This guide had Cristiane Minussi's collaboration, USP biologist professional responsible for the microbiological nature information.

