

Toxic Effects of Molds

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Toxic Effects of Some Common Indoor Mold

By Chin S. Yang, Ph.D., printed in *Enviros, The Healthy Building Newsletter*, Volume 4, Number 9, September 1994

An explosion of cases related to toxigenic molds and mycotoxins have been reported or discovered throughout the United States and Canada over the last three years. Courthouses in Florida were closed extensive decontamination, with costs as much as the price of the original building. Recently, an old school building in Canada, infested with toxigenic molds, had to be burned. This extreme measure underscored the importance of indoor fungal problems. Furthermore, the unusual weather conditions many parts of the U.S.A. over the last three years have provided conditions for the growth of toxigenic molds and potential human exposure to mycotoxins and other secondary fungal metabolites.

Reference "Aerobiology of the Office Environment", *Enviros*, September 1994 (Vol. 4, Number 9).



What are toxigenic molds and mycotoxins?

Some molds have been known to produce toxins that are harmful to animals and humans when ingested, inhaled, or in contact with the skin. The molds that produce toxins are known as toxigenic molds. The earliest known toxigenic molds, primarily *Claviceps purpurea*, produce the substance ergot. The ergot molds infect rye, grains and other grasses. Ingestion of ergot contaminated rye or other cereals causes ergotism. There are two types of ergotism recognized clinically: gangrenous and convulsive. Gangrenous ergotism affects the extremities as well as causes gastrointestinal symptoms. Convulsive ergotism affects the nerve system causing brain and spinal lesions which can lead to death or permanent mental impairment.

Many molds in addition to ergot molds produce secondary toxic metabolites, such as alkaloids, cyclopeptides, and coumarins. Metabolites that can produce adverse health effects (mycotoxicoses) in animals and humans are collectively known as mycotoxins. The latest World Health Organization (WHO) publication on mycotoxins, available in 1990, indicated that there are more than 200 mycotoxins produced by a variety of common molds. Historically, mycotoxins are a problem to farmers and food industries and in Eastern European and third world countries. However, many toxigenic molds, such as *Stachybotrys chartarum* (also known as *Stachybotrys atra*) and species of *Aspergillus* and *Penicillium* have been found to infest buildings with known indoor air and building-related problems.

In addition to mycotoxins, volatile organic compounds (moldy odors) released from actively growing molds may also pose a health risk.

What are the common toxigenic molds found indoors?

Many species in the genera *Aspergillus*, *Penicillium* and *Cladosporium* are known to produce mycotoxins. These three groups of molds are also very common indoors. Other toxigenic molds frequently found indoors are *Alternaria*, *Trichoderma*, *Fusarium*, *Paecilomyces*, *Chaetomium*, *Acremonium*.

Another fungus that has increasingly been linked to building-related problems is *Stachybotrys chartarum*. It is common in nature and grows on cellulose-rich plant materials. It has frequently been found to grow on water-damaged cellulose-containing materials, such as ceiling tiles, wall paper and sheet-rock wall board, in residential and commercial buildings. Many indoor air quality related problems have been traced to the growth of this fungus in buildings. Almost without exception, these buildings have usually had chronic water or moisture problems.

When discussing mycotoxins, species of *Aspergillus* deserve special attention. Species of *Aspergillus* produce such well known toxins as aflatoxins, ochratoxins, and sterigmatocystin. Aflatoxins that are produced by *Aspergillus flavus* and *Asp. parasiticus* are detected in stored peanut and grains. Ochratoxins are produced by many species of *Aspergillus* as well as *Penicillium*. *Sterigmatocystin* is produced by *Asp. versicolor*. These molds grow well on many common building materials soiled or damaged by water. Their ability to grow on common building materials makes them a significant problem in buildings where maintenance is poor or non-existent.

What are the health effects of mycotoxins?

Mycotoxins may cause a variety of short-term as well as long-term adverse health effects. This range from immediate toxic response and immune-suppression to the potential long-term carcinogenic effects. Symptoms due to mycotoxins or toxins-containing airborne spores (particularly those of *Stachybotrys chartarum*) include dermatitis, recurring cold and flu-like symptoms, burning sore throat, headaches and excessive fatigue, diarrhea, and impaired or altered immune function. The ability of the body to fight infectious diseases may be weakened resulting in opportunistic infections. Certain mycotoxins, such as zearalenone (F2 toxin), can cause infertility and stillbirths in pigs. Because these symptoms may also be caused by many other diseases, misdiagnoses of mycotoxin exposures are common. There are very few physicians with the experience or expertise in correctly diagnosing mycotoxin exposures or mycotoxicoses. Occupational or building-related exposures to mycotoxins through inhalation are slowly being recognized as a major indoor air quality problem. Generally, removal of causative agents is necessary. Treatment for symptomatic mycotoxicosis may be required. If exposure to molds and mycotoxins is suspected, consult an occupational health professional.

What are the options to avoid toxigenic molds and mycotoxin related problems?

Fungal growth in an indoor environment is often related to the availability of nutrient, water/moisture proper temperature range and the presence of inoculum (often fungal spores). The key factor is

water/moisture. Moisture control to reduce condensation and free water will prevent or control fungal growth.

In an environment where water/moisture-related problems often lead to fungal growth, rapid response the problem is the key solution. Mold-infested materials should be removed and replaced (see also below). Materials that can not be replaced should be decontaminated or treated. Consult an environmental microbiologist for such decontamination treatments. Proper project design and procedures are an important factor in a successful decontamination project. Biocidal application may necessary under certain conditions. More importantly, before any decontamination is performed, wat and excessive moisture must be controlled and eliminated.

Most importantly, fungal infestation may be directly correlated with building operation and mainten Spores of *Stachybotrys chartarum* are wet and slimy. They do not easily become airborne. Their dissemination is likely through insects (such as cockroaches), rodents, water incursion or air stream. Without the assistance of insects, rodents and free running water, the likelihood of *Stachybotrys chartarum* spreading from one location to the other requires the disturbance of a dried slimy spore ma Spoires and hyphae of *S. chartarum* have been detected in air samples. Any detection of *S. chartarum* spores in indoor air should be considered significant.

To prevent or eliminate fungal infestation in buildings, the following procedures should be observed:

1. Heating, ventilating and air-conditioning systems must be properly filtered and maintained.
2. Water intrusion must be taken care of within 24 hours. Never overlook small leaks. Ignored sr leaks are much more problematic than a properly handled major flood. For additional informat on the proper handling of water intrusion, please see *Enviros* Vol. 3, No. 8 (August 1993); back issues are available.
3. Proper handling and storage of food to keep insects and rodents away from buildings.
4. In a warm, humid climate, a building engineer should be consulted to make sure that a moisture barrier is properly installed and that no condensation will occur.
5. Install dehumidifiers in areas where humidity is constantly high. Keep relative humidity betwe 20% and 50%.
6. (print is unreadable)
7. If large areas of contamination are determined, asbestos-like remediation procedures are necess Consult an industrial hygienist with experience in asbestos remediation procedures, as well as i biohazard remediation.

If a building is known to have extensive fungal growth, consult an industrial hygienist with training a experience in microbiological control. Human and environmental protection must be observed when removing and handling fungal contaminated materials.

For further information contact:

Frank A. Lewis, Director
Office of Environmental Hygiene
U.S. Public Health Service
Division of Federal Occupational Health
Region III
Mailing Address: 3535 Market Street, Room 1310
Philadelphia, PA 19104

Inhalation of Indoor Fungus May Be Harmful

by Medscape Medical News



New York (MedscapeWire) — Fungus growing on bathroom walls may look innocent, but they could potentially cause health problems, according to Bruce Jarvis, chemistry professor at the University of Maryland, who presented data on the toxicology of molds during the 220th national meeting of the American Chemical Society, August 20-24, in Maryland.

According to Jarvis, certain kinds of fungi give off toxic (mycotoxins) spores that can be inhaled and cause flu-like symptoms. Mycotoxins are readily absorbed by the intestinal lining, airways, and skin. His research focuses on the *Stachybotrys chartarum* fungus, an uncommon mold considered to be one of the more serious threats to people living and working in water-damaged buildings. His presentation detailed the variety of potent toxins and immunosuppressant agents produced by *S. chartarum*, as well as other classes of toxigenic fungi.

S. chartarum has been linked with cases of infant pulmonary hemosiderosis (bleeding in the lungs), including a series of cases since 1994, where 12 infants have died. All of whom were living in substandard, water damaged inner city housing in Cleveland, Ohio. Cellulose materials such as paper, sheetrock, cardboard, ceiling tiles, and wood products are suitable sources for fungal growth if they become moist or water damaged due to water leaks, excessive humidity, or flooding.

"There's no question that living in a damp environment in the presence of molds may cause general health problems. Although *Stachybotrys* is not a common fungus found in damp buildings, any visible signs of mold growth should warrant attention because it indicates a water intrusion problem," said Jarvis. He also adds that even when the molds are removed, unless the source of water is taken care of, the molds will reappear.

According to Jarvis, *Stachybotrys* is not as common in flooded homes as other fungi such as *Aspergillus* and *Cladosporium*. However, all of these fungi take weeks or months to grow, which means that the presence of indoor molds reflect long-standing water problems. Fungal growth problems can also occur in new buildings and homes that were poorly constructed.

He says there are several treatment options for indoor fungal growth, but measuring how much mold a person is breathing in remains a challenge. Unlike using certain proteins or markers to measure the exposure to allergens, Jarvis says it's more difficult to measure an individual's exposure to the toxicogenic molds.

He adds there tends to be an overreaction to the presence of molds. While there has been cases that require extensive professional treatment in removing parts of the wall and floorboards, small amounts of fungal growth can be treated by simply wiping the area with diluted bleach.

"We're inhaling all kinds of particulate matter everyday, but we have powerful mechanisms in our lungs to protect us," said Jarvis.

Although *Stachybotrys* is not a widespread indoor environmental problem in the United States, Jarvis is working with scientists in Denmark where there is a national effort to investigate the risks *Stachybotrys* and other fungi pose to infant health.

For additional information, contact:
 Pure Air Control Services
 800-422-7873, ext. 802

Additional Sources of Information:

- [Beware the Fungus Among Us: Emissions from Molds May Be Culprits in Indoor Air Problem](#)
- [The Diagnosis and Incidence of Allergic Fungal Sinusitis](#) — Mayo Clinic
- [East High Mold Scare Propels Health Check; Asthma Death Linked?](#)
- [Causes and Symptoms of Mold and Dust Induced Respiratory Illness](#) — Virginia Cooperative Extension

H & E Home

Up

Here are some simple actions you can take to reduce energy costs, improve comfort, and reduce air pollution in your home or other building:

1. Use a powered exhaust system on any device that burns fuel indoors.
2. Eliminate the need for air leakage through your home's building envelope by using [mechanical ventilation](#) to supply as much fresh filtered air as you want.
3. [Seal air leaks](#) in the building's envelope to block entry of microbes, allergens, toxins, irritants, insects, and cold drafts.
4. [Insulate the walls and attic](#) as much, or more than, recommended for your local climate.
5. [Control indoor air pressure](#) to:
 - a) Minimize entry of radon and water vapor from the soil.
 - b) Keep insulation effective and mold-free by minimizing leakage of moist air through walls and attics that have been cooled by winter weather..

These actions will make your home a [safer shelter](#) if an accident, or a terrorist, releases chemical, biological or radiological substances upwind of your home.

Will additional energy price increases be *serious, certain and soon*? To examine the evidence, go to:

- [Association for the Study of Peak Oil & Gas](#)
- [Association for the Study of Peak Oil & Gas - USA](#)



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Please send your suggestions, comments, and questions to Jon Traudt (jtraudt@tconl.com)