

Mold awareness

FUTURE ENVIRONMENT DESIGNS, INC.

Mold basics

Molds (also known as fungi) are part of the natural environment. Molds live in the soil, or on plants, and on dead or decaying matter. Molds belong to the kingdom Fungi. Molds lack chlorophyll. Molds can be found anywhere, inside or outside buildings, anytime during the year. About 1,000 species of mold can be found in the



United States, with more than 100,000 known species worldwide. Molds can grow on virtually any organic substance. All mold needs to grow on these substances are moisture and oxygen. There are molds that can grow on wood, paper, carpet, foods, and insulation. In the natural environment molds play an important role by breaking down organic matter such as wood, fallen leaves, plant debris, and dead animals. Without mold we would not have foods (like cheese) and medicines (like penicillin). Molds reproduce by producing tiny spores (1 to over 500 microns in diameter/length) that usually cannot be seen

without magnification. Spores are aerodynamic and sticky. This makes spores easy to distribute, making them similar to plant seeds. Since the spores are sticky, it allows them to cling to surfaces. Spores can only be dislodged by brushing against them or by direct contact. When spores land on a damp spot, they may begin growing and digesting whatever they are growing on in order to survive. Spores (growing into molds) finding the right conditions can start producing thousands of spores within 24 to 48 hours. Spores remain able to grow for years after they are produced. Allergens on dead or alive spores remain allergenic for years. Molds gradually destroy the things they grow on. When excessive moisture accumulates in buildings or on building materials, mold growth will often occur, particularly if the moisture problem remains undiscovered or unaddressed. It is impossible to eliminate all mold and mold spores in the indoor environment. To control indoor mold growth, control indoor moisture. Common areas for mold growth are:

- Bathroom tile
- Basement walls
- Areas around windows
- Near leaky water fountains or sinks.

Common causes or sources of water for indoor areas are:

- Roof leaks
- Deferred maintenance
- Condensation associated with high humidity or cold spots in the building.
- Localized flooding due to plumbing failures or heavy rains
- Slow leaks in plumbing fixtures
- Malfunction or poor design of humidification systems
- Uncontrolled humidity (ex. Hot humid climates).

Mold Health effects

All molds have the potential to cause health effects. The presence of mold on building materials does not necessitate that people will be exposed or exhibit health effects.

Building occupants **exposed** to mold may report:

- Odors, or
- Health problems.

Building occupants exposed to mold may report health problems such as:

- Headaches
- Breathing difficulties
- Skin irritation
- Allergic reactions
- Aggravation of asthma symptoms

Molds produce:

- Allergens
- Irritants
- In some cases toxins that may cause reactions in humans.

Primarily two predictable mechanisms for molds to cause health effects:

- Direct
- Indirect

A direct mechanism is when the mold invades the tissues of the host. Examples of this is pneumonia or a skin infection. The organism invades and the body reacts to it and may destroy it but antibiotics may be needed to repel the invader. The response of the immune system may occasionally cause more disease.

Indirect mechanisms are toxins produced by the organism



and then secreted, including endotoxins, or exotoxins. The reason these toxic elements are secreted is in nature, all organisms must compete with others for territory. Organisms secrete these toxins in order to preserve their territory. Science actually uses this feature to isolate many of the antibiotics we have discovered (e.g., penicillin isolated from *Penicillium* mold).

Endotoxins are components of the structure of the organism. These components once liberated as the organism degenerates are toxic to the host. **Exotoxins** are specific molecules that are liberated into the environment that can cause injury to adjacent tissues. For the toxins to be active

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Mold remediation is similar to asbestos remediation.

Mold health effects

without the presence of organisms, the liberated substance would need to be first produced by the fungi and then transferred to the host to cause disease. The mere presence of the organism in the host is not sufficient to result in disease. Typically, specific toxins that cause health effects routinely cause those health effects in a predictable fashion given a set of conditions (e.g., i botulinum or tetanus toxins produced by specific bacteria).

Type and severity of symptoms depends on three factors:

- Type of mold present, or the nature of the material (e.g., allergenic, toxic, or infectious).
- Amount of exposure - Unfortunately there is no way to determine safe or unsafe levels. This is because measurements of exposure are not standardized and biological markers for exposure to molds are unknown.
- Susceptibility of the individual, which varies with genetic predisposition (allergies, asthma, etc.), age (children and the old are more susceptible), state of health (immune-compromised or immune-suppressed), and concurrent exposures (additive effects between combustion products and molds).

Specific human reactions to mold growth includes:

- Allergic reactions
- Asthma
- Hypersensitivity pneumonitis
- Toxic pneumonitis
- Irritant effects
- Opportunistic infections

Mycotoxins are toxins produced by molds.

Mycotoxins are non-volatile having low molecular weights. Over 200 mycotoxins have been identified and many more remain to be identified. A single fungal species can produce multiple mycotoxins. Not all fungi produce mycotoxins. Production seems to depend on environmental conditions. Presence of mold does not mean that mycotoxins are present or that they are present in large quantities. Mycotoxins affect on people varies dependent on:

- Specific fungi
- Dose of exposure
- Sensitivity of the individual
- Route of exposure

Some mycotoxins have been shown to be responsible for human health effects. However, health effects to mycotoxins are varied and controversial.

mold remediation

Primary response to fungal contamination in buildings is prompt remediation of contaminated material, and infrastructure repair. Emphasis should be placed on preventing contamination through proper building maintenance, proper HVAC system maintenance, and prompt repair of water damage.

There are **no federal regulations** (only a few states have regulations) for mold remediation. Most mold remediation is performed by following guidelines and reference documents. Some examples are the New York City Department of Health's "Guidelines on Assessment and Remediation of Fungi in Indoor Environments" and the Environmental Protection Agency's (EPA's) "Mold Remediation in Schools and Commercial Buildings." In addition, mold remediation should be conducted by professionals certified by the American Council for Accredited Certification (ACAC) as mold workers and supervisors. According to EPA's "Mold Remediation in Schools and

Commercial Buildings," the purpose of mold remediation is to remove the mold, to prevent human exposure, and damage to building materials and furnishings. It is necessary to clean up mold contamination, not just to kill the mold. Dead mold is still allergenic, and some dead molds are potentially toxic. The use of biocides, such as chlorine bleach, is **not recommended** as a routine practice during mold remediation, although there may be instances where professional judgment may indicate its use (for example, when immune-compromised individuals are present). A regular home cleaner/detergent would work best in mold remediation. In most cases, it is not possible or desirable to sterilize an area; a background level of mold spores will remain in the air (roughly equivalent to or lower than the level in outside air). These spores will not grow if the moisture problem in the building is resolved.

mold sampling

Is mold sampling needed? According to EPA's "Mold Remediation in Schools and Commercial Buildings," in most cases, if visible mold growth is present sampling is unnecessary. In specific instances, such as cases where litigation is involved, the source(s) of the mold contamination is unclear, or health concerns are a problem, you may consider sampling as part of your site evaluation. Surface sampling may be useful in order to determine if an area has been adequately cleaned or remediated. Sampling should be done only after developing a sampling plan that includes a confirmable theory regarding suspected mold sources and routes of exposure. Pre- and post-remediation sampling may also be useful in determining whether remediation efforts have been effective. After remediation, the types and concentrations of mold in

indoor air samples should be similar to what is found in the local outdoor air. Since **no** EPA or other Federal threshold limits have been set for mold spores, sampling cannot be used to check compliance. Sampling for mold should be conducted by professionals, such as ACAC-Certified Indoor Environmental Consultants (CIECs), with specific experience in designing mold sampling protocols, sampling methods, and interpretation of results. Sample analysis should follow analytical methods recommended by the American Industrial Hygiene Association (AIHA).

Keep in mind that air sampling for mold provides information only for the moment in time in which the sampling occurred. Experience in results interpretations is essential!