

Getting to Know the



By Lyle D. Hogan, P.E.

Indoor air quality is gaining momentum both as a matter of public acknowledgment and an insurance company liability. But buildings may have been infested with colonies of mold and mildew long before the onset of weather that inflicts physical damage. Questions to ask include:

- Which types of mold and mildew are now present?
- Were any colonies present prior to the storm?
- Was the condition exacerbated by the storm?
- How can the distinction be proven?
- Which fungal colonies are traceable to housekeeping practices, deferred maintenance, and sanitation habits versus those stemming from insurable storm damage?

A building science consultant is likely to encounter these questions. Hopefully, the team of professionals (often called litigants) will build arguments within the sciences of building construction and microbiology.

Meet the Molds

Molds discussed below are among those found during a storm investigation or other event of water leakage into a building. The varieties reviewed are certainly not inclusive of all that may be encountered. They are commonly revealed in building components, but they may be found elsewhere in the environment. Indeed, some are found virtually everywhere.

Stachybotrys (Figure 1) has gained considerable notoriety for compromising indoor air quality due to its production of potent toxins; however, this species rarely causes disease in humans. It is usually associated with cellulose-containing matter where water has been present for some time. It is thought to already be present in two to five percent of American homes.¹

Cladosporium is dark green to black and is a slow-growing form of mold, an aspect that can be helpful in determining *when* the colonies were fostered. The slightest movement will disrupt the branched chains, greatly complicating preparation of microscopic mounts.

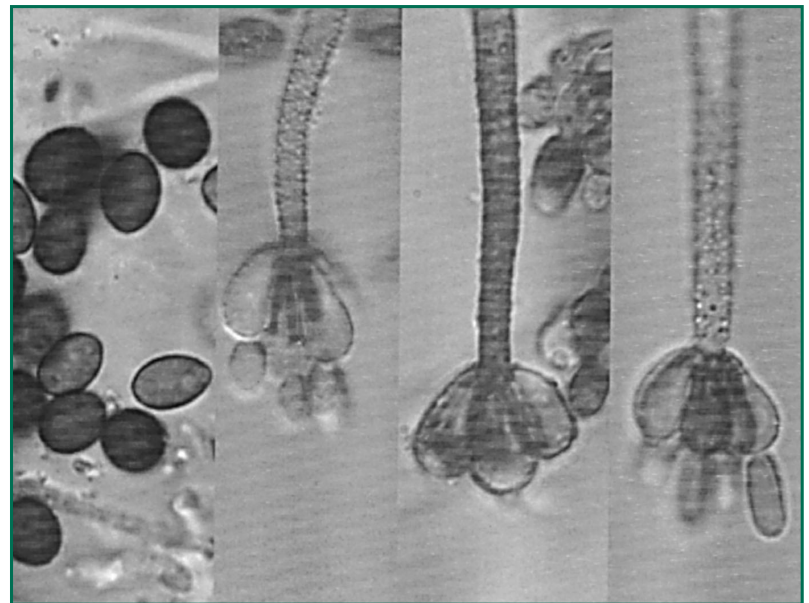


Figure 1: *Stachybotrys* has gained considerable notoriety for compromising indoor air quality due to its production of potent toxins; however, the species is rarely pathogenic for man.

Aspergillus is a common household mold that excretes digestive enzymes that enable growth on virtually any substance containing organic matter, including a number of building materials and foods. This genus of fungi is considered as both the most useful and most harmful to humans. Some produce industrially useful enzymes while others produce carcinogenic toxins.

Penicillium (not penicillin) can be found in locations as innocent as a mulch garden. It can begin to produce spores in as little

as a day after being given a fresh culture medium. The spores (some brilliantly colored) are consumed by the millions when humans eat blue cheese. This species tends to favor cooler temperatures.

Wet Basements and Crawl Spaces

When the same residential walls repeatedly have mildew stains, a damp crawl space is the likely culprit. This moisture may also cause problems in the attic, but it originates in the basement. There may be leaking pipes, surface water entering through basement vents, downspouts that do not adequately divert water away from the foundation, or other sources. And, even without these conditions, a bare earth floor can generate large amounts of moisture.

There is no way to completely eliminate indoor mold spores, but moisture can be controlled to keep growth to a minimum.² For moisture in a crawl space, the remedy is simple. Naturally, it's important to address the source of unwanted moisture, but an easy solution is to place polyethylene sheeting on the bare earth floor. This can sharply curtail the moisture that would otherwise permeate into the occupied spaces above.

Poorly Vented Attics

Proper attic ventilation is crucial for the roof as well as the rest of the building.³ Many investigations identify substandard attic ventilation as the culprit in premature steep roofing failures. *Figure 2* depicts severe mold/mildew in a humid Southern climate that was hot and dry at the time of the study.

Mold/mildew colonies develop in the winter from condensation, which then dries to a powder during the hot season. This condition alone may create pervasive indoor air problems, and poor attic ventilation is largely to blame.

Long-Term Leakage in Flat Roofing

If roof repairs are not implemented quickly, insulation becomes wet and prompts deterioration of the deck, which can sharply increase the cost of re-roofing. *Figure 3* depicts an example of fungal colonies discovered during roof removal. Colonies had spread widely below the rubber roof membrane. When entrapped water reached the underside of the roof deck and framing members, fungal colonies grew on those surfaces as well.

Even ceiling materials can harbor mold and mildew. When ceiling tiles repeatedly become wet, the moisture invites numerous types of fungal growth. *Figure 4* depicts form boards of a poured gypsum deck that repeatedly became wet from roof leaks. Concerns about indoor air quality can often be traced to this condition, particularly in a return air plenum (an air-filled space in a structure that receives air from a blower for distribution).



Figure 2: Fungus and spores and mold — Oh my! Mold/mildew accumulation in a humid southern attic. The colonies were fostered from a wintertime condensation scenario, drying during the hot season to the formation shown. Note that attic insulation must be held back in order for the soffit to serve as the intake port. A pre-manufactured baffle can be used to keep blown-in insulation from becoming a ventilation impediment.



Figure 3: Fungal colonies found during a roof tear-off. Colonies had spread widely below the roof covering. When entrapped water reaches the building interior, the same fungal colonies can grow on roof decks and framing members.

HVAC Ducts, Chases, and Condensate Pans

Dehumidification is a beneficial side effect of air conditioning, providing a pleasant escape in hot, humid climates. The summer months at coastal retreats may bring huge cooling loads where air conditioning systems are running at warp speed. Sheet metal surfaces in the HVAC devices are sure to sweat and, in the concealed chases, the equipment becomes a breeding ground for mold. Then, when the contaminated air is released into occupied spaces, it can create a number of health maladies.

Moisture from any source will condense on surfaces that become cooler than the dewpoint. HVAC devices create con-



Figure 4: Formboards of a poured gypsum deck having been exposed to cycles of wetting. Repeated wetting in this manner will culture fungal growth. Concerns about indoor air quality can be traced to this condition, particularly in a return air plenum.

denensation that must be collected and removed from the occupied space. Placing a condensate pan beneath air conditioning devices ordinarily takes care of this. The pan works well when there is:

1. adequate slope,
2. a functional outlet or port for drainage, and
3. a place for the water to go.

When any of these elements is missing, molds will harbor in the standing water. *Figure 5* shows a condensate pan where a curious mix of molds was fostered. Note also the dead rat in the water, a condition also found elsewhere in this upscale hotel. The storm prompting this investigation



Figure 5: A condensate pan beneath an HVAC unit. Not only was a curious mix of molds being fostered, a dead rat was floating in the water. The condition was found in several other rooms of this upscale hotel.

did not produce these conditions; however, at the outset, the mold remediation was included in this damage claim.

Water, water everywhere...

Hurricanes are common in many coastal regions. High-rise, oceanfront hotels are routinely exposed to torrential rains and high winds. Ocean-facing doors let in water that saturates carpets and sometimes invades the floors below. Power outages are also common after a hurricane. Put all those factors together and perfect conditions for growing mold are present. Wet carpet left for several days in a hot, humid, dark setting is a known breeding ground for fungal colonies. Hotel owners know that the first order of business after a storm is to dry out the building. For good reason, then, drying



Figure 6: Severe accumulation of mold colonies, thriving on the paper facing of the gypsum drywall and kept wet by the low permeability of the vinyl-backed wall covering. The condition is unrelated to a single identifiable storm event.

contractors are among the first on the scene in hurricane-ravaged areas.

During the clean-up period, wall coverings may be peeled back. To the building owner's astonishment, the back surface of vinyl wall coverings is often covered with mold colonies. But most buildings don't need a hurricane to foster mold and mildew. Since moist air will condense on any building surface colder than the dewpoint, the wall covering may be the first such component. *Figure 6* illustrates severe accumulation of mold colonies thriving on the paper facing of the gypsum drywall and kept wet by the low permeability of the vinyl-backed wall covering. The condition is quite likely to occur near window openings, bathroom ventila-

tion devices, and HVAC chases. Accordingly, it is unrelated to a single identifiable storm event.

Topics Worth Pursuing

The risk and cost of exposure to mold remediation for an insurance company would appear to merit research considerations. Such topics would include:

- Does one-time saturation of wood-framed construction irreversibly compromise building elements? Do the fungal colonies that develop after flooding go dormant to a safe level so that radical demolition of a structure can be avoided?
- Which types of fungal colonies develop during episodic, short-term wetting versus long-term, pervasive moisture conditions? Will there ever be "bright line distinctions" among the molds associated with these two kinds of wetting?
- Can universally accepted levels of mold/mildew be determined? Who would be the authoritative body to develop such levels?
- Are the current methods used for eliminating mold/mildew capable of restoring an occupancy to a "safe" level once that threshold is determined?

In the Meantime...

While standards writing and research projects take form, there are things that can be done.

- Protocols for building condition surveys should be modified to include better investigation of fungal colonies and the conditions likely to generate them.
- Building maintenance practices should include examination of surfaces that develop condensation. This is of particular importance when such areas are obscure, dark, and when the air from these regions mixes with that of occupied areas.
- Owners should become familiar with their properties to recognize probable locations of fungal development. Crawlspace, attics, duct chases, and related regions should be examined for possible impact on indoor air quality. HEPA filters are fine, but they do not dry out a wet basement.
- Insurance carriers should better delineate coverage terms for mold and mildew occurrences. A major storm event usually prompts the most thorough building inspection ever performed. The owner's representative will undoubtedly investigate mold occurrences that favor his/her claim of damages. This myopic fixation has, on occasion, inflated insurance claims to obscene levels.

Johnny Carson once mentioned the smog in Los Angeles during a comedy routine. He repeated a health warning to "sensitive people," which he defined as "anyone with a pulse." More and more people appear to contract health disorders from airborne contaminants; this trend is not likely to subside anytime soon.

Meanwhile, building construction professionals may benefit from heightened understanding of the various molds at work and the environments necessary to culture them. In many instances, understanding these environments can help eliminate the molds themselves.

FOR MORE INFO ON MOLD ...

www.MoldUpdate.com

The National Association of Mutual Insurance Companies (NAMIC) recently launched a website that will disseminate information about mold.

MoldUpdate.com provides current news, education, scientific links, litigation updates, state legislation, and acts as a clearinghouse for insurance industry issues relating to mold. The site is non-partisan and not-for-profit.

"While there have been references to mold and mildew since ancient times, we wanted to offer a 21st Century clearinghouse for mold-related issues that might assist the industry," said Larry Forrester, NAMIC president. "NAMIC has noted the importance of education and information on this subject."

The mission of MoldUpdate.com is to provide the most current data for insurers as they research this matter. NAMIC plans to develop and assemble content that will assist the industry, general public, and news media on the subject of mold.

1. "Beware the Mold *Stachybotrys*," Health Story Page (from *CNN Interactive* news bulletin) posted November 5, 1997.
2. Peter Kuchinsky II and Glenn Schwartz, from "Ten Things You Should Know About Molds," *Moisture, Molds and Indoor Air Quality*, (published by Environmental Assessment Association, Alexandria, MN.) page 6.
3. R.L. Corbin, "Attic Ventilation: Why It's Necessary," *Interface*, August 2000, pp. 20-22.

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