



CERAMIC TILE INSTITUTE OF AMERICA, INC.

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CTIOA FIELD REPORT 2002-6-13

SUBJECT: BIOORGANIC GROWTH (MOLD) Cause, Effect, Cleanup/Removal and Prevention

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INTRODUCTION

What is bioorganic growth?

Bioorganic growth, also known as mold, is classified as fungi. There are thousands of different types of fungi. These types of growths are microscopic organisms containing enzymes, which are responsible for digesting and decomposing organic materials, and spores, which are responsible for reproduction.

Bioorganic growth plays a vital role in the cycle of life. It is responsible for breaking down organic materials and recycling them for future use by plants and animals. Unfortunately, there is a dark side to bioorganic growth. Although this type of growth is of great benefit to our environment, it poses a very real threat to human health under the right or wrong (depending on how it is perceived) conditions.

CONDITIONS THAT PROMOTE BIOORGANIC GROWTH

Where does bioorganic growth thrive?

Bioorganic growth may be found lying dormant almost anywhere, outdoors as well as indoors. Unless moisture is present, there is usually little problem. It is common to find bioorganic spores in homes growing on damp surfaces. All forms of bioorganic growth thrive where appropriate moisture

content, nutrients and temperature exist on materials such as timber, wood composites, insulation, gypsum wallboard, drywall, carpet, cloth and all types of food.

How does bioorganic growth spread?

Bioorganic growth reproduces and spreads through spores, single celled reproductive bodies, which are released into the air and land on moist organic materials. These spores then germinate and spread out in elaborate networks. Some factors that affect the growth rate include temperature, amount of moisture, and the type of organic material the spores land on.

How do humidity and temperature affect bioorganic growth?

Generally indoors, where elevated levels of moisture vapor in the air, also known as relative humidity, is present, materials, building or otherwise, may absorb the moisture setting the stage for bioorganic growth. If there are no cold condensing surfaces present and the percentage of relative humidity is held below 60 percent, there will not be enough moisture within the given material for bioorganic growth to begin. Should the relative humidity reach or surpass 70 percent for extended periods of time bioorganic growth is sure to begin. Poor moisture management in homes, hotels, and school buildings has been specifically linked to bioorganic growth.

Aside from requiring moisture, different types of bioorganic growth require minimum, optimum and maximum temperature ranges for growth. The ideal temperature range falls between 60 degrees Fahrenheit and 80 degrees Fahrenheit. This temperature range also happens to be the ideal temperature range for human comfort.

What are some common causes or sources of moisture related problems?

Some common causes or sources of moisture related problems include the following:

- Poor design or maintenance
- Floods
- Roof leaks
- Inadequate ventilation
- Plumbing i.e., leaky or broken pipes
- Poor drainage i.e., improperly sloped floors, plugged weep holes in drain collars.
- Cracks or holes in buildings

Another source of moisture related problems is the effect of temperature gradients, differences in temperature, particularly in areas where warm, moist air may come in contact with cool surfaces. Condensation may occur in these areas, which would create an ideal environment for bioorganic

growth to occur.

COMMONLY FOUND TYPES OF BIOORGANIC GROWTH

A few examples of the more common types of bioorganic growth found in residential homes are, Cladosporium, Penicilium, and Alternaria, which have been known to cause chronic sinus infection, respiratory infections and asthma. A potentially lethal form known as Stachybotrys atra has also been found, although not as commonly. Exposure to Stachybotrys atra can cause inflammation and injury to gastrointestinal and pulmonary tissues in children and adults. It has been linked to diseases such as pulmonary hemosiderosis (bleeding lung disease). Due to the adverse health effects caused by these forms of bioorganic growth, they are classified as toxic bioorganic growth or toxic mold.

HEALTH EFFECTS OF TOXIC BIOORGANIC GROWTH

What adverse health effects can be caused from exposure to toxic bioorganic growth?

It is important to stress that not all forms of bioorganic growth are toxic and pose a threat to human health. However, exposure to toxic bioorganic growth is not healthy for anyone inside buildings. Toxic bioorganic growth produces mycotoxins, which are the toxic compounds responsible for the adverse effects on human health. Mycotoxins tend to gather in spores and present a hazard when inhaled as the spores are dispersed into the air. Bioorganic growth can affect individuals in different ways.

Toxic bioorganic growth has been linked to the following adverse health conditions:

- Eye irritation including watering, redness, itching, burning, light sensitivity, blurred vision
- Wheezing, difficulty breathing
- Nasal and sinus congestion
- Dry hacking cough
- Sore throat
- Nose and throat irritation
- Shortness of breath
- Chronic fatigue
- Fever
- Diarrhea
- Lung Disease
- Central nervous system problems including constant headaches, memory loss and mood changes
- Immune suppression

Who is at greater risk for adverse health affects?

Slight exposure to toxic bioorganic growth can cause sensitive individuals to experience reactions such as headaches, runny noses, skin rashes, nausea, sinus problems, hacking coughs and memory loss. Even the healthiest individuals who are overexposed may experience slight adverse health reactions.

The following individuals are more susceptible to being severely, even fatally affected by exposure to toxic bioorganic growth:

- Infants and children
- Elderly
- Pregnant women
- Individuals with compromised immune systems
- Individuals with existing respiratory conditions such as asthma, allergies
- Individuals with multiple chemical sensitivity

Should toxic bioorganic growth become apparent in an environment where these

types of individuals may be present, thorough cleanup or removal of infected materials should be performed as cautiously as possible in order to reduce the chances of spreading mycotoxin-laden spores through the air and increasing the possibilities of experiencing adverse reactions.

CLEANING AND REMOVING TOXIC BIOORGANIC GROWTH

How can you determine which materials can be cleaned and which materials should be removed?

There are two important factors to consider when determining which materials can be cleaned and which materials should be removed:

- How porous (absorbent) the affected materials are
- How extensive the growth is

Usually, non-porous materials such as hard plastics, glass or metal and semi-porous materials such as plaster or concrete that are visibly affected, but structurally sound, can usually be cleaned and reused. Generally, strong disinfectants or biocides can be used to kill bioorganic growth and spores, eliminating their ability to reproduce. A common household product that may be used to accomplish this task is bleach diluted with water. Porous materials such as wood or wallboard showing extensive moisture absorption and bioorganic growth should usually be removed and discarded. As porous materials absorb and hold moisture, they may be internally affected and cannot be completely cleaned.

How should materials requiring removal be handled?

Removing toxic bioorganic growth can expose individuals to toxic bioorganic particles, spores and other hazards as well. Precautions need to be taken in order to keep those particles and spores well contained in addition to using the proper equipment. It is not recommended that the removal of toxic bioorganic growth in largely affected areas be performed by homeowners, as inexperience can lead to problems. Instead, hiring of an experienced professional contractor or mold removal expert with extensive knowledge of removing toxic bioorganic growth from homes and offices is recommended.

The most important consideration to keep in mind when dealing with cleanup or removal of any type of bioorganic growth is that this type of growth requires moisture in order to thrive. It is important to identify any moisture sources contributing to the problem. If the moisture sources are not dealt with and corrected, any cleanup or removal of bioorganic growth will most likely be only a short-term solution.

PREVENTION

How can bioorganic growth be prevented?

The best preventative measure that can be taken is maintaining a clean and dry environment. By maintaining a clean and dry environment, toxic bioorganic species cannot begin to grow.

As previously mentioned in the CONDITIONS THAT PROMOTE BIOORGANIC GROWTH section of this report, there are a wide variety of variables that may contribute to initiating bioorganic growth. Regular inspections of buildings and areas in which these problems may arise would allow for timely repairs to be made in order to correct the small problem before it has a chance to develop into a bigger problem.

In environments where constant moisture cannot be avoided such as cellars or basements, reducing the relative humidity with a dehumidifier can help prevent bioorganic growth. Installations consisting of semi-porous and porous materials such as natural stone, masonry materials, clay pavers or cementitious ceramic tile grout may be treated with sealers, which can increase resistance to moisture and contaminant absorption. For information regarding proper sealing and maintenance recommendations, individuals can refer to publications such as CTIOA/COF Report # 7- Surface Treatments for Tile and Stone Floors, by Bill Tran, or by contacting a reputable manufacturer of sealing and maintenance products for proper recommendations.

Preventative measures should also be taken into consideration well before occupants ever set foot in a residential or a commercial building. Proper measures should be taken into consideration during the construction phase of any building, residential or otherwise.

Some considerations to keep in mind would be:

- Proper waterproofing of on or below grade concrete slabs from the outside
- Proper sloping of floors that may be subjected to moisture to allow for proper drainage
- Ensuring weep holes in drain collars are kept clear of debris that may affect drainage
- Proper sealing of windows and doors
- Testing water lines to ensure leakage does not occur
- Use of the appropriate backing and waterproofing materials in areas subjected to moisture

These are just a few of the many considerations to keep in mind. For proper material

recommendations and specifications, individuals can refer to information sources such as local building codes or the Uniform Building Code, which sets building code standards as well as publications from sources like the Tile Council of America such as

ANSI A137.1, American National Standard Specifications for Ceramic Tile or

ANSI A108, American National Standard Specifications for Installation of Ceramic Tile or the most current edition of the Handbook for Ceramic Tile Installation, also published by the Tile Council of America.

Aside from local building inspectors who may be brought in to perform inspections, the CTIOA (Ceramic Tile Institute of America) may also be enlisted in order to perform job inspections. This will help ensure the proper codes are met, and the proper materials are being used throughout the construction phase.

SUMMARY

As bioorganic growth is a naturally occurring process, it cannot be avoided. Though this process is a true benefit to our environment, exposure to the wrong types of bioorganic growth can threaten human health. Bioorganic growth is definitely best suited for outdoors and we must do what we can to keep this type of growth in its proper place.

We would like to thank Rick Fox for his fine work in the CTC Program.