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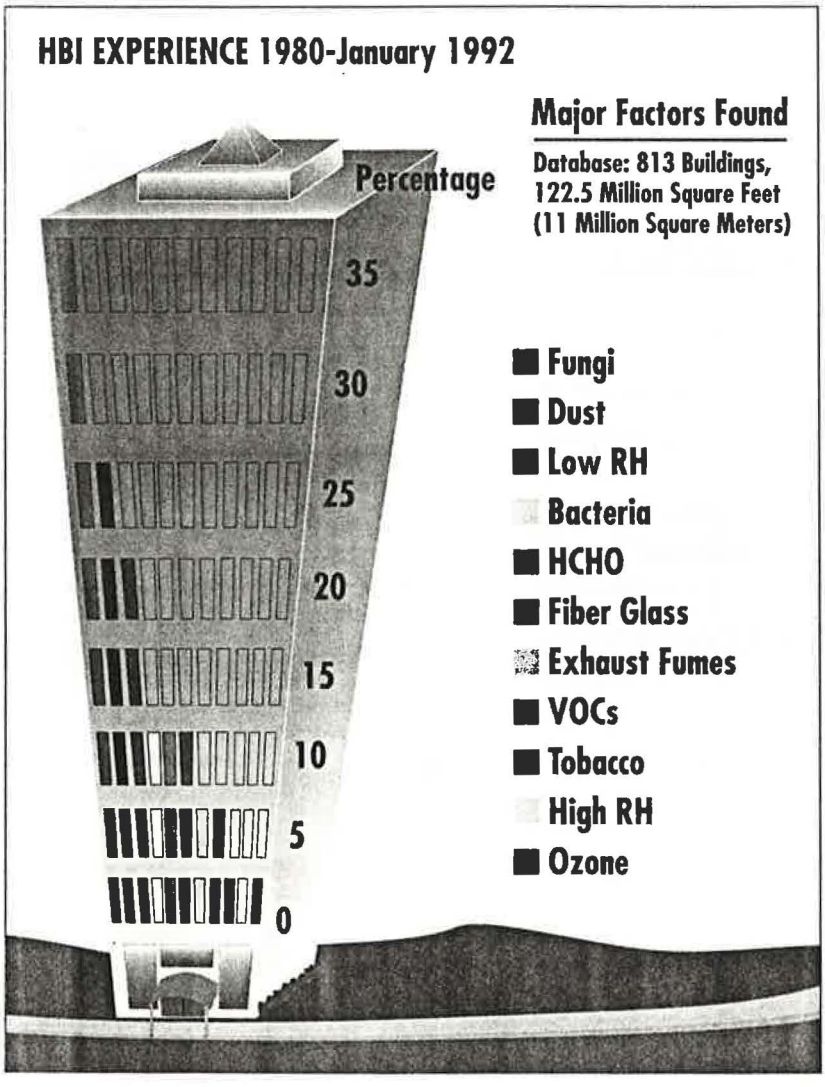
HEALTH & COMFORT

Controlling and Eradicating Fungal Growth

Sick building syndrome has been recognized in recent years as a true threat to the health and comfort of people who are living or working in buildings with indoor air quality problems. Building owners and managers, along with employers, know how sick building syndrome can detrimentally affect work schedules and profits through increased employee absenteeism and reduced worker productivity.

Sick building syndrome can seldom be attributed to only one cause or pollutant. It is usually a condition that includes a wide range of gases and vapors, fibers, dusts and bacteria, and fungi that work together to create serious indoor air problems. Other comfort conditions such as temperature, relative humidity, light and noise may also contribute to the problems. Many different kinds of fungi cause toxic and allergic reactions as well as infections in susceptible people exposed to them or their products. These allergens are often found in HVAC systems and their associated ducts, fan chambers and voids.

Fungi form a large group of organisms that feed on dead organic material and reproduce both sexually and asexually producing an abundance of spores that are easily carried on air currents that circulate throughout a building. Fungal organisms are found throughout our environment and colonize damp surfaces where moisture and nutrition are present. These organisms are very resistant and can be very difficult to eradicate from buildings once they are established.



From data based on skin reactivity studies, the four fungal genera that are the most prevalent in allergic respiratory disease are Cladosporium, Alternaria, Penicillium, and Aspergillus. From the results of hundreds of building studies performed throughout the world, HBI has found these four genera to be the most prevalent of fungi isolated in buildings. These fungi, along with high dust levels and low relative humidity are the most commonly encountered problems in buildings with sick building syndrome.

Classic sick building syndrome symptoms in office workers are mild, flu-like symptoms, eye, nose and throat irritation, headaches, sinusitis along with fatigue and irritability. People with asthma or allergies are often the most severely affected, and sometimes develop more severe involvement of the respiratory tract. Contact lens wearers also are usually the first to experience eye irritation that is associated with poor indoor air quality.

Fungi are one of a group of agents known as "biogenic," or derived from living organisms. When these agents become airborne, they are called "bioaerosols," and can create indoor air quality problems by causing infections, producing toxic reactions or stimulating allergic reactions in building occupants. Although a mild form of allergy is the most common reaction to fungi or their spores, they are capable of causing more serious effects in susceptible individuals under certain conditions.

Allergens and Allergic Reactions

Allergens may be any of the biogenic agents mentioned earlier, and they may also be a non-living substance that was derived from a living source. Common examples of these allergens are animal dander, dead insect and spider parts, house mite and cockroach feces, and remains of bacteria, fungi, molds, and their spores, and dried animal excretions. Certain chemicals commonly found in everyday products like some plastics, detergents, hair dyes and bleaches may also mimic antigens and produce reactions in sensitive individuals.

Allergens are any substances that can stimulate an antibody reaction and produce an allergic response in a sensitized person. Typically, an individual experiences an allergic reaction after the sec-

Keys to the Reduction of Fungi:

Maintain Proper Ventilation. Bringing in adequate volumes of outdoor air to allow the correct ventilation rate for a building will help to dilute any allergic substances in the circulating air. Ventilation can only be successful if this air is properly filtered.

Reduce Dust. Proper filtration of both the return and outside air will help to reduce the overall numbers of dust particles in the air. Essential to this is the proper specification of filters to provide adequate filtration and to remove the smaller respirable-sized particles.

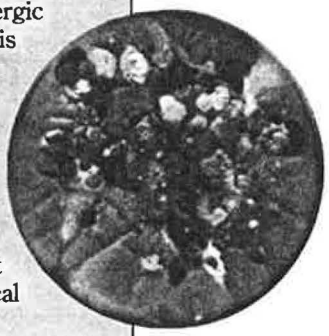
Maintain Proper Relative Humidity. Relative humidity should be controlled during both the heating and cooling seasons with year-round levels of at least 20 percent and less than 70 percent. The best method of humidification is steam from a water source free from chemical treatment additives.

Ensure Proper HVAC Maintenance. HVAC systems, by design, provide a breeding ground for fungi and other microbes that grow best in steady temperatures and darkness. If these systems are poorly maintained, dirt, dust and moisture aid in the multiplication and dissemination of these microbes. HVAC systems should be easily accessible for regularly scheduled inspection and cleaning. It is also essential that HVAC systems remain free from standing water in condensate pans and humidifier reservoirs to prevent or reduce the spread of bioaerosols throughout a building.

Ensure Proper Building Systems Operation. The operating methods of the building and its HVAC system should be monitored to ensure that specified procedures for the particular equipment are being followed.

Choose Products Wisely. Where possible, the use of biocide-containing building materials is recommended as an effective way to control microbial growth. Similarly, where the use of disinfectants, pesticides and cleaning materials is necessary, use "environmentally friendly" products.

Adopt Proactive Monitoring. A proactive monitoring program should be implemented to ensure that the building systems are operating properly and are free from microbial contamination.



Fungi, at left, are very resistant and can be very difficult to eradicate from buildings once they are established.

ond contact with a specific allergen. The allergic reaction is the response to the contact between the allergen and the body's immune system and can vary in severity from eye watering and running nose to severe allergic reactions involving the bronchi and lungs that can result in complications leading to severe illness or death. Examples of severe allergic reactions include hypersensitivity pneumonitis and humidifier fever.

Compounding Factors

Increased levels of airborne dust and low relative humidity levels play an important role in elevating allergic reactions in the indoor environment. Low moisture levels in the workplace can cause mucus membranes of the eyes, nose, mouth and throat to dry out and become less efficient in disposing of dust particles that carry allergenic substances. These dry membranes are "sitting targets" for allergic attacks and eye irritation.

Airborne Dusts. One of the most common allergenic sources in homes and other buildings is dust. The composition of the dust will depend on the nature of the surroundings and the types of activities being carried out. "House dust" contains many of the allergenic substances listed above and although "office dust" is less likely to contain such items as animal dander, it may contain other materials associated with office activities, such as paper dust. The cellulose in paper products may cause problems in two ways since it may be an allergy-producing agent in its own right, being biogenic, and also because the cellulose it contains provides nutrition for bacteria and fungi.

Relative Humidity. The control of relative humidity in the modern office is an important and often overlooked factor. If the level is too low—that is, less than 20 percent—the building occupants will experience discomfort from drying of the eyes, nose, mouth and throat, with the possibility of an allergic attack, as well as the unpleasant "shocks" that occur as built-up static electricity discharges on contact with other people or metal objects. Computer equipment is also sensitive to the increased static electricity which develops in low humidities. However, low relative humidity levels decrease the multiplication of fungi and molds. The optimum humidity range for fungal and mold growth is relative humidity above 70 percent.

Thus, in the winter months when heating is required in temperate and cool climates, it is important to provide some artificial humidification to keep the relative humidity levels within the range of 25 to 45 percent. At other times, and in warmer climates, it may be necessary to dehumidify the circulation air in order to keep the relative humidity levels from rising above 70 percent. This is necessary to prevent excessive condensation on cooler surfaces providing the moisture which allows bacteria, fungi, molds and mites to proliferate.

Prevention

Microbes, including fungi, are found everywhere and can be spread to unwanted areas in a multitude of ways. People carry and disseminate millions of these fungi everywhere they go, resulting in these allergens being carried in the air circulating through the HVAC systems in buildings. These fungi will also enter a building with the outside air which must be brought in to provide adequate ventilation. It is therefore essential that an ongoing operation is practiced in every building which will prevent conditions from developing that are favorable for microbial growth and dissemination.