MICROBES - INTRODUCTION

Microorganisms are part of our everyday lives and environments. In indoor environments, microbes are found on all environmental surfaces, in the air and in water associated with normal and catastrophic situations. The outbreak of Legionnaires Disease and the more complex indoor issues of today [Sick Building Syndrome (SBS) and Building Related Illness (BRI)] have put microbiologists and microbiological sciences in the headlines and on the line to help deal with the complex and difficult to control variables and problems associated with these issues. Technically, BRI is defined as the clinical
manifestation of occupant exposure to excessive airborne pollutants in a building. The arrays of symptoms include headaches, burning eyes, fatigue, dizziness, flu-like symptoms or upper respiratory complaints.

Although many different things can cause these symptoms, microorganisms are being implicated as primary and contributory factors more and more frequently. The buildings in which these organisms
are found are not simple environments. They are very complex in that a building undergoes constant change through its "life" cycle. Microbial contamination, in a varied but inevitable way, will occur at different stages of this life cycle and be manifested in many ways. The building can be thought of as a
biosphere. Within this biosphere, the organisms are in a constant flux. Nutrient and humidity changes and alteration of life – limiting (toxic) surfaces allow microbes to adjust and often adapt to the changing
conditions in their environment. A full range of microorganisms including bacteria, fungi, viruses, rickettsia, and algae are associated with buildings and their inhabitants. Each group of organisms has its
own niche and each fills a natural role in the microcosms of a building. No clear methods exist for retrieval, identification or linkage of microbes found in buildings to many of the human symptoms that are presented.

Microbes are not as simple as the whole intact organisms we test, but in fact, their somatic parts, reproductive parts and metobolites all are implicated as causative or potential human or building antagonists. Microorganisms are the only pollutant source that presents all forms of pollutants:
particulates, gases and infectious biologicals. They are particularly potent in that they can
amplify and cause the full breadth of discomfort, irritation, sensitization, toxic reaction and disease that we associate with indoor environmental quality.

ORIGINS OF MICROORGANISMS

The microorganisms represented in a building are complex. Every element of a building, its furnishing and the people within offers homes for microorganisms. Microorganisms need moisture, nutrients, and
more than 95% of them need to be associated with a surface. Moisture can come from catastrophic and
normal events – a leaky roof, a sweaty pipe, a leaky radiator, condensation on windows, condensation on more subtle surfaces where dew points are reached, humidified air from the HVAC system or any of hundreds of other sources. **A hotel or resort facility compounds the problem with the moisture from pools, spas, individual air conditioners and literally hundreds of bathrooms. This coupled with the**
wall to wall carpets, draperies, wall coverings, furniture, bedding and ceiling tiles, creates ideal
habitats for microorganisms. All of these types of surfaces and factors are found in the full array of buildings from offices to hospitals to schools to homes. Nutrients utilized by microorganisms can
be organic material, inorganic material and/or living tissue. For example, bacteria play an
important role as part of the body's microflora, and, along with skin, are shed continuously. Given acceptable growth conditions, they can multiply from one organism to more than one billion in just 18
hours. Although a building may be infested during construction and catastrophic events (particularly with fungi), more typically the organisms are routinely brought into the building by its occupants or air infiltration routes. Fungi – typically outdoor organisms known as mold, mildew, and yeasts – enter the
building on clothing, are wafted in through the open doors or are pulled in as "make up" air by the HVAC system. Bacteria follow these same routes, but are usually limited to the human carrier and very wet areas such as drain pans or other areas with constant or standing water. The HVAC systems, chases, and elevator
shafts efficiently transport airborne microorganisms throughout the building. One good growth source for a particular organism can quickly result in outbreaks in every part of a building. Also, with the almost universal use of air conditioning, recycling indoor air to improve energy efficiencies takes place. Yet,
that recycling tends to concentrate indoor air pollutants – including microorganisms and their annoying irritating, sensitizing, and toxic by –products.

TRADITIONAL SOLUTIONS

Ever since microorganisms were recognized as a major cause of problems in building, management has struggled against such organisms in an effort to provide a clean, pleasant and safe environment. There has
been an unending array of products, cleaners, chemicals, devices, strategies and methods available to combat microbial problems from mildew to pathogenic bacteria.

Housekeeping Procedures:

Housekeeping professionals regularly scrutinize building spaces and remove any visible growth. Detergent/sanitizer products are effective short term tools against visible mold and mildew, but some areas require harsh bleach or mildew removers. When musty odors develop, cleaning personnel frequently use perfumes and fragrances to mask or disguise the problem (and the often offensive odors of the sanitizers). These often create more of a problem than they solve. Engineering Procedures: Most tactics in this category include selection, operation, modification and maintenance of HVAC systems to permit "better" temperature and humidity control and better filtration. This does nothing to prevent microbial infestation, but it does occasionally reduce the rate of growth of mildew. The air handling/engineering specialists have worked with filtration and extraction of pollutants but have generally concentrated on dilution. The initial modern attempt was ASHRAE's (The American Society of Heating, Refrigeration and Air Conditioning Engineers) Standard 62-1981 in which a ventilation rate of 5 cubic feet of air per minute per person (cfm/person) was called out. Since this significantly diluted the amount of pollutants in the air, immediate human health benefits were realized. Unfortunately, since the pollutant sources were not being dealt with, the health problems frequently returned. The "answer" was ASHRAE 62-1989. This moved the Standard in a range of 15 cfm/person to 20 cfm/person in general office spaces. The latter also assumes a maximum occupancy of seven persons per 1000 square feet. Continuing problems in our modern buildings show that this dilution strategy does not fully address the real problems of Indoor Environmental Quality. The burdens of energy costs associated with such strategies make such actions of questionable value.

Industrial Hygiene Procedures:
Most industrial hygienists, schooled in chemistry, testing, and toxicology and reinforced by the public's "chemo phobia," have minimized the importance of added fresh air and have concentrated on identifying and removing and/or containing sources of pollutants and routes of pollutant transmission. This focus
has created an army of consultants and a lucrative new testing industry. Unfortunately, most authorities concede that a specific cause can be identified in less than twenty percent of so-called sick buildings. This means that no substance was identified that exceeded the PEL's or TLV's for compounds at the time of
the testing. Most industrial hygienists are not trained in microbiology and, in the absence of any standard methods, there is little that they can do in developing more than very general recommendations about microbial problems.

Additional Procedures: As buildings age, the normal routines of clean up and masking become less effective. Mold and mildew readily adapt to conventional sanitizers and biocides and many develop immunity. Also, we see clearly that certain species of fungi will find the engineered humidity and temperatures to their liking and will begin to grow in population. Recognize that, as we adjust our indoor environments for the comfort of the occupants, we also make it an ideal habitat for a great variety of microorganisms. When this happens, major corrective actions are required. These include exterior wall sealing with breathable water repellent coatings, replacement of materials of construction, replacement of furnishings such as carpeting and other soft goods, and upgrading components of the HVAC system.

A PROVEN SOLUTION
In 1969, researchers at Dow Corning Corporation discovered a unique way to attach biocide agents permanently and directly to a wide variety of surfaces. This extraordinary technology permits the continuous, durable activity against mildew that is required to prevent infestation. Also, because the material acts against microorganisms only on contact, rather than on being absorbed, the organisms
are not able to develop immunity against it. For the very first time, Dow Corning's new technology made it possible to actually control the growth and development of mildew and other microorganisms on any treated surface –even after repeated cleanings and extended use. This unique technology, now ÆGIS
Antimicrobial, has been widely used and is well reported on for its long-term effectiveness in the
control of microbial contamination in indoor environments. Case histories and peer reviewed
publications show how this material, as part of a total IEQ program, provides relief and protection from indoor microbial problems.