A GROWING EPIDEMIC

"Part II: "Sick Building Syndrome" (SBS) — The Causes

The causes of "Sick Building Syndrome" and "Building Related Illness" are endless. From dust to gases to microorganisms, the number of pollutants is infinite. Fortunately, there are three basic categories that we categorize the many pollutants that are a big part of our everyday lives.

The problems of SBS are serious and cause an economic impact on all people involved in the buildings marketplace. The billions of dollars of direct and indirect damage caused by indoor pollutants affect every surface, manufacturing process, piece of operating equipment, and person in a building. Asbestos, radon, lead, formaldehyde, and Legionnaire's Disease are only a few of the press-event pollutants that are present in our homes, offices, hospitals, hotels, schools and other buildings. These pollutants at high levels cause obvious and immediate effects. At low levels, symptoms start out small and gradually get worse. Human health problems range from simple irritations to deadly diseases, like cancers.

Indoor pollutants can be thought of in a rather simple way. They consist of particulates, gases, and biologicals. The diversity of each of these is great. The reality of an occupied and useful building is that these pollutants will always be present at some level. Much like weeds, many pollutants are normal until their levels or locations make them undesirable.

Particulates consist of a great variety of materials that vary in size from sub-micron to grains of sand. This matter which is transferred through the air is often small enough to be inhaled deep into the lungs, yet large enough to remain lodged once they enter. The nose, throat, and lungs filter out particles that are 1.5 microns in size (a micron is one-millionth of a meter), while particles smaller than 0.1 micron are usually exhaled. Therefore, the particles with the greatest concern are 0.1 to 1.5 microns. Asbestos, paint chips containing lead, disease-causing dust, or a fungus that stimulates an allergic response can be a serious problem. Even insecticides or rodent control treatments can cause short-term (acute) or long-term (chronic) health problems to occupants of building facilities. These join the list of second-hand smoke, industrial process source pollutants, and irritating dirt and dust from the outdoors and generated indoors by human activity, as serious health impacting indoor pollutants.

Gases are generally referred to as volatile organic compounds (VOC's) and include a wide variety of solvents, formaldehyde, and many other manmade and natural materials. They also include carbon dioxide, oxygen, nitrogen, ammonia, metallic oxides such as nitrous oxides and sulfur oxides. Ozone from machinery and formaldehyde from building materials have been recognized as "major health impacting indoor pollutants" long before today's concerns about indoor pollution came about. Formaldehyde is the most common of all VOC's. Six billion pounds are produced in the United States each year and globally this is still a major component of adhesives and insulation materials. Health effects of formaldehyde and other VOC's mimic that of a cold. If the exposure is prolonged, the health

effects generally get worse until the individual experiences such problems as chemical sensitivity, potential for an asthma attack, and other chronic health problems. Typically, indoor concentrations are 2 to 5 times higher indoors with some up to one hundred times higher.

Various insects, mites, ticks, protozoans, bacteria, and fungi are what make up the biological category. This group also includes particulates and gases as well. Biologicals interact so dramatically, directly, and destructively with buildings and their inhabitants that they have earned the right to be called the most potent of all pollutants. Even more significant, is the fact that the biologicals can be tied to all of the human responses that we associate with SBS. This is not true of the other pollutants. Non-biological pollutants, such as particulates or gases can stimulate specific human symptoms but not all of them. Besides the bacterial, fungal(mold, mildew, and yeast), and viral disease causing organisms, there are a number of these organisms that cause allergic response in sensitive individuals. Legionella bacteria, lung disease causing bacteria, E. coli, Salmonella species, and the typical skin bacteria such as Staphylococcus and Pseudomonas are all part of the biologicals found in buildings. Each of these organisms has specific life styles and habitats in buildings and are the reasons for the growing concern of occupants in today's buildings marketplace.

Particulates, gases, and biologicals represent the classes of pollutants that negatively affect people and materials in buildings. These groups are complex and are present in all areas throughout a building. The most potent of these pollutants are of course the biologicals. Knowing as much as we can about these classes, arms us with the knowledge necessary as we determine where these pollutants are and how they can be dealt with. This will be explored in the next article in this series.

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