

'Sick Building Syndrome': A Diagnosis in Search of a Disease

By Dr. Ronald E. Gots

Ten years ago, in 1988, I spoke at an international meeting of indoor-air specialists. There were 200 attendees. Six years later, when I spoke at a similar meeting held by the same organization, 10,000 people attended. Does this explosive increase in interest reflect an increase in our understanding of a new disorder, as has occurred in AIDS research? I would argue that this exponential increase in interest is related less to an increase in understanding than to the misperception, mischaracterization, and exaggeration of a problem. Suggestive of this is the gold rush of entrepreneurialism devoted to indoor air "solutions." Duct cleaners, makers of air-cleaning devices and vacuum cleaners, and purveyors to physicians and industrial hygienists of air testing, mold cleaning, carpet analysis, and newly formulated paints—all have brought their particular expertise to this burgeoning marketplace.

Bananas

Most remarkable is that this chaotic industry, with its motley army of providers, is an industry in search of a problem that occurs only rarely. But all too often, the awareness of a "problem," coupled with a legion of "problem solvers," is enough to trigger complaints about indoor air. A February 1997 incident at National Airport in Washington, DC, illustrates the degree of our fear of indoor environmental dangers. When someone reported smelling a "noxious gas" in a terminal, evacuation was ordered. Hundreds of people fell ill. A hazardous-materials crew in protective suits combed the building and found the culprit—bananas rotting in a trash can.

Such occurrences are not unusual; odors and fears are common causes of health-related indoor-air complaints. In 1992 air-quality consultants forced immediate evacuation of a Florida courthouse, proclaiming that the mold therein placed occupants at risk of cancer. The 1989 construction of the building had cost \$11 million; its renovation, overseen by the same consultants, cost \$9.5 million. In legal actions, pre-renovation occupants of the courthouse have alleged that they were injured. The building had indeed contained mold. All buildings in South Florida contain mold. But the mold in the courthouse had not been an unusual or immediate danger to employees. Such irresponsible misuse of "expertise" could cost hundreds of millions of dollars in inappropriate expenditures.

In 1992 several dozen employees of the U.S. Environmental Protection Agency (EPA) claimed that their building had made them sick. They forced the closing of the building and the relocation of their headquarters. Yet no tests have confirmed their alleged illnesses, much less a building-related cause. In the legal action that ensued, it was found that most of the litigant employees had symptoms of mental or emotional origin.

Fitting Problems to Solutions

How did this widespread state of high anxiety over indoor air develop? It may have begun with the death of 29 members of the American Legion who attended a 1976 convention at the Bellevue Stratford Hotel in Philadelphia. Mysteriously, 182 of the conventioners contracted a form of pneumonia that was later called

"Legionnaires' disease." Eventually the disease was traced to a bacterium (*Legionella pneumophila*) in the hotel's air-conditioning system. Whenever the system was on, it spewed bacteria through the building's air vents. In this case, both the identity of the culprit and the identity of the disease became clear-cut. At the time of the 1976 American Legion convention, the Bellevue Stratford Hotel was indeed hazardous.

When people die from contaminated indoor air, as did 29 of the American Legion conventioners, the clinical end point is unequivocal: death. But most health phenomena associated with indoor air are far less well defined. They center on nonspecific health problems, such as headaches, tiredness, difficulty in concentrating, and dryness of the eyes and mouth. Hundreds of conditions—ranging from hay fever and other run-of-the-mill allergies to everyday stress, personality traits, and even job dissatisfaction—can cause the nonspecific health problems associated with indoor air. The number of potential factors can be daunting. Limiting one's attention only to those potential factors that are airborne can be expedient—and profitable.

Perhaps no industry better exemplifies the adage "If all you have is a hammer, everything looks like a nail" than does the indoor-air industry. Purveyors of indoor-air "solutions" invariably ascribe problems to things they can "solve." Viewed together, two studies published in peer-reviewed journals illustrate how investigators can reach very different conclusions about similar problems. In one study, occupational-medicine specialists correlated workers' complaints and chemicals in indoor air. The researchers concluded that lighting and volatile organic compounds were responsible for the workers' complaints. In the other study, psychologists considered a comparable group and concluded that the workers' complaints depended not on the quality of the indoor air but on the degree of job satisfaction. Thus, what questions are asked and which variables are considered can determine whether bad air or a stressful occupation is deemed the culprit.

Some scientists claiming that indoor-air problems pose a serious public-health risk have used flawed survey techniques in attempts to increase the plausibility of their claims. For example, in a nationwide telephone survey conducted in 1987, 24 percent of the 600 office workers interviewed said that there were air-quality problems in their offices, and 10 percent said that such problems interfered with their productivity. The researcher extrapolated these figures to the nation, suggesting that 800,000 to 1,200,000 commercial buildings in the United States were breeding grounds for "sick building syndrome." The researcher further suggested that 30-70 million occupants were affected.

This leap from workers' opinions to epidemic threat is indefensible. Yet the telephone survey is what underlies the assertion that there are multitudinous "sick buildings"—and this assertion has been cited widely and has been accepted not only by indoor-air specialists but also by federal and state agencies. Indeed, it has been the impetus for the making of major and expensive regulatory policies.

What Is Sick Building Syndrome?

In the scientific literature, health conditions associated with buildings are commonly categorized as: (a) building-related diseases, (b) tight building syndrome or sick building syndrome, and (c) building-associated symptoms. The expressions "tight building syndrome," "sick building syndrome," and "building-associated symptoms" may soon be replaced by a new term, however: "building-related occupant complaint syndrome," or "BROCS."

The category "building-related diseases" comprises disorders due to specific, identifiable contaminants of indoor air. As noted above, a specific bacterium causes Legionnaires' disease. Certain other organisms that live in heating and air-conditioning systems—fungi, for example—can cause various disorders, ranging from mild, hayfever-like allergies to asthma and hypersensitivity pneumonia. Building ventilation systems can also spread cold and flu viruses; thus, even the common cold can be a building-related disease. But to categorize a disorder correctly as a building-related disease, one must have clear and convincing evidence that something in the building caused the disorder. And, preferably, one should identify the agent. Generally, building-related diseases have clear-cut clinical end points: influenza, lab-test-confirmed asthma, or death, for example. In contrast, the expressions "sick building syndrome" and "tight building syndrome" have been applied to situations in which workers reported many and varied symptoms. The sheer range of potential causes of the alleged symptoms renders both expressions misleadingly narrow.

These expressions were not in use in the 1960s. It has been argued, perhaps rightly, that the energy-efficient buildings constructed in the U.S. after the early 1970s substantially decrease the migration to the outdoors of contaminants—and thus increase their indoor accumulation. But while it is clearly true that modern buildings are more airtight than their predecessors, it is not clear whether today's indoor air is worse than pre-1970 indoor air. In 1965, for example, there were vastly more smokers in the U.S. than there are today. Then, office-building conference rooms were filled with smoke—containing hundreds of irritant chemicals—from cigarettes and cigars. Today, in contrast, chemicals present in parts per billion of indoor air—chemicals unseen and often unsmelled—are the focus of intense concern.

Because "sick building syndrome" (SBS) is associated with nonspecific symptoms and is identified on the basis of subjective responses to questions, it is difficult to determine whether air contaminants are more causative than psychological factors, or vice versa. Moreover, as reports of "indoor air problems" multiply, reporting biases will intensify. There have been few attempts to vary indoor air covertly and then to question occupants about symptoms—and these attempts have yielded mixed findings.

The prevalence of reports of "sick building syndrome" does not in itself establish that poor air quality is the cause. SBS could, for example, be due to a high outdoor pollen count, viruses responsible for the common cold, or workforce discontent. Moreover, the symptoms associated with SBS—because they are nonspecific and typically differ from person to person—do not establish that the cause of SBS is building-related.

Reasons for the Confusion over SBS

Several factors are major contributors to the confusion regarding SBS:

- * Indoor-air issues are addressed by many disciplines, including medicine, public health, industrial hygiene, toxicology, engineering, architecture, and building-products manufacturing. Thus, expertise is diluted, the "explanations" and "solutions" offered are dissimilar, and no one is in charge of monitoring the SBS phenomenon.

- * There is more fear than data concerning the health effects of indoor-air contaminants. Beliefs outpace data. Fear of invisible dangers tends to grow even if confirmatory data is lacking or the fear has been refuted (as by measurements of contaminants).

* More things can be measured than can be explained. Our ability to detect biological and chemical contaminants has increased tremendously over the last 50 years. But to those who expect a problem, the mere detection of a contaminant—even at unequivocally innocuous levels—can suggest danger.

* The symptoms that bring indoor air to the attention of building managers are generally common and nonspecific: fatigue, headaches, and eye and nose irritation. Because almost anything can cause these symptoms, they are not tip-offs of SBS. And patients' belief that a particular building is the culprit can impede medical investigation.

The answer to SBS lies in mindful, deliberate medical practice, including thorough physical examinations.

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