

A time-series study of sick building syndrome: chronic, biotoxin-associated illness from exposure to water-damaged buildings

Shoemaker RC, House DE

Abstract

The human health risk for chronic illnesses involving multiple body systems following inhalation exposure to the indoor environments of water-damaged buildings (WDBs) has remained poorly characterized and the subject of intense controversy. The current study assessed the hypothesis that exposure to the indoor environments of WDBs with visible microbial colonization was associated with illness. The study used a cross-sectional design with assessments at five time points, and the interventions of cholestyramine (CSM) therapy, exposure avoidance following therapy, and reexposure to the buildings after illness resolution. The methodological approach included oral administration of questionnaires, medical examinations, laboratory analyses, pulmonary function testing, and measurements of visual function. Of the 21 study volunteers, 19 completed assessment at each of the five time points. Data at Time Point 1 indicated multiple symptoms involving at least four organ systems in all study participants, a restrictive respiratory condition in four participants, and abnormally low visual contrast sensitivity (VCS) in 18 participants. Serum leptin levels were abnormally high and alpha melanocyte stimulating hormone (MSH) levels were abnormally low. Assessments at Time Point 2, following 2 weeks of CSM therapy, indicated a highly significant improvement in health status. Improvement was maintained at Time Point 3, which followed exposure avoidance without therapy. Reexposure to the WDBs resulted in illness reacquisition in all participants within 1 to 7 days. Following another round of CSM therapy, assessments at Time Point 5 indicated a highly significant improvement in health status. The group-mean number of symptoms decreased from 14.9 ± 0.8 S.E.M. at Time Point 1 to 1.2 ± 0.3 S.E.M., and the VCS deficit of approximately 50% at Time Point 1 was fully resolved. Leptin and MSH levels showed statistically significant improvement. The results indicated that CSM was an effective therapeutic agent, that VCS was a sensitive and specific indicator of neurologic function, and that illness involved systemic and hypothalamic processes. Although the results supported the general hypothesis that illness was associated with exposure to the WDBs, this conclusion was tempered by several study limitations. Exposure to specific agents was not demonstrated, study participants were not randomly selected, and double-blinding procedures were not used. Additional human and animal studies are needed to confirm this conclusion, investigate the role of complex mixtures of bacteria, fungi, mycotoxins, endotoxins, and antigens in illness causation, and characterize modes of action. Such data will improve the assessment of human health risk from chronic exposure to WDBs.

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