State of the Art: Bioaerosol Sampling

The Role of Fungal Mycotoxins in Determining the Safety of Building Occupants

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Fungal research over the last several years has focused on the mycotoxins found in certain fungi. These chemicals, which include ochratoxin A, the most potent natural carcinogen known, are contained inside the complete fungal spore and have been shown through laboratory testing to be released when the hyphae of the spore is disturbed and broken into fragments of less than 1.0 micron in diameter. While the consequences of exposure to mycotoxins in buildings with poor IAQ are essentially unexplored, there is a substantial body of case studies and some laboratory evidence collected since the 1980s which suggest that these toxins may contribute to reported complaints such as headaches, eye and throat irritation, nausea, dizziness, nose bleeds, and both physical and mental fatigue in subjects occupying such interiors. A smaller yet equally important set of studies conducted since 2000 show that the symptoms produced by various trichothecene mycotoxins include effects on almost every major system of the vertebrate body, including a wide range of gastrointestinal, dermatological, and neurologic symptoms. The CDC includes the following statement on its website: "Systemic symptoms (of trichothecene mycotoxins) can develop with all routes of exposure and might include weakness, ataxia, hypotension, coagulopathy, and death".

Recent studies have found that 1) mycotoxins are present in over 43% of all fungal material on surfaces; 2) airborne mycotoxins are present any time a toxigenic mold is growing in a building; 3) whenever airborne mycotoxins are present, a toxigenic mold is identified on building materials; 4) hyphal fragments contain far more mycotoxin than complete fungal spores. To date, however, there are no data describing what airborne concentrations of these toxins are necessary to affect human health, and normal background levels of such toxins have yet to be determined. In addition, researchers have found that airborne spore counts, which are the primary means of air quality assessment used by the majority of indoor environmental professionals (IEP) do not adequately represent the amount of mycotoxin-containing fungal fragments that are present in the air at any time. While a lab should always provide spore counts and hyphal fragments counted in a spore trap analysis, the hyphal fragments are easily overlooked by the person interpreting the results and most IEPs do not comment on them in their analysis. If the property owner did not engage an IEP, the popular home test kits are even less likely to provide important information about hyphal fragments.

Researchers at Texas Tech University's Health Sciences Center recommend that air sampling in environments where toxigenic fungi have been identified includes a means of collecting data on particulate of less than 1.0 micron followed by a specific and sensitive test for mycotoxins. The latter is cost prohibitive to most property owners, especially in the state of North Carolina, where the allowable insurance reimbursement for a mold claim is only $5000. Therefore, the most cost effective means of assessing for the risk of airborne mycotoxins is to follow the advice of researchers at Texas Tech, who recommend that sample collection include technology that allows exclusion of particles larger than 1.0 micron. In addition, the researchers stated "digital particle counters and analyzers would also be ideal for characterizing and enumerating the collected particles".

ESG's air sampling methodology has resulted in the collection over 40,000 airborne particle readings in the past five years. A chart of particle readings along with lab findings and data interpretation of both sets of information is includde with every client report.

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