THE OHIO STATE UNIVERSITY

Environmental Science Graduate Program Student Seminar Series

Understanding associations between microbial growth and MVOC emissions in the indoor environment

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Abstract

In the indoor environment, microbial activity due to increased moisture may be associated with asthma and allergic disease. Microorganisms grow in building materials such as carpet dust and drywall at elevated relative humidity (RH) conditions (>80% RH). As they grow, these microbes may release microbial volatile organic compounds (MVOCs) into the surrounding indoor environment. However, it is unknown how microbial growth and MVOC emissions vary in building materials under different RH conditions. The goal of this study is to characterize microbial contributions to indoor chemistry under various relative humidity conditions and in different building materials. Dust was collected from San Francisco, CA, Columbus, OH and Gainesville, FL, and embedded into unused nylon carpet. Samples of painted drywall were inoculated in homes in San Francisco, CA and Columbus, OH for 4 weeks. These samples then were incubated at either 50%, 65%, 70%, 75%, 80%, 85% or 95% RH for 2 – 4 weeks depending on the experiment. A proton transfer reaction time-of-flight mass spectrometer (PTR-ToF-MS) was used to measure VOCs at 1s time resolution. Results indicated that location origin of the sample (CA, OH, FL) was most indicative of determining species composition (R^2 = 0.21, p=0.001). Samples of San Francisco dust embedded in carpet incubated at either 50%, 65%, 70%, 75%, 80%, 85% or 95% RH for 4 weeks, were found to cluster into three distinct groups of similar fungal communities, Low (50%-70% RH), Medium (75%-85% RH) and High (95% RH)(R^2=0.25, p=0.001). *Aspergillus sydowii*, *Penicillium chrysogenum* and *Penicillium gladioli* were more associated with the High RH conditions than Low or Medium conditions, respectively. MVOC emissions also separated into Low, Medium and High RH categories (R^2=0.16, p=0.0013), with possible microbial associated compounds, furan, acetic acid hydrate, and dihydroactinidiolide associated with the High RH condition. Further work may reveal relationships between MVOCs and taxonomic identification.

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