Exposure and risk in indoor environment: VOCs analysis from unexpected microbiological sources

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In recent years, many studies were focused on volatile organic contaminants (VOCs) originating from biological sources and their relation to the air quality inside indoor environments, like archives, libraries, museums, schools, offices, etc.. In these climate controlled environments, particular fungal species are able grow, producing several volatile organic compounds that are suspended in the air or adsorbed on dust particles. The assessment of their nature is needed for a proper analysis of the indoor air quality, in order to understand the potential risk for the human health of workers and visitors and to propose fast remediation to avoid "sick building syndrome" phenomena.

A rapid tool to understand fungal contamination in indoor environments could be air sampling followed by gas chromatography-mass spectrometry (GC-MS) analysis. For the broad speciation of unknown trace of VOCs we tested evacuated stainless steel canisters to sample the indoor air within a few seconds.

The composition of the indoor air in a Ca' Foscari University Library, furnished with the innovative closed metal cabinets called Compactus® and affected by an active mold infection was analyzed with the aim of detecting a specific chemical fingerprints of fungi. Six canisters were adopted in different areas of the deposit to collect VOCs and subsequent analyzed by GC-MS. Moreover, laboratory experiments were development to collect VOC productions directly from the dominant fungal species isolated from the library by previous sampling and identified by morphological and molecular analysis (*Eurotium halophilicum, E. chevalieri, Aspergillus penicillioides, A. creber, Penicillium chrysogenum, P. brevicompactum* and *Cladosporium cladosporioides*). All the samples were monitored for 1 month by weekly analysis of the emitted VOCs. For all the analysis, microscale purge & trap Entech 7100 was adopted as sampling and pre-concentration system directly connected with corresponding sampling devices (canisters and culture bottles) and GC-MS. Several volatile organic compounds, both known (*i.e.* 1,4-pentadiene and 2-butanone) and unknown emerging substances, that were detected by the direct analysis of indoor air were also found in the emissions of the dominant fungal species isolated from aerobiological sampling. The results suggest a close relationship between the fungal infections and the poor indoor air quality.

Session: F – Identification and prioritization of emerging contaminants. Emerging contaminants of urban origin: sources, sampling, analytical issues and remediation techniques.

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