Application of Organic Impurity Profiling to Seized MDMA Samples Using GCMS with Hydrogen Carrier Gas

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Since the emergence of impurity profiling, several studies have been performed involving synthesis of MDMA and subsequent analysis for the identification of organic impurities present. However, in most of these studies, adulterants, fillers, and other substances found in real-world samples were not considered. Studies have also been performed on MDMA tablets seized in Europe, although those results varied and could not be expected to accurately predict what might be found in American samples. To date, not many studies have been performed on MDMA samples seized in America, and information from seized tablets may vary.

This study provides information on real-world MDMA tablets seized in the Philadelphia area, using an optimized liquid-liquid extraction (LLE) procedure paired with qualitative gas chromatography/ mass spectrometry (GC/MS) analysis using hydrogen carrier gas. The instrumental method was optimized to overcome sensitivity issues expected from using hydrogen carrier gas and, along with NIST's ADMIS deconvolution software, was capable of detecting trace-level impurities. When available, reference standards of expected impurities were analyzed to confirm identities of impurities present; otherwise, presumptive identities were determined based on comparison to available known spectra in public MS databases. In some cases, GC/MS results detected multiple impurities allowing inferences to be made about the starting materials or synthesis pathways of the real-world tablets.

This project will show attendees several synthesis pathways used for the manufacture of illicit MDMA, as well as educating attendees on the strengths and weaknesses of the use of hydrogen as a carrier gas and AMDIS deconvolution software, specifically as they apply to the detection of trace-level MDMA impurities. Finally, attendees will see GC/MS data from expected impurities associated with specific origins and synthesis pathways and for impurities detected in real-world MDMA tablets.