A144 Detection of Illicit Drugs by Linear Ion Trap LC/MS/MS

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After attending this presentation, attendees will learn how linear-ion-trap liquid chromatography mass spectrometry (LCMS/MS) can be applied for the analysis of commonly encountered drugs of abuse. This presentation will highlight advantages and limitations of ion-trap detection of illicit drugs over traditional single quadrupole LC/MS and GC/MS techniques.

This presentation will impact the forensic science community by demonstrating how ion-trap LCMS/MS can be effectively applied for screening multi-unit submissions of evidence for the presence of controlled substances utilizing full-scan and tandem mass spectrometry (MS/MS).

Analysis of seized drug evidence consists of a series of presumptive and confirmatory tests. Traditional presumptive tests include color, microcrystal, thin-layer-chromatography (TLC), GC, and/or high performance liquid chromatography (HPLC). Typically, mass spectral identification is required for confirmation of controlled substances in many forensic laboratories. The majority of cases encountered by forensic chemists are easily analyzed utilizing these traditional methodologies. However, with a continuing demand for faster, more efficient methodologies, the introduction of newer analytical instrumentation into the classical workflow is essential.

Advances in electrospray ionization (ESI) mass spectrometry have led to the increased popularity of direct analysis of drugs with minimal or no sample preparation allowing for faster analysis time. Additional advances in separation science have recently been attributed by the ion trap technology. For simple matrices, time-consuming chromatographic separations may not be required as multiple reaction monitoring (MRM) transitions can provide molecular confirmation. The purpose of this work has been to develop a method for rapid detection of drugs (target or unknown) utilizing a linear-ion-trap that will provide valid and reproducible data while maintaining cost-effectiveness.

In an effort to reduce case backlog and maintain quick analysis time, a non-chromatographic qualitative screening method was developed using ThermoFinnigian LXQ linear-ion-trap LCMS/MS. Analytes of interest were infused directly into the mass spectrometer using autosampler injections via a zero-dead-volume union. The mobile phase consisted of 50%/50% of (A) 0.1% formic acid in water, and (B) 0.1% formic acid in acetonitrile, delivered at 0.400mL/min. Mass spectral acquisition of data was performed with multiple scanning events using collision-induced-dissociation (CID) for full-scan and data-dependent auto MS/MS. Positive ionization mode was employed.

Applications presented will include the analysis of illicitly made tablets containing 3,4-methylenedioxymethamphetamine (3,4 MDMA), benzylpiperazine (BZP), caffeine, and trifluoromethylphenylpiperazine (TFMPP) as well as pharmaceutical tablets containing oxycodone, hydrocodone, and codeine. In addition, the analysis of commonly encountered benzodiazepines such diazepam, alprazolam, and clonazepam will be discussed. Preliminary results revealed sufficient MS resolving power for qualitative screening of analytes in multi-component mixtures without the need for chromatographic separation. The sensitivity of the linear-ion-trap LCMS/MS has been demonstrated in the nanogram range allowing for the detection of active ingredients in tablets containing less than one percent of the analyte of interest. For monoisotopic compounds such as methamphetamine and phentermine, detection utilizing chromatographic separation is required. The data showed that the linear-ion trap LCMS/MS can be used in compliment with GC/MS or LC/MS to provide principal means of identification. This approach, along with other limitations and challenges of different types of analyses, will also
be discussed.

Linear-Ion-Trap, Seized Drugs, Mass Spectrometry

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