B29 Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS) Detection of Cocaine in Packaging Residue

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After attending this presentation, attendees will understand the potential for LC/MS/MS to be used as a fast and accurate method to detect the presence of cocaine from very small amounts of adulterated powder residue.

This presentation will impact the forensic science community by illustrating the ability of LC/MS/MS to be used in forensic investigations as a fast and reliable method to analyze powder samples that may contain illicit drugs, such as cocaine.

In modern forensics investigations, common evidence of drug possession comes in the form of powder residue from packaging materials. Previous research has shown LC/MS/MS can be used to detect and quantify trace amounts of methamphetamine from packaging residue. This study proposes that Liquid Chromatography coupled with TOF Mass Spectrometry can also be used to detect minute amounts of cocaine within powder residue. Common drug packaging materials, such as zip-lock bags, may only have very small amounts of residue on them, and the drug itself may be impure. Powdered street drugs like cocaine are almost invariably mixed with adulterants, which reduce the amount of drug present in the powder residue and could make drug detection more difficult. The primary objective of this study was to determine lower Limits of Detection (LOD) and lower Limits of Quantitation (LOQ) for cocaine from bag residue when cut with different adulterants.

In order to test the efficacy of this method, cocaine hydrochloride powder was cut with nine commonly used adulterants, creating samples with cocaine amounts ranging from 0.1% to 4% by mass. One gram of each sample was loaded into a 1in-square zip-lock bag, then emptied, leaving behind approximately 10mg of residue. The bags were rinsed out with 1mL 18MΩ nanopure water, which was then diluted 100-fold and mixed with an internal standard of 10ppm D3-cocaine. Each sample was run using an Agilent® 1100 series binary pump liquid chromatograph coupled to a Bruker® Compact quadropole Time-Of-Flight (qTOF) mass spectrometer. Analysis was performed using Bruker® QuantAnalysis 2.2, and results were compiled in Microsoft® Excel®.

To unambiguously confirm the presence of cocaine, MS/MS was used to obtain fragmentation mass spectra of all ions with the *m/z* of cocaine and D3-cocaine, which were matched with literature fragmentation mass spectra of cocaine and D3-cocaine. LOD and LOQ were obtained for each of the nine adulterants tested. Calibration curves were created for each adulterant by correlating the cocaine: internal standard ratios with the percentage of cocaine in the samples. LOD ranged from 0.11% to 0.65% by mass, while LOQ ranged from 0.37% to 2.16% by mass.

This study explored the ability of LC/MS/MS to detect cocaine from packaging residue. Cocaine could be detected down to a purity as low as 0.11% by mass, from residue amounts averaging 10mg. Most real-world cocaine samples contain a far purer drug than the obtained LOD values, qualifying this method as a sufficiently sensitive cocaine detection tool. Adulterant properties such as water solubility and affinity for the inside of the bags appeared to influence the sensitivity of this method, but all LOD values were below 1%.

Trace Drug Detection, Cocaine, LC/MS/MS

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