A158 Identification of an Impurity in Methamphetamine Synthesized Via Reductive Amination

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After attending this presentation, attendees will better understand the importance of classifying methamphetamine based on synthetic route and one specific way in which that task is accomplished. Classifying methamphetamine based on synthetic route provides valuable intelligence concerning current manufacturing trends, which in turn leads to the effective monitoring of precursor and essential chemicals. Even in high-purity products, trace amounts of such route-specific impurities remain. Since manufacturing methods are ever-changing, it is imperative to keep abreast of these key “marker” impurities by isolating and identifying them, and determining their significance in any given sample.

This presentation will impact the forensic science community by making synthetic route identification of methamphetamine a little easier, therefore enhancing the communitys ability to track synthesis trends and movement of the drug.

In this study, one previously unidentified impurity was targeted for isolation and structural elucidation because of its presence in roughly 26% of seized methamphetamine samples produced via reductive amination that were analyzed at the DEA Special Testing and Research Laboratory in the past year. The samples were seized from various locations throughout the United States and port of entry locations at the Mexican border. A majority of the methamphetamine seized in the United States has been smuggled from Mexico where it is synthesized using one of two common reductive amination methods: the Mercury-Amalgam method and the Leuckart method. Both methods use phenyl-2-propanone (P2P) as the precursor, but subsequently use different essential chemicals. Very few reliable impurities have been identified that are specific to the Mercury-Amalgam (also known as the “Biker Method”) versus the Leuckart methods, making classification difficult. The targeted impurity in this study is theorized to be synthesized by the Leuckart method.

Isolation and elucidation were carried out using a methamphetamine hydrochloride exhibit that contained approximately 1% of the target impurity. The sample was extracted in a phosphate buffer designed to remove most of the methamphetamine from the impurity. Preparative high performance liquid chromatography was then performed on the extract to isolate the target compound from the remaining methamphetamine and any other minor impurities still present. Once completely isolated, carbon and proton nuclear magnetic resonance spectroscopy were performed to elucidate the structure of the impurity. With the structure known, the mechanism of its formation can be identified, and its value as a route-specific marker compound established.

In regards to the forensic community, this study will improve the classification of the synthetic route used to manufacture the methamphetamine, ultimately aiding the intelligence community with the monitoring of methamphetamine manufacturing trends as well as the trafficking of the drug and its precursors. The identification of another potential route-specific marker adds an additional distinguishing factor between exhibits. Since methamphetamine is completely synthetic, the place of manufacture cannot be determined by simply looking at the chemical analysis of the exhibit. Instead, methamphetamine exhibits are analyzed, classified by synthesis route, and then compared to one another by looking at several characteristics identified during analysis, especially impurities left behind from synthesis. The results of these comparisons are used to update methamphetamine manufacturing trends which in turn support the intelligence and law enforcement communities with the monitoring of precursors and essential chemicals.

Methamphetamine, Synthesis, Impurity