



B22 A Comparison of Portable Infrared (IR) Spectrometers and the Narcotic Identification Kit (NIK) Field Test for the On-Scene Analysis of Cocaine Hydrochloride (HCl)

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After attending this presentation, attendees will understand the benefits and limitations of both portable IR spectrometry and the NIK field tests for the on-scene analysis of cocaine HCl.

This presentation will impact the forensic science and law enforcement community by determining whether portable IR spectrometers or NIK field tests are more advantageous for the analysis of cocaine HCl at crime scenes.

The majority of inmates across the United States are incarcerated for drug-related offenses. It is important that the technology used to test for controlled substances is accurate and reliable. For on-scene presumptive testing, the NIK test is most often utilized to test for the presence of a controlled substance. The NIK tests use colorimetric reactions, which rely on a specific moiety of the drug molecule to react with the provided reagents to produce characteristic color changes. In the NIK test used to detect and identify cocaine, there are three chemical ampoules within a plastic pouch closed with a safety clip. To test a substance, a loading device is used to deliver the correct amount of sample to the pouch. A positive result for cocaine is indicated by blue or pink with blue speckles after the reaction in the first ampoule, pink after the reaction in the second ampoule, and a pink top layer with a blue bottom layer after the reaction in the third ampoule. Recently, it has been discovered that there have been numerous cases where false positive NIK tests at the scene were later disproven via confirmatory lab testing. As a result, there have been hundreds of wrongful convictions.¹ This has resulted in press coverage condemning the NIK tests, followed by significant public outrage. In addition, as of July 2017, the Houston, TX, police department has stopped using these tests at the scene, eliminating all on-scene drug testing. The possible dangerous exposure of officers to potentially lethal drugs such as fentanyl was also cited as a reason for stopping on-scene drug testing; however, this abandonment of on scene presumptive drug testing could be premature given the availability of portable IR spectrometers that can be used to provide accurate and reliable identifications at the scene, with minimal risk of exposure to law-enforcement personnel when appropriate levels of personal protective equipment are employed.¹ IR spectroscopy measures the absorption of IR radiation, specifically the vibrations of the bonds between atoms, to determine the structure of a molecule. This research compares the use of portable IR technology with NIK tests to determine which method is better suited for the on-scene analysis of illicit drugs, specifically cocaine HCl.

This research assessed important performance characteristics for each method, including a short- and long-term cost analysis, whether the method is destructive or non-destructive, the ease of use, knowledge and skill required of the operator, speed of analysis, limit of detection, susceptibility to false positives and false negatives, and the effect of common diluents on the ability to identify cocaine. The experimental determination of the limit of detection and the effect of common diluents on the recognition of cocaine HCl used common chemical diluents (e.g., lidocaine, mannitol, and caffeine) as well as common household diluents (e.g., artificial sweetener and baby formula). A positive result for cocaine HCl with the NIK test was indicated by the appropriate color changes and was documented with photographs. A positive result with the portable IR spectrometer was a “hit” for cocaine using the library search function for the instrument. Manual spectral analysis was conducted as well to identify any instrument false positive and false negative results that could be due to the search algorithm used for library matching. Replicates of each analysis were conducted to ensure reproducible results.

This research concluded that although portable IR spectrometers require a large initial financial investment, their high-performance characteristics (e.g., ease of use, rapid analysis, non-destructive, acceptable limit of detection, minimal false positives and negatives) makes them a more superior tool than the NIK tests for the on-scene presumptive analysis of cocaine HCl.

Reference(s):

1. Gabrielson, R. (2017, July 14). Houston Police End Use of Drug Tests That Helped Produce Wrongful Convictions. Retrieved from https://www.propublica.org/article/houston-police-end-drug-tests-that-helped-produce-wrongful-convictions?utm_campaign=bt_twitter&utm_source=twitter&utm_medium=social.

Infrared Spectroscopy, Controlled Substance, NIK Tests