

Case Report

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General Advantages and Disadvantages of the NIK Narcotic Test



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Abstract

The NIK Narcotic test is a commercially available colorimetric test kit that is used in law enforcement and in the correction system. Not many validation studies are available in the literature. Therefore, the test has been questioned by various authors who demonstrated that the NIK tests produce false positives. The NIK test was studied in our laboratories and we determined that there are several advantages and disadvantages of the test. Positive aspects include ease of use and the quick turnaround time for the results. Negative points include the high probability of using the incorrect sample size and the subjective nature of color changes that are interpreted by the operator.

Keywords : NIK test; Marquis Reagent; Modified Scott Test; Marijuana; False Positives; Cocaine; Methamphetamine

Introduction

Law enforcement and correctional officers use colorimetric spot tests to make a quick on site presumptive identification when a potential drug is seized from a suspect. Modern instrumental methods for drugs [1-3] of abuse have yet to replace wet chemical colorimetric assays for rapid lab and field screening of suspected material. Instrumental techniques can be time intensive and costly, requiring technical expertise in addition to being location-bound. Alternatively, simple colorimetric assays (i.e. "spot tests") offer speed, simplicity of operation, portability, and affordability [4-6]. The stability and versatility of these spot tests enable lab scientists to "triage" samples for additional drug analysis, as well as providing quick answers to law enforcement officers or crime scene analysts in the field. A number of spot tests, e.g. Marquis, Duquenois-Levine, and Scott, utilize an array of reagents with various handling requirements [7,8] These tests often use caustic reagents, such as strong acids or bases. While demonstrating impressive analytical power, these spot tests are often characteristic for a class of compounds relying on the reactivity of a specific chemical functional group [6].

The NIK test is commercially available from the Safariland Group but not many validation studies exist [3]. It is one of type of colorimetric tests that is sold as a presumptive color tests [8,9] for the identification of marijuana, cocaine, opiates and amphetamine compounds like methamphetamine, Ecstasy, GHB, and Rohypnol. The tests are contained in a sealed pouch with ampules that are filled with chemicals that react or not react with the analytes. The ampules are broken consecutively form

left to right with intermittent shaking from ampule to ampule. Some of the abused narcotics get tested with a cascade of tests referred to as poly testing that narrow down the analyte, and some tests are standalone tests. For example, in order to detect cocaine, if Test A (Marquis test) does not change color, then Test G (Modified Scott test) is performed and turns into a biphasic system with the top layer pink and the bottom layer blue. A standalone test that detects marijuana and hashish is Test E which is also a biphasic system (Duquenois-Levine test) with two different colors, purple on bottom and a light lavender color on top. The tests can be performed with solid analytes, but liquids must be dried on a paper before it can be tested.

Conclusion

Based on our testing procedures and results, we found positive and negative aspects of the various NIK tests. The chemical reactions are based on established chemistry and have solid literature precedence by the Department of Justice and the United Nations Drug Control Program [4-7]. The test can be performed quickly on the scene with very little sample on the milligram scale. Some tests like Scott test have been modified to reduce false negatives and positives [8]. Not much scientific expertise is needed to conduct these tests, and the cascade procedure narrows down the analyte identification for increased specificity. Overall the tests worked well with pure substances (99% purity obtained from commercial supplier) and caffeine and sugar, which are often used as cutting agents, [2-10] did not lead to false positives. On the other hand, the

color reactions that are used in the NIK tests have been used for a long time and seem outdated as newer colorimetric sensors have been published [5-11]. Some analytes are liquids and need to be dried on paper and the testing takes longer and can lead to a false negative if the user is not using the procedure correctly. Also, color is subjective and two different people could interpret tests differently due to different vision capabilities [6]. While the sample size for one test is 1-2 milligrams, if the entire cascade is tested sample size is a limiting factor. Based on our interviews with Local Law enforcement in Nebraska, local police only uses one test and not all of them because it takes too long to go through all of them. A conversation with the Nebraska State Crime lab said that they receive samples that tested positive or negative with the NIK test but could not get confirmed by GC/MS in the lab. Also, some pouches did not have instructions and the training CD needed to be consulted. Thus, the user needs to receive adequate training before using the NIK tests.

The NIK tests also fail if too much sample is used and some harmless substances, like sugar, sometimes give a faint yellow color with the first test (Test A) which may lead down the wrong path on the poly testing chart. Test E for marijuana and hashish turned purple with natural substances like Patchouli, Cypress and Eucalyptus oils but the purple color was not extracted in the bottom layer with the addition of the last vial as is the case with marihuana and hashish. The oils are highly concentrated in THC like substances. However, when the leaves were used instead of oils which are a more realistic scenario for hashish and marijuana, the tests were negative. Finally, no Material Data Safety Sheets were provided with the NIK tests and could not be found easily online except for through a convoluted science hub. Once found, the MSDS of the NIK tests showed that many of the tests have toxic chemicals. Thus, MSDS are critical for a person who tests with the NIK tests in case of poisonous exposure. Finally, one Nebraska State Trooper explained that the NIK test will probably disappear in Nebraska due to the fact that many modern street drugs like fentanyl [12,13] are mixed with opioids, and therefore the NIK test is not usable. In conclusion, the NIK tests are a quick, easy to use, presumptive colorimetric test that can detect many different abused narcotics. The NIK test has several advantages and disadvantages which must be taken into consideration when used in law enforcement or corrections.

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