B32 A Study of Microcrystal Tests for Emerging Psychoactive Substances

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After attending this presentation, attendees will be able to evaluate the role of microcrystal tests in the detection and identification of emerging psychoactive substances.

This presentation will impact the forensic science community by providing a renewed look at microcrystal tests as quick, simple, and effective steps in a drug identification process. This presentation describes the application and chemistry of traditional microcrystal test reagents for the identification of the new classes of psychoactive substances.

Microcrystal tests have held a place in drug identification schemes because they have features of both presumptive tests and confirmatory tests.[1] They are rapid, simple, and specific and can be used to discriminate between closely related analogs and isomers. The Scientific Working Group for the Analysis of Seized Drugs (SWGDRUG) classifies microcrystal tests as a Category B technique, recognizing they have a greater discriminatory potential than other presumptive tests. Crystals with characteristic shape, habit, and optical activity are formed when the drug is mixed with a precipitating reagent to form specific drug-reagent complexes.[2] Microcrystal tests are not without their limitations. Factors such as concentration, drying time, and adulterants can cause distortion in the crystal shape and habit. The best tests are reliable, quick, and produce recognizable crystals reproducibly with a given drug, like the ones for cocaine and amphetamine. The American Society for Testing and Materials (ASTM) guidelines for cocaine and amphetamine identification have been used by many laboratories to identify these drugs in drug exhibits.

The rise in highly sophisticated instrumental techniques has caused a decline in the use and growth in the area of microcrystal testing; however, because of the advantages described above, it is worth evaluating their performance characteristics with emerging drugs. A quick survey of SWGDRUG monographs reveals that several of the new classes of drugs do not have microcrystal tests described for them. Recently, Elie at al. described the crystals for selected drugs using mercuric chloride as a reagent.[3] The study describes the benzylpiperazine test, mephedrone test, and crystals of potential interferences such as caffeine. The study demonstrates that microcrystal tests can be used to analyze new psychoactive substances with traditional reagents.

This presentation evaluates well-established reagents and their reactions with compounds representing five classes of emerging psychoactive substances: piperazines, phenethylamines, tryptamines, aminoindanes, and cathinones. Each psychoactive substance is thoroughly studied with reagents such as gold and platinum bromides, gold and platinum chlorides, mercuric chloride, and iodide. The presentation discusses the behavior of each analyte with specific reagents under different conditions as well as the selectivity, repeatability, and reproducibility of each test.

Overall, the reagents with gold and platinum showed consistent drug-reagent crystals. Some structurally similar compounds that gave the same crystal shape and habit can be differentiated by the dichroism observed under cross-polars. Different crystal characteristics were observed for the salt and freebase forms of compounds.

This study will help analysts determine if the microcrystal tests can be adopted in their current analytical scheme to complement the instrumental techniques.

Reference(s):

1. Elie M.P., Elie L.E., Microcrystalline Tests in Forensic Drug Analysis, R.A. Meyers (Ed) *Encyclopedia of Analytical Chemistry*, John Wiley & Sons Ltd., Larkspur, USA, 2009.
2. Fulton C.C., *Modern Microcrystal Tests for Drugs: the Identification of Organic Compounds by Microcrystalloscopic Chemistry*, John Wiley Sons, Inc., New York, 1969.
3. Elie L.E., Baron M., Croxton R., Elie M., Microcrystalline identification of selected designer drugs, *Forensic Sci Int.* 2012; 214(1-3):182-8.

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