B17 Microcrystalline Tests for Emerging Drugs of Abuse

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After attending this presentation, attendees will be able to describe the steps used to develop and validate new microcrystalline tests. Attendees will be informed of the development of a database of microcrystalline tests for emerging drugs.

This presentation will impact the forensic science community by providing a detailed study of microcrystals observed for an array of emerging drugs of abuse. This presentation discusses performance characteristics of the tests, such as precision and selectivity. The forensic science community will be able to assess the tests for practical applicability.

Forensic laboratories have used microcrystalline tests both as preliminary and confirmatory tests when presented with unknown substances. A microcrystal representative of the substance being studied results from the formation of a temporary complex between the precipitating reagent and the substance. The crystal shape, habit, and optical activity are often used as parameters to identify the substance. Tests for cocaine, heroin, and amphetamines are very well documented. The tests are simple and rapid, requiring minimal sample manipulation. Creating an ideal environment for reproducible crystal growth has its challenges. Factors such as pH, concentration, humidity, and interfering compounds can all play a role in determining the quality of crystal growth. When these factors are studied and described, microcrystalline tests can be very valuable as screening tests and, with expertise, serve as confirmatory tests.

Recently, numerous substances with psychoactive properties have emerged as drugs of abuse. Despite the advantages discussed for microcrystalline tests, they have not been studied extensively for these substances. A recent compendium of microcrystals for various drugs and pharmaceutical substances describes tests for piperazines and crystal growth in mixtures.[1] More such studies are needed to understand the behavior of other emerging drugs with traditional microcrystalline test reagents.

This presentation describes a systematic evaluation of microcrystalline tests for 32 emerging drugs of abuse categorized into the following classes: cathinones, phenethylamines, opioids, piperazines, and others. A previous presentation discussed the feasibility of the study and demonstrated crystal formation for some compounds.[2] This follow-up presentation is an expanded study and discusses the performance characteristics of the individual tests. Each substance was studied with seven reagents to determine tests that provide reliable crystal formation. Effects of pH, concentration, temperature, and interferences on the crystal habit are presented. Mixtures of closely related substances affect the crystal formation in a concentration-dependent manner. Understanding crystal deformations in mixtures of two or more compounds is useful when heterogeneous samples are presented. All of this information is used to create a database of microcrystals for several emerging drugs of abuse.

Reference(s):

1. McCrone Research Institute. *A Modern Compendium of Microcrystal Tests for Illicit-Drugs and Diverted Pharmaceuticals.* 2015.

2. Brady S, Joshi M. A Study of Microcrystal Tests for Emerging Psychoactive Substances. *Proceedings of the American Academy of Forensic Sciences*, 68th Annual Scientific Meeting, Las Vegas, NV. 2016.

Microcrystalline Tests, Psychoactive Substances, Emerging Drugs