

Implementation of Microcrystal Testing at the BCA

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Microcrystal Tests to Reduce Turnaround Time in the Drug Section

The Issue

As of mid-2017, the average turnaround time (TAT) for the BCA Drug Chemistry Section is over 6 months and the number of backlogged cases is over 2500. As is true throughout forensic labs in the U.S., the BCA FSS is experiencing the highest volume of submissions we have ever seen. BCA FSS recognizes the importance of returning the TATs to an acceptable level and has identified a new testing scheme with the goal to provide efficient and useful laboratory results.

Background on Microcrystal Testing

Microcrystal (MC) tests provide a fast and inexpensive alternative to instrumental methods to indicate the presence of controlled substances. The result is the formation of highly specific crystals associated with a controlled substance when viewed using a polarized light microscope with appropriate filters. Three MC tests (cocaine, methamphetamine, and heroin) were validated by the BCA Drug Chemistry Section. The validation supported the combined use of microcrystal tests, visual observations, and color/spot tests to provide a strong indication of the presence of a controlled substance.

SUMMARY OF ACTIONS TAKEN

January 2016 – BCA Lab Management met with representatives from Hennepin County prosecutors, defense, and the bench to present the results of the MC Testing validation conducted at the BCA and the proposed procedure as a potential answer to that jurisdiction's large caseload. Microcrystal testing was initiated for Hennepin County cases that qualified in late March of 2016.

September 2016 – Hennepin County microcrystal cases were being reported within a few weeks of submission. Cases that didn't qualify for MC testing were reported in approximately 30 days and there is currently no backlog for Hennepin County cases.

February 2017 – Representatives from BCA met with prosecutors, defense, law enforcement officers, and judges in Dakota County and St. Louis County to propose the institution of MC testing. To date, a handful of MC cases have been tested in these counties and more are sought.

July 2017 – Representatives from BCA met with prosecutors, defense, and law enforcement officers in Carlton County to propose the institution of MC testing. Work is set to begin MC testing on all suitable candidate cases.

BCA Drug Section Microcrystal Testing Procedure

Implement MC testing for candidate cases suspected of containing methamphetamine, cocaine, and heroin (excluding trace amount, liquids, pharmaceuticals, and tar form of suspected heroin).

BCA Drug Section Microcrystal Test Reports

- A weight and uncertainty will be reported for each item/sub-item tested up to the maximum charging limit.
- Positive results will be reported as "indicates the presence of x", where x is methamphetamine, cocaine, or heroin; positive results must have been observed for all of the spot/color tests and one microcrystal test for each item/sub-item to be reported in this manner (NOTE: Because of the presumptive nature of the test and the lack of a structural elucidation technique, the term "indicates" is being used in the report.).
- Negative results will automatically be tested by GC-MS for confirmation. GC-MS testing will either confirm the absence of controlled substances or detect substances that were below the sensitivity level of the MC testing procedure.
- If the case proceeds to trial, we request at least 4 weeks notification to perform the GC-MS confirmation testing.

BCA Drug Section Microcrystal Testing Statistics as of July 31, 2017

1,622 MC tests have been performed

- 42 of those were MC negative (2.6%) but 40 of 42 went on to confirm the presence of a controlled substance by GC-MS
- 204 of the 1622 tests performed (13%) were returned for confirmation testing. All contained the controlled substance reported by MC testing (i.e. there were no false positives).

70% of BCA submissions can be tested with MC testing

8 MC cases can be worked in the time it takes to do 1 GC-MS test.

Bottom Line: You can get a report with a weight (plus uncertainty measurement) and a result that is accurate and reliable (but not confirmatory) for your earliest hearings instead of waiting to set the case for trial.

For more information about Microcrystal Testing please contact Glenn Langenburg at the BCA-FSS (651) 793-2967

Microcrystal Testing FAQ Sheet

Why is microcrystal testing beneficial to my case/my client?

Because of the high number of submissions of drug evidence to the BCA FSS, turn-around times are extremely long for drug testing. This results in numerous hearings with the defendant, opposing attorneys, court appearances, etc. while waiting for the BCA FSS to weigh and test the suspected drug. Microcrystal (MC) testing has been demonstrated to be an extremely fast, accurate, and reliable process, allowing attorneys to have a BCA FSS report with the weight of the substance and MC test results for early hearings. This allows attorneys to make more informed decisions earlier in the process.

What if we go to trial?

The BCA FSS will request to be notified that a jury trial date has been set. We require a minimum notice of approximately 4 weeks. We will perform standard GC-MS testing and issue a confirmation report for use at trial.

What if a microcrystal test is negative?

Due to the higher sensitivity of the GC-MS, microcrystal-tested evidence that produced a negative result will proceed *directly* to GC-MS testing for confirmation (i.e. the case will not go back into the backlog queue). We will not issue a report until the absence of a controlled substance is confirmed by GC-MS testing.

How accurate is microcrystal testing?

Internal validation of the MC testing process utilized by the BCA FSS supports the use of this highly accurate test on forensic evidence. Additionally, the BCA FSS has not discovered a false positive result to date using the MC testing due to the design of the MC testing approach currently in use. Confirmation testing has been requested for approximately 12% of cases with MC results and each of these tests confirmed the originally reported controlled substance from the MC test.

Why is microcrystal testing so much faster?

We estimate that a scientist can complete approximately 8 MC cases in the time it takes to do 1 GC-MS case. This is because:

- The MC testing process is very lean and streamlined.
- The MC testing process is limited to cases that are good candidates for the test and readily lend themselves to the process. Complex controlled substances, testing matrices (e.g. pharmaceutical tablets, liquids, edible food, etc.), and preparation techniques are avoided.
- The MC testing process does not include instrumental techniques that require additional quality control steps (e.g. performance checks, blanks, and reference materials) and generate a significant amount of data for multiple analysts to review.

Is microcrystal testing a new technique?

No, these techniques have been used for over a 100 years. In the 1940's through 1970's, these tests were confirmatory for the presence of controlled substances in crime labs in the United States. When GC-MS instrumentation became cheaper, smaller, and accessible, laboratories favored instrumentation over MC tests. MC tests lack a testing component that gives a measurement or data regarding the molecular structure of the compound (i.e. it lacks a "structural elucidation" component). Primarily for this reason, the microscopic tests fell out of favor. Furthermore, the Scientific Working Group for the Analysis of Seized Drugs (SWGDRUG) requires more than a microcrystal test to "identify" (confirm) the presence of a controlled substance.

Why aren't more laboratories using microcrystal testing?

Likely simply due to what appears to be a cultural stigma associated with the use of testing that lacks instrumental analysis. However, when properly conducted by a trained and qualified analyst, MC tests are fast, cheap, accurate, reliable, and very specific to the target drug and we anticipate the use of MC testing to increase as laboratories across the country experience record submissions. MC testing is currently used in a handful of laboratories in California to report a controlled substance. Other labs that use these tests do so in addition to instrumental testing.

Where can I go to get more information about microcrystal testing?

The McCrone Research Institute in Chicago, IL (a world-renowned center for microscopy) was recently awarded funding by the National Institute of Justice to conduct comprehensive testing of MC methods. The results are available at:

<https://www.mcri.org/v/777/Modern-Compendium-of-Microcrystal-Tests-for-Illicit-Drugs-and-Diverted-Pharmaceuticals>

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