Microcrystal Testing – The Impact on the Drug Chemistry Section Backlog

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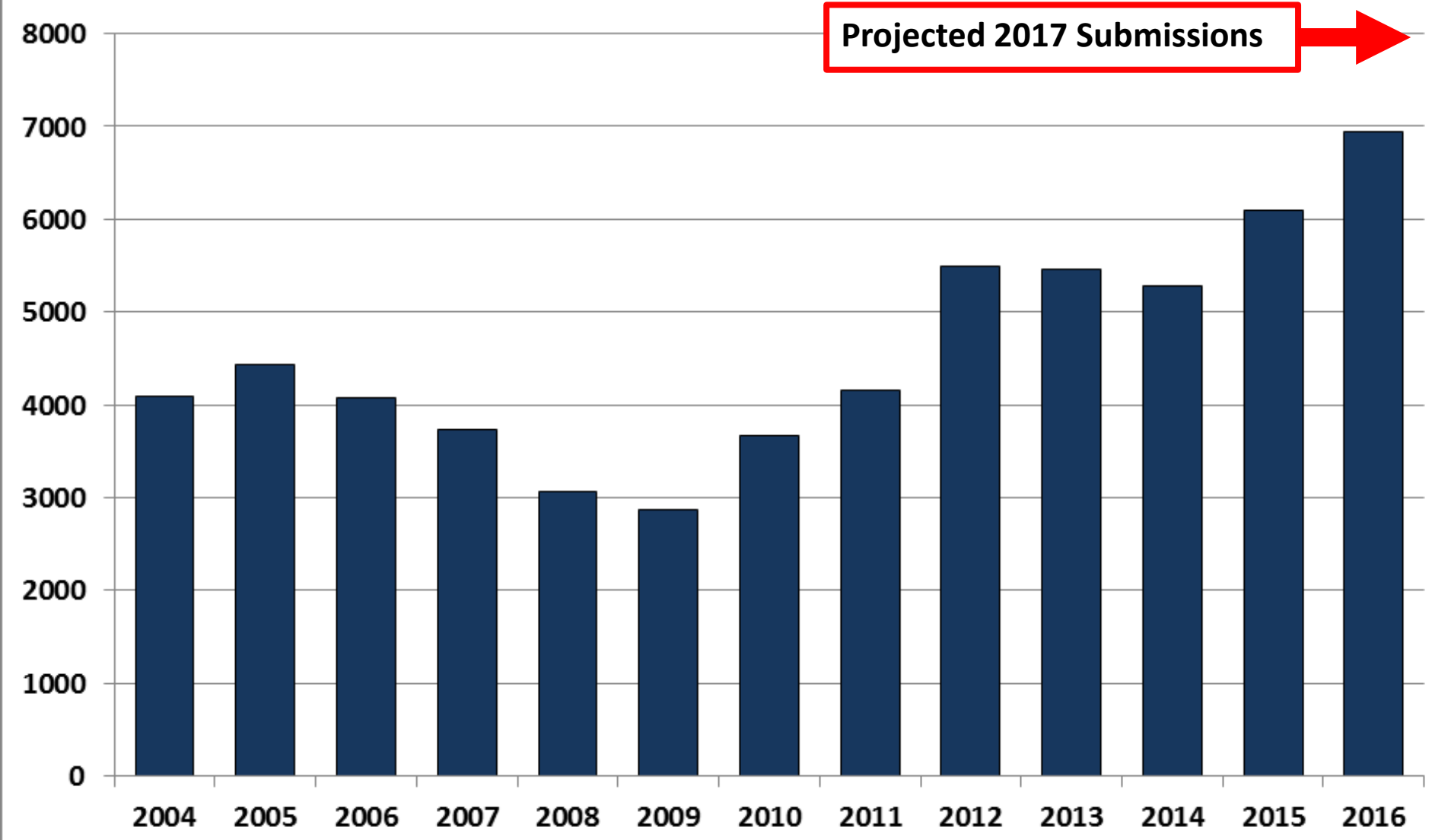
Number of Assignments Received - 13 Year Trend



CURRENTLY

- 700+ new cases per month
- Output is about 500 cases per month
- 2500+ case backlog
- Mostly methamphetamine, cocaine, heroin

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MICROCRYSTAL TESTS

- How does it work?
- Highly selective test
- Can easily discriminate common controlled substances: cocaine, methamphetamine, and heroin
- When used in conjunction with a second test (color tests), highly accurate and discriminating results
- Limitation: not a structural confirmation test

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SWGDRUG REQUIREMENTS TO "IDENTIFY" A COMPOUND

Category A	Category B	Category C
Infrared Spectroscopy	Capillary Electrophoresis	Color Tests
Mass Spectrometry	Gas Chromatography	Fluorescence Spectroscopy
Nuclear Magnetic Resonance Spectroscopy	Ion Mobility Spectrometry	Immunoassay
Raman Spectroscopy	**Liquid Chromatography/ Thin Layer Chromatography**	Melting Point
X-ray Diffractometry	Microcrystalline Tests	Ultraviolet Spectroscopy
	Pharmaceutical Identifiers	

VALIDATION STUDY

I. Specificity tests
II. Sensitivity tests
III. Blind testing (accuracy and reproducibility)

Tested: cocaine, methamphetamine, heroin

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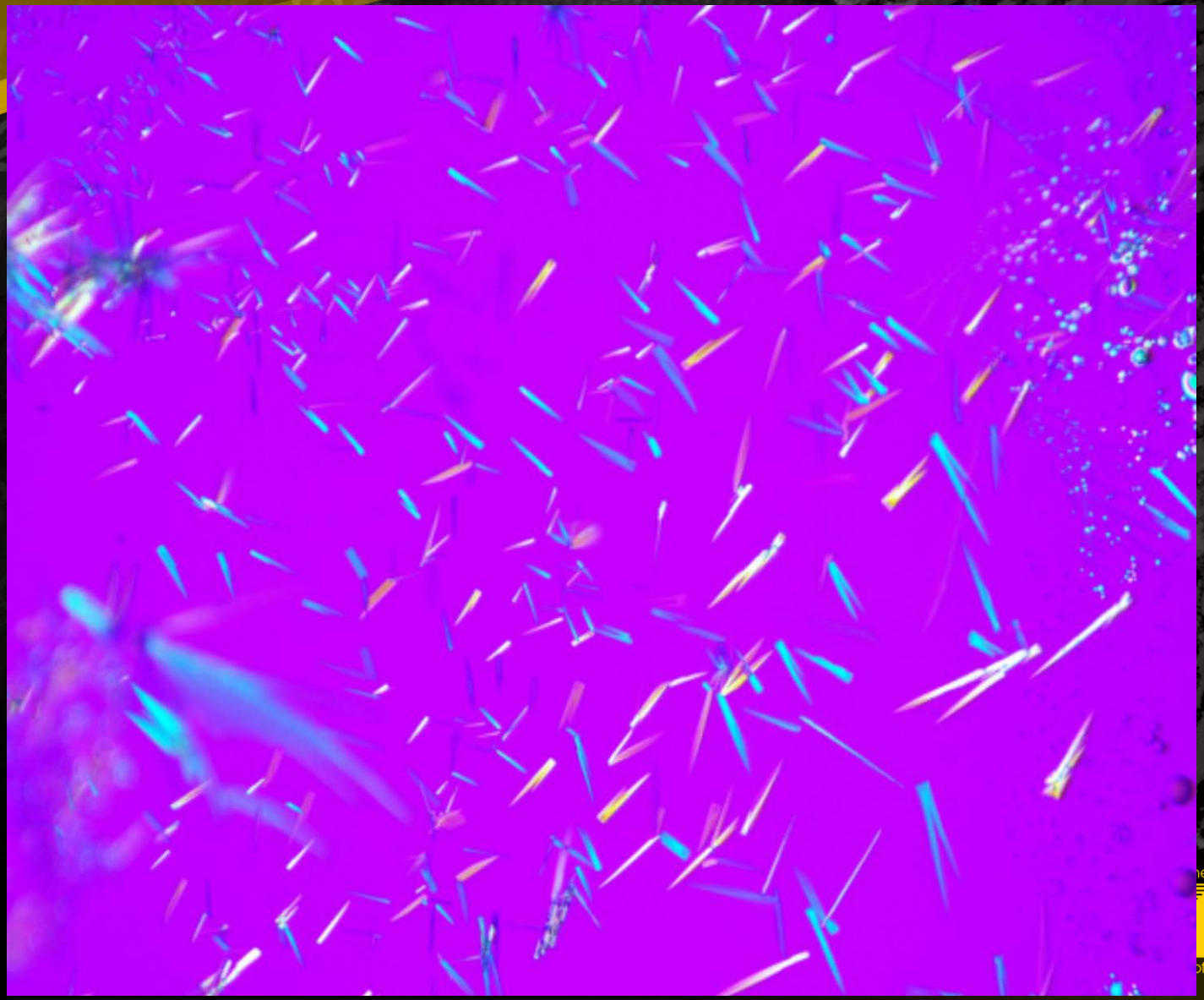
I. SPECIFICITY - METHAMPHETAMINE



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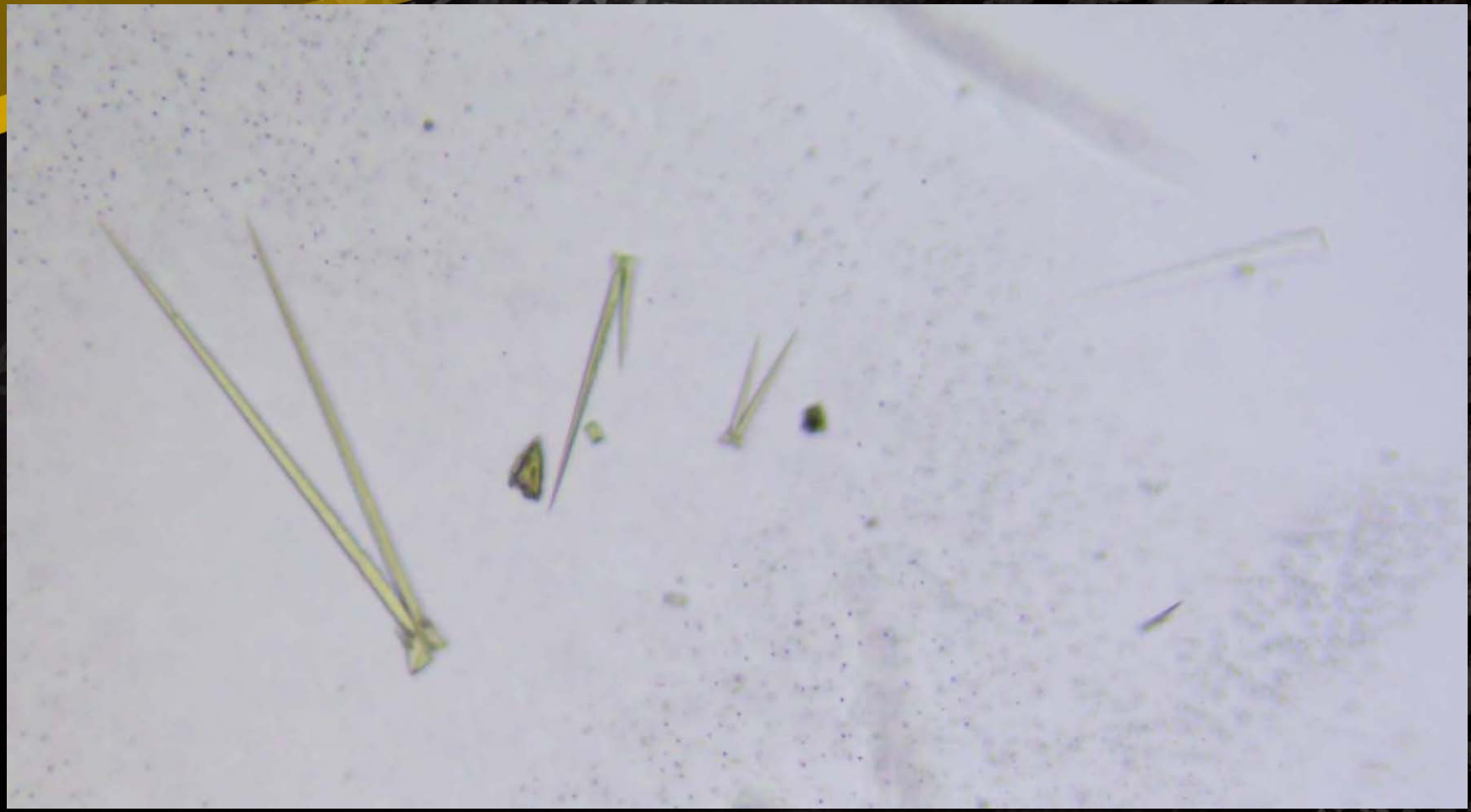
METHAMPHETAMINE "CLOTHESPINS"



No false positives. Dimethyl sulfone, pseudoephedrine, ephedrine, caffeine, lactose, phentermine, B-phenethylamine, N-benzylmethylamine, etc.

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I. SPECIFICITY - COCAINE

COCAINE FEATHERING CRYSTALS

No false positives. Benzocaine, caffeine, Inositol, lactose, levamisole, lidocaine, procaine, baking soda, alpha-PVP, bupropion, etc.

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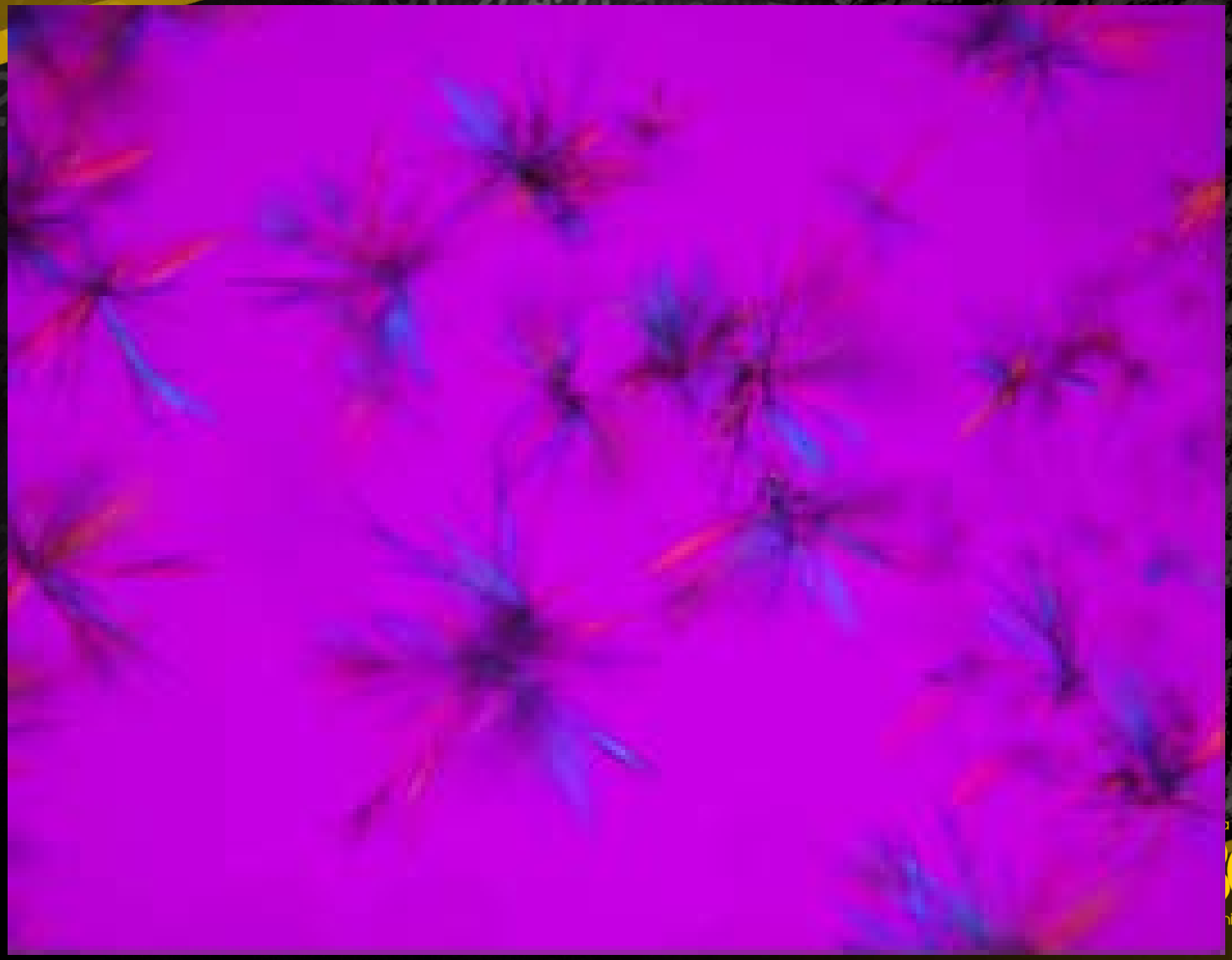
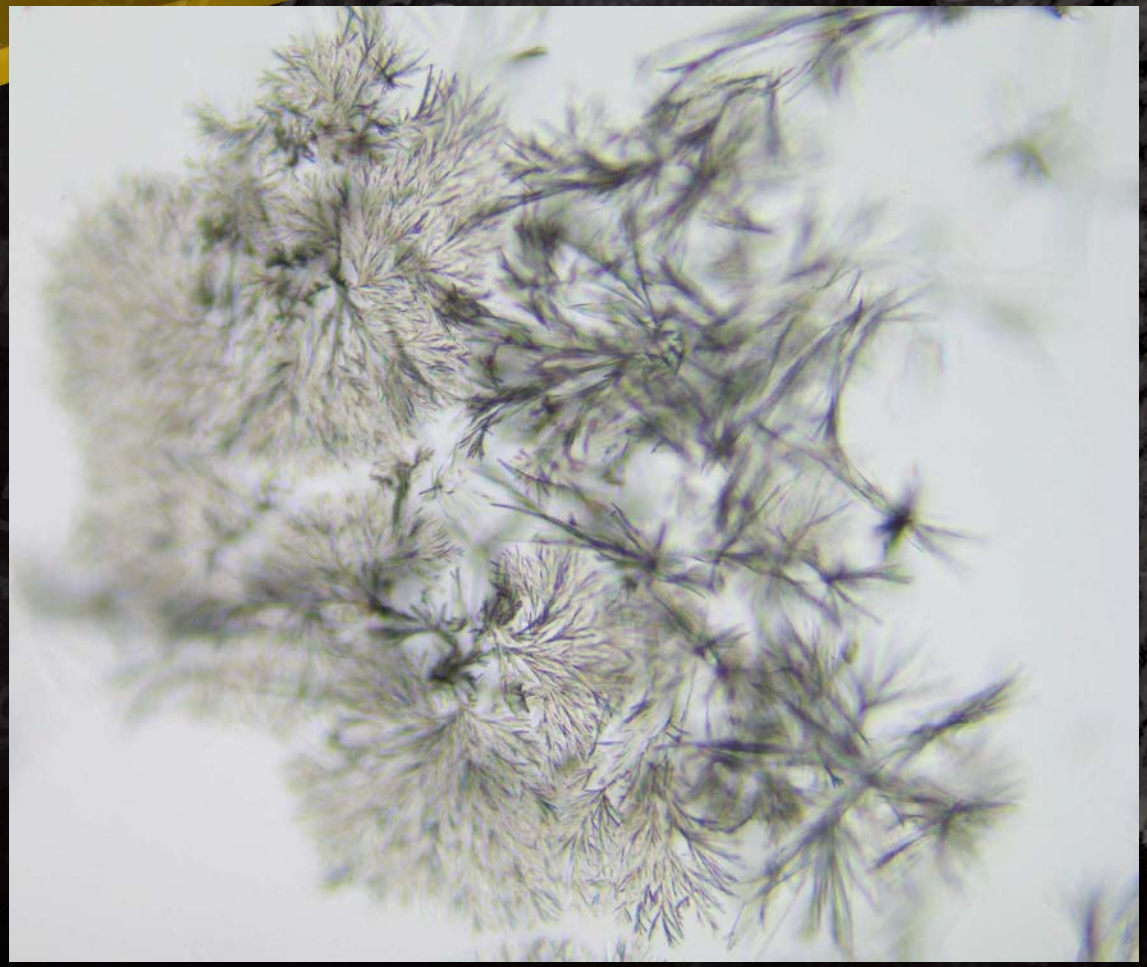
I. SPECIFICITY - HEROIN



HEROIN CRYSTALS



Potential for False positives: similar looking crystals with morphine and codeine.

Tested: 6-monoacetyl morphine, 6-acetyl codeine, thebaine, guaifenesin, caffeine, diphenhydramine, lactose, acetaminophen, etc.

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II - SENSITIVITY

Microcrystal tests	50% (w/w)	25% (w/w)	12% (w/w)	6% (w/w)	3% (w/w)	1.5% (w/w)
Methamphetamine	+	+	+	+	+	-
Cocaine	+	+	+	+	+	+
Heroin	+	+	+	+	-	-

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II - SENSITIVITY

Test	50% (w/w)	25% (w/w)	12% (w/w)	6% (w/w)	3% (w/w)	1.5% (w/w)
Methamphetamine Microcrystal test	+	+	+	+	+	-
Methamphetamine Color test - Marquis	+	+	+	+	+	+
Methamphetamine Color test - SodNp	+	+	+	+	+	+

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II - SENSITIVITY

Test	50% (w/w)	25% (w/w)	12% (w/w)	6% (w/w)	3% (w/w)	1.5% (w/w)
Cocaine Microcrystal test	+	+	+	+	+	+
Cocaine Color test - CoThCy	+	+	+	+	+	+
Cocaine Color test - WG	+	+	+	+	+	+

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II - SENSITIVITY

Test	50% (w/w)	25% (w/w)	12% (w/w)	6% (w/w)	3% (w/w)	1.5% (w/w)
Heroin Microcrystal test	+	+	+	+	-	-
Heroin Color test - Marquis	+	+	+	+	+	+
Heroin Color test - Mecke	+	+	+	+	+	+
Heroin Color test - Froehde	+	+	+	+	+	+

III. BLIND TEST ERROR RATES

	False + Error Rate	False – Error Rate
Methamphetamine		
---Color test	0%	0%
---Microcrystal test	0%	11%
Cocaine		
---Color test	3%	19%
---Microcrystal test	0%	2%
Heroin		
---Color test	0.5%	8%
---Microcrystal test	0%	8%

MICROCRYSTAL TEST SUMMARY

- Excellent accuracy, reliability, and selectivity for methamphetamine and cocaine
- Accuracy and reliability for heroin also strong; but care needed to differentiate morphine
- Test is being applied to suspected cocaine, methamphetamine, and heroin samples
  - Not of limited amount
  - Doesn't work on tar heroin

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PROCEDURE

- Substance viewed macroscopically and visual appearance, odor, etc. noted
- Color Tests
  - Must be positive or will go to GC-MS
- Microcrystal Tests
  - Must be positive or will go to GC-MS
    - Positive result is the formation of at least 5 crystals with the specified pattern
    - Negative result is the absence of the specified crystal pattern or a very minimal amount observed (less than 5 crystals)
- Still testing to the maximum charging level

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IMPLEMENTATION

- For Hennepin County:
- Did 1622 MC tests (Apr 2016 – Jul 2017)
- 2.6% were “negative” MC tests (but 95% have a CS)
- 13% were “confirmed” with GC-MS (0 false positives)
- 60-70% of submissions qualify for MC testing
- About 8:1 output (MC:GCMS)
- Eliminated approx. 4 hearings per defendant

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Description of Submitted Evidence:

Item	Type and Packaging	Description/Source
1	One plastic bag containing evidence classified as crystalline material	

Results of Laboratory Examination:

Item	Amount	Contents
1	1.234 ± 0.005 gram(s)	indicates the presence of methamphetamine

The results in this report were obtained using a visual examination, a minimum of two different spot/color tests and a microcrystalline test. If the case proceeds to trial, please re-submit the evidence in this case for further testing. The evidence must be received by the laboratory for confirmation testing using a structural elucidation technique (i.e. GC-MS or FTIR) at least 4 weeks before the results are needed.

The uncertainty of the reported weight is expressed at the 95% confidence level.

SUCCESSFUL IMPLEMENTATION

- Cooperation from all stakeholders
- MC reports going out in 2-4 weeks from receiving evidence
- Proof of concept supports expansion to other counties
- Currently training more analysts

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QUESTIONS?

THANK-YOU!

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