Fall 12-1-2021

Evaluation of the TruNarc Handheld Narcotics Analyzer as a Pre-Analysis Screening Device for the Orange County Crime Lab

Sarah Yang
Chapman University, syang091@gmail.com

D. Bauer
Orange County Crime Lab

C. Woltz
Orange County Crime Lab

S. Soto
Orange County Crime Lab

Michael Ibba
Chapman University, ibba@chapman.edu

Evaluation of the TruNarc Handheld Narcotics Analyzer as a Pre-Analysis Screening Device for the Orange County Crime Lab

S. Yang[1,2], D. Bauer[1], C. Woltz[1], S. Soto[1], M. Ibba[2]

[1]Orange County Crime Lab, [2]Schmid College of Science and Technology, Chapman University

Introduction

Forensic chemistry
- Analysis of unknown substances
- Contributes to police investigations and cases
- Chromatography, spectrometry, color tests, etc.

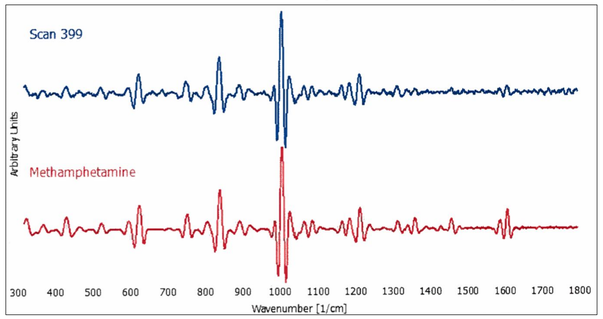
The Orange County Crime Lab (OCCL)
- Currently uses GC/MS, FTIR, LC/MS, Raman
- Analysts remove packaging and handle substances to conduct tests
- Powders, crystalline substances, tablets, paper

Rise of fentanyl
- Increasingly common in counterfeit drugs
- Analysts risk exposure
- Current techniques require handling of substance to begin any analysis

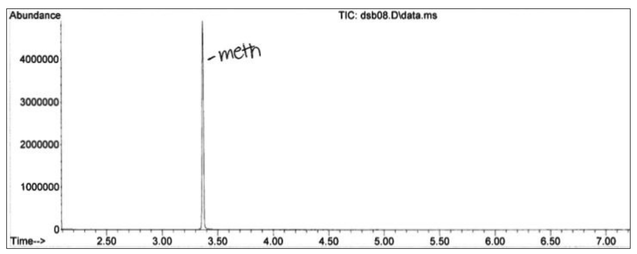
The TruNarc (Raman Spectroscopy)
- Point and shoot device for identifying substances through packaging
- Equipped with library of spectra for known drugs

Methods*

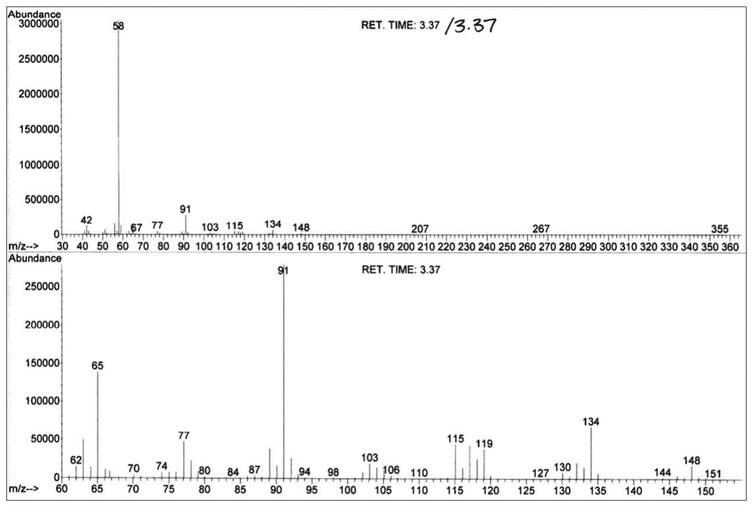
1. TruNarc Scanning (Raman)
- Removed outermost layer of opaque packaging to locate evidence
- Scanned for initial reading (below)
- Utilizes molecules' unique scattering pattern



2. Gas Chromatography/Mass Spectrometry
- Sample of substance dissolved/diluted in ethanol
- run/temperature sequence done according to TruNarc results (methamphetamine→METH_SPLIT1_9)



3. Match to OCCL MS Library
- Peaks in GC chromatogram indicate elution of compounds
- Mass spectra for each peak investigated
- Mass spectra of sample matched to mass spectra in OCCL MS library

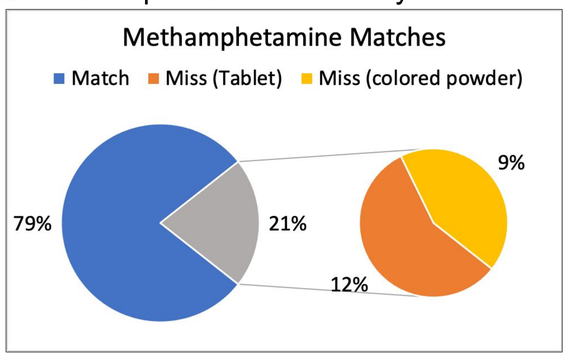


*images taken from casework #14 report

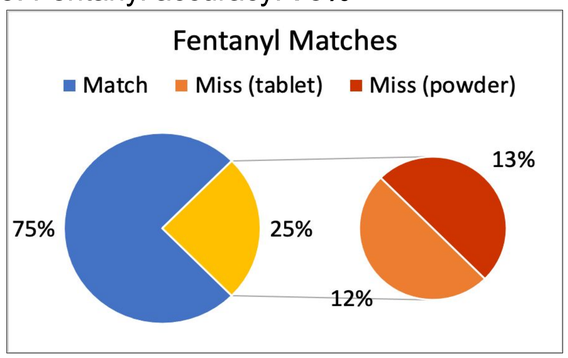
Results

Correct identification of drug

1. Cocaine accuracy: **100%**
2. Methamphetamine accuracy: **79%**



3. Fentanyl accuracy: **75%**



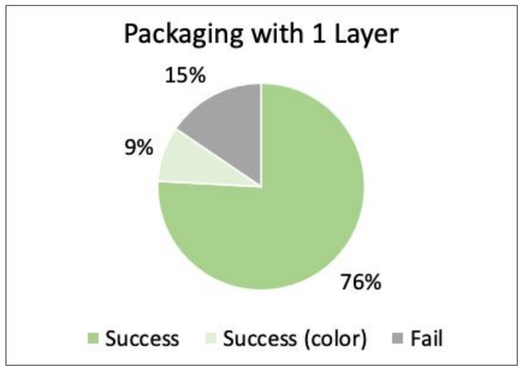
Correct identification of drug by substance type

4. White crystalline substances: **100%**
5. Tablets: **13%**
6. Powders: **71%**

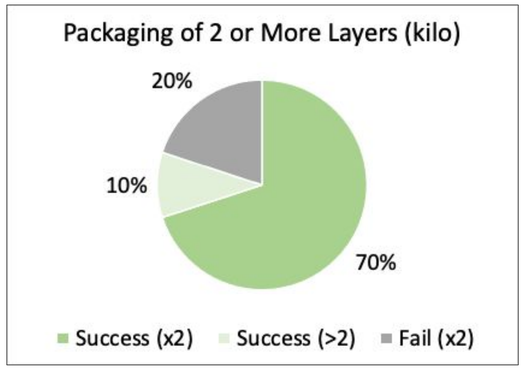
Failures included identifying binding agents (cellulose, lactose, mannitol) rather than the drug of interest

Effect of packaging on scan completion

7. One layer of plastic packaging: **85%**



8. Multi-layer plastic packaging: **80%**



Conclusions

- The TruNarc is able to scan and identify most drugs of interest that are light in color, powders or crystalline substances, and in translucent plastic packaging.
- Mixtures and tablets are difficult for the TruNarc to scan successfully due to their complex compositions. Scanning through glass is also difficult, but some scans of clear glass pipes have been successful. Glass packaging will be further assessed as other evidence comes to the OCCL.
- The TruNarc Handheld Narcotics Analyzer is an effective device for evidence screening prior to analysis in the OCCL. Further testing may allow the device to be used in the field or prison by the OC Sheriff's Department for quick identification of substances they may come across.

References

(1) Wait, A. D. Evolution of Organic Analytical Methods in Environmental Forensic Chemistry. *Environmental Forensics* **2000**, *1* (1), 37–46. https://doi.org/10.1006/enfo.1999.0001.
(2) Han, Y.; Yan, W.; Zheng, Y.; Khan, M. Z.; Yuan, K.; Lu, L. The Rising Crisis of Illicit Fentanyl Use, Overdose, and Potential Therapeutic Strategies. *Transl Psychiatry* **2019**, *9* (1), 1–9. https://doi.org/10.1038/s41398-019-0625-0.
(3) Kudelski, A. Analytical Applications of Raman Spectroscopy. *Talanta* **2008**, *76* (1), 1–8. https://doi.org/10.1016/j.talanta.2008.02.042.
(4) Medeiros, P. M.; Simoneit, B. R. T. Gas Chromatography Coupled to Mass Spectrometry for Analyses of Organic Compounds and Biomarkers as Tracers for Geological, Environmental, and Forensic Research. *Journal of Separation Science* **2007**, *30* (10), 1516–1536.