

Second Quarter Report to the Midwest Forensics Resource Center

1. Fast Gas Chromatography Capabilities in Drug Identification
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3. Second Quarterly Progress Report: April 1, 2011 – June 30, 2011
4. Project Description:

Fast gas chromatography with hydrogen mobile phase (Fast GC-H₂) enables significant increases in sample throughput, chromatographic resolution, and budget savings in drug identification involving GC separations. Peer-reviewed research in Fast GC and recent work by the PI with Fast GC-H₂ in ignitable liquid identification demonstrates significant improvements in each listed figure of merit. These benefits should translate to Scheduled compound analysis by Fast GC-H₂. This work will assess Fast GC-H₂ in drug identification, provide data for the use of H₂ in GC-MS, and create webinar modules and discussion networks for laboratory personnel to discuss the potential implementation of Fast GC-H₂.

5. Project Objectives:

The objectives of the project are three-fold:

- a) assess the primary impact of Fast GC and hydrogen carrier gas usage in the area of drug identification as each aspect may provide a substantial time savings per analysis,
- b) explore the limitations that Fast GC may place on MS signal collection;
- c) create webinars for a more robust dissemination of meritorious results from Fast GC in drug analysis as well as the capabilities of hydrogen carrier gas in GC-MS instruments with one area of interest being safety issues.

6. Current Status/Results

- a) Progress to date:

Instrumentation/Methodology:

The primary progress this quarter was in the areas of preparing the UWP Fast GC instrument and training the undergraduate student for the project. The baseline (control) method, corresponding to current conventional drug identification methodology was established on the UWP Agilent 6890 GC-FID. These experiments this quarter were

limited to over-the-counter (OTC) compounds and utilized the microbore (0.18 mm ID) column common to Fast GC.

Figures of merit included absolute error and RSD (2- 3%) for retention time replicates using helium and resolution data. In addition, calculation of chromatographic resolution was performed for these standard conditions by analyzing standard reference material mixtures of n-hydrocarbons and GRO mixes. In-house standards of OTC mixes were also analyzed for this purpose. Preliminary data confirmed better resolution for the shorter minibore column (DB-5 stationary phase) couple with H₂ carrier compared with the conventional 30-m column/He carrier gas.

This control data will now be used to statistically assess the degree of improvement as the heating ramps become more aggressive to maximize the intrinsic values of Fast GC. 1.0 mg/mL drug and drug mixes will be selected by Ms. Macans and analyzed by successively aggressive GC parameters, primarily steeper oven temperature ramps.

Sample Preparation: Work in this quarter used OTC samples and mixes while the PI prepared an application to the Wisconsin Department of Regulation and Licensing for a Special Use Authorization to handle Scheduled compounds on campus. Third quarter experiments will utilize 1.0 mg/mL solutions of Scheduled compounds and mixes (not requiring a campus SUA) selected by the Co-PI. The anticipated approval of the SUA for the PI will simply further facilitate experiments and provide avenues for calculating detection limits and assessing sensitivities should issues arise with the aforementioned concentrations.

Administrative: Several challenges arose in this quarter primarily related to instrument failure at UWP and in-house/Wisconsin administrative changes. The Fast GC encountered an electronics issue that was repaired with the exception of accessing the autosampler tray while the GC-MS has encountered issues with MS communication.

Changes in state and intuitional compensation policies necessitated distribution of substantial PI salary funds in the second quarter, prior to the UWP summer session.

Abstracts for the Midwest Association of Forensic Scientists annual meeting in Lombard IL in Sept 2011 and the American Academy of Forensic Sciences annual meeting in Atlanta GA (Feb 2012) have been completed in advance of the August 1 deadline.

b) Work that lies ahead:

We anticipate having our standard suite of compounds identified in the next few days with analysis to begin shortly. Data analysis will be completed by August 1. At that point, we will meet with the Wisconsin State Crime Laboratory – Milwaukee administrators and review data with an eye toward conversion of a GC instrument to Fast GC using a commercial upgrade kit. We will also review the use of hydrogen and the impact of switching to this carrier gas for the lab.

Outline and preliminary work on the webinar will also begin in earnest shortly. The timeline expectation is that the webinars will be completed by the end of third quarter with minor revision in the final quarter.

c) assessment of time and budget

At this point, the project appears to be within the time and budget allotted. Instrument down time has had some bearing on progress to date, but this has not altered the general timelines at this point. The undergraduate researcher training has exceeded expectations, and ample time and resources remain to complete all facets of the project.

Consumable consumption is well within budget. New time keeping and approval policies have delayed payment of the undergraduate salary; however, this situation will be soon remedied. With the Co-PI returning from leave, we will begin to travel to the crime lab in Milwaukee and access travel funding designated for that purpose.

7. Discussion of problems that have arisen:

Administrative issues have been solved but took time in some cases and forced actions in others. The primary impacts include taking salary prior to planned time frame to accommodate additional payment to state employee laws, and the somewhat unexpected retirement of the accounts payable employee overseeing the invoicing for the grant. Changes to the student payroll process and authorizations have also been worked through here this quarter.

Instrumental issues were on the UWP end. The Fast GC has been repaired in critical functions, but the GC-MS is still awaiting a service call slated for 7/18/11. Because the PI and student can use these instruments simultaneously, no issues to the timeline are anticipated.

8. Publications and Presentations:

Midwest Association of Forensic Scientists Annual Meeting 2011

Evaluation of Fast Gas Chromatography Coupled with Hydrogen Mobile Phases in Drug Identification (oral presentation) Charles Cornett, Rebecca Hansen, and Leah Macans

Evaluation of Fast Gas Chromatography Coupled with Hydrogen Mobile Phases in Drug Identification (poster presentation) Rebecca Hansen, Charles Cornett, and Leah Macans

American Academy of Forensic Sciences Annual Meeting 2012

Evaluation of Fast Gas Chromatography Coupled with Hydrogen Mobile Phases in Drug Identification (oral presentation) Charles Cornett, Rebecca Hansen, and Leah Macans

Evaluation of Fast Gas Chromatography Coupled with Hydrogen Mobile Phases in Forensic Sciences (poster presentation) Charles Cornett, Rebecca Hansen, Ashley Halligan, Leah Macans, and Joseph Wermeling