B116 Progress in the Individualization of Gasoline Residues

J. Graham Rankin, PhD, Jeremy Wintz, MSFS, and Raymond Everett, BS, Marshall University, Forensic Science Program, 1401 Forensic Science Drive, Huntington, WV 25701*

After attending this presentation, attendees will have a better understanding of the methodology of gasoline individualization, the problems associated with comparing neat gasoline samples with residues from fire debris and the use of multivariate statistical methods in making those comparisons.

This presentation will impact the forensic community and/or humanity by providing better methods for individualizing gasoline residues in suspected arson cases.

Gasoline is a frequent accelerant used by arsonists. Identification of gasoline in fire debris is relatively easy even when greatly evaporated. However, when a suspect is apprehended with gasoline residue on his clothes or a gasoline can in his vehicle, the question arises if the gasoline residue from the fire debris can be matched with that found with the suspect. This has proven to be a more difficult challenge. Further recent legal challenges to comparison evidence have stressed the necessity of establishing a statistical probability for that match.

Julia Dolan (ATF National Research Lab, Ammendale, MD), at the 2002 meeting of AAFS, presented a high-resolution GCMS method for comparing gasolines based on 20 sequential area ratios of 34 target compounds from 3-methylpentane through the 1-methylnaphthalene. Her data set included 36 different gasolines, including both regular and premium, mostly from around the Washington, DC area. In addition to neat gasolines, 25% and 50% evaporated samples were analyzed. Mark Sandercock (RCMP, Edmonton, AB, Canada) has developed an alternative method for gasoline individualization based on two and three ring polyaromatic hydrocarbons that he was able to differentiate even at 90% evaporation. Neither study involved simulated fire debris.

As part of an ongoing study, the authors have assembled a collection of over 100 gasoline samples from across the U.S. and have analyzed many of these by both the Dolan and Sandercock methods. In addition, analyses of simulated fire debris (charred wood and carpet pad) comparing the gasoline residues with their corresponding neat gasoline will be presented. The ASTM method E1412 (activated charcoal strip adsorption, ACS) is typically used in fire debris analysis but discrimination effects have been reported in the past. Effects of the ACS method on comparison of gasolines by both methods will also be presented.

Gasoline Individualization, Fire Debris Analysis, Principal Components Analysis

 ** Presenting Author*