

# TECHNICAL SESSION ABSTRACTS

## **An Interesting Officer Involved Shooting Case**

Dan Alessio, Oregon State Police Crime Lab – Portland, OR

On August 13, 2003 the Oregon State Police Portland Crime Lab was requested to respond to the scene of an officer involved shooting at a busy rest area along the I-5 freeway south of Portland. What seemed to be the routine documentation of a scene soon turned into a bit of a puzzle. Some lessons can be learned about information exchange at a scene and an officer under duress during a shooting situation.

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## **Detection of Chemical Residues Using Near-Infrared Dyes and Latent Blood Using Leuco Dyes**

Gabor Patonay, Department of Chemistry, Georgia State University - Atlanta, GA

Near-Infrared (NIR) chromophores have been used successfully in several applications. The advantage of NIR fluorescence spectroscopy is especially obvious in applications where the inherently low background fluorescence of the long wavelength spectral region reduces the need for sample preparation, but other areas of analytical chemistry also benefit.

The basic operation of NIR dye probes, light sources, and detectors for forensic applications will be discussed. A new NIR dye has been developed that can be used to detect pepper spray residues using NIR fluorescence detection. An area of interest such as clothing is sprayed with the dye solution followed by illumination with a NIR light source, e.g. a NIR filtered alternative light source (Crime Scope). Pepper spray residues will exhibit NIR fluorescence spots that can be observed using an appropriately filtered pocket scope, digital camera, CCD camera, or other NIR detection systems. A similar application will be discussed for gun shot residue detection as well. The main advantage of NIR detection is that the color of the background has very little influence on detection and that there are very few materials that would interfere by exhibiting NIR fluorescence. The use of pocket scopes permits sensitive and convenient detection. Once the residues are located, samples can be extracted for further analyses. This NIR detection method does not interfere with LC-MS, GC-MS, or similar methods. In addition, several other promising new NIR chromophores designed to detect latent prints, blood, metal ions, and other trace chemicals will be discussed.

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### **Detection of Chemical Residues Using Near-Infrared Dyes and Latent Blood Using Leuco Dyes, continued...**

Leuco dyes typically exhibit zero or very little fluorescence when applied to surfaces. If latent blood residues are present leuco dyes are oxidized and become fluorescent dyes. Fluorescein has been used frequently for this purpose. The chemistry used in the past has several disadvantages for example, rapidly diminishing contrast after application

This presentation will discuss a new chemistry for fluorescein latent blood detection. This new chemistry results in excellent contrast for several hours and in a significant number of cases the contrast remains for days or weeks. The FBI's Evidence Response Team and DNA I unit worked together with Georgia State University to validate this new fluorescein chemistry for use in the field. This new chemistry requires no preparation at the crime scene. Several examples will be presented to illustrate how time and conditions affect contrast and false positive results. The performance of the new fluorescein chemistry on different substrates will be discussed. While this new chemistry is fully compatible with presently used light sources, new truly portable blue LED light source can be used as well.

In addition to the visualization of latent bloodstains, this kit is also suitable to observe latent fingerprints on certain surfaces. This feature that is due to the delayed self-oxidation of the leuco dye, does not interfere with latent bloodstain detection, because it appears at a later time. In addition to fluorescein, rhodamines can be prepared in their leuco form and are oxidized by latent bloodstains. This new rhodamine chemistry requires no preparation at the crime scene similar to fluorescein. The longer wavelength absorption and fluorescence properties of rhodamine can be very useful on certain substrates of high interference.

# TECHNICAL SESSION ABSTRACTS

## **Correlation of Growth Phase with DNA Results Obtained from Hair Roots**

Rhonda Banks, Oregon State Police Crime Lab – Portland, OR

With the advent of more sensitive DNA analysis capabilities, forensic hair examiners are more and more frequently asked to perform hair comparisons as a screening tool for DNA analysis rather than for the value of the comparison itself. Some forensic laboratories no longer perform traditional microscopic hair comparisons. Frequently, however, the number of hairs in a given case is large and many of the hair roots do not yield a DNA result. This study correlates the growth phase of the hair root and the DNA results obtained in an effort to determine if it is possible at the screening level to target hairs that will yield useable DNA results.

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## **The Death of Barbara Hardegger: A Homicide Case Study**

Jennifer Riedel, Oregon State Police Crime Lab – Springfield, OR

In September 2001, the body of Barbara Hardegger was found buried in a rural area south of Eugene, Oregon. Sheriff's deputies were lead to the location by her husband, Gary Hardegger, who placed a 911 call stating that he "had done something terrible to his wife." As the investigation continued, one of the Hardegger's sons was also implicated in the crime and it was determined she had been buried alive.

The laboratory assisted with the crime scene investigation including excavation of the body and crime scene reconstruction. In-lab analysis of the physical evidence was also performed and a number of significant physical evidence findings were used to assess the accuracy of statements made by both Gary and his nephew. Ultimately, the case was negotiated without a trial.

The case history will be discussed along with some of the significant physical evidence results. A brief overview of OC (pepper) spray will also be presented, along with the analysis of OC spray from a cloth substrate using ethyl acetate to extract the stain and then analyzing the extract using a GC/MS. The extraction scheme was successful with an evidence sample that was over 3 ½ months old.

## TECHNICAL SESSION ABSTRACTS

### **Species identification of ginseng roots by HPLC and discriminant analysis**

Edgard Espinoza, DrPH, National Fish and Wildlife Forensic Laboratory -  
Ashland, OR

American ginseng (*Panax quinquefolius*), which is listed as a Threatened and Endangered species, is illegally harvested from Fish & Wildlife Refuges and National Parks. Often the apprehended suspects claim that the roots in their possession are Korean ginseng (*Panax ginseng*) and not the protected species. Botanists rely on morphological characteristics of the plant for making species inferences, and find they are unable to determine species of root without the stems and leaves.

These two ginseng species contain a wide variety of saponins called ginsenosides. An HPLC study of the ginsenosides show that their presence and abundance differs and can be the basis for determining species of origin. Discriminant function analysis of the HPLC data confirms that the principal components of the evidentiary roots are in agreement with the analysis of ginseng root standards.

This analytical approach was applied to commercial ginseng root preparations purchased at health food stores. The results indicate that, by and large, the manufacturers are truthful in their claims of species origin.

# TECHNICAL SESSION ABSTRACTS

## **A Visual Technique for Sex Determination in Humans Utilizing the Distal Humerus**

Nici Wanek, Oregon State Police Crime Lab – Portland, OR

Sex determination of unidentified skeletal remains has historically been performed on bony elements such as the pelvis and the cranium. When these elements are absent or fragmented, however, the sex of the unknown individual must be determined through other means. The distal humerus, a largely overlooked skeletal element, exhibits marked differences between males and females. 649 individuals from the Smithsonian Institute and the Cleveland Museum of Natural History were used to test a visual technique of sex determination from the distal humerus. Results of this research strongly indicate that characteristics of this element are accurate in sex determination, regardless of the biological affiliation of the individual. This technique can be used with great success in contemporary forensic cases, as well as multiple grave recoveries, mass disasters, and plane crashes.

# TECHNICAL SESSION ABSTRACTS

## **3D Spectrofluorometric Fingerprinting of Automobile Chassis Petroleum Products**

Dale Purcell, Oregon State Police Crime Lab – Portland, OR

Petroleum product residues are often present on chassis of automobiles. These residues are complex mixtures of oils, greases, coolants and hydraulic fluids. This work investigates the use of three dimensional (3D) fluorescence data, visualized as contour plots, to characterize these residues with the goal of associating the transferred residue with its source. A method was developed to separate different classes of petroleum compounds: oils, asphaltenes, and pre-asphaltenes. Absolute identification of individual compounds was not attempted. This study shows that sufficient individual characterization can be obtained when all three sample fractions are considered together to associate an unknown sample to a known sample.

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## **Identification of Some Components of Pyrodex<sup>®</sup> by Hot-Stage Microscopy**

Chris Hamburg, Washington State Patrol Crime Lab – Tacoma, WA

Experiments were conducted to create an easier method to identify the components of some black powder substitutes. Traditional methods of component identification of black powder substitutes have consisted of particle picking and extractions that can potentially produce mixtures. The differences in melting points and sublimation characteristics of some components, along with extractions and particle picking, help in obtaining component separation. The use of a hot-stage greatly assists in the identification by giving melting point data and sublimation temperature ranges. This approach can also be used with traditional (and inexpensive) hot plates and alcohol lamp.

# TECHNICAL SESSION ABSTRACTS

## **On-line SFE GC/MS of Human Hairs for Age Discrimination**

Jeremiah Bishop, George Washington University

Human head hairs from 13 female Caucasians of varying ages were analyzed for surface lipids by supercritical fluid extraction (SFE) gas chromatography – mass spectrometry (GC/MS) to determine if the age of an individual could be discriminated using the extracted surface lipids. Approximately 70  $\mu$ g of a hair sample was extracted using on-line carbon dioxide SFE and analyzed by GC/MS to determine what compounds were present. The extraction and analysis was completed a second time on each hair sample to ensure that as much extractable material as possible was removed. The reproducibility of these extractions and analyses were determined to be adequate for age discrimination by analyzing several samples multiple times. Using squalene, cholesterol, odd chain length free fatty acids, and wax esters age discrimination was accomplished. All but one of the known samples were correctly discriminated with respect to the originating individuals age. Two of the three blind study samples analyzed were correctly discriminated with respect to age. The third blind sample contained a contamination that prevented this sample from being discriminated correctly. Age discrimination of evidential hairs using on-line carbon dioxide SFE extraction coupled with GC/MS analysis may be a beneficial tool in the analysis of human head hairs.

# TECHNICAL SESSION ABSTRACTS

## **A Look at Explosive Disrupters**

Jeff Jagmin, Washington State Patrol Crime Lab - Tacoma, WA

Disrupters have become the primary tool used by bomb squads to disable explosive devices. A study was conducted to examine the various types of disrupters and what to expect when “rendered safe” evidence is submitted to the laboratory. Also discussed will be recommendations on what items should be submitted along with the “rendered safe” evidence, and questions to ask your bomb technician.

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## **The role of the prosecution and defense scientists in defense of murder cases**

James Pex and Peter Faye – former Chief Prosecutor, Lincoln County District Attorney Office

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## **Overview of Services Provided to Law Enforcement Agencies**

Wilma Jolly – National Law Enforcement and Corrections Technology Center, Western Region, California

## **Clandestine Ammonia Generation**

Eric Person, Washington State Patrol Crime Laboratory - Marysville, WA

Northwest Washington has seen rapid growth of the use of ammonium sulfate fertilizer in generating ammonia for use in the manufacture of methamphetamine. It is unlikely that ammonia generated in this fashion would be 'anhydrous,' raising the concern of whether water would interfere in the chemical reduction. The tolerance of the lithium-ammonia method to water, methyl alcohol, and isopropyl alcohol was investigated.