

**2010 meeting of the
Northwest Association of Forensic Scientists
Technical Session**

Acrosomeless Sperm Found in Casework

Devin Mast, Oregon State Police

Globozoospermia is a rare medical condition in which an acrosome is not formed with the production of sperm cells. The resulting sperm cells are missing a key morphological feature used for sperm identification in case work. This presentation is about the apparent discovery of Globozoospermia in a rape case and the way the Oregon State Police Forensics Division reported its findings.

Application of Spatial Statistics to Latent Print Identifications: Towards Improved Forensic Science Methodologies

Emma K. Dutton^{1,2*}, Steve Taylor¹, Pat Aldrich^{1*} and Bryan E. Dutton¹

¹Division of Natural Science and Mathematics, Western Oregon University, Monmouth, OR

²Oregon State Police, Forensic Services Division, Salem, OR

The goals of this project are to evaluate fingerprint characteristics using established techniques in spatial statistics, determine certainty levels for fingerprint uniqueness, and quantitatively validate the existing latent print ACE-V comparison methodology. The objectives are: 1.) to evaluate fingerprint characteristics or topological attributes (e.g., minutia number, type, and position typically employed by forensic latent print analysts) using spatial statistics to derive probabilistic models for predicting fingerprint uniqueness, and 2.) to utilize the derived fingerprint probabilistic models to establish certainty levels for latent print identifications.

The overall goal of our study will be to expand on previous studies to develop the baseline statistics for various fingerprint characteristics (e.g., minutia number, type, and position, pattern type, ridge flow) by extracting fingerprint topographical data using a suite of Geographic Information System (GIS) and morphometric (e.g., NTSYSpc) software. Fingerprint characteristics obtained from ten-print standards on file with the Oregon State Police (OSP) will be evaluated for each digit and in multiple combinations using spatial statistical analysis software to develop a probabilistic model for fingerprint uniqueness. The data generated will then be used to develop statistical models that estimate the accuracy of ten-print to latent comparisons and certainty levels for latent identifications.

Before we perform the full study, we must undertake several pilot studies to assess the feasibility of methodologies and test assumptions of probability models. Utilizing 30 ten-print cards, we will assess the assumption of independence of minutia characteristics within and among fingerprints from an individual through auto-correlation analyses. Obtaining information on independence of the variables within a fingerprint will affect the way the overall statistical model is created and the probabilities that are created by the model.

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Applications of UHPLC-MS in Forensic Science

Kayvon Jalali*, Kathryn Preston, Guifeng Jiang, and Terry Zhang, Thermo Fisher Scientific

UHPLC is a new technology that boosts the resolving power of HPLC and allows for separation of a large number compounds in complex mixtures. This additional resolution results in better detection with lower noise and sharper and bigger signal in any mode of detection such as UV, FL, MS, etc. Mass spectrometry is a universal detection tool for identification of organic compounds. In this presentation we show examples of where the resolving power of UHPLC coupled with mass spectral detection allows forensic analysts to identify and accurately measure the levels of illicit drugs, their salt forms and other compounds such as drug precursors in various matrices.

Automated Sperm Searching, Fantasy or Reality?

Devon Sommer, Oregon State Police

As anyone has ever sat in front of a microscope for any prolonged length of time looking at evidence can tell you, the exercise can become tedious very quickly. This is particularly true in the world of DNA and serology, where screening slides collected from sexual assault kits can be particularly tiring, especially when they are large and/or heavily smeared. One solution has been the introduction of the automated sperm searching microscope to the marketplace. The system is a computer attached to a microscope with software that is capable of performing a search for the analyst. Problem solved, right? Well, yes and no. While the physical ability to screen has been automated (after user-established parameters), the actual confirmation is still left to the analyst. So, there is still scope time involved with the screening process. This can be a minor inconvenience, but overall the system has the potential to cut significant time off the screening process. This presentation will address the strengths and weaknesses of the automated system currently in use in two Oregon State Police

Laboratories. It will describe the process involved for bringing our system online and our experience with the system to date.

"Can't I Just Take the Fifth?" - Testifying Without Terror

Heidi Eldridge, Eugene Police Department

For many latent print examiners, the thought of presenting an identification in court has always been a daunting one. Since the release of the NAS report in February of 2009, that level of concern has increased significantly for many as the number of challenges increases, the nature of the questions changes, and the comforting catch phrases that were so frequently employed cease to be appropriate.

In June of 2010, Ms. Eldridge successfully navigated a Daubert/Brown/O'Key admissibility hearing in Lane County, Oregon in a Motion to Exclude fingerprint evidence based on NAS report arguments. In this presentation, Ms. Eldridge explains how she addresses questions of validity, error rate, subjectivity, and certainty in a courtroom environment without relying on phrases such as "exclusion of all others," "100% certainty," or "zero error rate." She will explain when it is okay to agree with a criticism of the discipline and when to stick to your guns; what information you need to be armed with to adequately defend the science during this transitional period; and how to be honest and transparent and explain the limitations of your conclusions, without weakening your expertise and credibility in the eyes of the judge and jury.

By considering a new way to think about your testimony in court, it is hoped that you, too, will be able to Testify Without Terror.

Case Report: An Accidental Death Involving Inhalation of 1,1-Difluoroethane

Sara Short, Oregon State Police

A 35-year-old female with a history of depression was found deceased on the bedroom floor of her home one hour after exiting a hot tub. Femoral blood, urine, and vitreous humor were submitted for routine toxicological analysis. An initial toxicological examination confirmed 0.08 g/dL ethanol and therapeutic concentrations of the antidepressants sertraline and venlafaxine in the femoral blood. During the alcohol/volatiles analysis by headspace GC-FID, an unidentified peak was also observed. When compared to previous cases, the unidentified peak was suspected to be 1,1-difluoroethane (DFE), the propellant component in many canned air products, such as computer keyboard cleaner, which was later confirmed by a reference laboratory. The decedent's history of inhalant abuse was not known to investigators until our discovery of DFE. Without the identification and quantitation of DFE, the cause of death would have been undetermined. This case illustrates the necessity for further analysis when unexpected analytes appear during toxicological casework.

Evaluating Stochastic Thresholds for Four Amplification Kits

Julie Ferragut, Bode Technology

In July 2009 the FBI published a new version of the Quality Assurance Audit Standards for Forensic DNA Testing Laboratories. A new requirement for validation studies is to establish a stochastic threshold when applicable. The stochastic threshold would define a level at which the analyst can be confident that allelic dropout has not occurred and also to assist in the interpretation of mixtures.

Bode used this opportunity to evaluate the amplification systems it currently had in place to determine a stochastic threshold that would aid in interpretation. While many papers have discussed the need for stochastic thresholds and provide examples of stochastic effects, very few studies discuss how to empirically determine a stochastic threshold.

To determine an appropriate stochastic threshold Bode evaluated a highly heterozygote individual at different low level concentrations in four amplification kits: Profiler Plus, COfiler, Identifiler, and PowerPlex 16. The goal was to determine at what RFU level one could be confident that drop out of a sister allele has not occurred. Bode then also evaluated nine two-person mixtures to determine if the contribution of more than one individual would affect the stochastic threshold. This presentation will discuss: our validation plan, method for evaluating an appropriate stochastic threshold, the results of our study, and tips for conducting similar studies in your laboratory.

Evaluation of the Random Nature of Acquired Marks on Footwear Outsoles

Christopher Hamburg* and Rhonda Banks, Oregon State Police

The individualization of a footwear impression is based on the postulate that "accidental" marks on outsoles acquired through wear are random. This project tests that assumption by evaluating the marks acquired on multiple pairs of shoes during normal wear while attempting to control certain variables that include outsole design, wearer, travel paths, and length of wear. This project is a long-term evaluation of an entire outsole of modern material and design typically seen in casework.

Travel paths were essentially reproduced for each pair of shoes by careful documentation of the participants' daily activities along with the use of a pedometer to attempt to duplicate the number of steps taken.

Test impressions were taken from each pair of shoes prior to the start of the project and at each predetermined interval. Four pairs of shoes were worn, 2 for each participant. All right shoes and all left shoes were compared to each other.

No acquired marks were found to repeat.

Exploring the Limit of Gunpowder Particle Quantity for Distance Determination

Matthew Noedel, Noedel Scientific LLC

Gunpowder particles can be deposited on surfaces that are relatively close to the muzzle of a firearm at the time of discharge. Typically, the overall size, density and distribution of the entire pattern is compared to test patterns generated at known distances to offer an approximation of the muzzle to target distance. Some forensic practitioners attempt to quantify the total number of particles deposited or observed and correlate that count with a certain distance. This study was conducted to attempt to define the limits of counting or quantifying the number of gunpowder particles to estimate muzzle to target distance.

The HotLips Pizza Caper: A case of fingerprint pattern similarity

Melissa Lyman, Oregon State Police

This presentation will discuss an interesting case in which the suspect of a burglary was identified based on thorough forensic analysis and luck.

Identity Automation

Cami Green, Promega

As case submission rates continue to rise across the country, forensic labs have begun to evaluate automation technology as a way to improve the sample throughput. However, the individual needs of each lab are varied and process specific. Promega has developed automation methods for extraction, quantitation set-up, normalization, and amplification set-up that are both flexible and user friendly. The ability to customize the Promega automation solution allows labs to set access levels for administrators and users, handle samples differently based on quantitation results, set pipetting limits for sample consumption, and offer multiple reporting formats. The presentation will demonstrate the ease of use in adopting Promega's automation scripts into a laboratory's workflow.

NIST Office of Law Enforcement Programs (OLEP) Forensic Science Program and Overview of Current Research and Projects

Robert M. Thompson, National Institute of Standards and Technology; Office of Law Enforcement Standards

The Office of Law Enforcement Standards (OLES) is a unique standards, science, and technology organization within the National Institute of Standards and Technology (NIST) that collaborates within the public safety community. The presentation will introduce the work in which OLES is currently engaged:

- Counterterrorism and Response Technologies
- Detection, Enforcement and Inspection
- Public Safety Communication Research
- Protective Systems Research
- Forensic Sciences

Following this, a more detailed review of the Forensic Science Programs will be presented.

Obtaining Prints from Deceased Bodies Immersed in Water

Kathy Egli & Elizabeth Geltz, Oregon State Police

This method was originally used by the FBI to identify plane crash victims found in water. Recently, it has been successfully employed to identify victim remains following Hurricane Katrina. Friction ridges on the hands and feet flatten as a result of prolonged exposure to water; consequently, conventional methods are not always effective in obtaining sufficient friction ridge detail to identify a victim. The application of heat and moisture (by boiling the fingers/hands) helps to restore the three-dimensional nature of the friction ridge skin, thus making conventional methods more effective. After utilizing many methods over the last thirty-four years, Kathy Egli has had the most success with this methodology and has been able to make several key identifications.

OSP Cold Case Strategy

Susan Hormann, Oregon State Police

In September 2008, the Portland Police Bureau was awarded a NIJ grant to evaluate evidence from cold homicide cases and submit relevant items to the Oregon State Police (OSP) Forensic Laboratory for DNA analysis. The analysis of cold cases can be a bit overwhelming and when OSP Forensic Laboratory entered into an interagency agreement with Portland Police Bureau (PPB) there were many layers to the management and analysis of the cases. To simplify the process, OSP has implemented an approach that incorporates the information from the police agency, triage guidelines, submission requirements, and analysis strategy.

Coordination with PPB prior to the beginning this project was crucial in establishing the ground rules, goals, and expectations for each of the partners.

Once the project was in progress, the OSP Forensic Laboratory developed additional strategies to deal with internal laboratory challenges presented by the cold case evidence.

This presentation will outline the cold case approach of the OSP Forensic Laboratory and discuss how to meet the challenges that these cases can present. Having a coordinated cold case management plan will assist forensic laboratories who are called upon to perform analysis in cold case investigations.

The Retention and Transfer of Spermatozoa on Clothing by Machine Washing: A Review of the Relevant Literature and How it Applies to the "Laundry Defense"

Amy Wilson, Oregon State Police

The presentation will include a review of the relevant literature on the topic of laundering semen stains on clothing. Topics will include the retention of spermatozoa on laundered semen stains and the potential transfer of spermatozoa by machine washing. The various papers on this topic will be summarized and compared with one another in order to give the attendee an understanding of the published research. The popular "laundry defense" will be discussed and tools will be given to the attendee to be able to analyze a case scenario and determine if the "laundry defense" is a plausible explanation for the presence of spermatozoa on the evidence. This presentation will be geared toward forensic scientists conducting casework in Biology/DNA, but may also be of interest to attorneys and anyone with an interest in the topic.

RFID Technology - Enhanced Evidence Tracking

Robert Krivickas, Bode Technology

RFID technology can improve the efficiency of collecting, processing, storing, and managing forensic evidence and data. The presentation will provide an overview of the current process map for tracking and identifying evidence at Bode Technology using RFID technology. This process includes the automation of evidence tracking and monitoring throughout a facility, enabling real-time asset identification, and automation of Chain of Custody Transfer. The improved process will be compared against previous methods of sample tracking, identifying improvements in process flow, time saved, and enhanced process security.

Improving the efficiency and accuracy of evidence and data collection by utilizing hand-held RFID readers and RFID labels/tags at crime scenes and other points of collection will also be discussed. The potential impact of incorporating a RFID system at a crime lab to automate accessioning and evidence management will also be included in the discussion.

Meeting attendees will benefit by learning about how an existing technology can be implemented within their facilities that can improve overall efficiencies, improve security, and lower operating costs.

The Road to Better Report Writing - OSP Customer Survey Summary and Initial Findings

Ryan Chambers, Oregon State Police

Analytical reports being sent to various agencies need to strike a careful balance. On one hand, they need to be as simple and understandable as possible for readers who often do not have a science background. On the other hand, we are obligated (by ISO and professionalism) to include pertinent analytical information in our reports, which may necessitate technical terminology and concepts. How do we make sure we are finding that balance? The Oregon State Police Forensic Services Division formed a committee, deemed the CLEAR Committee (Clear = Clear, Legible, Effective, & Accurate Reports), in order to review reports from each forensic discipline in an attempt to identify problem areas and offer suggestions for improvement. In addition, the committee decided to go a step further and survey both the prosecution and defense communities of Oregon's legal system. Initial returns from the survey proved that problematic language and phrasing do exist in our reports and there is room for improvement.

Sensitivity and Specificity of Leucocrystal Violet: A Comparative Study of Three Reagent Formulations

Rhonda Banks, Oregon State Police

Leucocrystal violet (LCV) is often used as a chemical enhancement for bloodstains and impressions in blood. Several different formulations for this reagent have been published. This presentation will discuss and compare the sensitivity and specificity of three reagent formulations of LCV.

"Shot through the head, but who's to blame? Hobos give love a bad name (bad name)"

Veronica Vance, Oregon State Police

In January of 2009 forensic scientists responded to a law enforcement request for assistance in the excavation/ recovery of a skeletonized body in North Portland. A partially-skeletonized body was found located in a large thicket of blackberry bushes by the landowner attempting to clear the brush. The decomposing body was fully clothed, but No I.D. was found in the field. Initial observations revealed no apparent trauma to skull; several skeletal elements gave the indication that this was possibly a middle aged individual, and dental restorations were present. But it was when x-rays were taken at the

autopsy that "real" evidence of a homicide was discovered. This presentation shows how anthropology, crime scene analysis, and good old-fashioned investigative techniques solved the mystery of the "Blackberry Man".

Survey of Sexual Assault Evidence Kits

Jennifer Riedel, Oregon State Police

Statistics regarding the results of Sexual Assault Forensic Evidence (SAFE) kit analyses would be helpful in educating law enforcement and medical personnel on sexual assault response efforts. This study evaluated the incidence of semen positive results from 469 rape victims' SAFE kit samples. The kits were submitted to two Oregon State Police laboratories between 2003 and 2005. Information from officer's reports and victims' statements was also collected. Overall, 46% of the 469 victims had at least one sample that was positive for semen. As the time elapse between assault and sample collection increased, the probability of a positive result decreased. That probability leveled out to approximately 26-27% after 36 hours, with a spike of 40% in the 48-60 hour range. Additional conclusions evaluated positive results based on body locations reportedly penetrated, condom usage, reported voluntary intercourse, and other factors. Instances when both vaginal and cervical samples were collected and yielded different results were also evaluated. This study determined that while the victim's statement remains a good trigger for which samples should be collected, they should not be solely relied upon. Vaginal and cervical samples should both be collected when possible.

An Unusual Method of Suicide

Dan Alessio, Oregon State Police

How do you document evidence from an apparent suicide scene where the decedent was reportedly alone but no "firearm" was found? This presentation documents an unusual case, chronicling the thought process the examiner used, the documentation issues and the challenges faced while working to form a conclusion.

Validation and Implementation of GeneMapper Idx for Use as an Expert Assistance for Casework DNA

Jennifer Dahlberg, Washington State Patrol

This presentation will cover the Washington State Patrol Crime Lab validation plan to switch from GeneMapper ID v3.2 to Gene Mapper IDx v1.1. This will include which experiments were done and what the results were, focusing on the problem results and what was done to resolve these problems. The use of this software as an expert assistant for casework DNA will be discussed, as well as how it has helped or impeded our workflow.