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Contents

D56 The "CSI Effect" in a High-Profile Animal Cruelty Prosecution

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After attending this presentation, attendees will understand the need for better training of police, veterinarians, and animal cruelty investigators in the application of forensic sciences to the investigation and prosecution of animal cruelty.

This presentation will impact the forensic community by helping professionals understand how animal cruelty cases can be weakened by the failure of law enforcement to recognize the seriousness of such crimes, improper application of forensic methods to animal crimes, and slow and inadequate response to crimes in which animals are victims.

Potential penalties for severe animal cruelty have increased substantially in recent years. Extreme animal cruelty can be prosecuted as a felony offense in 48 states. Juries have held investigators to comparably higher standards of forensic evidence in such cases. These expectations often do not reflect the training and resources available to those involved in such investigations. This disconnect can result in unsuccessful prosecutions. A recent case history illustrating these problems and review steps that can be and are being taken to address the issue in agencies around the country is presented.

In 2007, two Baltimore, MD, boys allegedly poured gasoline on a young female pitbull and set her on fire in broad daylight. She succumbed to her injuries several days after the attack. The case of this dog, named "Phoenix" by those who cared for her, sparked international response and led to the formation of a permanent Anti-Animal Abuse Commission as part of the Baltimore City government. The case involved a variety of forms of evidence, including eyewitness testimony, expert testimony from a Baltimore gang specialist, street view video footage, veterinary records, evidence of accelerants on suspect's clothing and the dog's collar, and more. However, much of the investigation was delayed or did not follow accepted protocols of evidence collection, storage, chain of custody, and analysis due to the lack of resources and lack of police and veterinary experience in dealing with forensic evidence in criminal cases involving animal cruelty. Potentially significant evidence was either ignored or mishandled. The defense was largely based on forensic shortcomings in the investigation. Despite these problems, the initial trial of the suspects ended in an 11-to-1 jury deadlock to convict. A subsequent retrial several months later based on essentially the same evidence resulted in unanimous acquittal. Both suspects were later charged with other crimes committed against people while out on bail, including attempted homicide.

The lessons learned from this case and the implications for the proper application of veterinary forensic sciences to animal abuse investigations will be reviewed. Animals in such cases are both victims and evidence. In most cases, veterinary staff place the highest priority on meeting the victim's medical needs, which can compromise the collection of evidence. However, such interests need not conflict. Likewise, police are often unfamiliar with the evidentiary value of common elements at an animal crime scene, including feces, urine, blood, fur, and trace evidence. Efforts are underway to enhance the training of all professionals involved in animal cruelty investigation to avoid such problems in the future.

CSI Effect, Animal Cruelty, Veterinary Forensics

D57 Use of Canines to Detect Dried Human Blood and Instrumental Methods for the Determination of Odor Profiles

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After attending this presentation, attendees will learn about the principles of odor detection by canines, particularly human blood detection. Attendees will also learn of the volatile organic compounds comprising this odor and the methods for extracting and analyzing these volatiles.

This presentation will impact the forensic science community by expanding the general knowledge base concerning the abilities of canines and their use in support of law enforcement investigative challenges that require trace determinations of the Volatile Organic Compounds (VOCs) that compose the odor of dried blood.

It is widely accepted that canines have an exceptional aptitude for locating objects of interest based on odor. Recently, the first known detector canine trained specifically to locate small quantities of human blood has been utilized to assist crime scene technicians in locating hard-to-find blood spots for subsequent DNA analysis. It was hypothesized that this will be the first research to show, experimentally, that a canine is capable of locating miniscule quantities of human blood.

The capability of the blood detection canine to locate small blood spots of varying ages was evaluated using a canine that had been trained solely on aged blood, and had not been previously tested or exposed to fresh blood. To prepare the samples for evaluation, approximately one mg of blood (two blood drops) was placed onto carpet squares. The blood on the carpet squares was allowed to age in an open environment for a set amount of time. The age of the blood samples used ranged from one to twelve weeks. The canine successfully located all blood samples with no false alerts. This was the first time that the canine's ability to locate extremely small quantities of aged blood was demonstrated in an experimental setting.

In another set of experiments, the ability of the canine to locate fresh, compared to aged-blood was assessed. Two sets of samples containing human blood, aged and fresh, were presented to the canine. The aged set contained fresh blood spiked onto gauze pads and aged for two weeks prior to testing. The fresh set contained fresh blood spiked onto gauze pads within two hours of testing. The different gauze pads were placed in perforated cans for the canine to search. The canine responded positively to the aged blood samples, but did not show interest in the fresh blood. This indicates a change in odor profile from fresh to aged (decomposed) blood.

For the instrumental analysis of the odor profile of dried human blood of various ages, blood was drawn from three human subjects, placed in open glass vials, and allowed to age for a given amount of time before analysis. The headspace was extracted using Solid Phase Microextraction (SPME) and was analyzed by Gas Chromatography/Mass Spectrometry (GC/MS). The resulting odor profiles for each aged samples were compared. A unique group of VOCs were present in only the fresh sample, and there was a distinct change in odor signature from fresh blood to decomposed blood, occurring around Day 1 and Day 2. The VOCs detected on the first day represent the odor of fresh blood, while compounds detected after Day 1 represent the compounds that have evolved due to decomposition of the blood material, and the older samples show a continual change as the decomposition of the blood progresses.

In additional experiments, the odor signatures of dried human blood collected using several extraction methods in addition to SPME were

compared. Extraction methods included SPME with various fiber types, dynamic headspace sampling onto a sorbent tube and activated charcoal sampling. The extraction methods were compared based both on the compounds in the odor profiles as well as their precision. Based on the VOCs identified, it was observed that the extraction techniques do not necessarily yield similar results, yet instead may be considered complimentary extraction methods. To gain a better understanding of which of these compounds might be recognized by blood-specific canines, mixtures of compounds based on the odor profiles determined by each extraction method were created and presented to the blood detection canine in order to observe whether the canine would elicit a similar response to the selected blood VOC mixtures as to the actual blood.

Canines, VOCs, Blood

D58 Development of Latent Fingerprints on Brass Cartridge Casings: Survival of the Firing Process and Impact of Latent Print Development Using Acidified Hydrogen Peroxide on Forensic Firearms Examinations

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After attending this presentation, attendees will gain a better understanding of how often latent fingerprints deposited on brass cartridges survive the firing process and the extent to which latent print processing using acidified hydrogen peroxide interferes with forensic firearms examination.

This presentation will impact the forensic science community by demonstrating the survivability of latent fingerprints on brass cartridge cases after firing and discussing the extent to which latent print processing using acidified hydrogen peroxide interferes with forensic firearms examination.

Latent fingerprints developed on fired cartridge cases may serve as key pieces of evidence during forensic investigations; however, the success of developing latent fingerprints on fired cartridge cases has been a challenge for investigators due to the nature of the firing process. When fingerprints are placed on cartridge cases prior to or while loading of the weapon, there is a high probability they are destroyed due to the extreme temperatures and abrasive forces caused by the firing process. Despite these odds, other researchers have demonstrated that fingerprints, on occasion, do survive the firing process. Several methods for developing latent fingerprints on brass cartridge cases are available, which include cyanoacrylate ester fuming followed by Rhodamine 6G (CA/R6G) fluorescent dye stain and Acidified Hydrogen Peroxide (AHP).

While the majority of previous research has focused on identifying various techniques to develop latent fingerprints, very little research has evaluated the down-range effects of the development techniques to forensic firearm examinations. This is of particular interest with AHP since it is an irreversible reaction having the potential to corrode the brass and negatively interfere with the various impressions linking that cartridge case back to the weapon from which it was fired. The present study is separated into two phases. Phase I examines the survivability of latent fingerprints through the firing process, evaluates the development technique (CA/R6G, AHP, or CA/R6G-AHP) yielding the highest number of latent fingerprint impressions after firing, and the processing time required to develop fingerprints using AHP. Phase II examines whether and if so, the extent to which AHP may interfere with forensic firearm examinations at various processing durations.

For Phase I, the results indicate latent fingerprints deposited using the latent print matrix standards (both amino and eccrine) did survive the firing process; however, no latent prints deposited using the natural fingerprint matrix obtained from the study participant survived. Second, all three techniques were successful for developing latent fingerprints; however, AHP and CA/R6G-AHP were superior to just CA/R6G alone. Third, a maximum processing duration of 75 seconds should be observed when using AHP.

For Phase II, the results indicate firearms examiners considered all cartridge casings suitable for identification, but were able to differentiate whether a cartridge case had been processed. However, of those cartridge cases which had been processed, there was no statistical relationship between the processing technique nor the duration of processing and the level of degradation observed by the firearms examiners. Additionally, there was no statistical relationship of correlation values obtained using MATLAB of the images of the breach faces for each cartridge case before and after processing. These results warrant further research to better understand how the chemistry of fingerprint matrices, time, and normal environmental degradation of latent print residue will impact latent print development and its survival through the firing process. Additionally, further research is warranted to better understand the extent to which AHP processing may interfere with forensic firearms examinations using other types of ammunition and weapons.

The opinions or assertions contained herein are the private views of the authors and are not to be construed as official or as reflecting the views of the Department of the Army or the Department of Defense.

Cyanoacrylate-Ester, Hydrogen Peroxide, Fingerprint

D59 Evaluation and Validation of the SABRE Hand-Held Device for Pre- and Post-Blast Explosive Detection

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After attending the presentation, attendees will have an understanding for the use of an ion-mobility instrument in the detection of explosives and non-explosives.

The presentation will impact the forensic science community by providing a quick and easy technique for the detection and differentiation of explosives and possible false positive triggers.

Rapid detection of explosives is needed to provide real-time analysis of residues on suspected terrorists, explosive devices, and criminal offenders in military and domestic forensic settings. Instrumentation such as hand-held portable devices exists in the public market which identifies explosives with varying success. With an instrument capable of operating at a high level of accuracy and specification, personnel in theatre or security check points are capable of making informed decisions with minimal time delay. In addition, the device must be ruggedized for many different environmental conditions. The purpose of this study is to evaluate a portable hand-held device, the SABRE 5000, in the rapid identification of pre- and post-blast explosives for the defense and forensic communities. The SABRE 5000 is a recent update of its predecessor, the SABRE 4000, and utilizes Ion Mobility Spectrometry to identify the presence of explosives.

To evaluate the SABRE 5000 was conducted for pre- and post-blast explosives. For pre-blast explosives, 1,3,5-trinitroperhydro-1,3,5-triazine (RDX), Trinitrotoluene (TNT), Pentaerythritol Tetranitrate (PETN), Ammonium Nitrate (AN), and Potassium Nitrate (PN), samples were created in methanol at several concentrations from 1 ppb – 1000 ppm. Each sample at each concentration was analyzed in triplicate on the SABRE 5000 to determine its limit of detection for each explosive. Type I (false positive) and Type II (false negative) errors were calculated for each explosive as well as the sensitivity and specificity for the instrument.

In order to test for post-blast explosive samples, a test explosive consisting of an 8 gram mixture of a 60:40 TNT:PETN booster was carried out in two 55 gallon steel drums filled with saltwater. The