I.A.M.A.
International Association forMicroAnalysis

August 24, 2000
Volume 1, Issue 3

A NEWSLETTER DEDICATED FOR FORENSIC EXPERTS IN P-GSR ANALYSIS BY SEM/EDX.
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Announcement of the 3rd International Proficiency Test on Identification of GSR by SEM/EDX

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The 2nd International Proficiency Test on GSR, organised by the working group "Firearms" of the European Network of Forensic Science Institutes (ENFSI), is finished. Altogether 48 labs from Europe and North America participated in that test. A brief overview on the test results have been sent to each involved lab, and a detailed evaluation will be given at the next ENFSI working group meeting in Cracow, Sept. 2000.

We are now going to prepare the samples for the next proficiency test, which is scheduled to start in the 1st half of 2001. The task of organising and evaluating the third run will again be done by the Bundeskriminalamt (BKA) in Germany together with the Netherlands Forensic Institute (NFI) in the Netherlands, and the National Bureau of Investigation (NBI) in Finland. In general, all members of the European Network of Forensic Science Institutes are eligible to partcipate, but of course, other state registered Forensic Science Labs which do not belong to ENFSI are welcome to participate in this proficiency program.

The aim of this program is to evaluate and compare the types of instrumentation, software, and analytical method used in gunshot residue analysis. This will enable us to improve system settings and develop analytical methods and above all to help each other in performing GSR analysis successfully.

The performance of the 3rd test will be in the same manner as in the past. Lab code numbers will be assigned to all participating laboratories and their lab codes will be kept anonymous in order to maintain confidentiality. After the evaluation of the test, every lab will be informed about its findings. The results compiled from this program will be presented for discussion at the next meeting of the ENFSI working group and published.

The test items for the 2nd proficiency test consisted of a set of 48 completely identical samples, as is demanded in the ISO 5725 norm for the performance of proficiency tests. On each of these (synthetic) samples there were placed 43 wellknown "GSR particles" of a composition of PbSb, meaning that the size and location of each of these particles was exactly known by the organiser. The size and amount of particles were:

- 20 PbSb particles of 1.2 µm in diameter,
- 20 PbSb particles of 2.5 µm in diameter, and
- 3 PbSb particles of 6 µm in diameter.

This allowed an easy evaluation of the received results and information on the grade of quality of the automatic search.

As the results of the 2nd test showed, the use of a synthetic sample set is convenient, and the 3rd test will again be performed with a set of synthetic samples (an improved sample set including some particles below 1 µm and a particle composition of PbBaSb).

If you or your lab are interested in a participation on this proficiency test, please contact the author.

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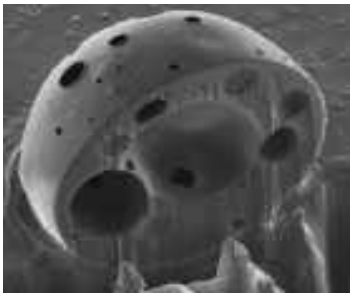
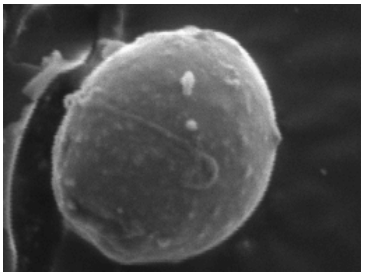
BKA

Incidence Of Gunshot Residues Transferred To Paper Bag Hand Covers



For a long time he remained there, turning over the leaves and dried sticks, gathering what seemed to me to be dust into an envelop and examining with his lens not only the ground, but even the bark of the tree as far as he could reach.

- Dr. Watson recalling the actions of Sherlock Holmes in "The Boscombe Valley Mystery



Often, scientific progress advances faster than evidentiary procedures. In other words, we invent or improve something scientific that will assist law enforcement, but how it applies as evidence in court or affects our evidence procedures can take several years to perfect the details. DNA is an example of this as is the scanning electron microscope (SEM) .

The Denver Police Department has long had the policy of bagging the hands of individuals involved in shooting incidents with paper bags if the subject's hands could not be sampled at the scene. Prior to the use of the SEM for the analysis of GSR, the AA was used for analysis. The bags were used only to protect the hands until sampling could take place. The bags were never analyzed by means of the AA, and therefore not saved as evidence because it was felt that not enough useful information was gained to render a scientific opinion as to whether the results were consistent with GSR. With the acquisition of the SEM we are now able to examine these bags for the presence of GSR. Put another way, the bags are utilized for the same purpose, but now we can gain useful information from the analysis of them. They now potentially became valuable evidence.

Unfortunately, the evidentiary value, or lack thereof, regarding the bags was not fully utilized or developed until it was brought to our attention by an inquisitive defense attorney. This same attorney tried to have the homicide charges against his client dismissed because the bags used on the victims hands were not saved and therefore not analyzed for GSR. The judge declined this generous offer and did not dismiss the charges. However, I felt that I should look at the issue of the evidentiary value of the bags because of the potential loss of evidence and the ramifications on case viability.

A survey of several labs in the country indicates that while the hands of the deceased are frequently bagged, the living, be they suspects or victims, are not bagged as often. If they are bagged, the bags are analyzed only if the hand stubs are found to be negative. My task was two-fold, first was to look at the frequency of GSR transferred to the bag interiors and second what factors may be affecting the likelihood of transfer. This was done to help establish department policy for our street officers and crime scene detectives as to when and why they should bag someone's hands and to help provide more complete trial testimony.

INSTRUMENTATION AND PROCEDURE

GSR analysis was done on a scanning electron microscope with an energy dispersive x-ray detector. The SEM used was a JEOL 5800LV, the EDX was an Oxford Link ISIS system with an automated GSR program. The following parameters were used:

Accelerating Voltage: 20kV
Magnification: 400x
WD: 10mm
Particle size range: 0.9ì m to 50ì m
Back scatter Threshold set manually on known GSR sample.

This laboratory uses the parameters set out by Wolten, et.al. that is, three component (Pb/Sb/Ba) particles are unique to gunshot primer residues, two component (any combination of Pb/Sb/Ba) are considered to be supporting or characteristic particles. There seems to be no universally accepted number or combination of unique/supporting particles required to call a given sample set positive for the presence of GSR. A survey done in 1989 shows 41% of the labs responding require only one unique particle to be present in order to call a sample positive for GSR. A more recent study done in 1994 again shows great variation and style in the evaluation and reporting of data. For the purpose of this study, I considered a positive result to be one where at least one unique, three-component particle was present.

Hand/face stubs were collected in the routine manner . Bags were sampled by cutting them open lengthwise (with clean scissors, of course) and sampling with the same type stubs as used for our GSR kits. The por-

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Incidence Of Gunshot Residues...*Continued*

Table 1

Sample Type	Hand Result	Bag Result	Type Bag	Living/Dead	Time from Shooting to Collection	Details
TF	+	+	E	L	15 min	42 rounds .45 cal semi auto/bag directly after shooting/bag worn 1 hour/hands & bag heavy GSR
TF	+	+	L	L	1 hr	3 rounds/bag directly after shooting/bag worn 1 hour/hands & bag heavy GSR
TF	+	-	L	L	1.5 hr	2 rounds.38 cal rev/bagged 1/2 hour after shooting/bag worn 1 hour/2 GSR on hands
TF	+	-	E	L	1.5 hr	2 rounds 9mm semi auto/bagged 1/2 hour after shooting/bag worn 1 hour/3 GSR on hands
AC	+	-	EE	L	2 hr	agg assault/GSR on left hand(6 particles)
AC	+	-	EE	L	2 hr	agg assault/1 GSR RH,several Ba/Sb
AC	+	-	M	D	n/a	homicide victim/1 GSR,2 Pb/Ba on RH
AC	-	+	M	D	n/a	suicide victim/stubs bloody, bags had lots of dried blood
AC	+	-	M	D	n/a	homicide victim/hands had lots of GSR/ bag did have one Sb/Ba
AC	-	-	M	L	3.5 hr	bagged over gloved hands/gloves negative for GSR/ suspect in homicide/subject cuffed
AC	-	-	M	L	2.25 hr	suspect in homicide/subject cuffed
AC	-	-	M	L	3 hr	suspect in homicide/subject cuffed
AC	-	-	M	L	3 hr	suspect in homicide/subject cuffed
AC	-	-	M	L	3 hr	suspect in homicide/subject cuffed/1 Sb/Ba RH
AC	+	+	M	L	3 hr	1 GSR RH, 2 GSR F/ 1 GSR RB
AC	+	+	M	D	n/a	homicide victim/bagged over gloved hands/GSR - 4 RH,2 LH,2 F/ bags very bloody
AC	-	-	M	D	n/a	homicide victim/stubs bloody/bags clean
AC	+	-	M	D	n/a	1 GSR LH,2 GSR F/homicide victim
AC	-	-	M	L	1.5 hr	suspect illegal discharge of firearm
AC	+	-	M	L	1.25 hr	suspect illegal discharge of firearm/large mass of GSR LH, 1 GSR face
AC	-	-	M	D	n/a	homicide victim
AC	-	-	M	D	n/a	suicide victim
AC	-	-	M	D	n/a	homicide victim
AC	+	-	M	L	.75 hr	agg assault victim/ 3 GSR LH
AC	+	+	M	D	n/a	homicide victim/lots on hand/bags blood/bags had lots of GSR as well
AC	+	-	E	D	n/a	homicide victim/4 GSR RH
AC	+	+	M	D	n/a	suicide vicitm/numerous on RH,LH,F/RB several GSR, some supporting particles
AC	-	-	M	D	n/a	suicide victim/.22 cal
AC	-	-	M	D	n/a	suicide victim/one Pb/Ba found on left hand, no GSR
AC	-	-	L	L	0.5 hr	witness to suicide
AC	+	+	L	D	3 days	subject in ICU with hands bagged for 3 days/conglom GSR LH/ 1 GSR RB/ 1 GSR LB

TF= Test Fire
AC=Actual Case
D=Deceased
L=Living/Mobile

Bag Type:
E=Evidence Bag
EE=Evidence Envelope
M=Mid Size Bag
L=Lunch Bag

Size:
14" * 8.5" * 6"
9.5" * 6.5"
12" * 6" * 4.5"
10.5" * 5.25" * 3.25"

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tion of the bag most likely to have come in contact with the hand was sampled.

RESULTS

Initially, some controlled testing was done by police officers. After firing numerous rounds with either a semi-

(Continued on page 4)

Incidence Of Gunshot Residues...*Continued*

Physical evidence can not be intimidated. It does not forget. It sits there and waits to be detected, preserved, evaluated, and explained.

-Herbert Leon Macdonell (Quoted at the opening page in his book "The Evidence never lies")

(Continued from page 3)

automatic or revolver, the officer's hands were immediately bagged for a period of one hour. One officer was bagged using an evidence bag and the other with a lunch sack (see Table 1 for size parameters). The bags and hands were then sampled and tested for the presence of GSR. Both sample sets were found to have a large amount of GSR present. This showed that, as common sense might tell you, the GSR will transfer from the hand to the bag interior. It also indicates that the bag size was not critical as there was transfer even when using a large bag that did not closely cover the hands. A second set of test fires was done by having the subject discharge the firearm twice and then conduct normal activities for 30 minutes. His hand was then bagged for one hour with a small bag. During this time the subject again took part in normal activities as much as possible, thus causing the hand to come in frequent contact with the interior of the bag. The hand and the bag were then sampled and tested. The hand stub was positive for GSR, although a minimal amount, and the bag was negative. Studies have shown that the amount of GSR left on the hand decreases with the passage of time. This would support the premise that the longer the time delay in bagging the hands of a living subject, the greater the loss of GSR and therefore, the less chance that GSR will show up on the interior of the bag. Put more simply, time is an ally of the shooter. As time passes there is a greater chance that all GSR that is going to come off easily has in fact come off and therefore no transfer occurs.

Actual case evidence was then examined (see Table 1) . Basically, any case that came in where the hands had been bagged, both the hand/face stubs were analyzed as well as the bags. In evaluating the data, I did not include the controlled test fires, nor did I consider the cases where both the hand stubs and the bag samples were negative because it was felt that one could not say GSR was present in the first place. While not a large sampling, the data indicates that GSR did transfer to the bags in 39% of the cases. The majority of those where the GSR did transfer were to the deceased (80%). This gives further evidence that the mobility of the subject affects the retention of GSR and the chance of transfer occurring. In the one case where the hand stubs were negative and the bags positive, the stubs and bags were very bloody. In another case, where both the hand stubs and bags were positive, both were also bloody. This would indicate that the GSR can be "washed" away with the blood. There were two individuals that had had their hands "bagged" with evidence envelopes. These envelopes were in close contact with the subjects' hands and yet there was no transfer of GSR found even though the hands were positive for both individuals. This again supports the premise that after a certain amount of time, mobile subjects have lost most GSR that is going to be easily removed.

CONCLUSIONS

In evaluating the test results certain factors seem evident:

- If hands are to be bagged it should be done promptly after the incident. Just as we have set a time limit on sampling hands, we should set a time limit on bagging the hands of mobile subjects.
- Bag size is not as critical as time.
- Bloody hands should be bagged and the bags tested, sampling the dried blood.
- If bags have been used, they potentially have evidentiary value and should be treated as such. They should be saved as evidence and analyzed if needed.

With the advent or acquisition of new instrumentation, such as the SEM, we in the forensic community are continually put in the position of doing all that is possible and must continually evaluate and update our policies and procedures regarding what may be of evidentiary value.

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(Continued on page 5)

Incidence Of Gunshot Residues...*Continued*

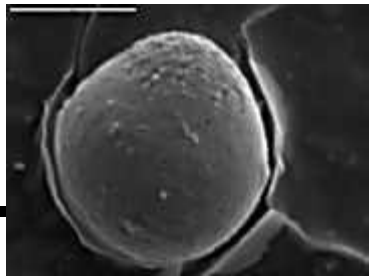
(Continued from page 4)

1.Wolton,G.M.,Nesbitt,R.S.,Calloway,A.R.,Loper,G.L., Jones,P.F., "Particle Analysis for the Detection of Gunshot Primer Residue:1.Scanning Electron Microscopy/ Energy Dispersive X-ray Characterization of Hand Deposits from Firing," **Journal of Forensic Sciences**, Vol. 24, No. 2, Mar 1979, pp409-422.

2.DeGaetano,D., Siegel,J.A., "Survey of Gunshot Residue Analysis in Forensic Science Laboratories," **Journal of Forensic Sciences**, Vol. 35, No. 5, Sep 1990, pp 1087-1095.

3.Singer, R.L.,Davis,D.,Houck,M.M.,"A Survey of Gunshot Residue Analysis Methods," **Journal of Forensic Sciences**, Vol. 41,No. 2,Mar 1996, pp.195-198.

4.Kilty,J.W., "Activity After Shooting and its Effect on the Retention of Primer Residue," **Journal of Forensic Sciences**, Vol. 20, No. 2, Mar 1975, pp 219-230.



The Aerospace Report Refreshed, Revisited, and Reconsidered

The West Virginia State Police Forensic Laboratory conducts automated gunshot residue particle analysis and classification on adhesive tape samples for all law enforcement agencies in the state. The CamScan system used today was the first one in the nation (1985) offering this capability.

The Trace Evidence section of the laboratory, after inquiring and assessing other collection kits, designed a three sample kit using ¾ inch carbon stubs labeled right hand, left hand, and face with conventional double sided tape (Scotch 665). An instruction sheet was developed along with a data sheet that asked about the time lapse between the shooting and collection, the subject's occupation, and activities before the collection. A search warrant to obtain these samples is deemed unnecessary because of the exigent circumstances associated with loss of GSR evidence over time and activity as well as the unintrusive nature of the collection. In 1993, carbon conductive adhesive tapes (c-tape) were introduced into the kits. Using c-tape greatly reduced sample preparation and eliminated the question of cross contamination during any carbon-coating procedure. The brittle nature of the carbon stubs was overcome in 1994 when ¾ inch aluminum stubs were customized to replace them. In 1997, a purer grade of aluminum stock was adopted to remove the stray heavy metal alloy particles occasionally encountered. For the past two decades the findings of the Aerospace Report has been the validation, guideline, and hall mark document for forensic scientists involved with (gunshot residue) particle analysis. Some of the Key Points include:

1. Uniquity of Ba/Sb/Pb; Ba/Sb; and Ba/Ca/Si
2. A list of characteristic particles
3. A list of "forbidden" elements precluding firearm origination.
4. The need to consider the overall particle types on a sample.
5. Occupational studies evaluating any sources which may yield false positives.

Since the report, changes have taken place in primer formulations, and discoveries have been made of potential non-firearm sources. Aluminum seems to be incorporated in more primer compounds and the presence of Ba/Al particles is encountered. Their morphologies are generally round, smooth, glassy, featureless spheres often ranging in size from 2-10 micrometers. Identification of these types of particles with trace to no sulfur or chlorine may be considered as characteristic of primer residue. Ba/Al particles with these morphologies have also been found in a minority along with Ba/Al/Fe particles. These are residue particles produced by common "sparklers", a pyrotechnic novelty. Ba/Al with sulfur may originate from barytes used in fillers, pigments, and friction materials, such as brakes and clutches. Ba/Al with chlorine may originate from some pyrotechnic devices which produce sparks and/or green colored flame.

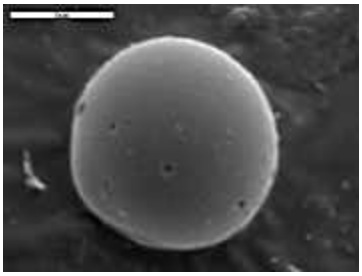
Sources of Ba/Sb and Pb/Ba/Sb composites have been identified in a small minority of friction materials used for vehicle brakes. Since

(Continued on page 6)

Circumstantial evidence is a very tricky thing. It may seem to point very straight to one thing, but if you shift your own point of view a little, you may find it pointing in an equally uncompromising manner to something entirely different.

-Sherlock Holmes

Aerospace Report Revisited…*Continued*



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high temperatures develop on these composites, the potential is there to possibly create Ba/Sb or Ba/Sb/Pb particles. However, these particles would be expected to also include a significant amount of iron, which is contributed by the rotor or drum. The overall particle population of such a sample of brake dust will have an outrageous amount of iron particles. With this considered, as directed by Aerospace, the origin of any Ba/Sb/Pb of Ba/Sb particles should be dismissed as being from a firearm.

Pyrotechnicians and a small number of pyrotechnic devices may have the potential of having Pb/Ba/Sb particles. Along with these three elements, chlorine and magnesium can also be present. When these combinations appear any association with firearms should be ruled out.

Ba/Sb particles with aluminum have been encountered in case work and this elemental combination is still known only to be from a firearm. Ba/Ca/Si particles without sulfur have been rarely encountered in primer residue case work and have also been detected in a pyrotechnic device known as "ground bloom flower". When such particles are identified, the presence of them in the ammunition involved in the investigation should be substantiated.

Tin with Sb/Pb particles or with Pb/Ba/Sb particles has a strong association to burden primed ammunition cartridges.

A comparison is the essence of this note and salvation of particles which have questionable firearm origins. As a reminder, the total population of all particles classified on a sample should be considered in the assessment of its forensic value.

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West Virginia State Police
Forensic Laboratory

The problem isn't with what we don't know. The problem is with what we do know that isn't so.

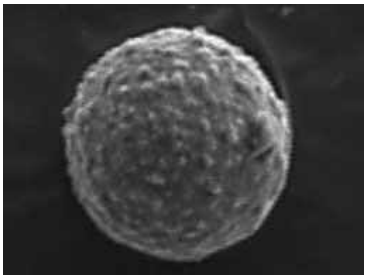
-Will Rogers. (Quoted at the beginning of the article "Shaken Baby Syndrome and Death of Matthew Eappen" by John Plunkett, M.D., in The American Journal of Forensic Medicine and Pathology", Vol 20, Number 1, March 1999 at page 17)

In Regard To...

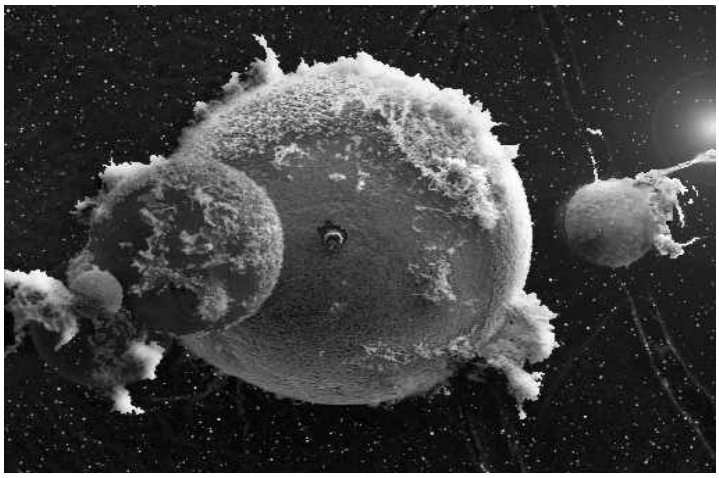
In the first and second IAMA newsletters, we asked if you could provide us with information as to how your laboratory analyzes P-GSR. We would like to thank all of those participants who provided us with this information. We plan to put this in database form and distribute it to all who are interested .

We would like to announce that the phenomenal growth in IAMA and its members list has led us to inquire about expanding onto the World Wide Web. We are vigorously working on grants, sponsors and/or donations in keeping this newsletter going. Our main goal at IAMA is to keep providing the newsletter free of charge to our members.

Additional comments can be addressed to **James Garcia** or **Mike Martinez** at (210) 335-4115, Fax (210) 335-4101 or e-mail: jdgarcia@co.bexar.tx.us or mmartinez@co.bexar.tx.us



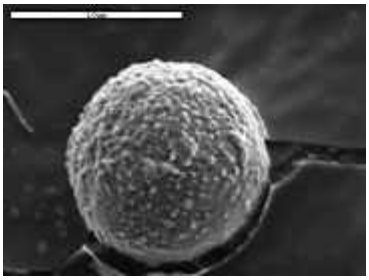
No, this is not an image from the Hubble telescope! It is a very enhanced SEM photo of lighter flint particles using Photoshop 5.5 and other various plugins.



In Theory...

This section of the newsletter is dedicated to short theoretical information specifically targeting the scientific theory, scientific information and/or scientific trivia as it relates to P-GSR.

ARKANSAS : Where Things Occur Naturally



At the Arkansas State Crime Laboratory, we have been analyzing Gunshot Residue (GSR) Kits by bulk analysis followed by particle analysis, when required, for the last two decades.

One of the reasons particle analysis is used is to confirm that the residues of Lead, Antimony and Barium which when found together are considered to be from GSR, are in fact from GSR. Part of this concern is based upon the fact that all three elements occur naturally within the boundaries of Arkansas.

Barium is found as a sulfate called Barite, barytes or heavy spar, a heavy mineral, ordinarily white but with impurities, it may be of any color. It usually occurs as a granular or crystalline material easily identified by its softness and high specific gravity. The principle use for Arkansas barite is the manufacture of a weighting agent for drilling muds used in the oil industry. Other uses include the manufacture of lithopone, a white paint pigment, and as a filler in paint, paper, rubber linoleum, cloth, road building, roofing paint and vehicle undercoating.

Most of the barite deposits in Arkansas are in the Quachita province, specifically in Hot Springs, Montgomery and Polk Counties. The Magnet Cove deposit, located just east of Magnet Cove in Hot Springs County, is the largest known deposit. The Dierks district is located in Sevier County.

Lead is found as a sulfide called Galena, 88.6 percent lead. It is soft, very heavy, gray in color with a metallic luster. It will make a dull gray mark on hard paper or unglazed porcelain. Metallic lead is used in making lead pipe, sheet lead and shot. It is alloyed with antimony, copper and bismuth to make type metal, used in electric lighting, storage batteries and pipe organs. White lead (basic lead carbonate) and litharge (red lead oxide) are used in paint pigments. Litharge and red lead (lead tetraoxide) are used in the manufacture of glass.

There are two regions in Arkansas where lead ores are known to occur. These are the north-central/eastern counties forming the north district and the mineral belt of west-central Arkansas extending through and including the counties of Pulaski, Saline, Garland, Hot Springs, Montgomery, Polk, Howard, Pike and Sevier. In west-central Arkansas the lead mineral occurs as veins in folded sandstones and shale's.

Antimony is also found as a sulfide called Stibnite, which contains 71.4 percent antimony and 28.6 percent sulfur. The mineral is heavy, steel-gray, with a metallic luster and is often in slender prismatic crystals which are sometimes curved or bent.

Antimony is a constituent in various alloys. Antimony not only hardens the alloy, but lowers the melting point and decreases the contraction during solidification. Its main usage is to impart stiffness and hardness to lead alloys. Antimony compounds are used in medicine, patent leather industry, pigments, enamelware and paints.

Stibnite occurs in the southwestern area of Arkansas in northern Sevier County with small deposits found in Pike County. Stibnite is found as lenses or pockets with quartz in veins which cut the steeply folded shale and sandstone beds.

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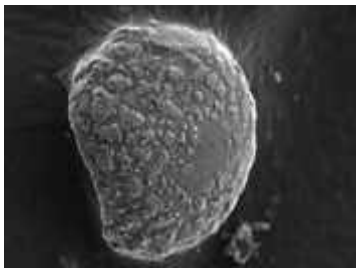
* Information concerning these elements was found in "Mineral Resources of Arkansas"; Bulletin #6, 1985, Arkansas Geological & Conservation Commission

Forensic Science is the link between the criminal and the crime.

-Ken Goddard, Wildlife Forensics, (quoted in Natur (German) Nov. 1990)



Gunshot Residue From Strange Places

Gunshot residue collection kits can be purchased by contacting any of these vendors:

-Tri-Tech, Inc.
(800) 438-7884
www.tritechusa.com/

-SPI Supplies
(800) 242-4774
www.2spi.com/

-RJ Lee Group, Inc
(724) 325-1776
www.rjlg.com/

-Faurot, Inc.
(800) 572-4603
www.faurotinc.com/

-Doje's Forensic Supplies
(407) 880-8149
www.dojes.com/

-Lynn Peavey Company
(800) 255-6499
www.lynnpeavey.com/

-Ted Pella, Inc.
(800) 237-3526
www.tedpella.com/

-Evidence Collection and Protection, Inc. (ECPI)
(800) 953-3274
www.crime-scene.com/

-Sirchie, Inc.
(800) 356-7311
www.sirchie.com/

Most gunshot residue kits that we receive for analysis represent tape lift samplings from the hands and/or faces of suspects. The SEM/GSR kits produced commercially contain glass or plastic vials prelabeled as Right Hand, Left Hand, Face, or Right Back, Left Back, Right Palm, Left Palm. While these are typical locations that are sampled from suspects, there are occasions where the sampling can be done elsewhere depending on the circumstances of the alleged crime. In several instances, I have been asked if tape lifts can be taken from places other than the hands and face of a suspect. My answer has always been: "Of course, you can; simply scratch out the existing label and rewrite a new label on the vial, indicating the location of the sampling." Tape lifts to determine the presence or absence of gunshot residue on just about any object can be done and, in some cases, may be the only way to implicate a suspect.

I was recently involved in two cases where gunshot residue analysis was conducted on areas that are not usually sampled for gunshot residue. The presence of gunshot residue was sufficient to produce a confession in one case, and a conviction in another.

CASE #1

A woman, during an argument with a man, claimed that the man pulled out a .22 caliber gun and fired the gun in close proximity to her head. The investigating officer found a dark smudge in her hair that he believed could have been related to gunshot residue. The officer received permission from the woman to remove some hair from the smudge area to send in for testing for the presence of gunshot residue with the idea that, if gunshot residue was found, the woman's claim would be more credible.

The hair samples were examined with a stereomicroscope to identify individual strands containing large quantities of particles. A few individual strands were then pressed onto double-sided carbon tape that was attached to an SEM stub. After removing the hair, the stub was examined in the scanning electron microscope utilizing backscattered electron imaging. With SEM conditions typically used for GSR analysis, we observed hundreds of particles. All of the particles had nearly equivalent brightness intensities and energy dispersive x-ray spectrometry (EDS) analysis of about a dozen particles revealed varying amounts of lead and barium along with consistently low levels (2-2.5 wt %) of antimony. Rim fire .22 caliber ammunition does not have an antimony compound as one of the primer components. Therefore, one would expect to find only the lead and barium containing materials.

The low and consistent levels of antimony seemed unusual and the investigation continued by examining powder scraped from a spent shell casing from the crime scene. A sample of bullet lead from an unfired cartridge found in another room was also analyzed. As expected, EDS analysis of the spent casing powder revealed only lead and barium. However, the bullet contained low levels of antimony consistent with those found from the hair samples. Combining these results leads to the conclusion that the particles from the hair are most likely bullet fragments coated with primer residue. The large number of particles in such a small region leads one to conclude that the gun was probably fired in very close proximity to the hair as claimed by the woman.

When confronted with the gunshot residue analysis evidence, along with other evidence provided by the District Attorney's office, the suspect confessed and admitted that he had fired the weapon near the woman's head only to scare her.

CASE #2

A man was apprehended as a suspect in a shooting at a local grocery store. Two eyewitnesses, young children, claimed that the man shot the woman behind the counter and placed the gun into a jacket pocket; but neither witness could remember which pocket. When the suspect was apprehended, he was wearing a jacket but there was no weapon in either pocket.

The District Attorney's office decided to send the jacket out for analysis to determine the presence or absence of gunshot residue inside the pockets. We re-

Gunshot Residue From Strange Places...*Cont*.

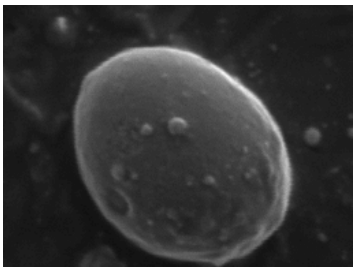
ceived the jacket and carefully turned the pockets inside out in order to conduct tape lift samplings of each pocket. Because the pockets contained all kinds of other particles and fibers, the tape lifts were heavily loaded. Therefore, the tape lift samples were coated with carbon in order to minimize charging in the scanning electron microscope during the analysis. The EDS analysis of the two tape lift samples found numerous particles of gunshot residue from the right hand pocket. Many of the particles were spherical in shape, like typical gunshot residue, but others were quite large, 100-300 µm, and very irregularly shaped. Large particles like these are typically found inside the barrel of a gun and inside spent shell casings, and are most likely non-vaporized primer components. These results were consistent with the witnesses' statements that the suspect had placed the gun inside one of the pockets, in this case, the right hand pocket.

Finding gunshot residue inside a pocket is certainly not a definitive indicator that the suspect actually fired a weapon. The jury, however, felt that the presence of gunshot residue in the right hand pocket was consistent with the eyewitnesses' testimonies and found the defendant guilty of attempted murder.

DISCUSSION

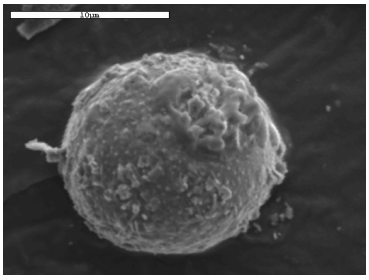
It is very important for detectives, police officers, and crime scene technicians to understand that gunshot residue can deposit in locations other than the hands and face of a suspect. Depending on the background information provided by all parties in the case, the sampling done for gunshot residue can be very critical. Once again, I must emphasize that, even though the gunshot residue kits supplied commercially contain prelabeled vials for the hands and/or face, one does not have to limit the sampling to those areas. Conduct the tape lift sampling anywhere you feel it is necessary and relabel the vials. Also, whenever I have an opportunity, I try to encourage law enforcement agencies to have their police officers carry gunshot residue kits with them at all times. It is important to obtain the gunshot residue tape lift samplings as quickly as possible after apprehending a suspect. It can always be determined at a later date if the time needed for gunshot residue analysis is required for the case. Once gunshot residue particles are on the tape, they will rarely become dislodged. Therefore, the gunshot residue kits can be evaluated at any time. It is better to have the evidence on hand and use it later if necessary than to not have the evidence at all.

Wayne D. Niemeyer
Senior Research Scientist
McCrone Associates, Inc.,
Westmont, IL



In 1974 the introduction of the first forensic application for the detection of gunshot residue (GSR) using scanning electron microscopy with electron dispersive X-rays (SEM-EDX) technology was developed by J. E. Wessel, P. F. Jones, Q. Y. Kwan, R. S. Nesbitt and E. J. Rattin at Aerospace Corporation.

Call For Papers!



At IAMA, we are committed to providing our subscribers with information that is timely and beneficial, and we welcome any suggestions for topics or articles. In addition, we are requesting papers or articles from our subscribers regarding research projects, proposals, interesting case studies, etc. If you have something you would like to see published in the upcoming newsletters, please submit to:

Mike Martinez Or James Garcia
mmartinez@co.bexar.tx.us jdgarcia@co.bexar.tx.us
Fax: (210) 335-4101

Technical Corner

This is a new section we have added to the IAMA newsletter addressing new advancements in instrumentation, interpretation analysis, software and manufacture updates/utilities/fixes.

There's no denying that we are engulfed in the new digital revolution, from basic television broadcasting, telephone technologies, banking, laboratory instrumentation, surveillance, intra/internet, evidence documentation and photographic documentation to name a few. No matter what forensic discipline you're involved in, digital documentation already is or will soon be a vital part of your daily task.

As a Trace Evidence Analyst, I have found it increasingly tedious to effectively manage the vast amount of digital information obtained for a criminal investigation. That was until I was introduced to an image management program that allows me to easily view thumbnails of all the images downloaded onto a hard drive, network, or CD-R. I realize there already exist many such utilities that will allow the end-user to do similar tasks, but the information obtained from these programs may be limited in viewing capabilities or for forensic documentation requirements.

The program I have been quite impressed with is ThumbsPlus 4.10. It allows for easy viewing of graphic files by locating and organizing a multitude of graphic file formats, as well as finding, processing and maintaining clip-art files, fonts and animations. The ability to instantaneously view thumbnails of images allows for easy perusal of a particular case image file without opening memory-exhausting programs. ThumbsPlus 4.10 manages the images, documents the information parameters for that image, and retains this information in a fully customizable database. The program also provides detailed information regarding file type and size, camera manufacturer, ISO settings, F-Stop, time and date original image was acquired/ modified or enhanced. ThumbsPlus 4.10 can effortlessly accomplish all of these features and more…

For a fraction of the cost of similar programs, ThumbsPlus 4.10 is a program worth looking into.

Further inquires into this software and its use by law enforcement agencies in the U.S. and internationally can be obtain by contacting :

Laura Shook
Senior Vice President
Cerious Software, Inc.
lshook@cerious.com
Voice: 704-529-0200
Fax: 704-529-0497
or visiting the web site at:
http//www.cerious.com

I hope this information was helpful.

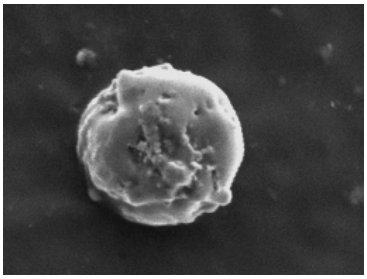
Mike Martinez, MSFS
Trace Evidence Analyst
Bexar County Criminal Investigation Laboratory

For murder though it has no tongue,
Will speak with the most miraculous organ.

- William Shakespeare (Hamlet)

Acknowledgements

SCANNING 2000 - A Forensic Success in San Antonio!



The ***SCANNING 2000*** International Scientific Meeting for scanning microscopies was held in San Antonio, Texas, May 9-12, 2000. The meeting sponsors numerous scientific sessions and training courses. As part of the ***SCANNING 2000*** meeting, the "Applications of Scanning Microscopy in Forensic Science" symposium consisted of three days of forensic related activities. Tuesday, May 9, was devoted entirely to a "Forensic Science Short Course". Instruction for the short course ranged from sample preparation and analysis, individual particle handling, gun shot residue analysis, "McGuyver bombs", pyrotechnics residue analysis, and food, beverage and pharmaceutical tampering and counterfeiting analysis by scanning electron microscopy (SEM) and energy dispersive x-ray analysis (EDX). The course was instructed by Dennis Ward (US DOJ - FBI), Michael Trimpe [Hamilton County (OH) Coroner's Of-

(Continued on page 11)

Acknowledgements

SCANNING 2000 - Continued

(Continued from page 10)
fice], John Giacalone (West Virginia State Police Crime Lab) and S. Frank Platek (US FDA – Forensic Chemistry Center). A total of 38 "students" from throughout the US and seven foreign countries attended the one-day short course. Wednesday and Thursday, May 10-11, were filled with scientific papers on a number of forensic topics. One section was devoted almost entirely to gun shot residue analysis, databases and related items.

The forensic session at the annual ***SCANNING*** meeting has been very well attended for more than eight years. Although the date has not been firmly set, ***SCANNING 2001*** is planning to sponsor another "Applications of Scanning Microscopy in Forensic Science" session. Along with the one-day forensic short course, there will again be two days of scientific papers for a total of three full days.

Questions or suggestions for papers, and comments should be addressed to:

S. Frank Platek
Forensic Chemistry Center, US Food and Drug Administration, 6751 Steger Drive, Cincinnati, OH 45237-3097, fplatek@ora.fda.gov

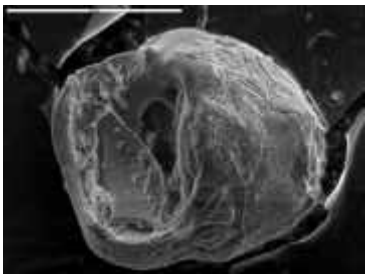
FYI!

A reminder for upcoming events:

P-GSR Technical Applications Workshop is scheduled to be held in **Fremont, CA.** late **November 2000** hosted by **Oxford Instruments, Inc.**. Additional inquiries can be obtained by contacting **Mark Betts** at (510) 656-8820 or e-mail: mark@ca.oxinst.com

Southwestern Association for Forensic Scientist (SWAFS) will be held at the beautifully historic Camberley Gunter Hotel in **San Antonio, TX** on **November 5-8, 2001** at a phenomenal rate of $70.00 per night. You can find more information about SWAFS by visiting http://www.cripkit.com/swafs/swafs.html

For additional information or reservation information please contact Gustavo De Leon at the Bexar County Criminal Investigation Laboratory at (210) 335-4148.



Wherever he steps, whatever he touches, whatever he leaves even unconsciously, will serve as silent witness against him. Not only his fingerprints or his footprints, but his hair, the fibers from his clothes, the glass he breaks, the tool marks he leaves, the paint he scratches, the blood or semen he deposits or collects - all of these and more bear mute witness against him. This is evidence that does not forget. It is not confused by the excitement of the moment. It is not absent because human witnesses are. It cannot perjure itself. It cannot be wholly absent. Only its interpretation can err. Only human failure to find it, study and understand it, can diminish its value.

-Crime Investigation, second edition, Paul L. Kirk (deceased), edited by John I. Thornton (1974), p. 2. (Quoted also in "Footwear Impression Evidence" by William J. Bodziak