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GSR Case Studies, Results and Interpretation

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In the Next 25-30 Minutes

- What is GSR
- How is it analyzed
- Issues – areas of discussion
- Case Studies
 - Results, Interpretation, Verdict

What is Gunshot Residue?

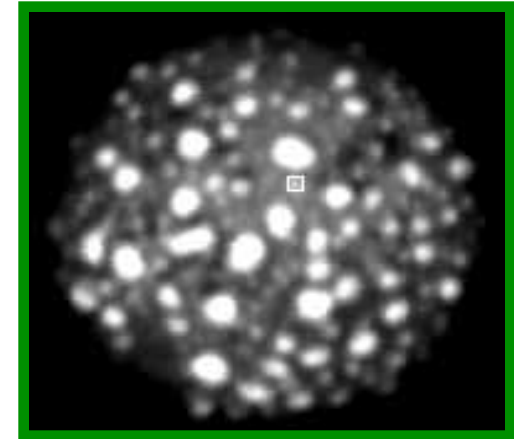
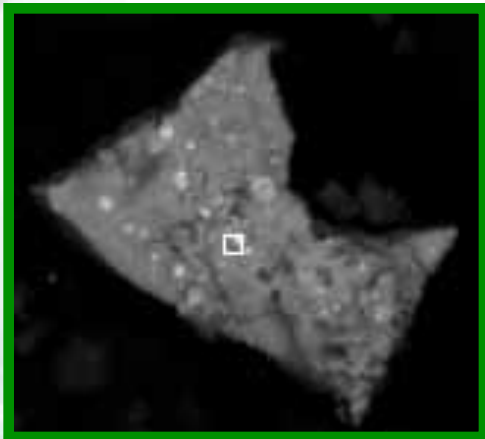
- Pb, Sb, Ba - originates from the primer cap.
- Typically, the primer cap is a small round insert found at the bottom of a cartridge case

Primer Cap



How do you analyze GSR?

- SEM – Scanning Electron Microscope



Categories of Particles

- 3 Elements (3 component)
 - Pb-Ba-Sb
- 2 Elements (2 component)
 - Pb-Ba or Pb-Sb or Ba-Sb
- 1 Element (single component)
 - Pb or Ba or Sb



GSR

- 2005 FBI symposium
 - “was to attempt to establish guidelines for the acceptance, practices, and interpretation of GSR examinations conducted primarily by scanning electron microscopy with energy dispersive X-ray spectrometry detection (SEM/EDS).”
- Scientific Working Group

Areas of Discussion

- Term Unique to vs. Characteristic of
 - Pb-Ba-Sb – 3 elements
 - Unique to GSR
 - Characteristic of GSR
 - Pb-Ba, Pb-Sb, and Ba-Sb – 2 elements
 - Consistent with GSR
 - Indicative of GSR

Areas of Discussion

- Number of particles required to call a sample "positive."
 - Is 1 enough? Is 3 enough?
- Number of samplers used.
 - Separate samples for the palms and backs of hands
 - One sample per each hand

Areas of Discussion

- Number of particles analyzed and/or relocated and reported.
 - Do you stop once a certain number is reached?
 - Do you need to analyze the entire stub?
- Number of samples analyzed per kit.
 - How many samples should be analyzed ... only one sample from dominant hand?

Case Study #1



- Suspect accused of discharging a firearm from the drivers side of his vehicle.



- 2 bystanders were struck by bullets.



- The suspect spoke to police after a few hours.



- The suspect's hands and vehicle were tested for GSR.

Case Study #1
GSR on Suspect's Hands

Hand Kit	3 Comp	2 Comp	Single Comp
Right Back	3	0	12
Right Palm	1	3	17
Left Back	11	1	13
Left Palm	3	2	9

Case Study #1
GSR in Suspect's Vehicle

Window Frame	3 Comp	2 Comp	Single Comp
Front	1	2	152
Back	32	23	26
Bottom	9	4	71
Top	4	2	21

Interpretation

- Cannot say “suspect fired the gun”.



- Cannot date how long GSR has been on an item.



Verdict

➤ Guilty!



➤ OTHER EVIDENCE

- Linked suspect to incident
 - Firearm
 - Witnesses

- Case is currently being appealed.

Case Study #2



- Man found shot in the head (he was in bed).



- His wife found him and called the police.



- Victim's hands sampled prior to autopsy due to suspect's (wife) claim of suicide.



- Later, gun was found in the house in a motorcycle saddlebag.

Case Study #2
GSR on Victim's Hands

Hand Kit	3 Comp	2 Comp	Single Comp
Right Hand	1	0	19
Left Hand	2	2	12

Test Fire??

- A test fire was requested by the client due to the presence of very little GSR particulate on victim's hands.
 - Does firearm produce ample amounts of GSR?
 - Environmental concerns?

Case Study #2

Test Fire

Hand Kit	3 comp	2 comp	single comp
Right Hand *	≥ 33	≥ 31	≥ 25
Left Hand	≥ 46	≥ 25	≥ 19

Interpretation

- Cannot account for movement of victim's hands and particle loss between incident and time of collection.
- Cannot account for particulate on suspect's hands.



Verdict

➤ Guilty!



➤ OTHER EVIDENCE

- Linked suspect (wife) to incident
 - Glove found inside a basket of wet clothing.
 - DNA was found on the inside & outside of glove
 - GSR was found on the outside of glove
 - Circumstantial evidence
 - Victim had an affair (wife knew about it)

Case Study #3



➤ Woman found shot in the basement of a church.



➤ Police had suspect based on statements from church members.



➤ Police interview suspect – next day gun found on bank of lake by fishermen.



➤ Suspect's wig and vehicle sampled for GSR .

Case Study #3

GSR in Suspect's Vehicle

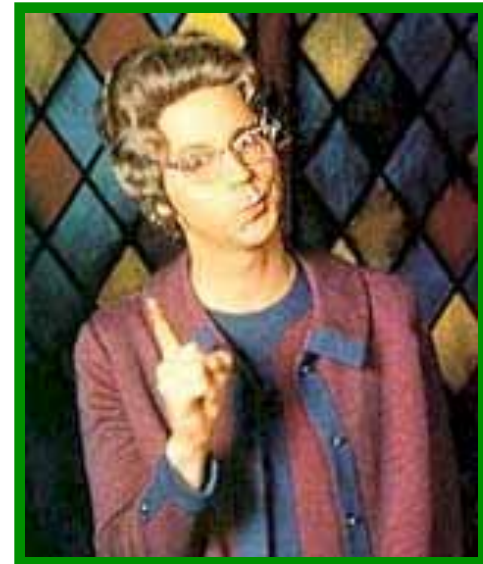
Vehicle	3 comp	2 comp	single comp
Door Handle Armrest	1	0	13
Wiper/Turn Signal	1	0	9
Driver Seat	1	2	13

Interpretation

Cannot say who had access to the vehicle (the vehicle belonged to the suspect's brother).

Only 3 of 18 samples were positive for GSR.

No GSR found on wig.



Verdict

➤ Guilty!

➤ OTHER EVIDENCE

- Linked suspect to incident
 - Gun registry
 - Character witnesses from church
 - pastor, other parishioners



Case Study #4



- A vehicle of men shot at another vehicle at a drive-thru window at fast food restaurant.
 - 2 passengers were shot, 1 survived.



- Police found suspects several hours later.



- ISID kits used to collect samples for GSR from 2 suspects' hands.
 - Suspect #2 admitted to discharging a firearm.

Case Study #4

GSR on Suspects' Hands

Hand Kit	3 comp	2 comp	single comp
suspect #1	0	0	1
suspect #2	0	0	0

Interpretation

- Type of kit could have effected the results of the analysis.
- Length of time between the shooting and collection can effect the results.



Verdict

➤ Suspect #2 – Guilty!



➤ OTHER EVIDENCE

➤ Linked suspect to incident

➤ Prior incidents between suspects and victims.

➤ Suspect #2 confessed!

Summary

- IF GSR is found, suspect could have:
 - Fired a weapon,
 - Been in the vicinity of a fired weapon, or
 - Touched an item with GSR on it.

Summary

- IF GSR is NOT found on suspect:
 - It wasn't there to begin with,
 - It was removed prior to testing due to physical activity,
 - Inefficient testing media was used, or
 - The ammunition is lacking one or more of the three elements.

Any Questions?

- Summary of the FBI Laboratory's Gunshot Residue Symposium, May 31–June 3, 2005, Forensic Science Communications, July 2005, Volume 8, Number 3
- www.google.image.com

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