

Approved by Director: Dr. Guy Vallaro

Title: SEM sample collection for gunshot residue (GSR) analysis

A. Purpose

To collect samples for the possible presence of gunshot residue (GSR) from primers.

B. Responsibility

Analysts authorized to conduct GSR examinations.

C. Equipment

1. Scanning Electron Microscope (SEM) (Hitachi 3700-N or equivalent)
2. Energy dispersive X-ray spectrometer (EDS) with GSR software (EDAX Genesis System or equivalent)
3. Stereoscope
4. Adhesive-covered SEM stubs
5. Acetone (Reagent Grade, or equivalent)
6. Diphenylamine (Reagent Grade, or equivalent)

D. Procedure:

1. Preparation
 - a. All evidence is handled in accordance with general laboratory (GL) policy.
 - b. Document appropriate label information on worksheet(s) and check the integrity of the seal on the outside of the package. Take appropriate case notes throughout the procedure and areas sampled should be appropriately documented.
2. Sample Collection
 - a. All items found packaged separately will be analyzed separately
 - b. Appropriate cleaning of examination area will be conducted in between different items of evidence.
 - c. Examination gloves will be changed in-between handling and/or collection from items of evidence.
 - d. New brown paper should be placed as a barrier between items of evidence and surfaces.
 - e. Additional sampling of evidence (e.g., for Forensic Biology/DNA section) may occur during the same time as collection for presence of GSR. Such sampling will be done by appropriately-trained analysts, according to the needs of the Forensic Biology/DNA section, and according to relevant procedures within that section.
 - f. Evidence containing bullet-type hole(s) should be examined microscopically using a stereoscope, particularly the periphery of the hole(s), for the presence of gunpowder-like particles.

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Status: Published
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- i. If gun powder-like particles are observed, document using photography. Remove the particle(s) using clean, fine forceps and place the particles onto a glass slide.
 - A. Solubility testing using acetone can be performed.
 - B. Chemical color testing using diphenylamine (DPA) reagent can be performed.
 - C. If particle(s) dissolve in acetone and give a positive (i.e., blue) chemical color result with DPA, gunpowder residue may be present.
 - D. Analyst(s) from the Firearms/Toolmarks Unit should be contacted in order to determine if GSR analyses should be conducted.
- ii. If no gun powder-like particles were observed during microscopy, use a blank SEM disc to sample the periphery area of the bullet-like hole(s).
- g. For all evidence not containing bullet-like holes, a general sampling for GSR particles using adhesive-covered SEM stubs can be used.
- h. Samples not conducive to SEM discs will be sampled according to best practices determined by the analyst. Documentation as to how sampling occurred should be recorded appropriately within examination documents. A Lead Examiner or another qualified Examiner should be consulted for unusual situations/evidence.
- 3. General sample collection for clothing items using adhesive-covered SEM stubs
 - a. Long pants: Take SEM samples from the outside/inside areas of all outside pockets.
 - b. Long sleeve shirt/jacket: take SEM samples from the areas of sleeve cuffs and all outside pockets.
 - c. Short sleeve shirt/T-shirt: Take SEM samples from the front area.
 - d. Shoes and hat: Take SEM samples from the areas of the outside surfaces of these items.
 - e. Inside shirts/underwear: No SEM samples are collected unless a special request is made by the submitting agency.
- 4. On a clean surface containing new brown paper take an SEM sample from a generalized area as would have been done with evidence. Use this stub as a negative control.

E. References

General Laboratory (GL) procedures

Other procedures within section related to GSR

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Revision History

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| 2 | Updated the 'purpose' and 'responsibility' sections. Re-worded procedure and changed title for clarity. Removed unnecessary verbiage. Added stereoscope to equipment list. Added collection of Forensic Biology/DNA samples when examining evidence within procedure section. Added option for use of brown paper. Added steps to ensure proper clean sampling techniques were employed. Added collection of a negative control sample. Updated references. Added revision history to the procedure. |
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