B6 Correlation of GSR Persistence in Decomposing Tissue to GSR Persistence in Blowfly Larvae

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After attending this presentation, attendees will be informed of the feasibility and nuances of chemically detecting and identifying gunshot residue (GSR) in decomposing tissue and in blowfly larvae that have been feeding on GSR containing tissue.

This presentation will impact the forensic community by serving as a means to chemically identify gunshot wounds on decomposing victims. The findings presented will aid forensic pathologists in determining the cause of death for a decomposing gunshot victim. This technique will be beneficial, for example, in cases where no bullet was recovered and the body is in a stage of decomposition which makes it difficult to visualize stippling around a wound.

Tissue and larvae samples are analyzed by means of inductively coupled plasma-mass spectrometry (ICP-MS) and scanning electron microscopy with energy dispersive spectroscopy (SEM/EDS) to determine the presence of GSR.

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When a firearm is discharged, a plume of GSR consisting primarily of lead (Pb), barium (Ba), and antimony (Sb) is emitted from the weapon and deposits on the hands of the shooter, the surrounding area, and on the victim. Gunshot wounds will often exhibit GSR tattooed onto the epidermis. Postmortem decomposition processes and insect activity can often obscure or alter wounds that would otherwise be easily recognizable by a forensic pathologist as gunshot wounds. Therefore, sensitive and reliable methods for the chemical identification of a gunshot wounds are desirable.

In this work, the persistence of GSR in decomposing porcine tissue will be presented. Swabs of shot porcine tissue will be analyzed by SEM/EDS to observe the morphology of the GSR particles and determine elemental composition. ICP-MS will be performed on microwave digests of GSR wounds from porcine tissue at various stages of decomposition, in order to detect Pb, Ba, and Sb, which are characteristic elements of GSR. In addition, blowfly larvae collected from the shot porcine wounds will be microwave digested and analyzed for Pb, Ba, and Sb using ICP-MS. By detecting GSR in blowfly larvae, the actual wound would be left intact for further analysis by the pathologists. The correlation between GSR whole body content of the larvae with the GSR content of the porcine tissue will also be presented.

The chemical identification of the metals known to be present in GSR will be shown by means of ICP-MS and SEM/EDS analysis in porcine tissue. SEM/EDS will be performed on swabs of the tissue in order to observe GSR particles and determine their elemental composition. ICP-MS will be performed on microwave digests of shot porcine tissue samples in order to detect lead, barium, and antimony.

The ICP-MS analysis of blowfly larvae feeding on a suspected gunshot wound will also be presented. By detecting GSR in blowfly larvae, the actual wound would be left intact for further analysis by the pathologists. Since a significant amount of lead, barium, and antimony would not normally be present in tissue that had not been shot or in maggots that had not been feeding on tissue with GSR, the detection of these three metals is indicative of exposure to GSR.

Both SEM/EDS and ICP-MS will be utilized throughout the decomposition process in order to determine how long after death GSR can be detected in tissue and in the maggots feeding on the tissue.

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Gunshot Residue, Chemical Identification, ICP-MS

 ** Presenting Author*