B38 An Analytical Approach to Comparative Bullet Lead Analysis: Physical and Chemical Aspects of Discrimination

Diana M. Wright, PhD, Charles A. Peters, BS, and Marc A. LeBeau, MS, FBI Laboratory, Chemistry Unit, Room 4220, 2501 Investigation Parkway, Quantico, VA 22135*

After attending this presentation, attendees will understant the methodology used for the physical and chemical analysis of bullet lead specimens. The protocol, method validation, report terminology, and significance assessments generally conveyed in testimony regarding positive associations of comparative bullet lead evidence will be presented.

This presentation will impact the forensic community and/or humanity by educating the forensic community to the steps taken to validate a protocol for quantitative analysis of a manufactured product. It will describe how the protocol was validated and provide the community with examples of the language used in reports and during testimony to convey the conclusions drawn from the analysis.

Comparative bullet lead analysis is the physical and chemical examination of lead bullets, fragments, or shot pellets. It is performed when a firearm is not recovered or if a bullet or lead fragment lacks sufficient marks of value for a firearms examiner to determine conclusively that the specimen can be associated with a specific firearm. This examination is not as probative as a positive association between a firearm and the ammunition it discharged. However, comparison of recovered cartridges to the bullets or fragments from the victim or scene can provide a circumstantial link based on the ammunition used in the commission of a crime.

This poster will describe the most current protocol used by the FBI Laboratory to perform this examination, which has been used in support of local and federal law enforcement investigations for over 35 years. While the sample described in this work requires certain parameters, the methodology can be easily adapted to analysis of any of the wide range of specimens increasingly encountered in modern forensic laboratories in the 21st century. For example, small modifications would allow the digestion procedure to be readily adapted to the analysis of glass or steel specimens.

The protocol begins with a physical comparison of the items submitted. Many discriminating features are commonly found on ammunition that can be used to disassociate items quickly and conclusively. These differences and the documentation necessary to describe them will be discussed.

In the absence of physical discriminators, a chemical analysis of the submitted lead specimens is required. The procedure will be described in detail to include: documentation of the physical alterations necessary to sample the evidence; the chemical digestion process; quality assurance and controls; and instrumentation used. Validation data for the chemical analysis of bullet lead specimens will be offered for consideration. The parameters that were measured in validating this method include: limits of detection and quantitation, accuracy, within-run precision, between-run precision, precision using separate analysts for data collection, linear range, sensitivity, and analyte recovery.

Results will be offered for a sample case in which the physical and chemical examinations could not differentiate between two or more specimens. The language used to report these findings will be provided. Lastly, the conclusions or interpretation that a qualified examiner would place on these findings will be described as a guideline for the strength and limitations of quantitative analysis applications to commercially - available manufactured products.

Bullet Lead Analysis, Compositional Analysis, Comparative Examinations

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