B107 Methods of Calculating a Firing Distance by Atomic Absorption Analysis of Lead From the Area of Target

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After attending this presentation, attendees will be briefed on the iden- tification of gunpowder residues has a great importance in the resolution of forensic science problems and especially in legal medicine, for shooter recognition or shooting distance determination.

This presentation will impact the forensic community and/or humanity by assisting individuals interested developing methods of calcu- lating a firing distance by atomic absorption analysis of lead from the area of target.

In a previous study, metallic gunpowder residues distributions were visualized on targets at different distances after their treatment with a spe- cific colorimetric reaction. Relationships between the residues amount and the firing distance were demonstrated and the distribution of the residues appeared in concentric circles around the entrance hole. The diameter of the circles depended on the weapon type, propellant, and distance. Among metallic elements on the target, lead was chosen because it is always present in modern primers.

In the present study, test shots were made with a Colt 38 Special at 5, 10, 20, 25, 30, 35, 40, 45, 50, 60, 80 and 100 cm target distances. The target was created with sheets of Whatman n. 1 paper on a polystyrene support. Each target was subdivided into three annuli carefully cut out (with diam- eters of 2, 3, and 4 cm, respectively). Each sample of residue was placed in a test tube and 20 ml hydrochloric acid 0.1 N was added. Test tubes were capped and placed at 45°C in a bain-marie. After dilution, 25 mcl of extracts were analyzed by graphite furnace atomic absorption spectrophotometry.

Lead analysis performed for each annulus yielded a linear relation between the firing distance (cm) and the logarithm of lead amounts (mcg/cm^2) in definite target areas (areas 2 +3):

$$[\ln d\mathrm{Pb}_{2+3} = a_0 + a_1\, l],$$

where $d\mathrm{Pb}_{2+3}$= lead mcg/cm^2 of area 2+3; a_0 and a_1 are experimentally calculated; l = distance in cm.

Firing Distance, Lead Residues Analysis, Spectrophotometry Atomic Absorption

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