

CASE REPORT

John I. Thornton,¹ D. Crim.

Close Proximity Gunshot Residues

REFERENCE: Thornton, J. I., "Close Proximity Gunshot Residues," *Journal of Forensic Sciences*, JFSCA, Vol. 31, No. 2, April 1986, pp. 756-757.

ABSTRACT: Intuitively, a hand held in close proximity to a firearm at the instant of discharge will intercept a significant amount of gunshot residue, even though the hand did not actually come into contact with the weapon. There is, however, little information specifically described in the forensic science literature concerning the residue levels which might be encountered in such an instance. The present work confirms that antimony levels consistent with an individual having fired or handled a firearm may be intercepted by a hand held in close proximity.

KEYWORDS: criminalistics, ballistics, gunshot residues

It is well established that elevated levels of gunshot residues on the hands of a subject are indicative of the subject having handled or discharged a firearm. A case was recently submitted to the author's laboratory, however, in which the issue was whether a hand *held in close proximity but not in contact* with a firearm would intercept enough gunshot residue to confuse the interpretation of whether the subject had actually handled or fired a weapon. Stated in more concrete terms, the issue was whether a deceased subject had handled or fired the weapon (the interpretation indicating suicide), or had defensively and reflexively thrown up a hand at the moment of discharge of the firearm by another person and consequently intercepted a portion of the gunshot residues (the interpretation indicating homicide). The hand of the deceased displayed a mid-level range of antimony residue consistent with having fired or handled a weapon. From the standpoint of the prosecution, it would have been difficult to charge an individual with homicide when the gunshot residues were in fact consistent with the deceased having fired the firearm.

Intuitively, it would seem probable that a hand held in close proximity to a firearm at the moment of discharge would intercept significant amounts of gunshot residue. This issue has been addressed briefly by Krishnan [1] and by Cornelius and Timperman [2], but data developed from an extended series of experiments do not seem to have appeared in the forensic science literature. The present study attempted to develop a data set of the sort needed to apply toward the resolution of the suicide versus homicide issue.

In this investigation, a series of test firings with the weapon in question (a RG14 .22 caliber revolver) and similar ammunition (Remington-Peters .22 Long Rifle) was conducted. In

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¹Professor of forensic science, Department of Biomedical and Environmental Health Sciences, University of California, Berkeley, CA.

TABLE 1—Concentrations of antimony in ppm. Hand of test subject held at a distance of 51 mm (2 in.) from the cylinder of the weapon.

Sample	Antimony, ppm
5% HNO ₃ control	none detected
Unfired hand swab control	none detected
Test firing 1	1.4
2	1.0
3	0.8
4	0.9
5	0.5
6	1.0
7	0.8
8	0.9

this series of test firings, the hand of a test subject was held laterally at a distance of approximately 50 mm (2 in.) from the cylinder of the revolver. Before and between test firings, the hands of the subject were washed exhaustively with detergent. After each test firing, the hand of the subject was swabbed with 5% nitric acid in the normal manner for the collection of gunshot residues for atomic absorption analysis. Eight test firings were conducted.

The samples were analyzed quantitatively by flameless atomic absorption spectrophotometry for the presence of antimony. Barium was not determined. (The writer adheres to the view that the interpretation of gunshot residues based on a single element should be conducted with the utmost diffidence, but a constraining reality is that it is not uncommon for .22 caliber ammunition not to incorporate barium, or antimony, or both, in the primer mixture.) The antimony levels are indicated in Table 1.

A commonly accepted minimum threshold value for antimony indicating recent contact with a firearm is 0.15 ppm (although Krishnan [3] places the threshold value significantly lower). Using the 0.15-ppm value, the levels of antimony observed in this series of test firings exceed the minimum threshold value by a factor of at least three (and on the high end by a factor in excess of nine). The criterion that antimony levels consistent with having handled or discharged a firearm must be at least three standard deviations above background levels is satisfied by these data.

These data indicate therefore that a hand held in close proximity to the firearm in question at the time of discharge will intercept a level of antimony consistent with having fired or handled the weapon, even though the hand was not the instrument of firing, and even though the hand did not come into actual contact with the firearm.

References

- [1] Krishnan, S. S., "Detection of Gunshot Residue on the Hands by Neutron Activation and Atomic Absorption Analysis," in *Scientific and Expert Evidence*, Edward J. Imwinkelried, Ed., Practicing Law Institute, New York, 1981.
- [2] Cornelius, R. and Timperman, *Journal of Medicine, Science and the Law*, Vol. 14, No. 1, Jan. 1974, pp. 98-116.
- [3] Krishnan, S. S., "Detection of Gunshot Residue: Present Status," in *Forensic Science Handbook*, R. Saferstein, Ed., Prentice-Hall, Englewood Cliffs, NJ, 1982.

Address requests for reprints or additional information to
 John I. Thornton
 University of California
 School of Public Health
 Berkeley, CA 94720