

A Low-Cost Improvised Collection Kit For Gunshot Residues

By ROBERT J. KOPEC

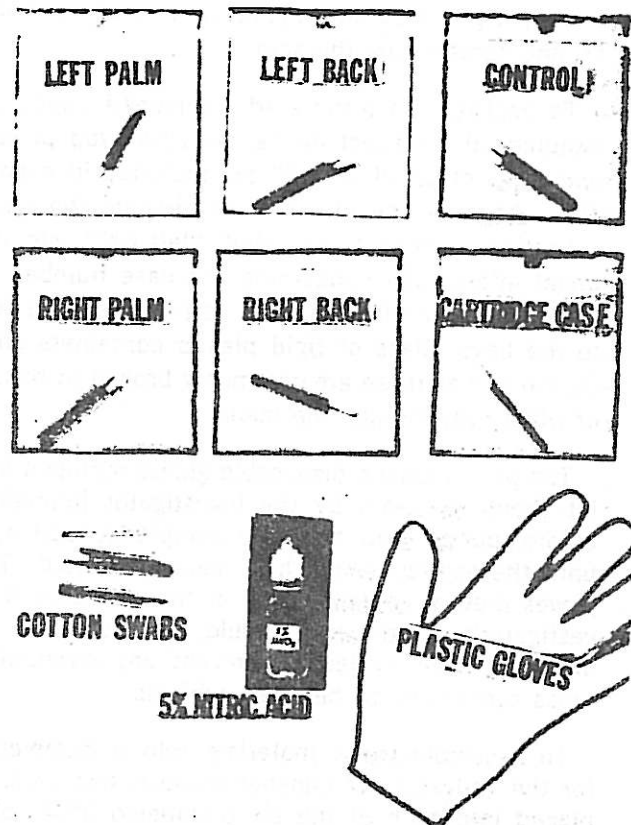
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Police investigators have sought a reliable, easily administered, and low-cost test to determine if a subject has recently fired or handled a firearm. At the present time, the most commonly utilized test relies on the collection of gunshot residues from a subject's hands by using cotton-tipped swabs moistened with dilute nitric acid. (1, 3) These residues originate from the detonation of the primer in centerfire and some .22 caliber rimfire ammunition. (4, 5) As these primer combustion products escape from around the cylinder or other vents on the firearm, they are deposited on the hands of the shooter. Swabbings are most commonly taken of the subject's left palm, left web area, right palm, and right web area. A control swab and a swab from the cartridge case is also usually taken. Upon submission to the forensic laboratory, the swabs are analyzed for the presence of barium and antimony by techniques such as flameless atomic absorption spectrometry. (6) If sufficient quantities of both of these elements are detected, they are indicative of the presence of gunshot residues on the swabs.

Although commercial gunshot residue collection kits can be purchased for approximately \$4.00, the police investigator can readily assemble an improvised kit of adequate quality for about fifty cents, using easily obtained materials. A reduction in cost can expand the use of this valuable forensic tool into more routine usage in the investigation of homicides, suicides, armed robberies, and other instances where a firearm had been used.

Each improvised gunshot residue kit requires the following materials:

1. Eleven singly-tipped plastic shafted cotton swabs (Johnson and Johnson, or equivalent).
2. A small quantity (e.g., ½ ounce) of dilute aqueous solution of nitric acid contained in polyethylene dropper bottle (Nalgene #2411-0015 or equivalent).
3. Six zipper-top plastic bags, approximately 3"x4".
4. One zipper-top plastic bag, approximately 6"x6".



5. One pair of disposable plastic gloves (Fisher #11-394-100B, or equivalent).

Single-tipped cotton swabs are prepared by snipping off one end of the doubly-tipped plastic-shafted cotton swabs which are easily obtainable in drug stores or sold under various trade names. The shaft should remain as long as possible after cutting to allow the swab to be handled by the investigator without contaminating the cotton-tipped end. Each kit will require eleven swabs. There are two swabs each for the right palm, right web, left palm, left web, and control, and one swab for the cartridge case. Wood or paper shafted swabs should **not** be used as these materials contain high amounts of barium (7) and will contaminate the gunshot residue on the swabs.

Dilute aqueous nitric acid solution is applied to each swab immediately before use, and is used as a solvent to dissolve the gunshot residue from the subject's hands and transfer it onto the swabs. This solution can readily be obtained from a pharmacist or local chemical laboratory. This solution is made by adding 5 milliliters of reagent grade nitric acid to 95 milliliters of distilled water. A small quantity of this solution, about ½ ounce, can be packaged in a snap-cap dropper vial and be included in each kit. Glass vials should not be used to store the acid solution since glass can contain appreciable levels of barium (7) and contaminate the acid.

To package the nitric acid, moistened swabs after swabbing the suspect hands, six zipper-top polyethylene bags of about 3" x 4" are included in each kit. These bags can be prelabeled to indicate the area of collection, such as "right palm", "left web", etc. Additional information concerning the case number, suspect's name, or other pertinent data can later be added to the bags. Glass or rigid plastic containers should be avoided as these are commonly broken in handling or when sent through the mails.

The pair of plastic disposable gloves included in the kit should be worn by the investigator immediately before, during, and after the sample collection, i.e., until the applied swabs have been packaged. These gloves prevent contamination of the swabs by the investigator's hands and should be discarded after swabbing each subject to prevent any possibility of cross contamination between subjects.

To assemble these materials into a complete kit for the collection of gunshot residue, two swabs are placed into each of the six prelabeled 3"x4" plastic bags. These bags, a small vial of the acid solution, and one pair of disposable gloves are then packaged into one larger bag of about 6" x6" in size. This complete gunshot residue collection kit, along with an instruction sheet outlining the collection procedures, can be conveniently carried by the investigating officer until needed. Upon completion of the swabbing of a suspect's hands, the contents of the kit can be forwarded to a forensic laboratory for analysis.

Detailed instructions on the recommended methods of gunshot and explosive residue collection are given in a pamphlet entitled "Advanced Techniques in Collecting Explosive and Gunshot Residue", which can be obtained from the Forensic Laboratory, Bureau of Alcohol, Tobacco and Firearms, P. O. Box 7615, Ben Franklin Station, Washington, D. C. 20044.

REFERENCES:

1. Hoffman, C.M., "A Simplified Method of Collecting Gunshot Residue for Examination by Neutron Activation Analysis", *Identification News*, 18 (10): 7-8 (1968)
2. Goleb, J.A., and Midkiff, C.R., Jr., "Firearms Discharge Residue Sample Collection Techniques", *J. For. Sci.*, 20 (4): 701-707 (1975)
3. "Advanced Techniques in Collecting Explosive and Gunshot Residue", *ATF Publication #7500.1 (6/75)*.
4. Midkiff, C.R., and Harriman, J.J., "Cartridge Case Identification by Headstamps — Modern .22 Caliber Rimfire Ammunition", *Identification News*, 25(3): 7-10 (1975)
5. Meyers, R.E. and Kopec, R.J., "Identification of .22 Caliber Rimfire Ammunition Suitable for Gunshot Residue Determination", *Identification News*, 25 (9): 10-13 (1976)
6. Goleb, J.A. and Midkiff, C.R., Jr., "The Determination of Barium and Antimony in Gunshot Residue by Flameless Atomic Absorption Spectroscopy Using a Tantalum Strip Atomizer", *Applied Spectroscopy*, 29 (1): 44-48 (1975)
7. Goleb, J.A. and Midkiff, C.R., Jr., "Barium Contamination in Gunshot Residue Collection Kits", *Applied Spectroscopy*, 28 (4): 382 (1974)