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DETECTION OF GUN SHOT RESIDUES ON THE SWAB TAKEN FROM HANDS OF A SHOOTER BY NEUTRON ACTIVATION ANALYSIS

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ABSTRACT

Using a swabbing technique, attempts have been made to detect firearm discharge residues on the hand of a shooter via the elements NO2, Pb, Sb,Ba and Cu. Pb was quantitated by AA (Atomic Absorption Analysis Technique) and the rest of elements by NAA (Neutron Activation Analysis Technique) . Two variations of the swabbing technique have been tried which shown that the one involving the use of different swabs for different areas on the firing hand is superior to the other involving the use of a single swab for the entire area. Further work to improve the swabbing procedure is in progress.

KEYWORDS: *Swab, Shooter, Neutron,*

When a firearm is discharged, firing residues is projected from the muzzle as well as through any vents that may be present in the firearm. Depending on the location of the vents and the manner in which the firearm is held at that time firing , the residue may deposited on the different parts of the body of a shooter like hand , cheek, etc. . Thus a shooter can be identified by detecting firearm discharge residue on his hand/cheek, etc., provided it can be ensured that the presence of residue did not arise due to any other reason, such as occupational contamination or handling a recently discharged firearm.

In the past, efforts have been made to develop an efficient procedure by which the residue deposited on firing can be removed and quantitated. Chemical tests were the first to be developed but later discarded in preference to extremely sensitive instrumental methods of analysis like the **NAA (Neutron Activation Analysis Technique)** and **AA (Atomic Absorption Analysis Technique) .** The FSL Lucknow has taken up the development work relating to the standardization of a practical procedure for shooter's identification for routine use in case work. In the present paper, some experiments to detect the traces of firearm discharge residue on the firing hand have been reported and the residue collection procedure has been examined.

PROCEDURE

A set of twelve control firing were conducted by .32 bore IOF make revolver using .32 bore S&W.L. KF cartridges . A swabbing technique was used from collecting residue from the hand of shooter. The swab consisted of a piece of white cotton. As the swabbing progressed, it was turned around to allow it to express the different parts of its surface for residue collection. Two different areas on hands were sampled. In first set of five firing, the area swabbed consisted of the region corresponding to the thumb, the thumb - web and index finger both on the palm and the back side of hand. The entire area was swabbed by a single swab. In the other set of seven firing, one swab was used to swab the thumb - web both on the palm and backside in addition to the lateral side ((Which is upward at the time of firing) of the index finger. Another swab was used to the swabs from the firing hand, control swabs were also obtained from the non- firing hand from exactly similar areas. All the swabs and controls were analyzed for elements NO2, Pb, Sb, a and Cu. The element Pb was quantitated by AA (Atomic Absorption Analysis Technique) and the rest of elements by NAA (Neutron Activation Analysis) as per the procedure standardized earlier (Jauhari et all, 1982). Data corresponding to the first set of firings is given table **1** and that corresponding to the second set is reported in table **2.**

CONCLUSION

Since the swabs were of approximately the same size and weight, the absolute values of the elements as reported in Tables **1** and **2** are comparable. A reference to Table 1 shows that the values of elements Ba, Cu, and Pb are not significant on firing hand (right) swab as compared to the non - firing hand (left) swab. However, the values of Sb are higher especially in first three firings. A reference to Table 2 shows that Ba, Cu, and Pb are again not present in

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significantly higher amounts on the firing hand samples in areas sampled as compared to the non - firing hand samples. However, Sb values are present in higher amounts in both the areas sampled especially in the area corresponding to the thumb- web region. Further while Sb is present in low amounts in the control swab of non - firing hand Ba, Pb and Cu record comparatively higher values. Studies on hand blanks (Guinn, 1967) (Midkiff,1973) suggest that Ba and Sb are only suitable elements for the quantification of firearm residue on hand. Recent studies(Jauhari et all, 1983) relating to blank values of elements in different materials suggests that Ba values are low in Whatman filter paper No. 1 and paraffin was as compared to cotton cloth, Johnson's bud, sanitary tissue paper and collophane tape. It will probably be advisable to use Whatman Filter paper No. 1 as he swabbing material to lower the blank Ba values thereby increasing the possibility of detecting this significantly . It is also noted that there is an improvement in detection of discharge residue via the Sb values when the thumb - web area in sampled separately instead of using a single swab for the entire region (First set of five firing, Table 1). It appears that in first procedure, the residue instead of being efficiently collected gets dispersed because a single swab is used repeatedly to swab a large area. This might be responsible for the lowering of the Sb values. Further Work to improve the swabbing procedure is in progress.

TABLE 1

CONCENTRATION OF ELEMENT ON FIRING AND NON-FIRING HANDS AS DETECTED ON SWABS OF THUMB –WEB (Both On The Back And The Palm Side) INCLUDING LATERAL SIDE OF INDEX FINGER AND THE FINGERTIPS

Firing No.	Concentration Of Elements µg								
	Pb			Sb		Ba		Cu	
	L	R		L	R	L	R	L	R
1	<7	<7		0.002	.007	<0.1	<0.1	0.32	0.36
2	<7	<7		0.002	.005	<0.1	<0.1	0.09	0.26
3	<7	<7	<	0.002	.003	<0.1	<0.1	0.19	0.29
4	<7	<7		0.002	.003	<0.1	<0.1	0.29	0.08
5	<7	<7		0.002	.001	<0.1	<0.1	0.05	0.05
Control Acid Moistened cloth	7			.002		0.1		.05-.11	

L: Left hand. R: Right hand.

TABLE -2

CONCENTRATION OF ELEMENTS ON FIRING AND NON FIRING HANDS AS DETECTED ON SWAB OF THUMBS-WEB (Both On The Back And The Palm Side) INCLUDING LATERAL SIDE OF INDEX FINGER AND THE FINGERTIPS

Firing No.	Concentration Of Elements µg											
	Pb			Sb			Ba			Cu		
	NFH	FT	TW	NFH	FT	TW	NFH	FT	TW	NFH	FT	TW
1	<5	<5	<5	.006	.020	.032	0.32	0.33	0.97	0.32	0.36	0.35
2	<5	<5	<5	.012	.022	.036	1.10	0.62	1.10	0.42	0.89	0.52
3	<5	<5	<5	.006	.032	.036	0.91	1.10	0.78	0.19	0.29	0.28
4	<5	<5	<5	.008	.024	.030	1.20	0.62	0.62	1.54	0.46	0.25
5	<5	<5	<5	.014	.018	.030	0.91	1.20	1.40	0.26	0.22	0.14
6	<5	<5	<5	.010	.020	.034	1.10	1.00	1.50	0.40	0.32	0.16
7	<5	<5	<5	.012	.024	.032	1.00	.73	1.35	0.39	0.40	0.22
Control Acid Moistened cloth	<7			<.002			<0.1			<.05-.11		

NFH: Non firing hand. One swab was used for swabbing all the areas corresponding to areas swabbed on the firing hands. FT: Swab of fingertips of firing hand. TW: Swab of thumb - web of firing hand both on the back and palm side.

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