

The importance of a well defined analytical strategy to solve complex murder cases

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Abstract. Forensic techniques are becoming more and more powerful and affordable. This allows labs to utilise precise strategies, permitting multiple analytical approaches on the same evidence, thus obtaining precious information to solve criminal cases. This paper refers to a murder in which we received a plastic bottle and four latex gloves. These items were collected near a stolen car used to perpetrate the murder, and then burnt in order to destroy evidence linked to the murderer. We collected samples of saliva from the neck of the bottle and one glove underwent three different analyses, which were:

- Sampling and genetic analyses of sweat traces taken from the internal surface of the glove, corresponding to the lower palm area;
- Detection of palm-prints from the internal surface of the glove, corresponding to the upper palm area;
- Collection of gun shot residues (GSR) from the edge of the glove.

Two full genetic profiles were obtained from the biological traces collected, one from the glove and the other one from the bottle. The analyses were instrumental in permitting the identification of the shooter who had played an important role in the murder. © 2005 Published by Elsevier B.V.

Keywords: DNA typing; GSR; Fingerprints

1. Introduction

This case concerns a murder in which the collected evidence consisted of four latex gloves and one plastic bottle. The items were found near a stolen burning car used to commit the crime and were quickly preserved from the blaze thanks to the immediate action of the Carabinieri patrol personnel.

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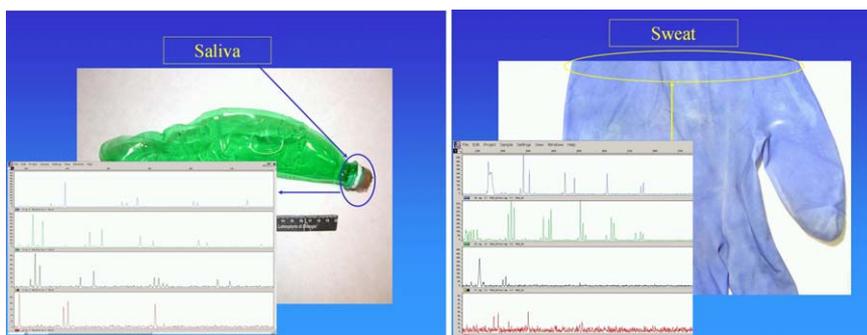


Fig. 1. (a and b) Collection areas and DNA profiles.

In this case, it was essential to define a strategy to collect biological residues as soon as possible, and subsequently allow the detection and the analyses of both GSR and latent fingerprints.

2. Materials and methods

2.1. DNA

Sweat evidence was collected quite immediately swabbing a portion surface of the glove with an Oral-Swab (Whatman—Fig. 1) trying to preserve the area of interest for other approaches. Saliva evidence was collected using the same technique from the neck of the bottle. Extraction was performed using “QIAamp 96 DNA Swab BioRobot Test” silica columns in association with BioRobot 9604 (QIAGEN) according to the manufacturer’s protocol [1]. Final elution was done with 50 μ l of DD water.

DNA quantification was conducted performing a Dot-Blot analysis with Quantiblot [2] (Applied Biosystems). Results were analysed with GeneGnome [3] (Syngene Bio Imaging) with Slot Quant Software v.2.1.5.5 (Hitachi).

The latter techniques have shown a sufficient quantity of DNA to perform a PCR.

Genotyping was done in PCR using Identifiler kit (Applied Biosystems) according to the original protocol.

PCR fragments were separated with capillary electrophoresis using ABI Prism 310 Automatic Sequencer (Applied Biosystems). Results were analysed with GeneScan v3.7 and GeneMapper v.3.2 (Applied Biosystems).

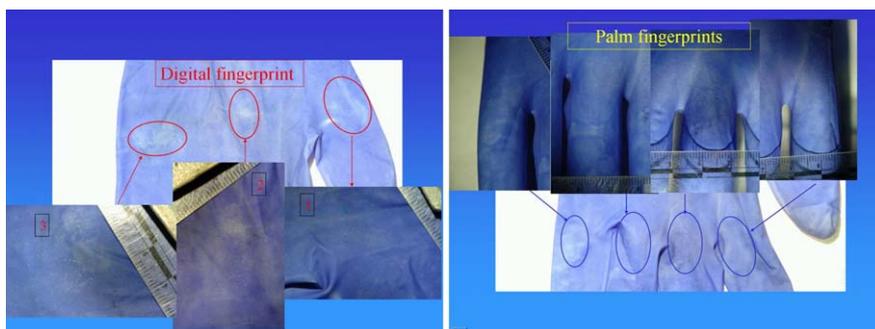


Fig. 2. (a and b) Digital and palm fingerprints.

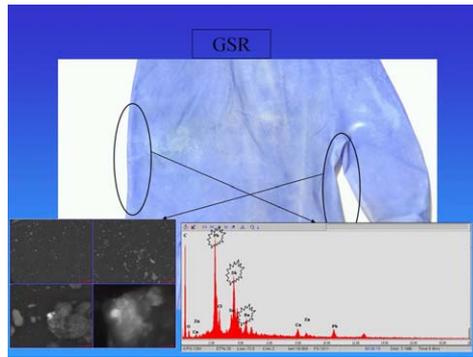


Fig. 3. Collected areas for GSR analysis.

2.2. Fingerprints

Gloves were treated with cyanoacrilate and subsequently with crystal violet. Fingerprints were observed (Fig. 2a and b) under UV source at 254 nm (Scenescope, Isa-Spex). Minutiae on fingerprints were automatically searched with Latent-Pro software (Isa-Spex) and manually adjusted. Find-out fingerprints were directly charged into the national A.F.I.S. database.

2.3. GSR

GSRs were sampled using stub (3M) on some restricted areas (Fig. 3). Carbon coating was done using BAL-TEC MED 020 instrument. Detection and analysis of GSR was performed with “Quanta 400” SEM (FEI) and EDAX microanalysis system.

3. Results and discussion

Two significant profiles were obtained, respectively, from one glove and from the bottle (Fig. 1a and b), which permitted the identification of one of the murderers. Seven useful fingerprints were evidenced on the glove (Fig. 2a and b). A significant number of unique GSR particles (Pb–Sb–Ba elements) were found on the glove (Fig. 3). In the following figures, collecting areas and partial results are shown.

It is the intent of this article to convey the capabilities of the modern forensic techniques, which even in extremely difficult cases, such as the one reported here, has a good rate of success. In particular, such a limited area involved in the biological sweat sampling could enable different technical analysis which, otherwise, would be completely compromised from the complete swabbing of the whole glove surface.

A quick and an expert way to collect these kinds of evidence is also necessary to well preserve any kind of scientific traces.

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