



Forensic identification of a murderer by LCN DNA collected from the inside of the victim's car

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Abstract. In this paper, we report a real case of a murder, committed in northern Italy whose culprit was identified through unusual evidences. The scene of crime did not show any traces. There were no signs of sexual assault on the body. The cause of death was determined to be manual strangulation. The investigators focused their attention inside the victim's car because they found some stains, to be presumably referred to blood. Subsequently, the victim's car was transferred to our lab for the analysis. In order to collect some sweat/skin residuals of the murderer, the surface of the steering wheel, as well as the gear lever and the handbrake, were sampled using FTA-Paper. A few days later, the investigators sent to our lab the oral swab of a suspect. A complete female profile of 15 STRs was obtained from blood stains on the upholstery and in the ashtray. The same complete male profile of 15 STRs was obtained from the sweat/skin residuals collected from the surface of the steering wheel and the gear lever. This profile was recognized as identical to that of the saliva obtained from the suspect who, afterwards, confessed the crime. These results are very important as they highlight that it is possible to type even low copy number (LCN) DNA if a proper and immediate collection of biological evidence is performed. © 2003 Published by Elsevier B.V.

Keywords: DNA typing; STRs; LCN DNA

1. Introduction

In the afternoon of 21 September 2002, the naked body of a young woman was found in the countryside near Bagnocavallo, a small village in northern Italy. There were no signs of sexual assault on the body. The cause of death was determined to be manual strangulation. Her clothes were found nearby and her car was found later, abandoned not far from the body. The investigators focused their attention inside the victim's car because they found some stains, presumably blood, located on the upholstery and in the ashtray. Also, some witnesses said that, during the same morning, they had seen the victim together with a man in the victim's car, as they left the car park of a supermarket. Subsequently, the victim's car was transferred to our lab in order to analyse the alleged

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blood stains and to collect some sweat/skin residues of the murderer, probably left on the surface of the steering wheel, as well as in the gear lever and in the handbrake. At the same time, it was presumed that a credit card and all of her money had been stolen. Investigators asked the company which had issued the credit card to track it down. On the same day, a man tried to use the victim's credit card at a cash dispenser and was thus filmed by the closed circuit cameras of the banks. Because of the very low quality of the camera recordings, it was only possible to recognise height and sex. It was also possible, however, to see the model and colour of the car driven by the man, including some of the licence plate numbers. All these elements allowed the investigators to focus their attention on a middle-aged man who lived in the same town as the victim. He was followed and filmed, and it was proved that he used a car of the same type and colour as that used by the alleged killer, with corresponding car plate numbers. Thanks to these results this man thus became the main suspect for the murder and a sample of his saliva was collected for comparison with biological traces still present in the victim's car.

2. Materials and methods

2.1. Inspection of the victim's car

A first general examination of the victim's car, was carried out by a squad of crime scene officers: they found some stains, presumably blood, located on the upholstery and in the ashtray. A more accurate inspection then followed in a specialized area of our labs, aimed at identifying latent biological traces. It was conducted by means of a Crimescope CS-16 [1] tunable forensic light source used in a specific darkroom at a wavelength ranging from 415 to 490 nm, but no interesting results were obtained.

2.2. Blood identification

In order to confirm the presence of blood, a small portion of the above traces underwent the *Combur test strip* [2], which gave positive results.

2.3. Trace collection, DNA extraction and typing

The blood stains were collected by *Sterile Dacron Polyester Tipped Applicators* [3]. The potential sweat/skin traces of the murderer were collected by *FTA classic cards* [4], which were scraped twice on the steering wheel, as well as on the gear lever and handbrake, in order to increase the quantity of cells sampled. All samples, including the saliva collected from the suspect, were submitted to phenol–chloroform extraction [5] and then purified using the QIAamp DNA mini kit [6]. DNA quantitation was carried out by slot-blot hybridization [7] with the chemiluminescent signals recorded by GeneGnome CCD imaging systems [8]: the amount of DNA extracted was <100 pg for the traces collected from the steering wheel and the gear lever, while the blood stains and the oral swab showed a quantity ranging between 20 and 30 ng. For the amplification and typing, we used the *AmpFISTR Identifiler PCR Amplification Kit* [9]. Electrophoresis was carried out on ABI Prism 310 Genetic Analyzer. Data were analysed by Gene Scan v.3.1 analytical software.

3. Results and discussion

The profiles we obtained from the biological material collected from the steering wheel, as well as on the gear lever, even if the DNA extracted was very low, equal to less than 100 pg were both fully interpreted for the 16 loci markers we studied, and showed to be consistent with the suspect's profile. Based on these results, the suspect was then arrested and confessed to the murder. In this case, it is important to stress, once more, how crucial it was to have the immediate availability of the victim's car in order to carry out an accurate and extensive inspection of the internal surfaces from which it seemed much more probable to collect biological residues left by the perpetrator. Not less important was a particular strategy for LCN DNA extraction [10], amplification and typing, which made it possible to obtain full and a easy to interpret profiles, even starting from a few cells, which were fundamental to highlight the suspect's responsibility and solve the crime.

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