

Unusual Linking of Suspect and Deceased on the Weapon Through Locard's Principle

More BP^{1*}, Kudekar DY¹, Dhere VA¹, Padale VR,¹ Yenkar SV¹, Ghumatkar SV¹

Directorate of forensic Science laboratories, Government of Maharashtra, India.

Submission: April 14, 2023; Published: May 09, 2023

*Corresponding author: More BP, Directorate of forensic Science laboratories, Government of Maharashtra, India

Abstract

Forensic science is a multidisciplinary science that has a prominent role in the justice delivery system in criminal cases. When a crime has occurred, shreds of evidence are seized from the scene of the crime, victim and accused. Forensic science laboratory receives all types of Exhibits. The Locard's principle 'every contact leaves a trace' is the basis of the examination. This evidence is analyzed in different departments by a respective forensic scientist. All the results are collected and compared together; the evidence becomes stronger without any flaw. One of the cases received in the following forensic casework involves both biological and physical evidence examinations. The physical fit of the weapon was carried out in the physics department and both the pieces are of the same weapon. Exhibits test positive for blood. The two single DNA profiles are obtained on the weapon i.e., knife and one of the profiles matches with the suspect and the other profile matches with the deceased. This is a unique case where the suspect and deceased are linked by DNA profiling on the same weapon.

Keywords: DNA Profiling; Locards Principle; Murder; Physical Fit; Knife

Abbreviations: DNA: Deoxyribonucleic Acid; STR: Short Tandem Repeat; PCR: Polymerase Chain Reaction

Introduction

Locards principle is the basis of forensic science and criminology. During a crime, the physical or biological material is transferred between the crime scenes, victim/deceased and accused. Transferred material is the clue that leads the investigation agency towards the accused that this person is the true culprit of crime and frees innocents from suspicions. In forensic science body fluid recovered from a crime scene, culprits and deceased or victim have a vital role because it is a direct link between true culprits and the sufferer [1]. As the nature of the evidence is of different types so its forensic examination varies accordingly [2]. Biological pieces of evidence like blood, semen, hair, blood-stained clothes and where the biological fluid examination is necessary, it is performed in biology -serology. And later, in such cases, if DNA examination is necessary then it becomes a part of DNA genotyping. Biology and DNA genotyping are sequential work, and their examination is accessory to one another. Single and mixed DNA profiles were obtained from a revolver, a pistol, a break-action shotgun, and a pump-action shotgun [3]. A mixed DNA profile is obtained from a revolver [4].

In this case, two single DNA profiles of the deceased and accused were obtained from a knife.

A 23yr old male was murdered by two thugs using a knife as a weapon. At the time of the incident, the deceased tried to save himself from the attack but the person holding it was too fierce and the knife was thrust into the stomach of the deceased. In this dead heavy attack, the knife broke down and a sharp-edged piece of the knife remained in the body of the deceased. The culprits ran away from the scene with the other part of the weapon in hand. But during this fierce fight, one of the main accused himself got injured by the knife which he was holding. The deceased was hospitalized by police, but the doctor declared him dead. The FIR of murder was registered, and police caught the two culprits of this crime. A weapon was seized from one of the accused. The accused tried to wipe out all the evidence. Meanwhile, Postmortem examination was done, and the doctor took out a metallic part from the deceased's body and advised the police to submit the same to the forensic laboratory for further examinations. The crime scene exhibit, cloth of deceased and culprits along with medical samples were sent to the forensic laboratory for examination.

Experimental

Materials

- Phenolphthalein solution and Hydrogen peroxide
- Prep filer Express Kit (applied biosystem) AmpF/STR Identifiers kit (applied biosystem)
- Forensic Buffer pH 8
- Proteinase K
- Phenol: Chloroform: Isoamyl Alcohol (100:100:4)
- Isopropanol
- Automate Express Forensic DNA System

Kit Used: PrepFiler Express and PrepFiler BTA Kit

Polymerase Chain Reaction (PCR) Thermal Cycler Machine, Capacity: 96 well x 0.2 ml PCR Tubes

Methods

Detection of blood

Although forensic science has greatly evolved from past twenty years; still the Kastle Mayer test for detection of blood is being used because it is a very efficient test for blood detection and blood is vital evidence in crime like murder, rape [5]. The presence of blood on the cotton cloth which was taken from the crime scene and blood and other seized clothes from the accused and deceased were confirmed by testing with Kastle–Mayer test. The principle of the reaction is that haemoglobin present in the blood catalytically decomposes by hydrogen peroxide to release nascent oxygen which reacts with phenolphthalein to give pink colour [6]. After detection of blood, the DNA examination is followed on positive articles.

Isolation of DNA

DNA was isolated from the human blood detected on cotton cloth, jeans pants, knife, small metallic piece, and reference blood samples of injured and accused. For DNA extraction from the blood of the accused, the organic method was employed [7] while for the rest of the exhibit, DNA extraction was carried out on Automate express [8].

Organic extraction

The control of the bloodstain of the accused was taken for organic analysis. Forensic buffer, Proteinase K and 10% Sodium Dodecyl sulphate were added in an approximate amount to each sample. It was vortexed, quickly spun and incubated at 56°C for 3 hours. Then Phenol, chloroform and isoamyl alcohol were added in the proportion 25:24:1 volume/volume. Proteinase gets denatured and collected in the organic phase while nucleic acids remain in the aqueous phase. Then 2 Molar Sodium Acetate and chilled Isopropanol were added to the aqueous phase to precipitate DNA. The precipitated DNA was finally dissolved in

Tris-EDTA buffer. The blood detected on the weapon, metallic piece and clothes were taken for automated extraction. PrepFiler Express Kit of applied Biosystem is used for automating express for bloodstains. For DNA extraction from bone PrepFiler BTA Express Kit is used. The Automate express extraction system has great efficiency for the extraction of DNA from blood, hair, swabs, and bones [9].

Quantification

Extracted DNA was quantified using the quantifiler Duo DNA quantification kit of Applied Biosystem on 7500 real-time PCR system according to the manufacturer's recommended procedures [10].

Polymerase Chain Reaction

The quantified DNA was taken for PCR reaction. Accurate dilution was done and added into master mix from AmpFISTR®Identifiler® PCR amplification kit [11].

- Master mix used for Polymerase Chain Reaction was-
- AmpFISTR PCR reaction mix: 10.5µl
- AmpFISTR Primer Set: 5.5µl
- Polymerase: 0.50µl.
- Volume of Master mix used: 15µl
- Volume of sample: 10µl

After completion of PCR amplification and denaturation, STR Genotyping was done using Gene analyzer 3500 machine successfully [12]. The DNA profiles were obtained successfully from all the exhibits. The DNA profiles obtained from the exhibits are tabulated in (Table 1).

Results

The DNA profiles obtained from the crime scene from two swabs are of different male origins, and one of them matched with the DNA profile of the deceased while another DNA profile matched with one of the culprits. The DNA profile obtained from the accused's jeans pant is mixed and contained DNA profiles of the deceased and accused. On the other hand, the DNA profile obtained on the knife whose pointed part is missing (from the accused) is of male origin but surprisingly it matches with the same accused (accused 1) whose DNA profile matches with one of the crime scene swabs. The physical fit examination was carried out and it was clear that the metallic part recovered from the body of the deceased is the missing part from the pointed edge of the weapon i.e., knife (Figure 1,2,3).

Discussion

As expected, the pointed part recovered from the body of the deceased, the DNA profile obtained from it matched the deceased. On contrarily to this, the DNA profile obtained from jeans pant is of mixed and it contains DNA profile of both victim and main

accused (here accused 1), but the jeans pant belongs to other thugs who also involved in crime. This proves his presence on the crime scene scientifically. Physical examination was also part of this case which was done by another expert as it is different from

biological and DNA genotyping analysis. Physical fit examination as shown in figure-3 proves that the part recovered from the dead body (Figure 2) and the missing part of the weapon that was recovered from the accused (Figure 1) fit each other perfectly.



Figure 1: Missing part of the weapon that was recovered from the accused.



Figure 2: Small metallic part recovered from the body of the deceased.

Table 1: The DNA Profiles Obtained from the Exhibits are Tabulated.

STR LOCUS	Cotton Cloth (Crime Scene)	Cotton Cloth (Crime Scene)	Jeans Pant Blood Stain (Accused 2)	Prepared blood Stain from knife	Prepared blood Stain from small metallic Piece	Blood Stain of Injured	Blood Stain of Accused 1	Blood Stain of Accused2
D8S1179	15,16	14,14	14,15,16	14,14	15,16	15,16	14,14	10,15
D21S11	31,31.2	31,31.2	31,31.2	31,31.2	31,31.2	31,31.2	31,31.2	30,30
D7S820	12,12	9,12	9,12	9,12	12,12	12,12	9,12	10,10
CSF1PO	11,12	10,12	10,11,12	10,12	11,12	11,12	10,12	10,10
D3S1358	14,16	15,17	14,15,16,17	15,17	14,16	14,16	15,17	15,16
TH01	7,9	8,9	7,8,9	8,9	7,9	7,9	8,9	6,8
D13S317	10,12	11,12	10,11,12	11,12	10,12	10,12	11,12	12,14
D16S539	9,11	12,12	9,11,12	12,12	9,11	9,11	12,12	11,11
D2S1338	23,25	17,22	17,22,23,25	17,22	23,25	23,25	17,22	17,25
D19S433	14,15	12,16	12,14,15,16	12,16	14,15	14,15	12,16	13,14.2
vWA	14,16	16,19	14,16,19	16,19	14,16	14,16	16,19	15,18
TPOX	8,11	9,12	8,9,11,12	9,12	8,11	8,11	9,12	11,11
D18S51	12,14	11,19	11,12,14,19	11,19	12,14	12,14	11,19	15,15
AMELOGENIN	X, Y	X, Y	X, Y	X, Y	X, Y	X, Y	X, Y	X, Y
D5S818	11,12	10,12	10,11,12	10,12	11,12	11,12	10,12	11,11
FGA	21,25	20,21	20,21,25	20,21	21,25	21,25	20,21	21,21



Figure 3: Fit Each Other Perfectly.

Conclusions

Although the exhibits examination is of different types, when we put them together, we received clearer results. The DNA profiles from two parts of the weapon are of two different people which state that the accused was also injured. The physical fit examination proved that the part recovered from the dead body and the missing part of the weapon that was recovered from the accused fit each other perfectly. On the other hand, the DNA profile obtained from blood from the jeans of the other accused (accused 2) contains the DNA profile of the injured and his injured partner in the crime. Both the results proved that accused were not only present at the crime scene, but they are the ones who have committed such a horrific crime. Forensic examination done in this way in such cases will be more helpful in court. The examination of crime exhibits in a scientific way can establish the relationship between the crime scene, the accused, and the victim or deceased. In cases where the eyewitness or the witness becomes hostile, the involvement of criminals can be well established before the court through the forensic examination reports.

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DOI: [10.19080/JFSCI.2023.17.555962](https://doi.org/10.19080/JFSCI.2023.17.555962)

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