

Sperm and Epithelial Genomic Male DNA unfold the Sodomy and Homicide Case: A Sensational Case Study

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Abstract

Forensic samples, such as those from sexual assault cases, which contain male sperm cells mixed with male and female epithelial cells always pose challenges for DNA scientists in Forensic laboratories. Sometimes, it becomes more challenging when there is a mixture of male epithelial and sperm cell of petrilineal suspect. It is very difficult to obtain DNA profile from a mixture of two different sources with different quantity. In the present paper, we report a case of sodomy and murder, in which culprit was a petrilineal relative to the deceased. To identify the culprit through DNA technology only autosomal STR markers were helpful and Y STR markers were not helpful in this case, due to the culprit was petrilineal relative of the deceased, having same DNA Profile of Y lineage STR markers. DNA profile obtained from semen stains detected on kameej of deceased, chaddi of suspect, anal swab of deceased, soil and hair recovered from crime scene exposed the suspect to be involved in the crime.

Keywords: Sodomy; Homicide; Forensic; DNA; STR.

Introduction

Presently, most popular short tandem repeats (STR's) based DNA analysis is widely used in forensic application as well as anthropological and medical studies of the populations. Short tandem repeats (STR's) based DNA analysis is entirely different from the first formal application of DNA technology^{1,2} which came in existence 30 years ago. Short tandem repeats (STR's) based DNA analysis is most popular in use due to high repeat numbers approximately once in every 10,000 nucleotides i.e. 3% of the total human genome.³ Differential

extraction is a modified version of the organic extraction methods to isolate the female and male fractions in sexual assault cases that contain a mixture of male and female DNA.⁴

By separating the male fraction away from the victim's DNA profile, it is much easier to interpret the perpetrator's DNA profile in a rape case. But sometimes, it becomes more difficult in a case of sodomy where culprit belongs to petrilineal relative to the male victim. As per our previous study, in a mixture, the presence of high quantity of DNA interferes the amplification of low quantity of DNA⁵.

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Material and Method

In the present study, a case of sodomy and homicide was registered and following exhibits were sent to State FSL, Jaipur for DNA examination.

1. Kameej of deceased
2. Chaddi of suspect
3. Anal swab of deceased
4. Soil recovered from scene of crime
5. Hair recovered from soil.
6. Control blood sample of suspect.
7. Scalp hair of deceased.

Biological and Serological examination was carried out for examination of blood and semen on these exhibits. Human semen was detected on kameej of deceased, chaddi of suspect, anal swab of deceased and soil recovered from scene of crime.

DNA was extracted from the stains, control blood samples and hairs by automated DNA extraction system Automate Express (Applied Biosystems, Foster City, CA, USA). Semen stains also processed by Organic Phenol Chloroform Isoamyl Alcohol (PCIA) differential extraction

method. Real Time PCR ABI 7000 (Applied Biosystems, Foster City, CA, USA) was used for quantification of the isolated DNA using the Quantifiler Duo DNA Quantification Kit (Applied Biosystems, Foster City, CA, USA) as per the recommended protocol by the manufacturer. 0.5 to 1 ng of DNA template was used for downstream processing by Amplification of 20 STR locus which includes the loci Amelogenin, D3S1358, D1S1656, D6S1043, D13S317, D16S539, D18S51, D2S1338, CSF1PO, TH01, vWA, D21S11, D7S820, D5S818, TPOX, D8S1179, D12S391, D19S433 and FGA using Powerplex® 21 and loci DYS576, DYS389 I, DYS448, DYS389 II, DYS19, DYS391, DYS481, DYS549, DYS533, DYS438, DYS437, DYS570, DYS635, DYS390, DYS439, DYS392, DYS643, DYS393, DYS458, DYS358AB, DYS456 and YGATAH4 using Powerplex® Y-23 multiplex system kit (Promega, CA, USA) as per the recommended protocol supplied by the manufacturer except half reaction volume. Genotyping was done by capillary electrophoresis of amplicon using Polymer POP-4 on Genetic Analyzer 3130 (Applied Biosystems, Foster City, CA, USA) as per recommended protocol.

Table 1: PowerPlex® 21 system allelic data analyzes

Locus	Semen stains from Kameej of deceased	Chaddi of suspect	Scalp hair of deceased	Blood sample of suspect	soil recovered from crime scene	Hair recovered from soil
Amelogenin	X,Y	X,Y	X,Y	X,Y	X,Y	X,Y
D3S1358	15,16	15,16	16,18	15,16	15,16	15,16
D1S1656	15,15	15,15	13,15	15,15	15,15	15,15
D6S1043	11,11	11,11	12,13	11,11	11,11	11,11
D13S317	8,12	8,12	8,12	8,12	8,12	8,12
Penta-E	13,15	13,15	13,19	13,15	13,15	13,15
D16S539	11,12	11,12	9,11	11,12	11,12	11,12
D18S51	12,15	12,15	14,14	12,15	12,15	12,15
D2S1338	19,20	19,20	18,23	19,20	19,20	19,20
CSF1PO	11,13	11,13	12,12	11,13	11,13	11,13
Penta-D	9,11	9,11	13,13	9,11	9,11	9,11
TH01	9,9	9,9	9,9	9,9	9,9	9,9
vWA	14,17	14,17	18,19	14,17	14,17	14,17
D21S11	29,31.2	29,31.2	29,30	29,31.2	29,31.2	29,31.2
D7S820	10,11	10,11	10,12	10,11	10,11	10,11
D5S818	11,11	11,11	11,11	11,11	11,11	11,11
TPOX	8,8	8,8	8,10	8,8	8,8	8,8
D8S1179	14,14	14,14	13,15	14,14	14,14	14,14
D12S391	17,23	17,23	18,19	17,23	17,23	17,23
D19S433	12,14	12,14	14,2,15	12,14	12,14	12,14
FGA	23,24	23,24	21,2,24	23,24	23,24	23,24

Results and Conclusion

Autosomal and male specific Y STR DNA profiles were obtained from all the tested exhibits. All the sample showed same male DNA (Y chromosome STR markers) profile which was due to petrilineal relation of suspect and deceased, hence this male DNA profile was not helpful in identification of culprit in this case. The autosomal DNA profile obtained from chaddi of suspect, semen stains detected on soil and hair recovered from soil matched with the DNA profile obtained from blood sample of suspect. The DNA profile obtained from the DNA sample of kameej of deceased which was extracted by automatic extraction system, but as expected mixed profile was not obtained from this exhibit, however, semen stains were detected on this exhibit. Possibly, it is because of high and low DNA mixture ratio of deceased’s epithelial cell genomic DNA and culprit’s sperm cell genomic DNA respectively. In order to find out this outcome, DNA was extracted by differential extraction organic Phenol Chloroform Isoamyl alcohol (PCIA) method. Male fraction which contained sperm

cells, generated DNA profile which matched with the DNA profile obtained from blood sample of suspect. And fractions which contained epithelial cells generated DNA profile which matched with the DNA profile obtained from scalp hair of deceased. (Table 1 and 2)

Conclusively, differential organic extraction phenol chloroform method is very useful in sexual assault cases, especially in those cases where two male DNA mixtures are found and Y-STR does not help much more. The present paper shall be highly useful for the working scientists engaged in Forensic DNA examination.

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Table 2: PowerPlex® Y-23 system allelic data analyzes

Locus	Semen stains from Kameej of deceased	Chaddi of suspect	Scalp hair of deceased	Blood sample of suspect	Soil recovered from crime scene	Hair recovered from soil
DYS576	16.3	16.3	16.3	16.3	16.3	16.3
DYS3891	13	13	13	13	13	13
DYS448	20	20	20	20	20	20
DYS389II	31	31	31	31	31	31
DYS19	15	15	15	15	15	15
DYS391	10	10	10	10	10	10
DYS481	23	23	23	23	23	23
DYS549	12	12	12	12	12	12
DYS533	12	12	12	12	12	12
DYS438	11	11	11	11	11	11
DYS437	14	14	14	14	14	14
DYS570	19	19	19	19	19	19
DYS635	24	24	24	24	24	24
DYS390	24	24	24	24	24	24
DYS439	10	10	10	10	10	10
DYS392	11	11	11	11	11	11
DYS643	10	10	10	10	10	10
DYS393	14	14	14	14	14	14
DYS458	16	16	16	16	16	16
DYS385a/b	11,15	11,15	11,15	11,15	11,15	11,15
DYS456	15	15	15	15	15	15
Y_GATA_H4	13	13	13	13	13	13

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