CASE REPORT

Role of DNA Fingerprinting in Disputed Paternity

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ABSTRACT

The use of DNA fingerprinting in solving crime is proving to be as revolutionary as the introduction of fingerprint evidence in court more than a century ago. It has emerged as one of the most powerful tools available for solving many medical as well as legal complexities. DNA fingerprinting plays an important role in the establishment of the paternity of an individual. Most of cases regarding disputed paternity arise in the context of affiliation orders, divorce proceedings and questioned legitimacy, may also be used to find out paternity in cases of inheritance, guardianship, maintenance, legitimacy, adultery or fornication. The present work was done to solve the paternity dispute.

Keywords: Dispute, Forensic genetics, Paternity

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INTRODUCTION

The use of DNA fingerprinting in solving crime is as revolutionary as the introduction of fingerprint evidence in court more than a century ago. It has emerged as one of the most powerful tools available for solving many medical as well as legal complexities. DNA fingerprinting is proving to be of great importance in the establishment of the paternity of an individual. Although forensic DNA analysis is commonly used to detect the criminal activities such as homicide and rape, it can play vital role in disputed cases to establish the paternity of disputed offspring.[1, 2]

DNA fingerprinting is a technique, in which virtually unique sequence of bases in the DNA strands of chromosomes are used to compare one biological sample with another to investigate genetic relationship. Using these sequences of base pairs, every person could be identified solely by the sequence of their base pairs. DNA fingerprinting tests any DNA containing biological trace evidence. The composition of DNA molecule does not vary from cell to cell thus; DNA in blood is identical to that in other biological material such as hair, semen, skin, and bone marrow.[3]

In India and Nepal, DNA fingerprinting has been added to the routine work of disputed paternity cases as a reliable tool of investigation in Forensic cases. The old conventional investigation based on blood antigen systems like variable blood groups, HLA tissue typing was no more used in such sensitive cases because of the limitation or invariability of loci analyzed.[4]

Paternity, the state of being a father, can be legally established in several ways. When the parents of a child are married, paternity is commonly presumed. To determine whether a man is the father of a child born out of wedlock, a lawsuit known as a "paternity action" must be brought. In such a suit, paternity may be established if the alleged father admits paternity.[5]

Blood-group studies, which commonly employ the ABO system, cannot establish paternity but can conclusively exclude an alleged father from being a candidate. This is the case because a child must inherit blood type from the mother and father; thus, if the child's blood type differs from both: the mother

and the alleged father, the man could not possibly be a parent of son. A typical population frequency for conventional blood typing might be one in 200, for DNA one in 5,000,000. This means that only one in 5,000,000 people would have the same DNA profile. Adequate samples for DNA typing can be collected from blood, blood stain & oral swab easily. DNA typing compares strands of genetic material between the child and alleged father comparing strands from various locations of the genetic material allows accuracy ratings of 99.9%.[6] DNA typing allows an alleged father to be excluded with 100% certainty.[7] The aim of present work is to perform an analysis of evidence to help the court in establishing physical facts of criminal and civil disputes.

CASE DETAILS

The study was conducted at Central Forensic Science Laboratory, Hyderabad, India after ethical approval from Director, CFSL, Hyderabad. Samples were collected from Department of Biology and DNA Fingerprinting Unit, Central Forensic Science Laboratory, Hyderabad through legal proceedings.

As per the court order in paternity dispute, the parents along with the child were sent to the laboratory, for collection of blood samples regarding the paternity test. Two milliliter blood from the alleged father, mother and child were collected and stored for further analysis to carry out DNA fingerprinting.

Blood sample of father: Exhibit A, blood sample of mother: Exhibit B and blood sample of child: Exhibit C.

Isolation of good quality DNA is a primary step in DNA finger printing which was done by organic extraction method. To check the quantity of DNA, its quantification was done by 1% agarose gel electrophoresis. Then, its amplification was carried out by using PCR machine to increase the quantity of the DNA.[8] After amplification, denaturation of double strand was taken place followed by DNA proofing which was based on STRs (short tandem repeats).
Allelic distribution of STR loci of all exhibits is presented in Figure 1(a) to figure 1(d), which are represented in Table 1.

Figure 1 (a): Allelic distribution of disputed paternity case (STR loci: D8S1179, D21S11, D7S820 and CSF1PO)

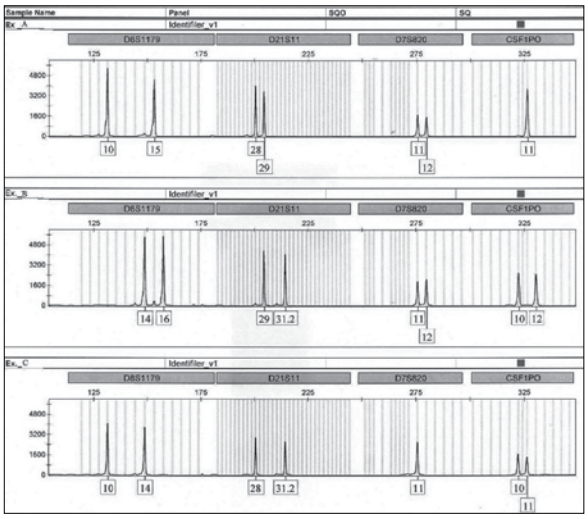

Figure 1 (b): Allelic distribution of disputed paternity case (STR loci: D3S1358, THO1, D13S317, D16S539 and D2S1338)

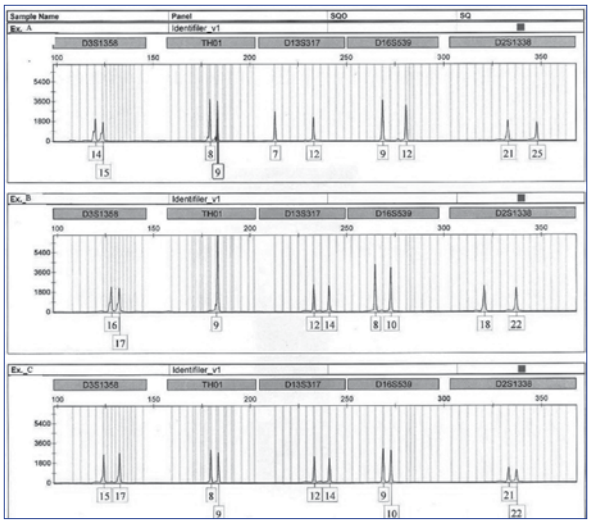

Figure 1 (c): Allelic distribution of disputed paternity case (STR loci: D19S433, VWA, TPOX and D18S51)

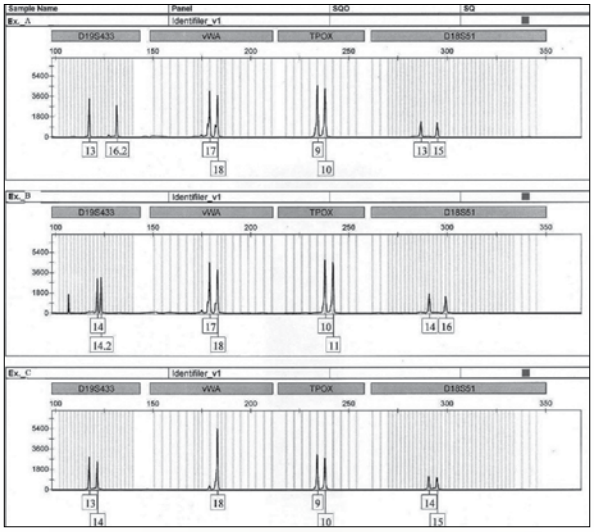

Figure 1 (d): Allelic distribution of disputed paternity case (STR loci: D5S818, FGA and AMELOGENIN.

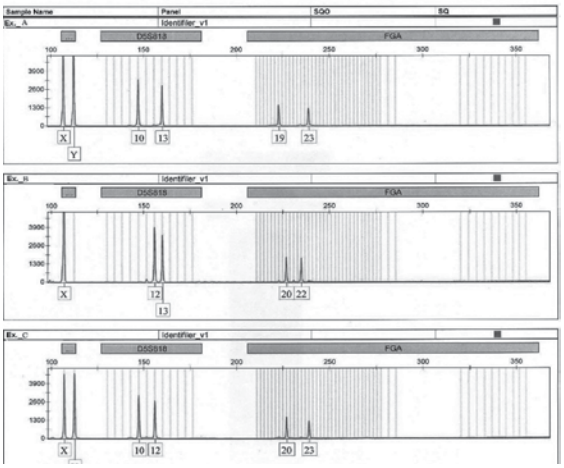

Table 1: The results of autosomal genetic markers of CODIS for the trios on the bases of DNA profile [from Figure 1(a) to Figure 1(d)]

Locus/marker	Father (Exh.-A)	Mother (Exh.-B)	Baby (Exh.-C)
D8S1179	10, 15	14, 16	10, 14
D21S11	28, 29	29, 31.2	28, 31.2
D7S820	11, 12	11, 12	11, 11
CSF1P0	11, 11	10, 12	10, 11
D3S1358	14, 15	16, 17	15, 17
THO1	8, 9	9, 9	8, 9
D13S317	7, 12	12, 14	12, 14
D165539	9, 12	8, 10	9, 10
D2S1338	21, 25	18, 22	21, 22
D19S433	13, 16.2	14, 14.2	13, 14
vWA	17, 18	17, 18	18, 18
TPOX	9, 10	10, 11	9, 10
D18S51	13, 15	14, 16	14, 15
Amelogenin	X, Y	X, X	X, Y
D5S818	10, 13	12, 13	10, 12
FGA	19, 23	20, 22	20, 23

DISCUSSION

Liquid blood sample 'B' of mother had one of the alleles in the genotype profile, of the amplified identifier STR loci, alike to one of the alleles in the genotype profile of the liquid blood sample of baby 'C'. All the non-maternal alleles of the amplified identifier STR loci of the liquid blood sample of father 'A' were alike to one of the alleles in the genotype profile of the liquid blood sample baby 'C' [Figure 1(a) to Figure 1(d)].

The above observation revealed that person 'A' is the biological father of baby 'C'. The probability of Exhibit 'A' contributing the non-maternal alleles to the baby is 99.999% than any person at random (Table 1).

CONCLUSION

DNA typing has an advantage over traditional protein analysis and it is more informative and can be analyzed in minute and/or degraded material as DNA is physically much more resistant to degradation that protein. DNA analysis provides the best avenue for unequivocal exclusion of the innocent suspects. Due to all these impressive applications, DNA test has become the darling of the criminal and civil justice system globally.

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