



DNA Paternity Testing: An Analysis of Forensic Aspects

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Abstract:

DNA testing is currently the most advanced and accurate technology to determine paternity. It has come a long way from application in immigration case to identification of foetus of rape victims and missing persons/ deceased. DNA paternity testing in forensic casework is greatly based on comparison with reference biological samples of close blood relatives. The choice of reference samples depends largely on the authenticity of biological relationship with the individual in question. However, in certain conditions the relationship may not be biological. Today with the advent of new reproductive technologies like IVF, surrogacy etc, it becomes imperative to review the problems in forensic paternity testing for legal remedies in future.

Key Words: DNA, Forensic Paternity Testing, Authentic Reference Samples, Privacy Concerns.

Introduction:

DNA paternity testing determines the biological father-mother- child relationship between a man, woman and a child. Every individual's DNA or genetic fingerprint is unique except for identical (monozygotic) twins. The DNA of an individual does not change once it is formed at conception. The DNA paternity test compares the DNA fingerprints between the tested man/woman and child to determine if the child inherits his/ her DNA.

DNA profiling or fingerprinting is a technique by which an individual can be identified at the molecular level. Portions of DNA structure are as unique to each individual as finger prints. Alec Jeffrey's and his colleagues who made these revelations named the process for isolating and reading these DNA markers as "DNA fingerprinting." The chance that two unrelated people have an identical total DNA gene sequence is at least 1 in 6 million. Monozygotic

twins have almost exactly the same DNA sequence. The tests do not look at the information in the genes but instead examine non-coding DNA that separated the genes along the chromosomes. Specifically the DNA is examined where there are large numbers of repeated sequences of letters along its length. The pattern of different numbers of STRs at certain sites on the chromosomes are used to create a DNA pattern or DNA fingerprint. Short tandem repeat (STR) technology is used to evaluate specific regions (loci) within nuclear DNA. Variability in STR regions can be used to distinguish one DNA profile from another. DNA profile for a multiplex of 15 autosomal STR markers is generated and obligatory alleles are compared with parents/ siblings/ close relatives. The Y chromosome is passed directly from father to son, so analysis of genetic markers on the Y chromosome is especially useful for tracing relationships among males. .

Forensic Investigation:

DNA testing is currently the most advanced and accurate technology to determine parentage. Increasingly it is being undertaken to determine parentage or other family relationships. To determine paternity, traditionally the alleged father, the child and (if desired) the mother participate in the DNA test. The DNA paternity testing results have been used as a piece of legal evidence for support, inheritance, social welfare benefits, immigration, or adoption purposes. Some choose to find out paternity before the child is born i.e. prenatal paternity test. DNA paternity testing also has legal importance for offsprings of rape victims. Some never need to use the testing results for legal purposes and may not want to involve a third party in the specimen collection process, choose a curiosity DNA paternity test which allows them to collect their own specimens with complete privacy. Until recently, DNA testing was primarily paternity

testing that is establishing whether a man had fathered a child. Identification DNA testing is also being used as an aid in identifying victims of crime, natural or other disasters i.e. missing person identification or disaster victim identification (DVI) Thus, it is evident that forensic DNA paternity testing may involve establishment of paternity of an individual or reverse paternity testing for identification of the deceased.

Material and Methods:

Comparative method was used for evaluating qualitative data.

Results and Discussions:

Reference Samples and Biological Aspects

In a kinship case, to generate an autosomal DNA profile, the indirect reference samples of the following are required.

- Either or both biological parents
- Biological mate of the victim and their children.
- Biological full siblings, sharing the same parent as victim.

Mitochondrial DNA or Y-Chromosomal markers can be also employed respectively with distant relatives for maternal or paternal lineage in absence of close relatives. The authenticity for biological relationship of the donors is however crucial. It is expected that donors have the same biological relationship as presumed and monozygotic or close relatives are not involved.

Occurrence of a rare spontaneous tetragametic chimera formed by merging of embryos in the uterus can lead to false interpretation as mixed pattern of different genotypes can be obtained in an individual. Maternity in most cases is not in doubt hence any discrepancy can be checked by collecting samples of different tissues from the mother. However in case father is a chimera with different genetic makeup in sperm and blood cells he can be falsely excluded. In cases of *in vitro* fertilization incidence of tetragametic chimerism may rise due to close contact of embryos.

Closely related individuals like parent/child or full siblings share more obligatory alleles than unrelated individuals making forensic paternity testing difficult. In cases of motherless paternity

or fatherless maternity, incest, cases involving mutations and full siblings impersonating as parent/child, testing with multiplexes of 15 autosomal STR loci becomes difficult. 21 autosomal STR loci were utilized in a case to identify the true father between two brothers by Goodwin et al .

Authenticity of the relationship of the donor of reference samples should be clear. Donor having biological relationship with the child or individual is more important than legal or social relationship. In forensic DNA paternity testing the donor of the reference sample -

(a) may know true relationship with the individual i.e. adoption, step relation, ART;

(b) may know true biological relationship like false paternity (may or may not disclose) ;

(c) may not be aware of true biological relationship i.e. child swapping , surrogacy/ IVF.

Step relationship usually known can be disclosed. Adoption of child / individual if well documented and known can be disclosed. In certain cases of adoption however, the biological parents of child may be unknown.

New reproductive technologies employ donor egg, sperm, or surrogates. Children conceived through Assisted Reproductive Technologies (ARTs) may have five parents i.e. (i) genetic father donating the sperm (ii) genetic mother providing the egg (iii) surrogate mother and (iv & v) two parents who have no biological connection but who commission others to start a family. Anonymous donations lead to several half -siblings unknown to one another. Fertility clinics may not conceive the woman with her husband's sperm. ART clinics may not keep on record DNA fingerprints of the donor, child, surrogate.

False paternity situations make DNA paternity testing difficult as establishing identity of missing or deceased may also raise ethical problems for the mother.

Child swapping of which the donors may not be aware of and hence the biological relationship of the child/ individual unknown.

Surrogacy is an arrangement in which a woman carries and delivers a child for another couple or person. The surrogate may be the child's genetic mother (traditional surrogacy) or she may be genetically unrelated to the child (gestational surrogacy). In a traditional surrogacy, the child may be conceived via home artificial insemination using fresh or frozen sperm or impregnated via IUI (intrauterine insemination) or ICI (intracervical insemination). In gestational surrogacy intended mother's egg (not able to carry due to hysterectomy, diabetes, cancer etc. and father's sperm are used to create an embryo (via IVF) which is transferred into and carried by the surrogate mother.

The intended parent/ parents (social parents) may arrange a surrogate pregnancy due to female infertility and other medical issues which make pregnancy/ delivery impossible, risky or undesirable. In such cases sperm or egg may be provided by the commissioning parents but donor eggs, sperm or embryos may also be used. In traditional surrogacy with intended father's sperm the child is genetically related to its father and surrogate mother. In traditional surrogacy with donor sperm the child is genetically related to the sperm donor and surrogate mother. However in gestational surrogacy the resulting child is genetically related to its parents and the surrogate mother has no genetic connection, if the embryo is created by intended father's sperm and mother's ovum/egg. The conditions if not disclosed during collection of reference samples effect DNA paternity testing.

Legal Aspects-

- Section 112 of the Indian evidence Act, 1872 is based on the rule that the child born in wedlock should be treated as the child of the man who was then the husband of his mother.
- Courts in India are very cautious in following DNA paternity testing as they feel that it may go against the basic principles of Human Rights and Dignity as the order for such test may interfere with the personal liberty of that person (Article 21 of the

Constitution of India). Court also feel that such an order may violate the right of an accused person protected under Article 20 of the Indian Constitution ⁵. As per the Hon'ble Supreme Court's landmark judgement (Gautam Kundu v/s state of West Bengal) the observations are as follows-

- 1- Courts in India cannot order blood test as a matter of course.
- 2- Whenever applications are made for such prayers in order to have roving inquiry the prayer for blood test cannot be entertained.
- 3- There must be a strong 'prima facie' case in that the husband must establish non access in order to dispel the presumption arising under Sec. 112 of Indian Evidence Act. 1872.
- 4- The court must carefully examine as to what would be the consequence of ordering the blood test. Whether it will have the effect of branding a child as a bastard and the mother as an unchaste woman.
- 5- No one can be compelled to give sample of blood for analysis.

In 2011, however, Delhi High Court issued contempt notice to N.D. Tiwari for his deliberate disobedience of its order to give blood sample for DNA test to determine a youth's paternity⁶. Earlier, in 2008, in a landmark judgment, Gujarat High Court conferred Indian Citizenship on twin babies fathered through surrogacy by a German national in Anand District⁷.

- Commercial surrogacy is legal in India. The Indian Council for Medical research has given Guidelines in 2005 regulating Assisted Reproductive Technology procedures. The records of DNA fingerprints of the donor, child, couple and surrogate is however voluntary on the part of ART clinics (with the consent of the couple). As per the observations made by Law Commission the birth certificate of the surrogate child should contain the name of the commissioning parent (s) only and right to privacy of donor as well as surrogate mother should be protected.

- Privacy concern is the major concern as DNA can provide insights into several intimate aspects of individuals and their families including legitimacy of birth.

Conclusion:

DNA paternity testing is no doubt the most effective tool in solving civil and criminal cases. However with the changing scenario of the society where offspring's may not have biological relationship with either or both their parents the forensic DNA paternity testing may become problematic if biological records are not properly maintained. Storage of biological samples of all persons contributing to the biological formation of the child would be meaningful. Legal monitoring and legislation are essential so that in near future there may not be chaos and DNA paternity testing may continue contributing in society be it a case of paternity or identification of foetus or missing person/disaster victim.

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