Disputed Paternity

Introduction:

When a child is born he or she carries the DNA of both the parents. Both parents are equally responsible for the birth of the child. The man who has contributed his sperms to this child is considered to be the biological father. But there is another term called legal father, a legal father is the one who is recognized as the father of the child by the law. The legal father may not be the biological father of that child. The word paternity means legal fatherhood of the child. Every child has a biological father but not legal father. A legal father has the right to support the child financially, take care of the child etc.

In many societies it has been found that the child is born from unmarried parents, in this case this biological father is not considered as the legal father. Even if the name is written in the birth certificate then also he is not the legal parent of the child. He has to establish it with the help of law by recognition of parental (ROP) process and by court of law.

Paternity disputes occur when the father claims that he is not the biological father of that child and refuse to take the responsibility of the child, however the mother claims that the man is the biological father of her child.

The question of disputed paternity may arise in cases of (Khaganwal; 2012):

1. Illegitimacy
2. Posthumous birth
3. Suppositious child
4. Nullity of marriage
5. Divorce
6. Inheritance of property
7. Guardianship
8. Maintenance

As we know that only a legitimate child can inherit the property. In case of Lohi and Radhika Singh the Supreme Courted states that if a man and woman who are unmarried and stay together for a long time and behave like a married couple then there is presumption of a valid marriage and the child born will be legitimate and will have the right to inheritance and succession.

Under Section 3(57) of the General Clauses Act, 1897, the definition of son includes an adopted son and under Section 12 of the Hindu Adoption and Maintenance Act, 1956, an adopted son or daughter is entitled to succeed to the estate of his adoptive parents.

Approaches to solve disputed paternity:

Disputed paternity can be solved through different approaches:

1. Morphological approach between the child and parent.

2. Serological approach

3. Immunological approach through Human Leukocyte Antigen (HLA) typing

4. DNA typing (DNA Profile) which include Variable number tandem repeats (VNTR), short tandem repeats (STR), polymerase chain reaction (PCR).

Morphological Approach between the child and the Parent:

Every trait is transferred from parents to children. Each parent contributes equally in the formation of zygote. So it is normal that the child represent the characters similar to its biological parents. The dominant characters are expressed in phenotypically. The child resembles his or her parents many times in features like figure, skin color, nose form, eyes, stature, hair and other personal details. Many a times some deformaties or developmental details are also seen in the child. Many diseases are transformed from father to boy as Y chromosome in inherited from father to son and many diseases are carried from mother to son as X chromosome is transferred from mother to son. In case of female child one X chromosome is transferred from mother to child and another X chromosome from father to child. In female child many times genotype is not represented phenotypically i.e., morphologically as because they are the carrier. Sometimes child represents the trait that their grandparents have, as traits are inherited and transferred from one generation to another. For example: Hypertrichosis pinnae auris is a Y-linked autosomal dominant trait in which the helix of the ear shows hair growth. This trait is transformed from father to son as it is located on the Y chromosome.

Few Mendelian traits like ear lobe, tongue rolling etc. also help in disputed paternity. Joint ear lobe is a dominant trait and attached ear lobe is a recessive trait. Rolling-tongue is a dominant trait while not rolling-tongue is a recessive trait.

Serological Approach

ABO Blood Group System

ABO blood group was discovered by Landsteiner in 1900. ABO blood group has antigen A and B. Blood group of a person is identified with the antigen and anti-body. A blood group carry only A antigen, B blood group carry only B antigen, AB blood group carry both A and B antigen and O blood group carry no antigen. Again, A blood group has anti-B antibody in the plasma, blood group B has anti-A antibody, blood group O has anti-AB antibody and blood group AB has no antibody.

BLOOD GROUP	ANTIGEN PRESENT	ANTIBODY PRESENT
A	A	anti-B
B	B	anti-A
AB	A,B	none
O	none	anti-A and B

ABO blood group has three allelic genes A, B and O. Genotype and phenotype of different blood group is given below:

GENOTYPE	PHENOTYPE
OO	O

AO	A
AA	A
BO	B
BB	B
AB	AB

The factors that determine the blood group of the child are inherited from parents. But blood grouping test can never affirmatively fix paternity of a man, but they may exonerate him. To understand how this blood grouping helps in knowing that a man is not the father of the given child, it is necessary to understand the way in which blood groups are inherited: during zygote formation haploid sperm cell and a haploid ovum fuses with each other if father has blood group AB then two types of sperm will be produced one that will carry A and the other that will carry B. If the mother also has AB blood group then she will also produce two types of ovum one that will carry A and the other that will carry B. The genotype of the child can be AB, AA, BB and AB. So there is 50% chance of the child to have AB blood group and 25% chance for AA and BB blood group.

If the father has blood group B then the genotype of the father can be BB and BO, if the father has genotype BB then all the sperms will carry B genes and if the genotype is BO then half sperms will carry B and the other half will carry O genes. Now if the mother also have B blood group then genotype can be BB and BO, if the genotype is BB then all the ovum will carry B genes and if the genotype is BO then half of the ovum will be carrying B genes and the other half will carry O genes. Then the child will have B blood group but if father and mother have genotype BO and BO then it is possible that the child will have O blood group. As because the possible genotypes will be BB, BO, BO, and OO. If both the parents have blood group A then the possible genotype can be AA or AO and their child will have A blood group. But if the parents have genotype AO and AO then the child can have blood group A and O.

If one of the parents has blood group AB and other have blood group O than the child can have blood group A or B.

ABO blood group also helps in establishing non paternity, if the blood group of the father and mother is known then easily we can get to know the blood group of the child and if the child does not have the possible blood group then non paternity is established.

PARENT'S BLOOD TYPES	POSSIBLE CHILD	NOT POSSIBLE CHILD
A and A	A,O	B, AB
A and B	A,B,AB,O	no
A and AB	A, B, AB	O
A and O	A,O	B, AB
B and B	B,O	A, AB
B and AB	A, B, AB	O
B and O	B,O	A,AB
AB and AB	A, B, AB	O
AB and O	A,B	AB,O
O and O	O	A,B,AB

MN Blood Group System

MN blood group also helps in determining blood group: the MN blood group is controlled by autosomal loci which are present in the chromosome 4 and two alleles responsible for this blood group MN are LM and LN. This blood group is determined by the presence of glycoprotein on the surface of the red blood cell. The three phenotypes which are possible are MM, NN and MN. This is also inherited from one generation to another so it helps in determining the paternity.

If the mother has blood group M, then the genotype is MM and the child has blood group MN then the father should have blood group N and the genotype is NN. if the mother has blood group M, then the genotype is MM and the child is of blood group M, genotype is MM then the blood group of the father of the child is also M or MN. If the blood group of the mother is N and the child also have the blood group N then the blood group of the father is also N or MN.

Immunological Approach through Human Leucocyte Antigen Typing:

This is also a kind of serological test which helps in determining paternity. Human Leukocyte was developed by Dr. Paul I. Terasaki, Professor of Surgery at the University of California at Los Angeles, in 1964. He discovered this system to minimize the possibility of rejection of transplant organ.

The Human Leukocyte Antigen system is based upon the identification of antigens, substances that stimulate antibody production when introduced into another human body. Because the HL-A test detects antigens by using antisera (antibodies), it is known as a serologic test (Sterlek, 1980). As genes are inherited from the parents, by making calculations on the basis of the antigens present on the surface of the white blood cells probability of paternity in calculated. This test is based on one of the two ways:

That there may be exclusion; the man is not the father of the child according to the principles of genetics.

Another, there may be inclusion; the man can be the father of the child or may have similar genetic makeup.

The advantage of HLA over blood typing is that all HL-A types are relatively rare. If the accused man shares high percentage of combination of HL-A types than the man could be the father of the child. But high rate of exclusion are possible products of multiple testing, costs and diminishing returns render excessive multiple testing impractical (Sterlek, 1980).

DNA Typing:

DNA is the deoxyribonucleic acid which is the genetic material and inherited from both the parents. DNA is the ideal source for identification as it is unique in every individual, it shows the blue print. It is a method for identification of the individual used in forensic science. It also helps in the parental analysis by taking the allele size for all microsatellite markers. This technique was developed by Alec Jeffreys in 1987.

Techniques which are involved are:

a. Variable Number Tandem Repeats (VNTR)

These are short tandem sequences of 10-100 base pairs which are repeated. These regions vary from individual to individual in numbers. Each variant act as an inherited allele allowing them to use as

personal identification and parental identification. It is almost impossible having equal VNTR regions in two unrelated person.

Multilocus DNA fingerprinting is one of the important tools in determining paternity because they provide great information, somatic stability and Mendelian inheritance.

b. Short Tandem Repeats (STR)

These are short arrays of tandem repeated sequences of 2-6bp in length. These are the polymorphic regions which vary from individual to individual.

These are widely used in forensics since 1993. STR is dependent on the PCR which confers much greater sensitivity on the test system.

This technique does not consume much time and is used in forensic case work. Greater sensitivity allows the use of more convenient sample.

The relative reduction in discriminating power with respect to SLP profiling has a more profound effect in parentage testing, where generally only one allele at each locus is informative, than in identity testing, where a match at both alleles is required. This distinction means that a six locus STR system such as the Second Generation Multiplex (SGM) has been designed which has an equivalent discriminating power in identity cases to four SLPs but many more STRs are required to provide equivalent paternity indices to the six SLPs currently used by the UDL laboratory in cases of disputed paternity (Thomson, 1999).

c. Polymerase Chain Reaction

It was discovered by Kary Mulluis in 1983. It was established as a standard method for paternity testing. PCR helps in multiplication of a specific region of DNA strand many times. It is the most accurate and fastest method for determining paternity as DNA is inherited from parents to the child. Through PCR one can determine the closeness between two individual or how closely they both are related with each other. The two DNA source is multiplied and seen whether one is derived from the other or if the two had similar parentage.

A child inherits a unique combination of DNA from its parents. Because scientists have extensively used PCR for DNA testing, a greater amount of information has been accumulated to form a database for accurate DNA analysis. This large database enables paternity testing via PCR to have the highest power of exclusion (Khanagwal, 2012).

According to Chakraborty three human microsatellites which are commonly typed by PCR are apoB, D17S5 which are also known as D17S30 and D1S80. These markers can amplify easily and detected after electrophoresis.

Earlier restriction fragment length polymerase (RFLP) is used in determining paternity but nowadays it is not used much as it requires large amount of DNA and takes a long time to process. Now new methods like PCR are used.

Summary

Disputed paternity is when a man claims that he is not the biological father of the child and does not take the responsibility of the child. Biological father is the one who donates his sperms to the child. Legal father is the one who is recognized as the father of the child by the law. If a married couple has

a child, then the man is the legal father. But if a unmarried couple has child then the father has to claim his paternity with the help of law by recognition of parental (ROP) process and by court of law.

This is a newly introduced concept mainly found in foreign countries where divorce and living together before marriage is very common. In many cases paternity disputes should be solved regarding inheritance of property, legitimacy, divorce etc. There are many ways in which paternity disputes can be solved that are: morphologically, serologically, human leucocytes antigen system and DNA typing. In morphological approach similarity in body figure, nose form, lips, eyes, etc are seen and compared with the parents. In serological approach blood group are matched but blood group cannot give conformity about the parental disputes. The human leukocyte antigen system based upon the identification of antigens, substances that stimulate antibody production when introduced into another human body. HL-A regions are relatively rare. DNA typing is done by using many techniques like short tandem repeats, variable number tandem repeats and polymerase chain reaction. Earlier restriction fragment length polymerase was used but nowadays it is not used as it requires large quantity of DNA. Polymerase chain reaction is one of the largely used techniques as it consuming less time. DNA typing gives a confirm result about the paternity test.