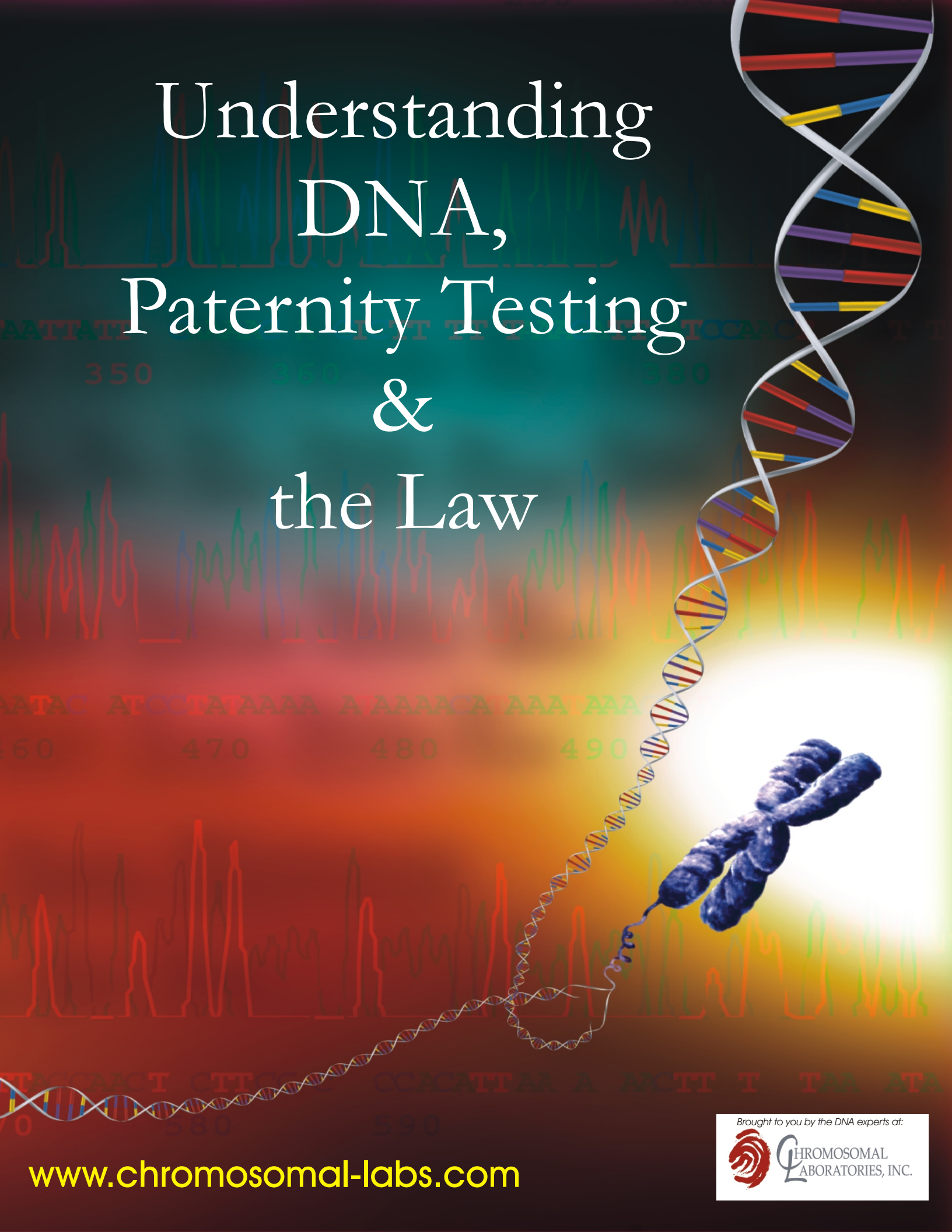


# Understanding DNA, Paternity Testing & the Law



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## Introduction

US Paternity Laws can trace their origins to 18<sup>th</sup> Century England. Chief Justice of the King's Bench, Lord William Murray Mansfield, served from 1756 until his retirement at age 80 in 1788. His decisions greatly influenced English common law, which remains the basis of law in the United States today. Sometimes referred to either as the Bastardy Statute or British common law origin, the Lord Mansfield's Rule, defines a child born into a marriage to be a product of that marriage. The husband of the mother is legally bound to support the child as though it were his own. While use of the Mansfield Rule is falling on disfavor, many states still use this guiding principle. A summary of individual State's position on the use of the Mansfield Rule can be found at the US Social Security Administration.

[Click Here](#)

### Establishing Paternity

Establishing paternity means being declared the legal father after the child is born. If the parents of a child were not married when the mother became pregnant or when the child was born, the child does not have a legal father until paternity is established.

Establishing paternity is important for both the child and the parents. A child is entitled to the sense of belonging and identity that comes from knowing both parents. Establishing paternity often has an important emotional and psychological benefit for the child. Also, until there is a determination that a biological father is the legal father, the child has no right to receive financial support from the father, to inherit from the father or to obtain insurance, veterans', social security or other benefits through the father. Likewise, until paternity is legally established, the biological father has no legal rights to the child, such as parenting time with the child. Additionally, he has no legal right to participate in major decisions about the child, such as medical treatment, education or religious training. Additionally, genetic diseases are inherited, thus knowing your biological ancestry can be useful in proactive care and transplantation.

Paternity laws tend to vary from state to state. [Click here](#) for individual state laws. The Uniform Parentage Act of 2002 by the National Conference of Uniform State Laws modernizes the law for determining the parents of children, and facilitates modern methods of testing for parentage.

[Click here](#) to review online. Delaware, Texas, Washington and Wyoming have adopted this act and Mississippi, New Jersey, North Dakota, Oklahoma, and Utah have introduced the act as bills in 2005.

Current scientific methods for determining paternity use the power of DNA to achieve highly accurate results.

### History of Paternity Testing

Before DNA testing became available, several blood testing methods were used to determine paternity. These tests, based on different blood group systems (BGS), were difficult to perform and often produced inconclusive results. Most courts now accept only DNA test results as evidence for paternity cases.

### Evolution of Paternity Testing Methods

Time Period	Method	Sample	Power of Exclusion
1920s	ABO Blood Type	Blood	30%
1930s	Rh, Kell & Duffy Blood Groups	Blood	40%
1970s	HLA Typing	Blood	80%
1980s	RFLP-DNA	Blood	99.99%
1990s	PCR-DNA	Swab	99.99%

### ABO Blood Typing

Certain proteins located on the surface of red blood cells, called ABO antigens, determine the blood type of A, B, AB or O. ABO antigens are inherited from the father and the mother. Depending on the blood types of the two individuals it was sometimes possible to exclude an alleged father, but not prove paternity.

Blood typing, based on the ABO blood group system, is not an accurate method for determining paternity. It eliminates (excludes) only 30% of the entire male population from being the possible father. It cannot be used to prove paternity.

## ***Rh, Kell and Duffy Blood Groups***

This test is somewhat similar to the ABO typing system in that it measures inheritable protein groups in blood. This method increased the power of exclusion to approximately 40%, but was not useful in proving paternity.

## ***HLA Typing***

HLA Typing measures Human Leukocyte Antigens (HLA), found on most cells in the body, except red blood cells. White blood cells contain the greatest concentration of HLA and are the same markers associated with organ transplant rejection.

This method increased the power of exclusion to 80% and in some cases it was possible to produce a probability of paternity of up to 90%. However, HLA testing could not differentiate between related alleged fathers. The large amount of blood required for this test limited its use to infants older than 6 months of age, and made testing uncomfortable for small children.

## ***RFLP***

RFLP, short for Restriction Fragment Length Polymorphism, is a DNA technique that relies on the genetic uniqueness of all individuals in the world. No two persons have the same DNA sequence, except for identical twins. DNA is extracted from blood and treated with specific enzymes to create DNA fragments. The size of the fragments are measured and statistically analyzed. If too many fragments do not have a match, then the father is excluded. This technique increased the power of exclusion to 99.99% and greater.

## ***PCR***

PCR, or Polymerase Chain Reaction, is similar to RFLP in that it uses DNA. PCR is an extremely powerful technique for analyzing DNA on very small amounts of biological samples, from almost every part of the body. All cells in the body have the same DNA, so the results are the same regardless of the type of biological sample taken. PCR produces billions of copies of select portions of DNA from a small sample, such as a swab rubbed against a patient's inner cheek. The resulting DNA is analyzed on a Genetic Analyzer and statistically evaluated. This technique has a power of exclusion of 99.99% or greater.

PCR has been extensively used for DNA testing, and large databases have been accumulated for accurate DNA analysis. This large database enables paternity testing via PCR to have the highest power of exclusion.

## **Paternity Fraud**

Paternity fraud, or the false identification of a man as the father of a child, is a serious problem in the US and throughout the world. According to USA Today, a report from the American Association of Blood Banks says that approximately 30% of the over 300,000 paternity tests performed annually in the United States result in exclusion of the alleged individual as the biological father.

The LA Chapter of the National Coalition of Free Men estimates that there are over 7 million children in the United States that are unknowingly calling the wrong person, Dad.

Paternity Fraud or the false identification of a man as the father of a child, forces thousands of men each year to pay for children fathered by other men. In many cases paternity is assigned by default without testing or appearance of the accused. Recent legislative trends in some states are providing justice for the wrongfully accused. On Sept. 28, 2004 California Governor Schwarzenegger signed Assembly Bill (AB) 252 into law.

[Click here](#) to review AB 252. AB 252 allows the court to set aside previously established paternity judgments and related child support orders if the court determines the father named in the court order is not the biological father of the child or children. This trend is likely to echo through other states throughout the country.

## **Method for Determining Paternity**

Almost universally, paternity testing is now performed using PCR. When selecting a paternity test, there are two main factors to consider.

- **Number of Genetic Markers Tested**
- **Type of Paternity Test (Private or Legal)**

**Genetic Markers**

DNA results often decide the outcome of the case. It is important to understand the bottom line results on the paternity test report. All paternity test results and conclusions are founded in statistics and probabilities. The greater the number of genetic markers examined the greater the strength of the genetic evidence and hence the final result. Industry wide, paternity tests can be generated using as few as four markers, to as many as 16 markers, with the latest high resolution technology. The 16 marker technology can achieve a probability of identity of 1 in 40 quintillion, or 1 in 40,000,000,000,000,000,000.

**Private Paternity Test**

A Private Paternity test is a simple, easy and confidential method to determine paternity. This self administered procedure can be accomplished by testing only the alleged father and the child. There is not a need to involve the mother. Collecting samples for DNA analysis is an easy and painless procedure. A sterile swab, very similar to a Q-tip, is rubbed on the inside of the cheek from the child and the alleged father. The swabs are then placed into their corresponding envelopes and sent back to the lab for analysis.

Private paternity tests are excellent for cost effective confidential determination of paternity for a number of applications including peace of mind, curiosity, or validating a case prior to incurring the expense of court orders and attorneys. Private paternity testing is not available in the State of New York as a court order or prescription is required.

**Legal Paternity Test**

A Legal Paternity test is very similar to a private paternity test. The primary difference is that the samples must be collected by a competent person with no interest in the outcome. This means that spouses, children, family or friends are excluded from collecting samples. People that may qualify include ministers, child support workers, physicians, attorneys or a person hired by the laboratory. At the time of sample collection identification will be verified, a fingerprint and photograph will be taken and sample collection will be witnessed. Legal paternity tests are required for consideration by the courts.

**Private vs. Legal Paternity**

Criteria	Private Paternity	Legal Paternity
Expensive	No	Yes
Confidential	Yes	Yes
Private	Yes	No
Painless	Yes	Yes
Court Ordered	No	Yes
Requires 3rd Party Sample Collection	No	Yes
Convenient	Yes	No
Accurate	Yes	Yes
In-Home Testing	Yes	No

**Finding an Attorney**

In the event that legal representation is necessary, the qualifications and experience of the firm selected should be sufficiently evaluated.

[Click here to search for attorneys.](#)

**Ask the Experts**

For answers to case specific questions, please inquire [here](#).

**Glossary**

**Allele:** One of the variant forms of a gene at a particular locus, or location, on a chromosome. Different alleles produce variation in inherited characteristics such as hair color or blood type. In an individual, one form of the allele (the dominant one) may be expressed more than another form (the recessive one).

**Biological Father:** A man who fathers a child by impregnating the mother. The biological father is not a legal father unless paternity is established or presumed by law.

**Chain of Custody:** An unbroken trail of accountability that ensures the physical security of samples, data, and records.

**Chromosome:** One of the threadlike "packages" of genes and other DNA in the nucleus of a cell. Different kinds of organisms have different numbers of chromosomes. Humans have 23 pairs of chromosomes, 46 in all: 44 autosomes and two sex chromosomes. Each parent contributes one chromosome to each pair, so children get half of their chromosomes from their mother and half from their father.

**Combined Paternity Index (CPI):** CPI is a measure of the strength of the genetic evidence and can range from 0 to infinity. A CPI of 1 means that the genetic test does not provide information one way or another as to whether the tested man is the father. If the CPI is less than 1, the genetic evidence is suggestive of non-paternity. If the CPI is less than 0.001 the tested man is excluded as the father. CPI greater than 1 suggests the tested man is the father. The greater the CPI, the stronger the genetic evidence.

**DNA:** The chemical inside the nucleus of a cell that carries the genetic instructions for making living organisms.

**Electrophoresis:** The process in which molecules (such as proteins, DNA, or RNA fragments) can be separated according to size and electrical charge by applying an electric current to them. The current forces the molecules through pores in a thin layer of gel, a firm jelly-like substance. The gel can be made so that its pores are just the right dimensions for separating molecules within a specific range of sizes and shapes. Smaller fragments usually travel further than larger ones. The process is sometimes called gel or capillary electrophoresis.

**Gene:** The functional and physical unit of heredity passed from parent to offspring. Genes are pieces of DNA, and most genes contain the information for making a specific protein.

**Genetic Marker:** A segment of DNA with an identifiable physical location on a chromosome and whose inheritance can be followed. A marker can be a gene, or it can be some section of DNA with no known function. Because DNA segments that lie near each other on a chromosome tend to be inherited together, markers are often used as indirect ways of tracking the inheritance pattern of a gene that has not yet been identified, but whose approximate location is known.

**Genetic Testing:** A scientific method for determining paternity involving samples from a mother, child and putative father, then comparing the results. These tests are sometimes referred to as DNA tests because the information in the samples compares the DNA, or basic chemical codes, found in each person's body.

**Heterozygous:** Possessing two different forms of a particular gene, one inherited from each parent.

**Homozygous:** Possessing two identical forms of a particular gene, one inherited from each parent.

**Legal Father:** A biological father who has been legally established to be a child's father and who then is entitled to the rights and responsibilities of parenthood under the law.

**Locus:** The place on a chromosome where a specific gene is located, a kind of address for the gene.

**Microsatellite:** Repetitive stretches of short sequences of DNA used as genetic markers to track inheritance in families.

**Mutation:** A permanent structural alteration in DNA. In most cases, DNA changes have no effect or they can cause harm, but occasionally a mutation can improve an organism's chance of survival and it passes the beneficial change on to its descendants.

**Paternity:** Paternity means being the legal father. If a woman is married when a child is born, the husband is presumed to be the father. If parents are unmarried, the child does not have a legal father until paternity is established.

**Paternity Index (PI):** PI is a likelihood ratio between the chances that the alleged father may pass the paternal gene compared to the chance that a random man may pass the paternal gene to the child.

**Pedigree:** A simplified diagram of a family's genealogy that shows family members' relationships to each other and how a particular trait or disease has been inherited.

**Power of Exclusion (A):** The ability of a genetic test to exclude a wrongfully accused man of paternity and is dependent upon the phenotypes of the mother and child and the ethnicity of the alleged father.

**Presumed father:** A person who the law assumes is the father of a child because he was married to the mother during pregnancy or when the child was born.

**Probability of Paternity (W):** A statistical method describing the likelihood that the alleged father is the biological father of the child. This process utilizes both the genetic (Paternity Index) and nongenetic (Prior Probability) evidence.

**Putative Father:** A person claimed to be a biological father. When paternity is legally established, a putative father becomes the legal father.

**Random Men Not Excluded (RMNE):** RMNE is the approximate proportion of the male population that would not be excluded as the father of the tested child by a set of genetic tests.

**Sex Chromosome:** One of the two chromosomes that specify an organism's genetic sex. Humans have two kinds of sex chromosomes, one called X and the other Y. Normal females possess two X chromosomes and normal males one X and one Y.

**Voluntary paternity establishment:** One of several methods to establish legal fatherhood for a child when the parents agree on the father's identity.

## References

1. Uniform Parentage Act, 2002, National Conference of Commissioners on Uniform State Laws.
2. AABB. 2003. Standards for Parentage Testing Laboratories. Bethesda, MD: American Association of Blood Banks.
3. AABB. 2004. Guidance for Standards for Parentage Testing Laboratories, 6<sup>th</sup> edition
4. NRC. 1996. The Evaluation of Forensic DNA Evidence. Washington, DC: National Academy Press.
5. Butler, J.M. (2005). Forensic DNA Typing, 2<sup>nd</sup> Edition: MA Elsevier Academic Press.

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