DNA Diagnostics Center

Explanation of Results

Introduction to the DNA Testing Process

DNA (Deoxyribonucleic acid) is the genetic material found in the cells of your body. A person receives half of his/her genetic material, or DNA, from the biological mother and the other half from the biological father. DNA can be extracted from a few drops of blood or cheek cells. DNA testing is based on a highly accurate analysis of the genetic profiles of the mother, child, and alleged father. Using this type of testing, conclusive results regarding parentage can be achieved.

DNA paternity testing is performed through PCR-based analysis. PCR analysis starts with a process that amplifies specific areas of an individual's DNA for further examination. These specific areas (called genetic loci) contain regions of the DNA known as short tandem repeats (STRs)—short, repeating units of DNA. The number of repeats at each genetic locus is variable and is inherited from the biological parents. Each person typically has two *alleles* (alternate forms of the DNA which may have different repeats), one inherited from the biological mother and one inherited from the biological father. The alleles detected from the PCR analysis are listed as numbers in the report and represent the number of repeats detected. If the same allele is inherited from each parent, then only one allele, or number, is listed on the report.

How do I Interpret the Paternity Test Results?

The paternity test results show the allele sizes for the mother (if tested), child, and alleged father. When all three are tested, the alleles that the child received from the biological father (called the obligate paternal alleles) can be determined by subtracting the mother's contribution to the child's DNA. If the alleged father does not have the obligate paternal alleles at three or more loci, he is excluded as the biological father of the child. If only a child and alleged father are tested, and they do not share any common alleles at three or more loci, the alleged father is also **excluded**. When the alleged father contains the obligate paternal alleles at all loci tested, then he is **not excluded** as the biological father of the child.

Paternity Index

The Paternity Index (PI) is the genetics odds in favor of the alleged father being the biological father of the child. A PI is calculated for each DNA locus and is listed in the report. The PI for each locus is calculated as the chance of the alleged father contributing the obligate paternal allele versus a random, untested, unrelated man in the population. The Combined Paternity Index (CPI) is calculated by multiplying individual Paternity Indices. For example, if the CPI is 100,000, this means that the tested alleged father is 100,000 times more likely to be the biological father of the child than an untested, unrelated, random man in the population. If the alleged father is excluded at three or more loci, the PI at the excluded loci is 0 and the CPI is 0, indicating that the data is consistent with the exclusion of the alleged father as the biological father.

Occasionally, test results show a non-match for one or two loci. This may indicate mutations (explained below); it may also indicate that a close biological relative of the alleged father (such as a brother, father, or son) may be the biological father of the child. Additional calculations can be performed to help address this possibility. However, it is always best to have all possible alleged fathers tested to establish the true biological father.

Probability of Paternity

The Probability of Paternity (expressed as a percentage) is calculated from the CPI and indicates the chance of paternity based on the complete DNA test results. In order to convert the CPI to a percentage, we used a "prior probability of paternity" of 0.5 in the calculation. This prior probability is a neutral value (without bias) that assumes the alleged father is as equally *likely to be* as he is *not to be* the child's biological father.

A DNA test result with a **0%** probability of paternity means that the alleged father is **excluded,** or cannot be the biological father. A probability value of **99% and above** means that the alleged father is most likely the biological father.

Mutations

Occasionally, an alleged father will not have the obligate paternal allele at one or two loci. Such results could be the result of a mutation in the DNA. When this occurs, it may be necessary to perform additional analysis to determine whether the alleged father is excluded or not excluded as the biological father. If no additional loci exclude the alleged father as the biological father after additional analysis, a PI reflecting the mutation rate is listed on the report and a CPI and Probability of Paternity is calculated.

Siblingship Analysis

DNA testing can also be used to determine the likelihood of individuals being related as siblings. The DNA of two possible siblings is compared to determine if there are any common alleles between the two. At each DNA locus, two people may share 0, 1, or 2 alleles, whether the two are siblings or not. Any matching alleles are analyzed to determine the statistical chance that the people in question would share that DNA if they were siblings, compared to the chance if they were unrelated. Based on this statistical analysis, the relative chance that two people are full-siblings or half-siblings can be calculated. It is important to note that it is not possible to determine with 100% certainty whether or not two people are definitely siblings; only whether they are likely or not likely to be siblings.