

# Understanding DNA Paternity Results



Technical Bulletin 40-019

Setting the Standard for Quality DNA Identification

During a paternity test, a DNA profile is generated from each sample and will ultimately help prove or disprove the paternity of a child.

The laboratory report will generally have one of three possible conclusions, which are determined from the DNA results and a series of complex statistical calculations. Following is a statement of the most common conclusions along with a simple explanation of its meaning.

1. The results indicate that the alleged father is not the biological father of the child. This conclusion is based on the absence of two or more obligate paternal alleles in the alleged father, as indicated by a Paternity Index of 0.

*This means that the tested man is not the father.*

2. The results indicate that the alleged father can not be excluded as the biological father of the child. The reported probability of paternity, as compared to an unrelated, untested man of the same race, is calculated assuming a prior probability of 0.5.

*This means that the tested man is the father. While the formal report language might seem awkward and ambiguous, it is a necessity founded in statistics. Because the entire human population was not tested you cannot say "you are the father" because that implies 100% probability.*

3. The statistical results derived from the genetic tests fall within the inconclusive range for paternity. Inclusion of the mother will likely be sufficient to yield a conclusive result.

*This means that additional testing is necessary to determine if the tested man is the father or not the father. This result occasionally occurs when the mother is not included in the analysis.*

## Paternity Index

Paternity index 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. If the paternity index is zero, it is because the father does not have any matching alleles with the child at that particular marker. If the paternity index is greater than zero it means the father does have a matching allele with the child.

## Combined Paternity Index (CPI)

The combined paternity index is the product of all of the individual paternity index values multiplied together and is a measure of the strength of the genetic evidence. The CPI can range from 0 to infinity. When the combined paternity index is 0, it means the alleged father is not the dad. When the combined paternity index is greater than 100 it means the alleged father is the dad, however it cannot be stated simply as "you are the father". Because the probability of paternity can never be 100% (you will often see 99.999%), you cannot say "you are the father" because that implies 100% certainty. Therefore, the results are reported as "the alleged father can not be excluded as the biological father of the child". When the combined paternity index is greater than 0, but less than 100, the results are inconclusive. Inconclusive results are most often the cause of doing a paternity test without the mother. In most instances, inclusion of the mother's genetic profile into the statistical calculations results in a conclusive result.



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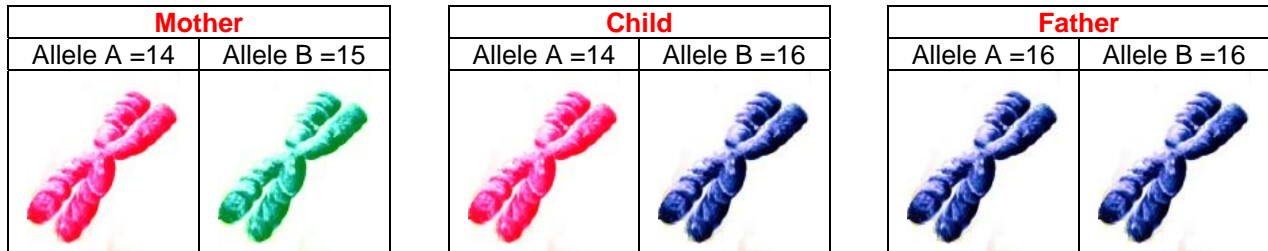


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## The Science of Inheritance

The colored images below illustrate how DNA is passed down from the mother and father to the child. As you can see, the mother passes a red chromosome to the child, and the father passes a blue.



## Example Results for a Paternity Inclusion

Genetic Marker	Mother		Child		Alleged Father		Paternity Index
	Allele A	Allele B	Allele A	Allele B	Allele A	Allele B	
D8S1179	14	15	14	16	16		1.81
D21S11	30		30	30.2	30.2	31	38.5
D7S820	10	12	10	13	10	13	23.4
CSF1PO	11	12	10	11	10		3.66
D3S1358	15	17	16	17	16		3.24
TH01	7	9	7		6	7	1.13
D13S317	11	13	11	12	12		2.06
D16S539	10	12	10	12	12	14	1.66
D2S1338	24	25	22	24	18	22	3.56
D19S433	14		14	16.2	14.2	16.2	23.9
vWA	14	18	14	17	15	17	2.69
TPOX	8	11	6	11	6	8	5.66
D18S51	14	15	14	15	13	15	2.12
AMEL	X		X	Y	X	Y	1
D5S818	11	13	11	13	11	13	1.96
FGA	24	28	24	26	19	26	12.9
<b>Combined Paternity Index</b>				5,190,000,000			
<b>Probability of Paternity</b>				>99.999%			

## Discussion

If the father's DNA profile does not contain a matching allele with the child the paternity index would be zero. When two or more genetic markers yield a paternity index of zero, the alleged father is excluded as the biological father of the child.



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