



MOTHERLESS PATERNITIES

Why Test the Biological Mother?

We are often asked if the mother should provide her DNA. After all, she knows she is the mother. What many people do not realize, however, is that it is actually critical to provide the mother's DNA; firstly from a legal consent aspect (i.e. the wrong woman is not presenting for testing and pretending to be the mother) and secondly, from a biological aspect (a conclusive result over 99.99% is required for a match).

This is even more pertinent where the father may have a mutation in his DNA causing a single mismatch between the father and child. If the mother is not tested at the outset and the lab discovers this mismatch, then the mother must be tested and we must advise clients who have not submitted the mother's DNA, as it suddenly makes the result inconclusive.

Why is it SO important?

With the exception of our Laboratory, which tests a few more regions of the DNA than other labs do, a DNA paternity test typically analyses between 16 and 24 locations across the genome to look for matches between the alleged father and child. All markers must reflect a match (or mutation) or else the alleged father is not the biological father. Each match receives a Paternity Index value indicating the strength of the match;

“the more unique the match, the higher the index”.

The probability of paternity is calculated as the product of all of the paternity index values.

Whilst many DNA paternity tests that examine only an alleged father and child can show a conclusive probability of paternity; usually 99.99% when the alleged father CANNOT BE EXCLUDED as the biological father, or 0% when he is EXCLUDED as the father, in some cases the matches between an alleged father and child provide an inconclusive result. Having the mother's DNA would provide a conclusive result.

Here is a Case Study to help explain this further;

Consider this:

Locus	Biological Mother (not tested)	Alleged Father	Child	Parentage Index
D2S1338	—	12, 13	10, 12	1.845
D2S441	—	8, 11	11, 14	2.714
D8S1179	—	21.2, 32	19, 21.2	2.675
D19S433	—	15, 18	12, 15	7.338

Alleles in red are ASSUMED matches – the parentage index is reduced as this is only an assumption.

In this case, the probability of paternity is 98.2896% (the product of all the parentage indexes). The result is inconclusive (because it must be greater than 99%), yet the alleged father and child match at all locations.

Now, add the biological mother's sample to the DNA paternity test:

Locus	Biological Mother (Mother A)	Alleged Father	Child	Parentage Index
D2S1338	8, 10	12, 13	10, 12	1.853
D2S441	12, 14	8, 11	11, 14	2.725
D8S1179	15, 19	21.2, 32	19, 21.2	2.686
D19S433	8, 12	15, 18	12, 15	7.373

Alleles in green came from mother, THEREFORE alleles in red definitely came from father. See how the parentage indexes increase.

The probability of paternity increases to 99.99%. Why? In the first example, one of the two markers from the child and alleged father match at each location. However, we don't know which of the child's markers comes from his mother and which must come from his father. By testing the child's mother, we see which of the child's markers must have come from the father. In the second table, the overall paternity index is higher. Not only does the child match the alleged father, but the match is with the marker that must have come from the child's true biological father (since we can see which marker came from the child's mother).

In fact, the index value is higher at each location because the biological mother participated in the DNA test.

But, what if the mother's DNA produced different markers?

Locus	Biological Mother (Mother B)	Alleged Father	Child	Parentage Index
D2S1338	8, 12	12, 13	10, 12	0.000
D2S441	12, 14	8, 11	11, 14	2.725
D8S1179	21, 21.2	21.2, 32	19, 21.2	0.000
D19S433	15, 17	15, 18	12, 15	0.000

With this data, the probability of paternity becomes 0%. The alleged father is NOT the child's biological father. The biological mother must match the child at all locations. We can see that this alleged father does not match those child's markers that must have come from the child's biological father. In some places where he appeared to match the child's markers, the markers clearly come from the biological mother.

Note that there are still some matches between the alleged father and child. If this alleged father is truly the biological father, he must match at all locations (except in cases with a mutation). PLEASE NOTE that almost any two people (even if totally unrelated) will have at least some matches, but a father-child relationship will show matches at all locations. Two/three mismatches can be enough to exclude the alleged father from being the child's biological father.

In this case, DNA testing the biological mother turns an inconclusive result to a definite "no" - this alleged father cannot be the child's biological father.

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