

- If the mother is not included in grandparent analysis then it is more likely that no relationship can be detected even if a biological relationship does exist.

### ***Aunt/Uncle testing***

This test relies on the child's parent and the aunt or uncle sharing enough DNA markers as siblings and then these same matching markers being inherited by the child. This type of analysis can only provide an indication of the relationship and is not conclusive. In some cases it may not be possible to detect a relationship even though one may exist. The DNA statistical results quoted in the report will be significantly lower than those obtained from parentage testing.

### ***Phrases your report may contain***

#### **Combined Paternity Index**

This is a 'likelihood ratio'. It is a statistical comparison of how many times more likely it is that the tested individuals are related as claimed against being unrelated or related as claimed against another relationship. The statistical result is a likelihood ratio calculated from the frequency of the matching DNA markers in the general population.

#### **Probability of Paternity**

This is calculated from the combined paternity index and is expressed as a percentage.

#### **Prior probability is 0.5**

In order to calculate a Probability of Paternity it is necessary to make certain statistical assumptions. A prior probability of 0.5 is the standard approach used in relationship analysis since it assumes that before considering the DNA results, it is equally likely that the man tested is, or is not the father.

#### **A rare genetic change**

A child will usually inherit its DNA markers from its parent unaltered. Occasionally a natural change in a marker can occur when it is inherited. Scientifically this type of change is known as a mutation. Any such apparent mutation is taken into consideration in our calculations in accordance with accepted scientific standards and has the effect of reducing the combined paternity index.

Cellmark  
PATERNITY TESTING



### ***Understanding your results***



## Introduction

DNA testing works by detecting certain parts or “markers” in the DNA molecule that are known to vary greatly between unrelated people. Our tests compare the DNA at a number of these markers to determine if people are related.

The process is called Short Tandem Repeat (STR) profiling. STR profiling is a very sensitive DNA testing procedure. DNA is extracted from the sample and a special enzyme is used to copy the genetic code at the relevant regions in the DNA. An STR profile is the result of several separate DNA tests.

## Paternity Testing

In each STR DNA test performed up to two DNA markers are observed in an individual’s DNA profile. One marker will have been inherited from the mother and the other marker will have been inherited from the father. By comparing the child’s DNA profile to the mother’s DNA profile we are able to determine the maternally inherited markers in the child’s DNA profile.

The remaining markers in the child’s DNA profile must have been inherited from his/her father. If the tested man is the biological father of the child then he is expected to match all or all but one (or in very rare cases all but two) of the child’s paternal markers.

If three or more tests are observed where there is no matching DNA marker between the tested man and child then this result excludes him from paternity. In cases where the man tested is excluded from paternity, the samples are re-tested as part of our quality procedures before the report is issued. If the tested man is excluded from paternity then the report will state that the tested man is not the biological father of the child.

## Conditions which will influence the results

Two children with different statistical results  
When more than one child is tested the combined paternity indices can be quite different between the children. This is because they do not inherit the same DNA markers from their parents unless they are identical twins.

## Paternity testing without the mother

When paternity testing is performed without the mother certain assumptions must be made which reduce the statistical certainty of the conclusion. Without the mother’s

sample it is assumed that a matching marker between father and child is the child’s paternal marker and the result is consistent with a father and child relationship.

There is a very small chance that the addition of the mother will alter the original DNA result obtained if the result is consistent with a parent and child relationship. However if the DNA result excludes the father then addition of the mother will not change this DNA result.

## Paternity testing when the brother or father of the tested man could be the father

It is expected that the biological father will match all of the paternal markers in the child’s DNA profile. If the tested man is related as the child’s uncle then it is expected that there will be a number of tests where there are no matching paternal markers.

1. If the result is consistent with the tested man being related as the child’s biological father then there will be two statistics quoted in the report:

- The likelihood of the tested man being related as the father rather than being unrelated.
- The likelihood of the tested man being related as the father rather than being related as a close relative.

2. If the tested man is excluded from paternity then the DNA report will state paternity excluded. However, the DNA report may include a statistic stating the likelihood of the tested man being a close relative of the child e.g. uncle or grandfather to the child.

3. Sometimes no relationship can be detected between the tested man and child. Whilst this may indicate that he is unrelated to the child it is possible that the true nature of the relationship is a close relative such as uncle or grandfather since there are not enough shared markers between them to be able to detect this relationship.

## Sibling testing

DNA relationship testing, where alleged siblings are tested, is not as conclusive as parentage testing. This is due to the nature of the inheritance of DNA markers. On average full siblings will share more DNA markers than half siblings, who in turn will share more DNA markers than unrelated individuals. However, due to the nature of inheritance this analysis can only give an indication of the relationship - it is not conclusive.

- Individuals are full siblings when they have the same genetic (biological) mother and father.
- Half siblings share only one biological parent, either the mother or the father.
- Inconclusive between Full and Half Siblings is reported when the comparison of the DNA profiles provides a strong indication of a sibling relationship but, due to the patterns of DNA inheritance it is not possible to determine the true nature of the relationship tested.
- If the DNA report indicates that it is most likely the individuals are unrelated this does not exclude the possibility that a half sibling relationship exists but the individuals have not inherited enough of the same DNA markers in order to be able to detect this relationship.

## Grandparentage testing

When the father is not available for testing and we have tested the mother, child and both paternal grandparents the child’s paternal markers can be identified and compared with the DNA profiles of the grandmother and grandfather.

When only one grandparent is tested and a relationship is detected then the statistical result obtained in such cases is significantly lower than that obtained in parentage testing.

- When all the child’s paternal markers match then a statistical analysis is performed and a combined grandparentage index is quoted in the report. The report will state that the DNA result is consistent with the grandmother and grandfather being related as the biological grandparents of the child. This means that the DNA results are consistent with a son of the grandparents being related as the child’s father.
- If no relationship can be detected then the DNA report will state that no relationship can be demonstrated. However, because it is possible that a child can inherit paternal markers that were in turn inherited from the other grandparent, this does not exclude the possibility that the true nature of the relationship between the tested individuals is grandparent and grandchild.