

## Appendix III - Analysis of Non-Paternal Events

### Summary

One of the challenges that genetic genealogy researchers face when carrying out Y-DNA testing on groups of men within a family surname study is to identify which male haplotype profile actually represents the ancestral genetic line for that family. Various studies suggest that the possible incidence of non-paternal events (NPE's) may be a significant factor to be dealt with.

An analysis of the results being obtained from the ongoing Manx Y-DNA study is able to provide a new and relevant perspective on this issue

### What is a NPE?

Discontinuities in a male genetic line, described commonly as non-paternal events (NPE's), are identified when the Y-DNA profile, determined to be associated with a man's hereditary family name or surname, is different from the Y-DNA profile he actually inherited from his father.

This situation can have been brought about historically for a wide range of different reasons, including most commonly, in a family history research context:-

- Illegitimacy outside marriage where the male son takes the maiden name of his biological mother.
- An infidelity within marriage where the male child still takes the surname of his mother's husband.
- A widow remarries and a male child takes the surname of his new step-father.
- Informal adoption, where an orphan or foster boy takes the surname of his guardian.
- A family name-change, where a man might take the maiden name of his wife or mother in order to inherit land or property.

Usually such events, which of course are only discernible in the male family line, will not have been recorded and their ultimate identification through Y-DNA testing always comes as a surprise. Also, because some of the possible causes of such an event were subject to a social stigma, certainly in earlier times, there were always pressures on the involved parties to keep things secret.

A screening strategy for Y-DNA testing within a family history study will always try to identify and avoid, in advance of testing, those candidates whose family history indicates there may be a possible break in their ancestral genetic line. This means that when an NPE is identified, it is usually a surprise.

Thus, during Y-DNA testing of a family which is believed to be descended from a single patriarch, when someone's results are different from other men bearing the same name this suggests that there has been an NPE somewhere back in their family tree.

### How often do NPE's occur?

By the very nature of NPE's, prior to the arrival of accessible DNA testing, no real assessment of their historical frequency in the general population could have been possible. There are studies from various countries which have tried to assess and record the level of illegitimacies in their populations and which report that these can range from 2% to 30% Such studies have examined birth records from the middle ages to the present day.

However, as we can see from the above, illegitimacy is only one of a number of possible causes of a non-paternal event and present day analysis based on DNA testing studies (rather than illegitimacy rates), suggest that the effective rate of NPE's in the current population is around 1-2% per generation<sup>1</sup>. Such analysis is nevertheless qualified by small sample sizes and differences in the nature of the populations being assessed.

The prediction of NPE rates that can be expected within a Y-DNA surname study becomes complicated by the length of time that a particular family name has been in use, because the level of incidence is compounded through each previous generation. So, if the average rate of NPE incidence is 2% per generation and a male family line has used the same family name for 800 years, i.e. since 1200AD, then a male descendant of that line being Y-DNA tested today would have a 49% probability of having an NPE today, which occurred somewhere back in the 33 previous male name-bearing generations of his family. If the NPE rate is 1% per generation, then the probability is still a significant 28%<sup>2</sup>.

On the basis of these figures, then the incidence of NPE's in a population of men being tested within a Y-DNA surname study may well pose a problem to researchers and hinder an understanding of the true genetic picture of that family line.

Analysis from the Manx Y-DNA study<sup>3</sup> currently underway may help to provide a realistic perspective on this issue.

### **The Manx Y-DNA study**

The Manx Y-DNA study commenced in 2010 and had the objective of testing men of Manx origin who were bearing any of the 120+ indigenous Manx family names to identify their Y-DNA classification and early genetic connections. Some 320+ men have been tested so far, representing more than 100 of these unique Manx family names.

So whilst the project still has some time yet to run, there is now a sufficient body of data to help us to gain some sort of insight into the level of NPE's in men of Manx origin.

First of all, it may be useful to identify specific factors about the Manx population which might be expected to have some impact on the level of NPE's to be found in present day Y-DNA testing. For example:-

- Family names started to be adopted on the Isle of Man during the 11<sup>th</sup> century and by the early 13<sup>th</sup> century seemed to be relatively well-established. So on average we can say that most of these indigenous Manx family names have been in use for around 800 years at least. Although many, if not all, of these Manx families names have evolved significantly from their early Manx Gaelic forms into the versions we see today. Thus each family name would have been in use for some 33 generations on average, sufficient time for non-paternal events to have taken place.
- The population of the Isle of Man has always been small in number and close-knit, so that most people knew each other's business. For centuries the Church exercised considerable power over the population and during this time even the slightest moral transgression was worthy of punishment. For example, failure to attend church on a Sunday, working on a Sunday, etc., all merited a personal appearance before the Church's Consistory Court and sometimes invoked the punishment of imprisonment. Thus, the more severe moral crimes of fornication and adultery were sought out and punished heavily. It is not clear whether this heavy-handed approach actually reduced the rate of illegitimacy per se, or meant that every incident was reported without fail or even resulted in the opposite situation by stimulating suppression of such information.
- Evidence from the Manx Y-DNA study indicates that the majority of the indigenous<sup>4</sup> families were each descended from just one patriarch, i.e. descended from one single male genetic ancestor. This is also what would be expected for such families which are relatively small in population living on a small island, compared to those in larger geographical entities<sup>5</sup>. Nevertheless, it was also clear that a small number of particular Manx families, based on their relatively large size and widespread geographical distribution on the island, were most probably descended from more than one patriarch. This fact has also been confirmed by Y-DNA testing and the identification of such few families continues. The dominant situation where most Manx

families are of single patriarch origin however makes the identification of a NPE within the Y-DNA results of a family much easier.

A further possible complication is that the population of Manx men (or, more correctly, men of proven Manx ancestry) who have been tested in the study now live all around the world. From the late 18<sup>th</sup> century onwards many Manx families sought a better life overseas, either in England or in the New World. So far, from the cohort of men in the Manx Y-DNA study, only 34% were born on the Isle of Man. The remainder are descendants of men who have left the Isle of Man since the 18<sup>th</sup> century and who perhaps might show a higher level of NPE incidence than the families they left behind, as they moved into new, unfamiliar and perhaps more liberal societies.

## Findings

Within the study, the identification of men who show a NPE somewhere in their male line ancestry may also present a challenge. From the 313 men tested so far 39 have been identified as showing non-paternal events. These judgements have been made on the basis of the following criteria:-

- A. When a man shows Y-DNA results which are significantly different from the ancestral haplotype within a family whose name he bears and which is judged to be descended from one single patriarch. And/or:-
- B. When a man shows results which are close or identical to the haplotype of another Manx family (of single patriarch origin), but he does not bear the family name of this other family. Or
- C. When a man shows results which are significantly different from the ancestral haplotype within a family whose name he bears, and subsequent detailed genealogy research identifies a recorded illegitimacy or name change in his ancestry, previously unknown.

### Non-paternal events seen in Manx study

	Type of NPE	Born: Isle of Man	Born: Rest of World	Total
A	Y-DNA different from the rest of family	5	13	18
B	Y-DNA different from own family but matches other known family	10	8	18
C	Y-DNA different from own family but later research identifies source of NPE	1	2	3
	Total	16	23	39

The table above shows the breakdown by type of NPE versus the place of birth of the man tested. 23 out of 39 occurred in men born outside the Isle of Man and 14 NPE's were found to match with other families whose ancestral haplotype had already been determined within the study.

**It is significant that all these other matching families identified were of Manx origin although the majority of these men were born outside the IOM.** This indicates that these NPE's either occurred on the Isle of Man or in Manx expatriate communities abroad.

Looking at the larger picture, as shown in the next table, we can see that the actual incidence of NPE's in the body of men contained within the study is virtually identical, regardless of where they were born.

The actual cumulative incidence of NPEs is in the range was 10-12%, or, in other words, one in every ten men tested showed a non-paternal event in his ancestral male line. **This translates to an incidence rate per generation of approximately 0.5%, markedly less than the 1-2% popularly quoted.**

<b>Incidence of total NPE's</b>				
	<b>No of Men tested</b>	<b>No of NPE's</b>	<b>Actual cumulative rate of Incidence</b>	<b>Incidence rate/generation*</b>
<b>Isle of Man</b>	106	16	15.1%	0.59%
<b>Rest of World</b>	207	23	11.1%	0.43%
<b>Total</b>	313	39	12.5%	0.48%
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<b>Creer study</b>	25	6	24.0%	0.99%

However, it is important to note the variations that may occur with different sample populations. Contained within the body of the total study results as shown above, are the data from an earlier Manx surname study, the Creer study. From a tested sample population in this study alone, 6 out of 25 were shown to be NPE's, representing a cumulative incidence of 24% or 1% per generation. So from this evidence some level of variation in NPE incidence is to be expected, dependent on sample size.

It is also of interest to record the anecdotal circumstances surrounding the identification of two examples of the NPE's contained within the study, to illustrate their possible complexity. As follows:-

1. A boy was born illegitimately in 1870 to a single mother and he was recorded as being christened with his mother's family name. Two years later he was christened again with the family name of the father, but without full identification of the father being provided. However, when the child was married subsequently, his father's name and occupation was given on the marriage certificate. The father was married at the time of the illegitimate birth, hence the secrecy. Eventually two present day living male descendants of the father were Y-DNA tested. However of the men tested, one matched all the other males in that family, and the other, descended from this illegitimate birth, did not, turning out to be a NPE. Although, based on the known family history there was no reason to doubt the parentage of the illegitimate child. So this ended up as an example where a single mother named her illegitimate son after a wealthy suitor, but where he was not the biological father.
2. Another boy was born illegitimately in Douglas in 1878; the parents were named on the christening register, the child taking his father's family name. A few years later the boy is found living with a recent widow and her family as a paid lodger. He stayed with this family until adulthood and in 1902 decided to emigrate to the USA. On the boat journey he changed his name and assumed the family name of his foster family with whom he had lived most of his life. So all his subsequent descendants living in the USA went by his assumed foster family name, and it was only when one of these descendants was Y-DNA tested and did not match others with the same surname, that it became clear there was a non-paternal event somewhere. Deeper digging into his genealogy subsequently revealed the previously unknown illegitimacy and family name change.

## **Conclusions**

- a. Based on a reasonably large sample size in the Manx study so far, the observed rate of NPE was ca 12% in the tested population, equating to a rate of 0.5% per generation. This is lower than observed elsewhere.
- b. Despite conditions on the Isle of Man which might be considered to reduce the potential for NPE's for men born there, the sample population showed that the incidence of NPE's seemed to be independent of place of birth.

- c. The causes of non-paternal events may not always be simple to diagnose, and should not be automatically equated with an illegitimacy.
- d. Even at a cumulative rate of 12%, the likely occurrence of non-paternal events still represents a challenge for genetic genealogists and this factor should not be ignored.

More background on the subject of non-paternal events can be seen here<sup>6</sup>

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<sup>1</sup> According to Family Tree DNA ([www.FTDNA.com](http://www.FTDNA.com))

<sup>2</sup> Based on an average age per reproductive generation of 25 years

<sup>3</sup> [www.manxdna.co.uk](http://www.manxdna.co.uk)

<sup>4</sup> Known to be living on the Island before 1500AD and surviving today

<sup>5</sup> Some families possessing totally different family names have proved even to be descended from one single male ancestor who lived before family names were adopted. The descendants of his sons evidently assumed different family names at a later date as this became the habit.

<sup>6</sup> [http://www.isogg.org/wiki/Non-paternity\\_event](http://www.isogg.org/wiki/Non-paternity_event)