

Interview with Dr. David MacLennan of the University of Toronto about the Clan MacLennan DNA Project:

Part 1: What can we (MacLennan Clan members) learn from DNA-based genetic genealogy?

Melanie:

People are becoming interested in DNA research and talking about the use of genetic genealogy to understand their family history. What is DNA testing through the Clan MacLennan Surname DNA Project at Family Tree DNA telling us regarding our relationships?

David:

Our DNA results to date show very clearly that there is not a single, genetically distinct, MacLennan clan family. They show us that many families with different genetic backgrounds formed a community under the MacLennan Clan banner and adopted that surname.

Melanie:

The Clan MacLennan Surname Project is targeted to men because the Y chromosome, found only in men, is being traced as the father's father's etc. line. I also understand that the Y chromosome is different from all of our other chromosomes in that it changes only very slowly over time, making it a very good line to test. When a male MacLennan has DNA tests done, what do the test results show and how do we know what the results mean?

David:

I'll have to introduce a lot of unfamiliar terms to answer this question. "Haplogroups" are the many divisions of our current Y chromosome, which have evolved from a "single" ancestral version that originated in Africa about 200,000 years ago. Over the years, mutations, known as

SNPs (Single Nucleotide Polymorphisms), have occurred on the many branches of the evolving ancestral Y chromosome. Some SNPs, but not all, have survived to form very large branches. Large surviving branches under a single major SNP have been given alphabetical names and early migrations concentrated different haplogroups in different parts of the globe. In the MacLennan surname project, we see mainly individuals with the "R1b" Haplogroup, who came to Britain by "southerly" migrations and others in the "I" haplogroup, whose ancestors came by "northerly" routes from Scandinavia or Northern Germany. These SNP-based groupings provide information about relationships that have existed for tens of thousands of years. For example, people who are members of the "I" and "R1b" haplogroups had a common ancestor who lived about 40,000 years ago, probably in the Steppe region around Kazakhstan. The SNP patterns within haplogroups continue to branch and diverge.

Melanie:

Can you explain what it means when test results come back and a person has been identified as being part of a particular haplogroup and then following that there is a haplotype?

David:

Within your haplogroup, your individual "haplotype" is simply the pattern of STR markers that you received from FTDNA when you ordered a 67 or 111 marker test. STRs (Short Tandem Repeats) are different from SNPs and represent a second type of mutation in your Y DNA that can help to identify you and distinguish you from all but your closest relatives. STR patterns mutate faster than SNPs arise, so STRs are useful for evaluating shorter-term relationships. When we get our STR markers, we can compare our pattern against all of the patterns in the whole database. Individuals with similar patterns can be grouped into "clusters". This test of relationship can be misleading, however, because the same pattern can emerge in unrelated groups by "convergent evolution". Therefore, we have to follow up STR marker tests

with SNP tests, which show, on a longer time scale, whether individuals within a cluster did or did not inherit the same SNPs and, therefore, are or are not closely genetically related.

Melanie:

If they inherited the same SNP's, what does this mean?

David:

Individuals, who inherit the same SNPs are genetically related and, whether they are or are not associated with the same cluster, are identified as members of the same genetic "clade" or "subclade". For example, I am a member of the R1b clade - all of those millions of people who carry various forms of the R1b haplogroup - and also a member of the F1265 subclade to which only 10 people in the whole database currently belong. Since SNPs are positioned in a branching tree, it is important to determine your "terminal SNP". If you share a truly terminal SNP with another individual, you are likely to be related within a few hundred years. In this case, you will probably share a similar STR pattern, which will confirm a close relationship. Following your chain of SNPs backward in time is like following branches on a tree from smaller twigs back to larger branches all the way back to the trunk.

Melanie:

This is the point where things begin to be useful for the family historian isn't it?

David:

Yes. As an example, one of my terminal SNPs, F1265, has not been found outside of a Highland area bordered by the Isle of Skye, Alligin and Applecross on the west coast; Inverness, Dingwall and the borders of the Cromarty and Beaully Firths on the east and Achnacochine on the south. F1265 arose around 1265 CE (Christian or Common Era aka AD). Individuals who share this SNP belong to different clans, MacLennans, McKenzies and MacDonalds, indicating the ancient porosity of Highland clan structures. Two of us are related within 6

generations and all of us are related within 21 generations.

Melanie:

It's reasonable then that the intermingling of surnames would happen within the family group as a result of many different sociological factors. For instance, an F1265 MacLennan male might have married a MacDonald girl and decided to join the MacDonald clan, thereby changing his name and that of his F1265 descendants to MacDonald.

David:

Yes, and there are other alternatives: An F1265 McKenzie boy might be adopted into a MacLennan family or the son of an F1265 MacDonald, born out of wedlock, might retain his mother's surname of McKenzie. In all cases, the surname would be changed, but the Y chromosome containing F1265 in its DNA would be passed on as a very slightly modified version of the Y chromosome that was present in the man in whom the F1265 mutation originated, regardless of whether his name at that time was MacLennan, McKenzie or MacDonald or of the number of generations back to him.

Melanie:

So if we start at the tip of the branches and we work backwards up the tree branches, you're saying the STRs and SNPs can give us an idea of when, in terms of time, the smaller branches and twigs sprouted off of the larger branches.

David:

Once a clade is identified by inheritance of a common SNPs, a comparison of STR patterns within the clade can provide short range estimates of the "Time to the Most Recent Common Ancestor" (TMRCA) of the clade and estimates of the number of generations separating individuals within the clade.

In our example, the TMRCA for F1265 is about 700 years ago. With an average of 3 generations per century (33.33 years per generation), individuals within the F1265 clade are separated

by up to 21 generations. Since reliable civil records in Scotland go back only 6-7 generations, to the second half of the 1700s for people born around 1950, relationships are considerably extended by STR analysis.

SNPs can be traced back much further. The major SNP upstream (or working further back up the tree branch towards the trunk) of F1265 is S7814. This mutation occurred in Northern Ireland around 800 CE. Thus the ancestors of F1265 must have been Irishmen who moved up the western isles between 800 CE and 1300 CE. M222, a major SNP upstream of S7814, entered the British Isles by a migration from the continent at the beginning of the Christian Era. It survived and became highly concentrated in Northern Ireland and Southwestern Scotland.

Melanie:

It's remarkable how retracing DNA is also illustrating migration of our ancestors over extended periods of time. Most of us will never know the names of our ancestors back before seven to ten generations in our family tree, and yet this broader understanding of where we came from in a geographical and historical context gives a depth to our family history that wasn't possible before.

David:

By joining the MacLennan surname DNA project it's possible that you will discover relatives with the same surname, perhaps living in different parts of the world, whose paper pedigree will intersect with your own. However, it is more likely that you will discover relatives who are separated from you by tens of generations and who will have different surnames. The fun parts are to discover both your short-range and your long-range inheritance.

To get started go to www.clanmaclennan-worldwide.com/dna. We have arranged a special rate with Family Tree DNA for your testing kit.