

Introduction to Use of DNA in Genealogy

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DNA is present in every living species, including plants. It is composed of four basic building blocks called nucleic acids because they are found in the nucleus of the cell. These are Adenosine, Thymine, Cytosine, and Guanine or GACT for short. The distribution is not even, Adenosine and Thymine each comprise 30% of DNA while Cytosine and Guanine are each 20% of the total. They are always paired together: Adenosine bound to Thymine and Cytosine to Guanine. These are attached together in the shape of a spiral double helix, similar to a coiled paper streamer you throw on New Year's Eve. The DNA joins together to form long strands called chromosomes. Humans have 23 Pairs of chromosomes, half of each pair derived from one of the parents. 22 Pairs are called autosomes because they control various attributes of the body – stature, body shape, eye and hair color, etc. The 23rd pair are the sex chromosomes. XX designates a female and XY makes a male.

DNA can currently be used for many things – determining paternity of a child in a disputed case, identifying people who have committed a crime, and identifying characteristics of many diseases and cancers. We are not talking about those things today. There are currently three types of DNA useful in genealogy: Y or male DNA, mt or mitochondrial or female DNA, and autosomal or Family Finder DNA.

Y DNA is found on the Y chromosome, which is present only in men, and thus only men can perform the Y DNA test. A woman can get her brother, father, grandfather, paternal uncle, paternal line male cousin to perform the test and follow the male line back “hundreds of years” (I'm not sure this phrase is accurate anymore), provided there was not: a nonpaternity event where someone else other than the husband was the father; a switch in babies in the hospital; an orphaned boy who changed his name to his adoptive father's name; or a surname change along the line. The test can be done at different numbers of markers, 12, 25, 37, 67, 111. The cost is \$49 to \$359. For most men 37 markers is the best balance between cost and effectiveness.

Mitochondrial DNA is found in both men and women, in the mitochondria, which are tiny organs outside the nucleus in every cell. Their main function in the body is to convert food substance into energy to run all the body's processes. They also carry the markers of female inheritance. Since both men and women have mitochondria, both can test for their maternal DNA, going back unchanged over “hundreds of years”. This traces the straight female line back hundreds of years. The number of markers performed varies by testing lab, but is in the 25-37 range, unless you get a “full sequence.” Cost is \$49 to \$149.

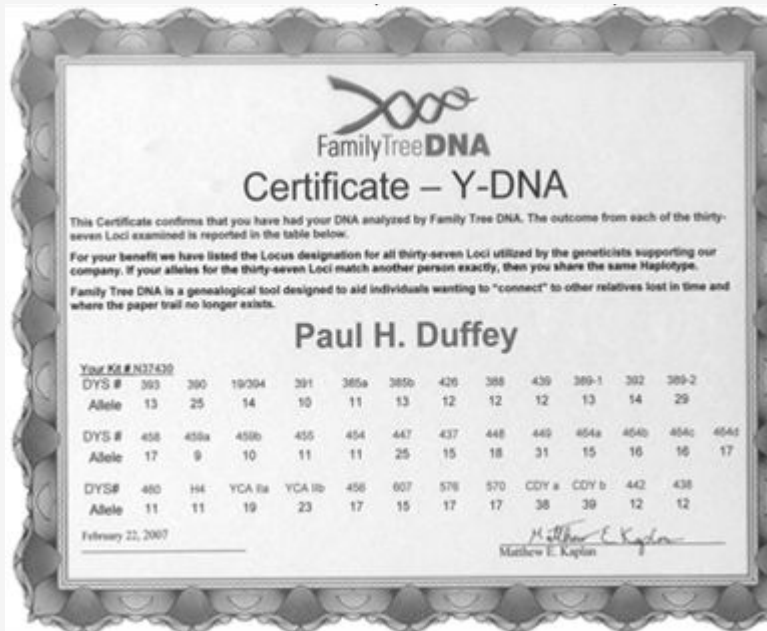
Autosomal DNA is found in both men and women and has portions inherited from both mother and father, approximately 50% from each. This type can cross gender lines, but is only accurate back 5 generations. The percentage between sixth cousins becomes too small to be accurate. The test covers 500,000 to 800,000 markers. Since it crosses gender lines, it more than doubles the number of possible matches over the other types of DNA. This makes it more likely you can find someone who is a match, with whom you can share pedigree information and figure out your exact relationship. Between the two of you, you can fill in more family tree information. The fee currently is \$99 for Autosomal DNA testing. There is often a sale just before Christmas. One warning, some of the autosomal markers are the same as used by police: If you are at risk because of having committed a heinous crime, the autosomal DNA test is not for you.

The test for DNA is a simple cheek swab. You order the test from one of the three main testing companies: Family Tree DNA.com, Ancestry.com, and 23 and Me.com. Each has positive points which

will be discussed. Sorenson Molecular Genealogy Foundation for a time did genealogy testing for free, but had several disadvantages: It took 18 to 24 months or more to get results, and then you had to know how to decode the results. See information at end of summary.

Autosomal DNA is relatively new, but is proving helpful in unraveling complex and unusual relationships. For most people the least expensive and most likely effective test will be autosomal or Family Finder DNA. If money is no problem, you can test all three: mitochondrial, Y, and autosomal, but most people find that unnecessary. When you find a partial match, figure out how to email the person who submitted the matching sample and provide your family information on that line and ask them to share theirs. It is through collaboration with other genealogists that you make progress.

Now we turn to reports. A Y DNA report will show the number of markers you paid for listed like this:



In order to find matches to your DNA, you need to enter your markers into Ysearch.org, a free website. A mitochondrial DNA report will look like this:

HVR1 16069T, 16126C
HVR2 73G,228A,263G,295T,315.1C
HVR3 462T,489C

In order to search for matches, you need to enter these results into Mitosearch.org, a free website. If you make a mistake in entering HVR2 numbers into the HVR1 column, the box will turn red, so you know to change columns.

Autosomal DNA with 500.00-800.000 markers is too large to manually enter into a database. Family Tree DNA has, in my opinion, the best software for showing matches. They will also, for a small fee, accept data from the other 2 testing companies, Ancestry and 23 and Me. That way, you have the ability to search two databases for relatives. A match is measured in centiMorgans, a measure of distance on the DNA strand. The higher the number of centiMorgans you share, the more closely you are related to the other person.

Examples of finding relatives with DNA will be shown. At all of these websites **you must remember and record your kit number and password.**

FACP

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Finding Your Exact Y DNA Results In Sorenson

1. Go to www.smgf.org and click on the Search Y database for your male surname.
2. Your result will usually be at the top. Look for your surname and locations under the colored boxes. You can open the pedigree chart by clicking on the family tree symbol to make sure it's you. The numbers across the top are those of the reference standard, not yours. Light blue square means your results match the standard on that box. Dark blue signals you do not match the standard on that DYS marker.
3. Print out a copy.
4. Use the browser back arrow to go back to the search page.
5. Select one of the DYS mismatches, click on the drop down arrow next to it, and change the number by 1, either up or down.
6. Search again by surname.
7. If the DYS box you changed turned from dark to light blue, you have found your result for that marker. Leave it.
8. Keep changing that marker number until you get a light blue box.
9. Do the same for each number, until all of the boxes are either light blue or white. White means not tested.
10. When all the boxes are light blue, print it out – that is your exact Y DNA pattern.
11. You can use this to search for an exact match in Sorenson.

Directions for Finding Your Exact

Mitochondrial DNA Results

From Sorenson

After you send in your swab and pedigree, wait 6-24 months to get an e-mail from Sorenson saying that they have added new data to the website database.

1. Search Sorenson mitochondrial database by surname using your mother's maiden surname.
2. You will find your pedigree at the top of the results.
3. A pink box denotes a match of your result with the reference standard.
4. A purple box indicates you do **not** match the reference standard.
5. The GACT letters across the top are the reference standard results, not yours.
6. Write down a list of the numbers (markers) and the corresponding letters, **only if the letters are in bold type**.
7. If the letter is faint, that means your result is blank for that number.
8. Click on Search again at the bottom.
9. For the numbers with a purple box, you need to try changing the letter for that numbers. This is trial and error.
10. It helps to keep a list of what you have tried unsuccessfully so you don't have to repeat.
11. For the numbers where the letter was faint, don't enter that number in the search panel.
12. For the numbers with a pink box and a bold letter, enter that number and letter in the search panel. You enter the last 3 numbers of the marker and one capital letter.
13. If a number has a .1 or .2 after it, that is the box to the right of the number in the search panel.
14. If after you leave a box, it turns red, you have done something wrong, such as entering it in the wrong HVR column.
15. When you finish all the numbers, click on search.
16. Look to see which purple boxes are now pink, and record the proper letter or blank entry on your list.
17. For the boxes still purple, click on search again, and change the letter just on the numbers that were still purple.
18. When all the boxes are pink, print it out, because that is your result.
19. Go to Mitosearch, and enter your results in your new user account and search this database.

Note: Sorenson limits the number of searches you can do in a day. It took me 4 different days to finally understand their system and get it right. With these directions, I hope you can do it in one day!