DNA Testing – Does it really help your family history research?

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5 May 2010

Twenty years ago genealogists were completely dependent on dusty archival books, hand-cranked microfilm readers, and the goodwill of busy librarians. Today, we still need those archival records, but we can do much of our research from home using personal computers and databases on the Web. Technological advances have made pursuit of our family histories much easier and have given us a reach we didn't anticipate in the early 1990s. Advancements in technology continue. If you have been watching the recent spate of family history shows on network TV, you know that DNA testing is the new hot technology. The big question is, once we look beyond all the hype, what can DNA testing really do to help us develop our family trees? To answer this question, we have to understand a little about what is tested and how the results are presented.

Normally we have 23 pairs of chromosomes. These chromosomes exist within the nucleus of each cell. The first 22 consist of *autosomal DNA*. You inherit about half of each pair from your father, the other half from your mother and the two halves are "shuffled" to form new DNA strands. The 23rd pair are the sex chromosomes which determine your gender. Females get an X-chromosome from each parent. If you are male you get an X from your mother and a Y from your father. In addition, you inherit mitochondrial DNA (mtDNA) from your mother. This is found within your cells, but outside of the cell nucleus.

Y-DNA testing examines sections of DNA (called *markers*) that exist between the genes of your Y-chromosome. Within each marker a specific sequence of DNA chemicals repeats a number of times. In Y-DNA testing, geneticists examine the Y-chromosome markers and count the number of "repeats" at each one. Over generations, changes occur in the number of repeats at some markers. These changes occur slowly and at a different rate for each marker. By comparing your Y-DNA pattern (the number of repeats at each marker) with the pattern of a (hopefully) related man, you can estimate how many generations back in time you must go to find a common ancestor. Because there is uncertainty in change rates, geneticists express this as a *probability* that two men have a common ancestor within, say, 8 generations.

Keep in mind that Y-DNA testing applies only to males. Females must find a related male willing to do a Y-DNA test. Also, note that the test reveals information only about <u>direct male</u> ancestors (the top/outer family line in Fig. 1), not the ancestors that arise through any of the female branches of your family tree. Commercial firms, like FamilyTreeDNA

(FTDNA), offer 12, 25, 37, or 67 marker tests. Generally, I recommend testing 37 or 67 markers, but sometimes an inexpensive 12 marker test can be useful.

A few years ago, I met Abram Dekhtyar, an elderly pensioner in Bazaliya, Ukraine, a town near my ancestral town of Kremenets. I wondered, "Have I at last found a living relative in Ukraine?" After considerable discussion, he agreed to a DNA test. Table 1 compares Abram's 12 marker test results with mine. We matched on only 4 of 12 markers, indicating we are not even remotely related. In this case, a 12 marker test was sufficient and there was no need to pay for testing more markers.

FTDNA's database displayed the best matches between me and 181,560 others who have tested. Five people and I have exact matches at 12 markers. This means there is a 46% chance that we have a common ancestor within the past 8 generations (my 6th great-grandfather's generation). The 67 marker test showed one match, but with a genetic distance of 3. This means there is a 65% chance that we have a common ancestor within 8 generations; and, it is almost certain that we have a common ancestor within 18 generations. Eight to twelve generations is within a genealogical time frame that can be confirmed by a paper trail. However, unless you come from rabbinic ancestors, it is extremely difficult to trace your ancestry 18 generations back.

In addition to testing for ancestors, Y-DNA tests identify your deep anthropological roots, including the migration path your ancestors took out of Africa and where they may have stopped along the way. Genetic anthropologists use abbreviated codes to identify these migrating groups. FTDNA says that my paternal Haplogroup is E1b1b1. This Haplogroup originated in east Africa about 50,000 years ago, then spread among north and east African populations. About 20,000 years ago E1b1b1 people migrated into Europe from the Mediterranean.

Mitochondrial testing examines either HyperVariable Region 1 (HVR1) or HyperVariable Region 2 (HVR2), or both, of mtDNA. Since mtDNA mutates even more slowly than Y-DNA, matches on the two regions are only marginally useful for genealogy. Even if your HVR1 and HVR2 both are identical to another person's, the best we can say is that you have a common ancestor within the past 28 generations. However if there is an extensive mismatch, you can say with some certainty that you are *not* related along your direct female line. Similar to Y-DNA testing, mtDNA tests are useful in an anthropological timeframe. Keep in mind that mtDNA testing reveals information only about your mother's ancestry, and only along her direct line (the bottom ancestral line in Fig. 1).

If you do Y-DNA or mtDNA testing, give your testing company permission to make your results public so that others who match your DNA can contact you. In turn you will get contact information for people who match your DNA. Also, upload your results to the public databases Y-Search and Mitosearch. You can do this easily by clicking on hyperlinks that FTDNA provides.

Autosomal testing is "the new kid on the block". Genetic scientists analyze the number and length of blocks of DNA on the other 22 chromosomes. This eliminates the gender restrictions inherent in Y-DNA and mtDNA testing. Comparing the blocks you have in common with those of another person allows geneticists to estimate the degree of your relationship (e.g. 4th cousin). This works for both males and females and along the indirect as well as direct branches of your family tree (the interior ancestral lines in Fig. 1). Autosomal DNA testing has great potential to help us fill out our family trees. Get more information and tutorials at www.familytreedna.com/faq/answers/17.aspx.

Commercial firms offer a variety of tests for each type of DNA. The International Society of Genetic Genealogists (ISOGG) website compares each company's prices for a variety of tests. Go to www.isogg.org/ydnachart.htm to compare five companies that do Y-DNA testing and www.isogg.org/mtdnachart.htm to compare 8 companies that do mtDNA testing. Visit each company's website for up-to-date information.

To learn more about DNA testing, look at FTDNA's tutorials, videos, and other documents (www.familytreedna.com). They offer price discounts if you order tests through the Jewish Genealogical Society of Oregon (JGSO) page on FTDNA's website. Go to www.familytreedna.com. In the Surname Search box, type JewishGenOregon. Under "Projects" click through to JGSO's page. Scroll down for prices and ordering information. Also, look through the extensive materials on the ISOGG website (www.isogg.org). Some are tailored for "newbies" and some are more advanced. In addition, Emily Aulicino (aulicino@hevanet.com) leads a DNA Special Interest Group at the Genealogical Forum of Oregon (www.gfo.org). The group meets once each month.

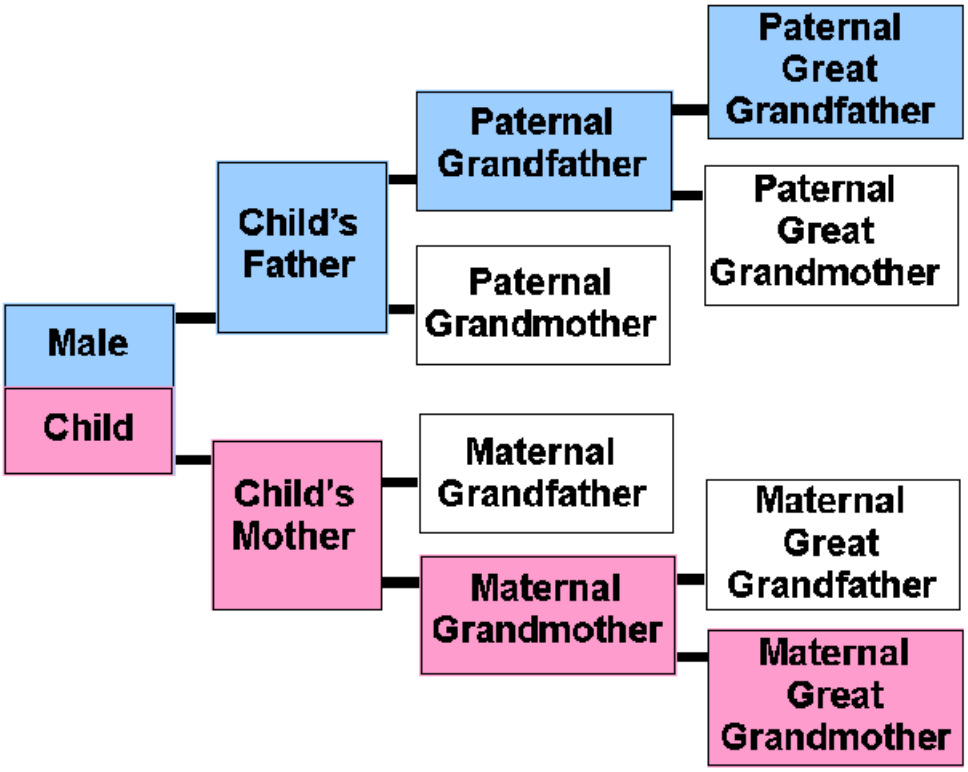
Next month, I'll discuss genealogical software for recording your family history and for producing reports about it.

Table 1
12 Marker Y-DNA Test Results for Ron Doctor and Abram Dekhtyar

DYS (Marker No.)	393	390	19	391	385a	385b	426	388	439	389-1	392	389-2
No. of Repeats for RDD	14	25	13	9	17	18	11	12	13	13	11	30
No. of Repeats for AD	13	23	15	11	15	16	11	12	11	13	13	30
Genetic Distance	-1	-2	+2	+2	-2	-2	0	0	-2	0	+2	0

RDD is Ron Doctor, whose ancestors were from Kremenets, Ukraine.
AD is Abram Dekhtyar of Bazaliya, Ukraine

Figure 1



Y-chromosome DNA (Y-DNA) is passed from father to son along an all-male line (the top row, highlighted in blue). Mitochondrial DNA (mtDNA) is passed from mother to child along an all-female line (the bottom row, highlighted in pink). Males pass Y-DNA to their sons, but do not pass mtDNA to their children. Autosomal DNA testing includes all of the ancestors and their descendants shown on the chart. (derived from www.isogg.org)