

## DNA for Genealogy

### Introduction

In genealogy, DNA research is a groundbreaking, new tool that researchers can add to their tool belt. It is a tool that can be utilized to break through those tough brick walls or solve adoption cases. Just like a census record, marriage record, or deed, DNA is another piece of evidence that genealogists use to build their family tree. DNA evidence must always be used in conjunction with traditional genealogy research.

DNA carries the genetic instructions for all living things. It is organized into long molecules called chromosomes. Every person has 23 pairs of chromosomes: 22 pairs are autosomal chromosomes and 1 pair is sex chromosomes (X/Y). There are four types of DNA: autosomal DNA (atDNA), X-DNA, Y-DNA, and mitochondrial DNA (mtDNA). Various companies sell tests for the four types of DNA. Visit the International Society of Genetic Genealogy online to learn more about how to choose a testing company ([www.isogg.com/wiki](http://www.isogg.com/wiki)).

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### Autosomal DNA Inheritance

Autosomal DNA is the most frequently tested type of DNA. This is the most useful starting point when trying to solve an adoption or brick wall case. Autosomal DNA testing looks at the first 22 pairs of chromosomes. Everyone can take this test.

Everyone inherits 50% of their DNA from each parent. However, the 50% that is inherited is random. Random DNA inheritance allows for many genetic possibilities between siblings and their descendants. As a result, everyone has two family trees: a **genealogical family tree** and a **genetic family tree**. The genealogical family tree contains every ancestor of an individual and can be documented with traditional genealogy records. The genetic family tree only consists of genetic relatives. DNA is randomly inherited, causing ancestors to start “falling off” the genetic family tree after 5-7 generations.

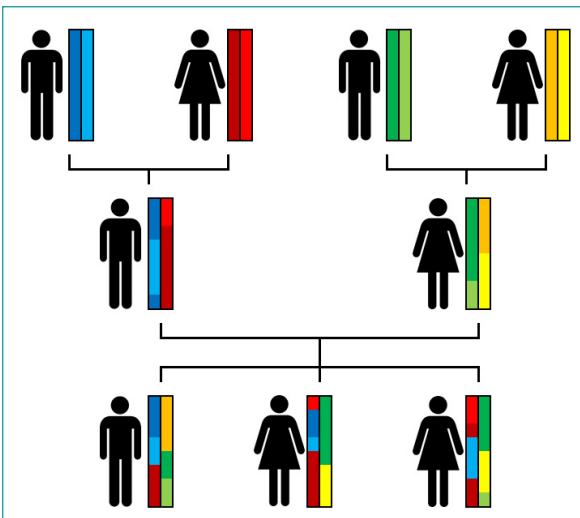


Image: Random DNA Inheritance: Jordi picart, CC BY-SA 4.0 <https://creativecommons.org/licenses/by-sa/4.0/>, via Wikimedia Commons

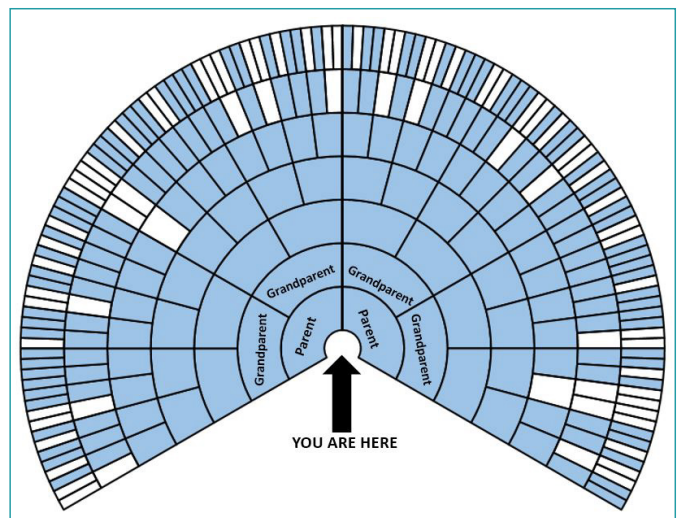


Image: Genetic Family Tree: Image created in Microsoft Excel. Adapted from: Blaine T. Bettinger, 2019. *The Family Tree Guide to DNA Testing and Genetic Genealogy*, pg. 18

## Analyzing Autosomal (atDNA) Test Results

### Ethnicity Estimate

Many people take DNA tests specifically for the ethnicity estimate. When reviewing an ethnicity estimate, consider two things:

- *Reference populations:* These are groups of people that all test takers are compared to. Individuals in the reference population have a confirmed paper trail and DNA confirmation. As reference populations grow, ethnicity estimates are updated.
- *DNA inheritance patterns:* DNA is inherited randomly. This can lead to ethnicity estimates that do not exactly match the documented genealogy. Siblings will have different ethnicity estimates.
- *Remember, an ethnicity estimate is just that, an ESTIMATE.*

### The Shared cM Project

When your test results come back, you will be able to view a match list. Each match on your list will note how much DNA you share. This will be given as a percentage or in **centimorgans (cM)**. Companies group your matches with estimated relationship ranges, but these are just educated guesses. No testing company can tell how you are related to someone, just how much DNA is shared. Use your genealogy paper trail and the amount of shared DNA to assign a relationship to your matches.

A useful tool for evaluating DNA matches is *The Shared cM Project* which is available at <https://dnapainter.com/tools/sharedcmv4>

## Organizing atDNA Test Results with the Leeds Method

The Leeds Method, created by genetic genealogist Dana Leeds, is a way to organize your DNA match results and view them in one place. Start by creating a spreadsheet. Include columns for the match's username, the amount of shared centimorgans, for any relevant notes, and one for each of your four grandparents. Follow these steps to color-code your matches:

1. Enter all of your matches that fall between 90 cM and 400 cM in descending order.
  - a. *Disregard any matches over 400 cM as you likely share two grandparents with those individuals.*
2. For your first match, assign a color in the Grandparent 1 column.
3. View your "shared matches" with that first match and assign the same color in the same column.
4. Find the next unrelated match and assign them a different color in the Grandparent 2 column.
5. View the "shared matches" for that match and assign everyone the same color in the same column.
6. Repeat these steps until all matches have been assigned a color.

## Helpful Tips

### Focus on your best matches first.

The more DNA that is shared, the more certain we can be of the relationship.

### Test family members as far back in your family tree as possible.

The closer the relationship is to your brick wall ancestor, the higher the chance of the test taker sharing DNA with individuals that can help with your research.

### Test with multiple companies.

People choose testing companies for a variety of reasons. Testing with multiple companies may connect you with additional matches.

**Check back often.** You may not be able to solve your DNA problem today, but new people are always taking DNA tests. You may have an addition to your match list in the future that makes all the difference.

Name	shared cM	Notes	1	2	3	4
Ringo Starr	700	Great Uncle				
K457x	523	1C1R	Red			
T.T.	458	1C1R	Red			
Elvis Presley	456	1C1R	Red	Blue		
A.M.	441	1C1R	Red		Yellow	
D. Smith	421	1C1R	Red			
Jason Bourne	400					
Smith.Jane	345		Red			
David Jones	294		Red			
D.P.	267		Red			
Edward FP	265		Red			
Iron Man	231		Red			
John	218	2C1R				Green
4ever fishing	197	3C				Green
mkeyb43	175			Blue		
lballgirl	153	2C1R				Green
Jean-Luc Picard	144		Red			
M.C.	136	managed by 4ever fishing				Green
W.C.	131	managed by d2002c		Blue		
E. Smith	124		Red			
E.T.	123	managed by wsmith83		Blue		
George Washington	123	managed by JPCustis54			Yellow	
Martha Washington	120	managed by JPCustis54			Yellow	
urfamily1994	119					Green
D.S.	118	managed by Rick Astley		Blue		
EDT	114				Yellow	
Anna Smith	110			Blue		
ILOVECATS	105				Yellow	
James Smith	104				Yellow	
Freddie Mercury	104					Green
Thompson_Molly	101		Red			
d2002c	100			Blue		
DNA4ME	98					
tlkessoccer@gmail.com	97		Red			
Johnny Appleseed	97					
buddysmith	96					Green

*Image: An example of the Leeds Method created using Microsoft Excel. This method of organization was created by Dana Leeds.*

**Visit Dana Leeds's website to learn more:**  
[www.danaleeds.com/the-leeds-method](http://www.danaleeds.com/the-leeds-method)

## Y-DNA Testing

Y-DNA is passed down from father to son unchanged. This makes it a powerful tool in genealogy for researching the paternal line. Only those who have a Y chromosome can take this test. This inheritance pattern helps to solve paternal (surname line) brick walls. Y-DNA can also be used to identify instances when a father and son are not biologically related.

There are different levels of tests available for Y-DNA. The higher-level tests will test more pieces of DNA. Depending on the level of test you purchase, you will be assigned a **haplogroup**. This is a group of people who share several of the same genetic mutations and a common ancestor.

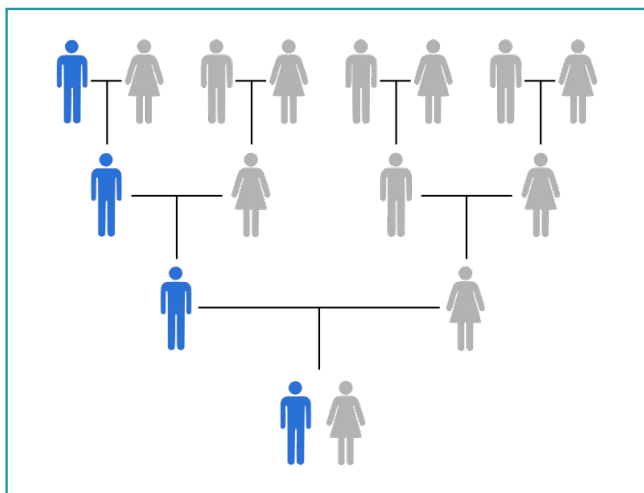


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## Mitochondrial DNA Testing

Mitochondrial DNA is a small circular piece of DNA, and the only DNA that occurs outside of the nucleus of the cell. This type of DNA is passed down from mothers to their children unchanged. Everyone can take a mtDNA test; however, fathers do not pass on their mtDNA to their children.

Mitochondrial DNA tests assist in finding ancestral origins but give limited information on closer relationships. An exact mtDNA match only has a 50% chance of being maternally related through a common ancestor who lived within the past 775 years (Bettinger, *Guide to DNA Testing and Genetic Genealogy*, p. 131.) Test results are compared to a reference sequence and a haplogroup is assigned.

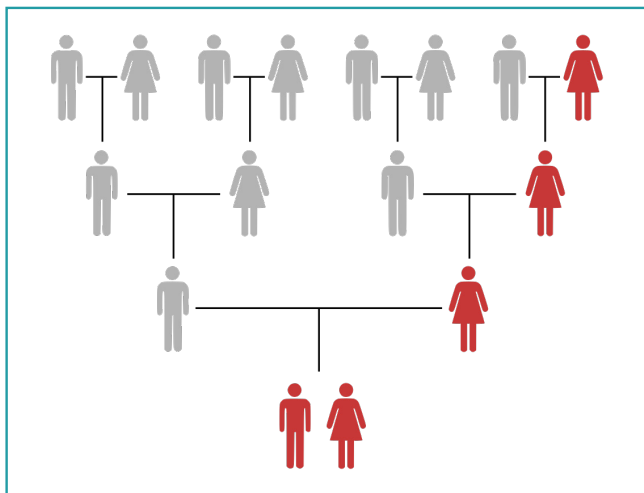
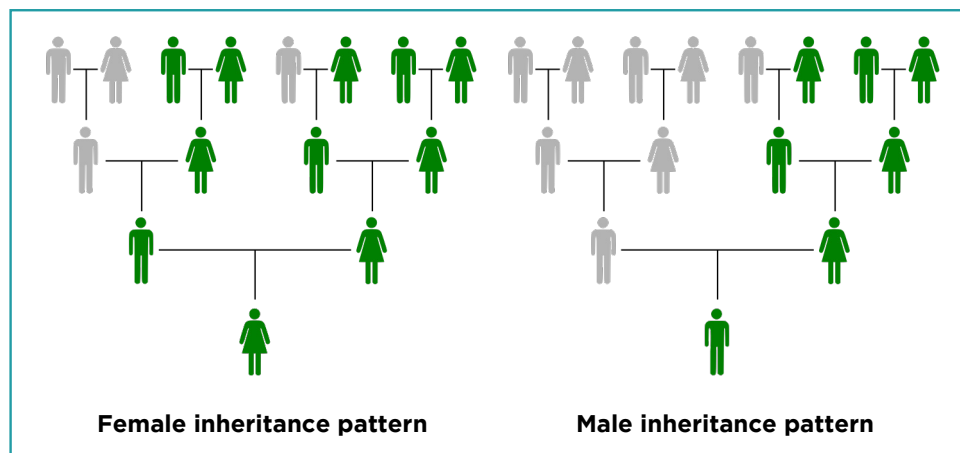


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## X-DNA Testing



X-DNA is not a stand-alone test. It is often included, but hidden, in atDNA test results. To view your X-DNA results, upload your atDNA to a third-party website. X-DNA has a unique inheritance pattern that make it an important tool in DNA research.

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## Choosing a Testing Company

When choosing a testing company, there are many considerations such as price, research goals, and total number of testers (more testers equals more possible matches.) Additionally, you should carefully read the privacy, security, and sample retention policies of each test provider. MGC staff cannot recommend a specific company, but more information can be found by viewing the testing comparison charts at the International Society of Genetic Genealogy website, <https://isogg.org>.

Popular testing companies include:

- *Ancestry DNA* – [dna.ancestry.com](https://dna.ancestry.com)
- *MyHeritage* – [www.myheritagedna.com](https://www.myheritagedna.com)
- *FamilyTreeDNA* – [www.familytreedna.com](https://www.familytreedna.com)
- *Living DNA* – [www.livingdna.com](https://www.livingdna.com)



## Additional Resources for Researching with DNA



### MGC Resources

Use the Mid-Continent Public Library's online catalog to locate these titles:

- *Advanced Genetic Genealogy: Techniques and Case Studies*
- *DNA for Native American Genealogy*
- *Finding Your Roots: The Official Companion to the PBS Series*
- *Genetic Genealogy in Practice*
- *Research Like a Pro With DNA: A Genealogist's Guide to Finding and Confirming Ancestors with DNA Evidence*

- *The Adoptee's Guide to DNA Testing: How to Use Genetic Genealogy to Discover Your Long-lost Family*
- *The Family Tree Guide to DNA Testing and Genetic Genealogy*
- *Your DNA Guide the Book: Step-by-Step Plan to Connect You With Your Family Using Your DNA*

### Online Resources

- **International Society of Genetic Genealogy** – <https://isogg.org>
- **Shared cM Project** – <https://dnainter.com/tools/sharedcmv4>
- **DNA Adoption (step-by-step adoption research help)** – <https://dnaadoption.org>
- **Blaine Bettinger's *The Genetic Genealogist*** – <https://thegeneticgenealogist.com>
- **Roberta Estes's *DNAeXplained*** – <https://dna-explained.com>
- **Diahan Southard's *Your DNA Guide*** – <https://www.yourdnaguide.com>



[midwestgenealogycenter.org](https://midwestgenealogycenter.org)

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