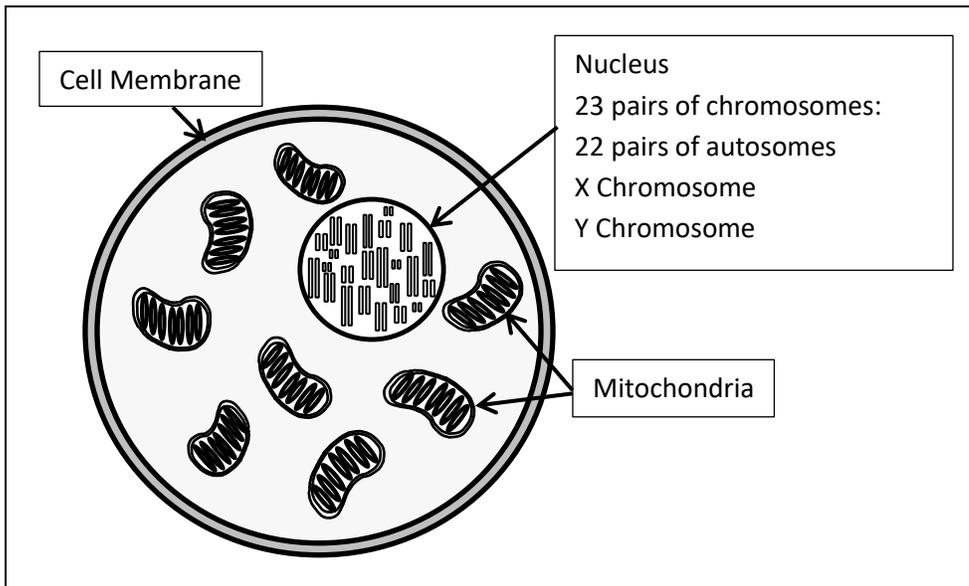


# DNA Basics

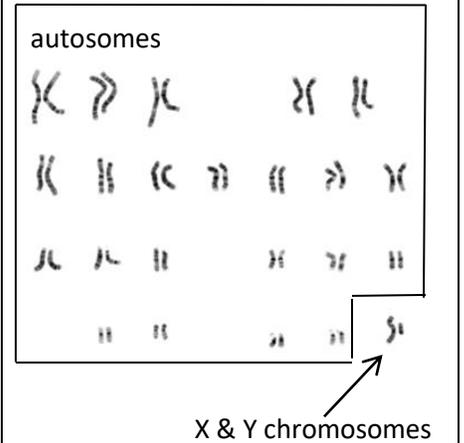
Lisa McCullough, [lisagmc@comcast.net](mailto:lisagmc@comcast.net)

## Basic DNA Information



## 23 Pairs of Chromosomes

The image below is from National Human Genome Research Institute - <http://www.genome.gov/glossary/resources/karyotype.pdf>



**DNA** – Deoxyribonucleic Acid - is a polymer chain of nucleotides on a sugar phosphate backbone arranged in a double helix. The sequence of nucleotides determines the genetic code.

## DNA Testing – Is It Right For You?

DNA Testing is one of many tools used in Genealogical Research

### DNA Testing can help

- Find living relatives
- Provide general information regarding past ancestors
- Determine if your parents are related
- DNA testing can also give some surprises
- Are you ready for them?

### Reasons to Test

- Find cousins
- Find where your family originated
- Find out more about your ethnicity
- Find parents and siblings if you are adopted
- For fun

### DNA Testing Cannot

- Determine specific paternity
- Identify a link to specific ancestor
- Determine specific genetic diseases
- Identify a medical disorder

## Four Basic DNA Tests

### Y DNA Test – Only For Men

37 Markers, 67 Markers, 111 Markers, Big Y, SNP Testing  
(12 Markers and 25 Markers can only be ordered as a part of a group project)

### Mt DNA Test – Anyone

HVR1 & HVR2 (Hyper Variable Regions 1 & 2), FMS (Full Mitochondrial Sequence)

### Autosomal DNA Test – Anyone

Test 22 pairs of chromosomes plus the X Chromosome(s)

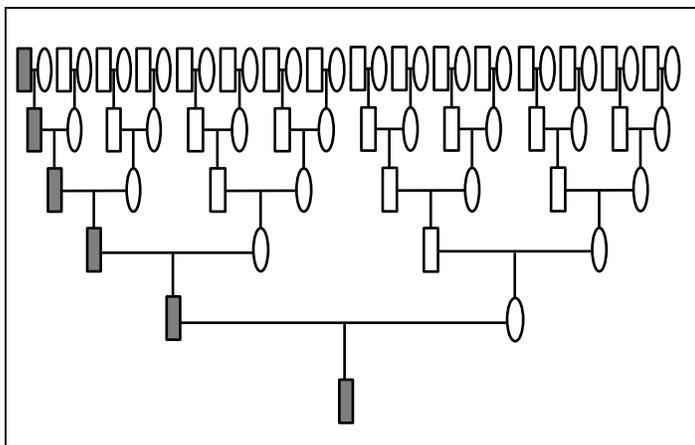
### X Chromosome Test – Anyone

Generally included as part of an Autosomal DNA Test  
Men have one X-chromosome, Women have two X-chromosomes

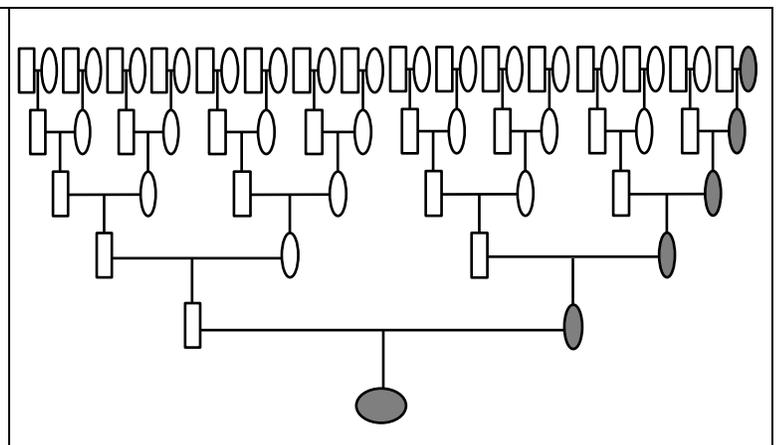
### DNA Testing Companies

Company	Y DNA (Y Chromosome)	MtDNA (Mitochondrial DNA)	At DNA (Autosomal - includes X Chromosome)	Price
Family Tree DNA	Yes	Yes	Yes, Family Finder	\$89 (\$69)
23andMe, Ancestry with Health	Yes, basic with at test	Yes, basic with at test	Yes, Relative Finder	\$99 \$199
AncestryDNA	No	No	Yes	\$99 (\$79)
My Heritage	No	No	Yes	\$99 (\$69)
Living DNA	No	No	Yes	\$159 (\$99)
Genographic Project (Geno 2.0)	Yes	Yes	Yes, Basic	\$199 (\$99)

### Y Chromosome Inheritance



### mt DNA Inheritance



### YDNA Haplogroups ≠ mt DNA Haplogroups

**Haplogroup** - Is a major branch on either the maternal or paternal tree of humankind. Haplogroups are associated with early human migrations. Today these can be associated with a geographic region or regions.

### Y DNA Testing, Genetic Distance: TMRCA Probability Table Based on an exact match.

# Generations	# Markers				
	12	25	37	67	111
4	33%	61%	83.49%	89.79%	90.1%
8	56%	85%	97.28%	98.96%	99.0%
12	70%	94%	99.55%	99.89%	99.99%
16	80%	97.73%	99.93%	99.99%	99.99%
20	87%	99.12%	99.99%	99.99%	99.99%
24	91%	99.66%	99.99%	99.99%	99.99%

Holland Society & Family Tree DNA: Y-DNA Genealogy 101, Sean Staats, 17 Dec 2014, <http://www.hollandsociety.com/HSNY-Genetic-Genealogy-Y-DNA.pdf> .

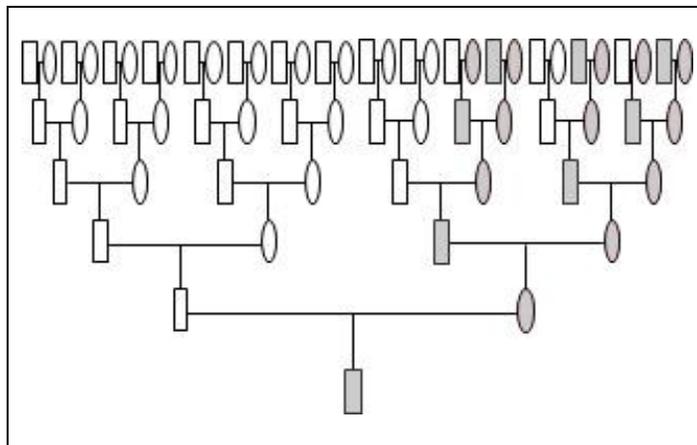
### mt DNA Genetic Distance: TMRCA Probability Table Based on an exact match

Level of Testing	Probability to share common maternal ancestor	Number of generations	Number of Years
HVR1	50%	52	1,300
HVR1 & HVR2	50%	28	700
FMS	50%	5	125

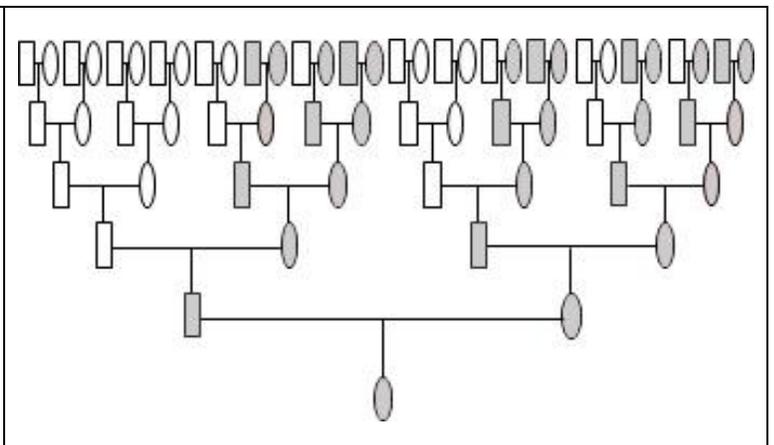
Family Tree DNA, <https://www.familytreedna.com/learn/dna-basics/mtdna/>

### Autosomal Test

#### X Chromosome Inheritance for Men



#### X Chromosome Inheritance for Women



Autosomal DNA testing is best used to determine relatives within the most recent 5 generations.

Chances of a matching a known relative:	
Relationship	Match Probability
2 <sup>nd</sup> cousins or closer	> 99%
3 <sup>rd</sup> cousin	> 90%
4 <sup>th</sup> cousin	> 50%
5 <sup>th</sup> cousin	> 10%
6 <sup>th</sup> cousin and more distant	Remote (typically less than 2%)

Family Tree DNA, 17 Dec 2014, R, A. Canada, <https://www.familytreedna.com/learn/autosomal-ancestry/universal-dna-matching/probability-relative-share-enough-dna-family-finder-detect/> .

## **Autosomal Test names/DNA Testing Companies/Web Address**

**Family Finder** – FTDNA’s test for autosomal DNA matches - <https://www.familytreedna.com/>

**Relative Finder** – 23andMe’s test for autosomal DNA matches - <https://www.23andme.com/>

**AncestryDNA** - Ancestry.com’s DNA test - [www.ancestry.com/DNA](http://www.ancestry.com/DNA)

**National Geographic Geno 2.0 test** - <https://genographic.nationalgeographic.com/>

**My Heritage** - <https://www.myheritage.com/dna>

**Living DNA** - <https://www.livingdna.com/en-us>

### **Resources:**

Bettinger, Blaine T., *The Family Tree Guide to DNA Testing and Genetic Genealogy*, Cincinnati, OH, Family Tree Books, 2016. Print. ISBN-10: 1-4403-4532-5; ISBN-13: 978-1-4403-4532-6

Bettinger, Blaine T. and Debbie Parker Wayne, *Genetic Genealogy in Practice*, Arlington, VA, National Genealogical Society, 2016, Print. ISBN-13: 978-1-935815-22-8

Doolin-Aulicino, Emily F. *Genetic Genealogy: The Basics and beyond*. Bloomington, IN, Authorhouse, 2014. Print. ISBN: 978-1-4918-4090-0; ISBN: 978- 1-4918-4089-4

Dowell, David R., *NextGen Genealogy: The DNA Connection*, Libraries Unlimited, Print. ISBN-10: 1610697278; ISBN-13: 978-1610697279

Fitzpatrick, Colleen, and Andrew Yeiser. *DNA and Genealogy*. Fountain Valley, CA: Rice Book, 2005. Print. ISBN-10: 0976716011; ISBN-13: 978-0976716013

Smolenyak, Megan, and Ann Turner. *Trace Your Roots with DNA*. Emmaus, PA: Rodale, 2005. Print. ISBN-10: 1594860068; ISBN-13: 978-1594860065

### **Useful Websites**

**International Society of Genetic Genealogists (ISOGG) Wiki** - [http://www.isogg.org/wiki/Wiki\\_Welcome\\_Page](http://www.isogg.org/wiki/Wiki_Welcome_Page)

**FTDNA FAQ** - <https://www.familytreedna.com/learn/>

**FTDNA Forum** - <http://forums.familytreedna.com/>

**FAQs – AncestryDNA** - <http://dna.ancestry.com/legal/faq>

**Ancestry Message Boards** - <https://www.ancestry.com/boards/>

**Kitty Cooper’s Blog** - <http://blog.kittycooper.com/tools/my-graphing-or-mapping-tools/chromosome-mapper/>  
<http://kittymunson.com/dna/ChromosomeMapper.php>

**GEDmatch** - <https://www.gedmatch.com/login1.php>

### **Helpful Blogs**

**DNAeXplained - Genetic Genealogy, Roberta Estes** - <http://dna-explained.com/>

**The Genetic Genealogist, Blaine Bettinger** - <http://www.thegeneticgenealogist.com/>

**DNA Genealem’s Genetic Genealogy, Emily Aulicino** - <http://genealem-geneticgenealogy.blogspot.com/>

**DNA Testing Advisor, Dick Hill** - <http://www.dna-testing-adviser.com/>

**The Legal Genealogist, Judy G. Russell** - <http://www.legalgenealogist.com/blog/>

**Shared cM Project** - <https://thegeneticgenealogist.com/2017/08/26/august-2017-update-to-the-shared-cm-project/>