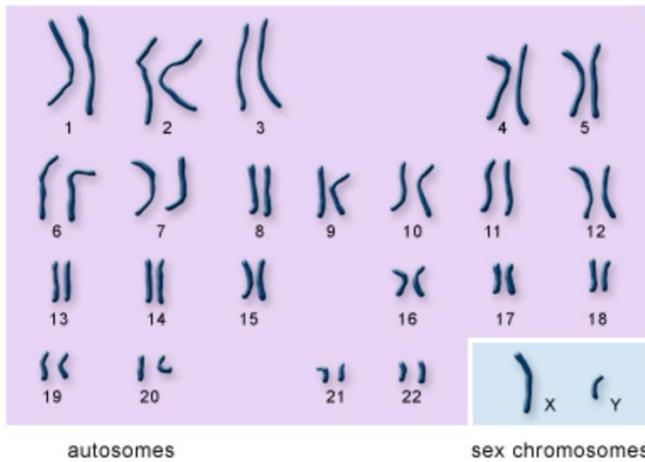
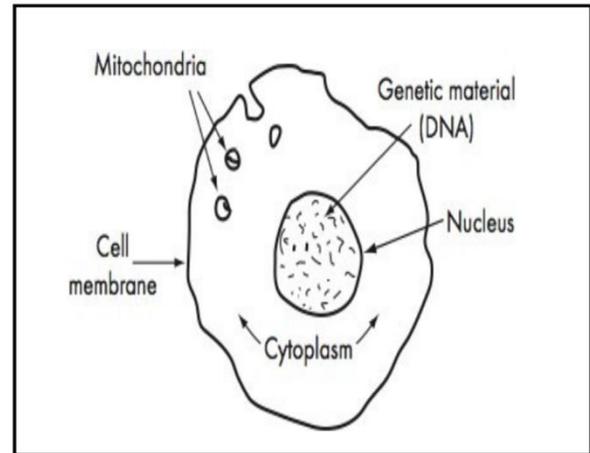


Which Ancestors Send DNA Messages?

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Almost all your DNA is inside the nucleus of each of your 3 billion cells. The exception is your mitochondria (mtDNA) which may have hundreds of copies within an individual cell. The image at right is reprinted with permission from the Centre for Genetics Education.



U.S. National Library of Medicine

The rest of your DNA is contained in 23 pairs of chromosomes within the nucleus. 22 pairs (containing more than 95% of your DNA) make up your autosomes (atDNA).

One additional pair, the sex chromosomes, is also in the nucleus. The example to the left is of a male. Males have one X chromosome containing their xDNA and one Y chromosome containing their yDNA. Females have no Y chromosome but instead have a second X chromosome.

Developing a working knowledge of the different inheritance patterns of your four kinds of DNA (three if you are female), is one of the key skill sets you need to become a competent genetic genealogist. This knowledge is critical as you attempt to decipher which of your ancestors can send you family history information.

Who does DNA come from?

Women Receive DNA

- 50% **atDNA** from each parent
- 100% **mtDNA** from mother
- Get **NO yDNA**
- Get **xDNA** from each parent

Men Receive DNA

- 50% **atDNA** from each parent
- 100% **mtDNA** from mother
- 100% of **yDNA** from father
- Get **xDNA** from mother but **NO xDNA** from father.

Promiscuous DNA recombines in each generation and half of it is lost in that process.

Celibate DNA is inherited essentially intact by each generation with very little change.

Dr. D's Laws of atDNA inheritance

- Each parent gives offspring 50% of their **atDNA**
- **atDNA** of siblings only overlap about 50%
- It is all inherited at random as far as we know.
- It can be tracked reliably and predictably only about 5 generations back.
- Half of it gets lost in each generation.
- It is a *PROMISCUOUS* DNA.

Dr. D's Laws of xDNA inheritance

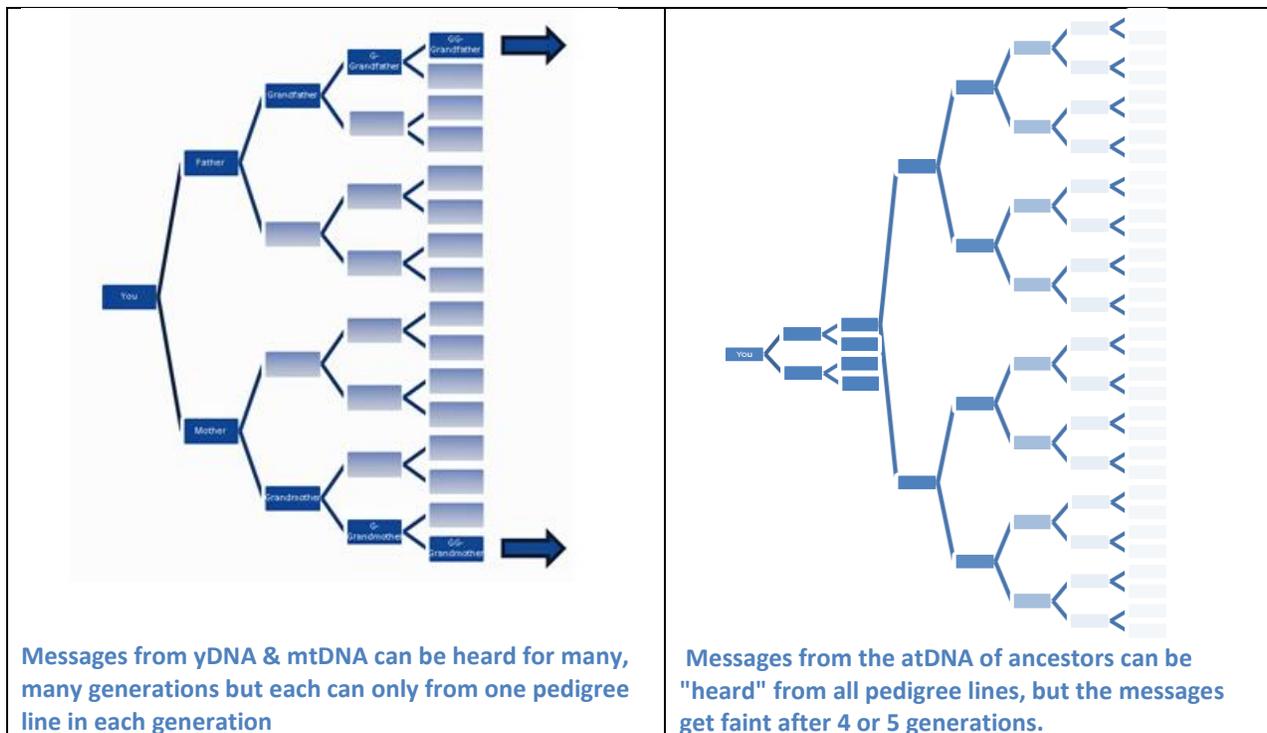
- Everyone has **xDNA**.
- We all inherited some from our mothers.
- If we are women we also got some from our dads in lieu of inheriting yDNA.
- It's a "celibate" DNA for men but a "*PROMISCUOUS*" DNA for women.
- It can be tracked reliably back just a few generations.

Dr. D's Laws of mtDNA inheritance

- Everyone has **mtDNA**.
- They got it from their mothers.
- It's a "**celibate**" DNA
- It can be tracked infinitely back into prehistory because it changes very slowly over many, many generations.
- It is not good for making subtle distinctions among closely related individuals.

Dr. D's Laws of yDNA inheritance

- Only guys have **yDNA**.
- They inherited it from their fathers.
- It's a "**celibate**" DNA
- It can be tracked infinitely back into prehistory because it changes very slowly over many, many generations.
- It is not good for making subtle distinctions among closely related individuals.



Probability of atDNA Matching

Relationship	Probability of Detecting Common Segment
2 nd cousins or closer	> 99%
3 rd cousin	90%
4 th cousin	45-50%
5 th cousin	10-15%
6 th cousin and more distant	< 5%

For additional comparative information on DNA testing, see www.isogg.org/wiki

Adapted from **David R. Dowell**, *NextGen Genealogy: The DNA Connection*,
 Santa Barbara, CA: ABC-CLIO, 2015, p. 13, Figure 1.7.

Summary of the Characteristics of the Four Types of DNA

DNA	Autosomal	X-Chromosome	Mitochondrial	Y-Chromosome
Who has it?	Everyone	Men have 1 chromosome; women have 2 chromosomes	Everyone	Only men
Who passes it on?	Each parent	Women to all children; men only to daughters	Only women to children of either gender	Only men
Where is it located?	In the nucleus of cells	In the nucleus of cells	Inside cells but outside their nucleus	In the nucleus of cells
How many are passed down?	One copy of each of the 22 pairs of chromosomes in each cell	1 chromosome in men and 2 chromosomes in women	Multiple copies in each cell	1 chromosome to men only
From whom is it inherited?	Half from mother and half from father	Men get 1 chromosome from their mother only; women get 1 chromosome from each parent	All from mother to all children	From father to son only
Who can be tested for it?	Everyone	Everyone (but men have only a maternal contribution)	Everyone	Men only
What do the most common consumer test results report?	Length of matching segments shared between people; bio-geographical inheritance charts	Length of matching segments shared between people	Actual chemical bases; there are only 16,569 locations, so each is important; haplogroup migrations	Number of short tandem repeats (STRs) at given locations (markers); haplogroup migrations; advanced SNP tests for deeper ancestral locations
Which companies test this?	FamilyTreeDNA.com 23andMe.com Ancestry.com	FamilyTreeDNA.com 23andMe.com Ancestry.com	FamilyTreeDNA.com	FamilyTreeDNA.com
What levels of testing?	Autosomal SNPs: FTDNA - 708,092 23andMe - 577,382 Ancestry - 682,549	Matches on X-chromosome: FTDNA - Yes 23andMe - Yes Ancestry - no specific testing or reporting of X	mtDNA Plus; mtDNA Full Sequence	STR testing: Y-DNA12, 37, 67, 111; haplogroup and SNP predicted; individual SNPs and SNP panels available