DNA Testing:
What, How, Why, and Who

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BYU FHL

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The questions

- What is DNA?
- What is a DNA test?
- How do I take a DNA test?
- Why take a DNA test?
- Who should take a DNA test?

What is DNA? The Basics

- The “code” that tells your body how to be you
- Represented by letters A,G,C,T
- All organisms and some viruses have DNA

DNA Basics- continued

- 40-60% of your DNA is identical to a banana
- 99% of your DNA is identical to a chimpanzee
- 99.9% of your DNA is identical to that of all other humans

What is a DNA test?

DNA tests focus on that .1% of genes that vary between different humans

<u>Three</u> types of “unique DNA” testing

1. Y DNA

On the Y chromosome, male to male inheritance

2. MTDNA-mitochondrial DNA

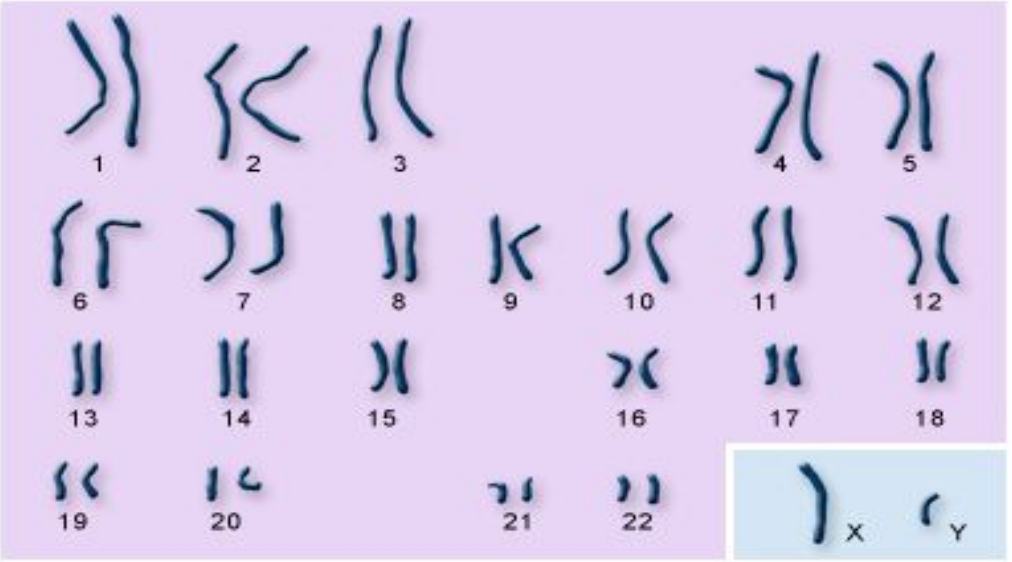
Part of cells inherited from your mother

3. Autosomal DNA (at-DNA)

half inherited from each parent

Autosomal DNA (at-DNA) test

- Looks at “unique” segments on 22 of your chromosomes
- Main kind of DNA test people take
- Males or females can take it



autosomes

sex chromosomes

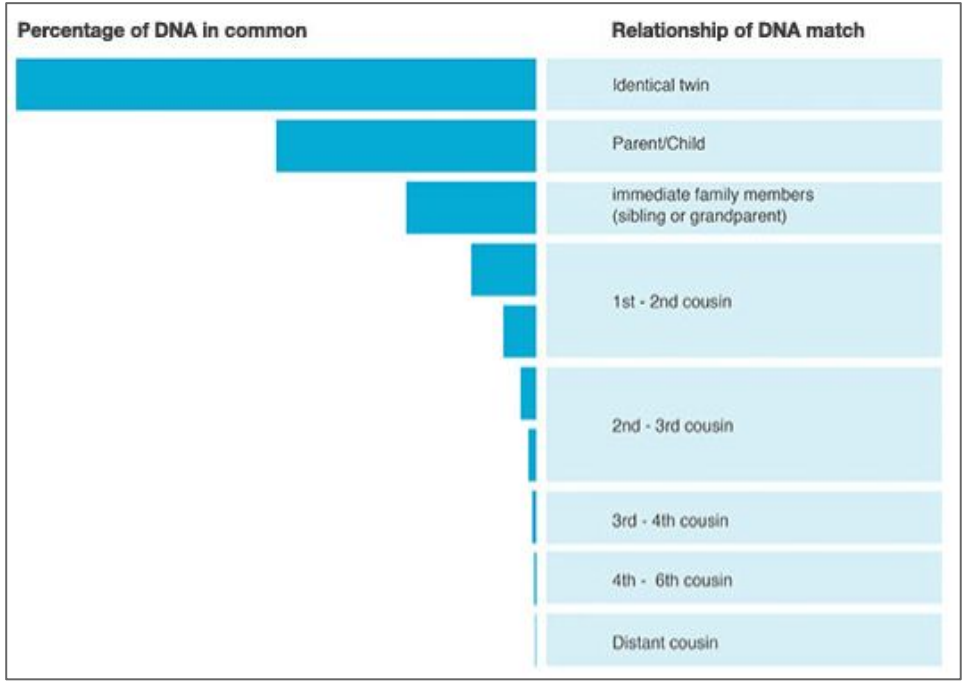
U.S. National Library of Medicine

Autosomal DNA Facts

- Some “unique genes” have known jobs:, eye color, lactose intolerance, etc
- Certain genes are most commonly found in certain populations-used to predict ethnicity
- Some have no known job

More Autosomal DNA Facts

- 450,000 to 750,000 highly variable data points on chromosomes 1-22 are tested
- Matches are generated by comparing your DNA data to that of others who have tested
    - The more of these data points in common, the closer the familial relationship
    - Useful for verifying relationships 6-7 generations back



How do I take a DNA test?

Basic Testing Process

1. Order a test kit
2. Spit in tube or swab cheek following directions on packaging
3. Register your kit with the testing company
4. Mail your kit to the laboratory
5. Receive your results (often takes 6-8 weeks)

Choosing a company to test through

Major Autosomal Test Companies

Company	Type of test	Cost	tests in database	Allows external transfers?
23andMe	3 in 1	$99 or $199	12 million	No
Ancestry.com	Autosomal	$99	19 million	No
Family Tree DNA	Autosomal	$79	1.4 million	Yes
Living DNA	3 in 1	$99	300,000	Yes
MyHeritage DNA	Autosomal	$89	4.5 million	Yes

*Numbers as of January 2021

Why take a DNA test? Health and Ethnicity

- **Health reasons**

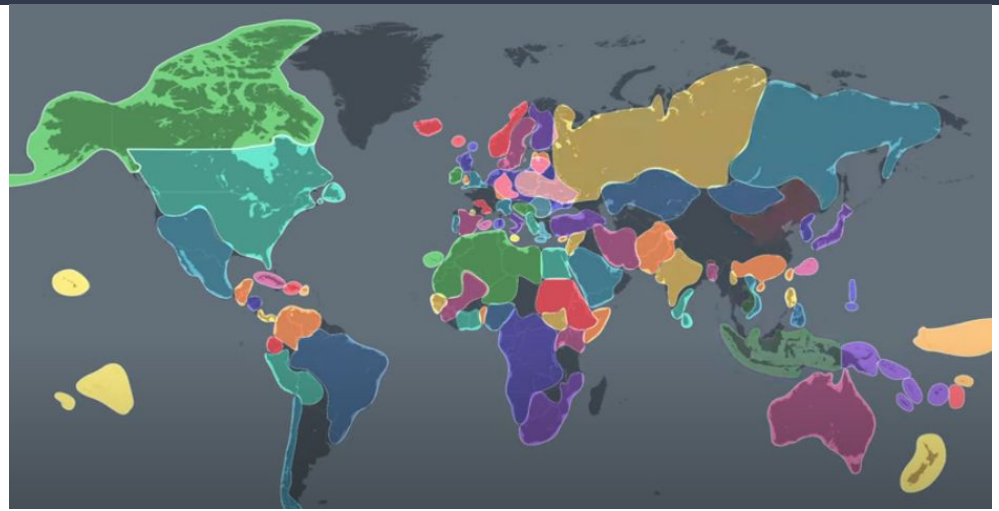
Predisposition to cancers, allergies, heart problems, etc.

- **Curiosity about ethnicity**

Has been a particularly successful marketing strategy in the US

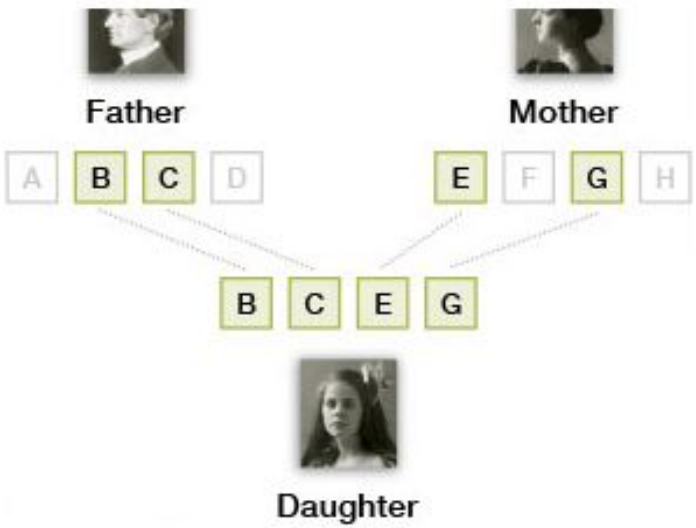
Ethnicity Science

- Researchers take DNA samples from locals
- DNA samples are then studied for unique markers
- Ethnicity science is constantly evolving as researchers get additional data



Explaining your ethnicity estimate

- Calculated by sampling your DNA then looking for markers unique to certain populations
- Results from each sampling run are averaged.
- You don't inherit ethnicity markers (or other genes) evenly from your ancestors beyond your parents



A simplified view of how an individual receives a random mix of DNA from each of their parents.

Same person different companies (2021)

My Heritage

Europe	100.0%
South Europe	50.1%
Iberian	34.8%
Italian	15.3%
North and West Europe	49.9%
Scandinavian	27.1%
English	16.1%
Irish, Scottish, and Welsh	6.7%

Ancestry.com

England, Wales & Northwestern Europe	47%
Ireland & Scotland	24%
Portugal	24%
Spain	4%
Mali	1%

Additional Communities

South Carolina Settlers
From your regions: England, Wales & Northwestern Europe; Ireland...

Coastal Carolinas Settlers

Portuguese
From your regions: England, Wales & Northwestern Europe; Portugal

Madeira & Hawaii

Eastern North Carolina Settlers
From your regions: England, Wales & Northwestern Europe; Ireland...

Ethnicity Results–Comparing relatives

Sister 1		Sister 2
39%	Scotland	26%
29%	England & Northwestern Europe	56%
12%	Sweden & Denmark	4%
9%	Ireland	7%
6%	Portugal	1%
2%	Norway	2%
2%	Wales	0%
1%	Nigeria	0%

Great Grandmother		Great Granddaughter
33%	England & Northwestern Europe	71%
15%	Scotland	5%
2%	Ireland	3%
43%	Portugal	0%
5%	Spain	0%
1%	Basque	0%
1%	Senegal	0%

Why take a DNA test?-Family History Research Reasons

- Confirm “paper trail research”
- Connect with relatives who are also interested in the family history
- Solve a mystery (brick wall, adoption, missing person, misattributed parentage)

Autosomal DNA Relative Matching-cM chart

Relationship	Average cM shared
Parent/child	3400.00
Full siblings	2550.00
Grandparent/grandchild, aunt-or-uncle/niece-or-nephew, half-siblings	1700.00
Double first cousins	1593.75
First cousins, great-grandparent/great-grandchild, great-uncle or aunt/great-nephew or niece, half-uncle or aunt/half-nephew or niece	850.00
First cousins once removed, half first cousins, great-great-grandparent/great-great-grandchild, great-great-aunt/uncle, half great-aunt/uncle	425.00
Double second cousins	425.00
Second cousins, first cousins twice removed, half first cousin once removed, half great-great-aunt/uncle, great-great-great-grandparent/great-great-great-grandchild	212.50
Second cousins once removed, half second cousins, first cousin three times removed, half first cousin twice removed	106.25
Third cousins, second cousins twice removed	53.13

Limitations of Autosomal DNA

- If your relatives haven’t tested, or didn’t test through the same company, they won’t show up in your matches.
- Your matches may not answer messages or sign into their account regularly.
- You may have to work to figure out how you and your match connect
- The further back your research question is, the less likely it is that autosomal DNA will be helpful

Who tests?

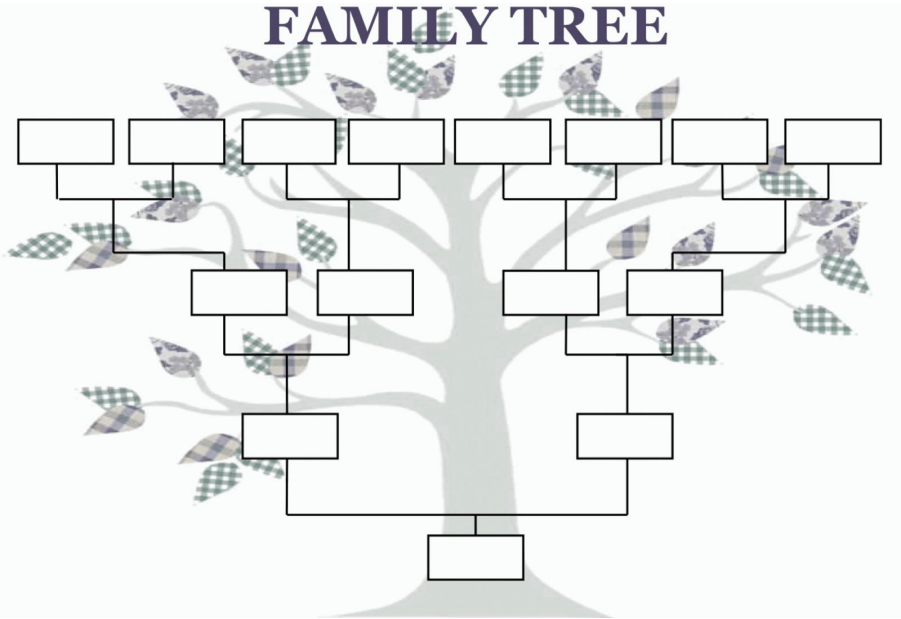
Depends on what question you are trying to answer with DNA.

Possibilities

- Self
- Your parent(s)
- Half sibling or aunt/uncle
- Oldest relative in a family line
- Potential biological relatives

When you get your results in 1-2 months:

- Get help from someone who has experience with interpreting the results
  - We are happy to help in the BYU Family History Library
- Transfer results to other databases/companies
- Attach a family tree to your DNA results on the test company's website.



Helpful links

International Society of Genetic Genealogy Wiki
https://isogg.org/wiki/Wiki_Welcome_Page

Article comparing different autosomal tests
https://isogg.org/wiki/Autosomal_DNA_testing_comparison_chart

Shared Centimorgans Project
https://dnapainter.com/tools/sharedcm

Kitty Cooper (A prominent DNA blogger) listing some of her favorite DNA blogs
https://blog.kittycooper.com/other-blogs-and-resources/dna-blogs/

13 Secrets to getting replies from DNA matches
https://www.legacytree.com/blog/13-secrets-to-getting-replies-from-dna-cousin-matches

Letter to a birth parent (can also be adjusted for writing other biological relatives)
https://thednageek.com/letter-to-a-birth-parent/