



John Campbell  
Maternal Haplogroup

## Maternal Haplogroup

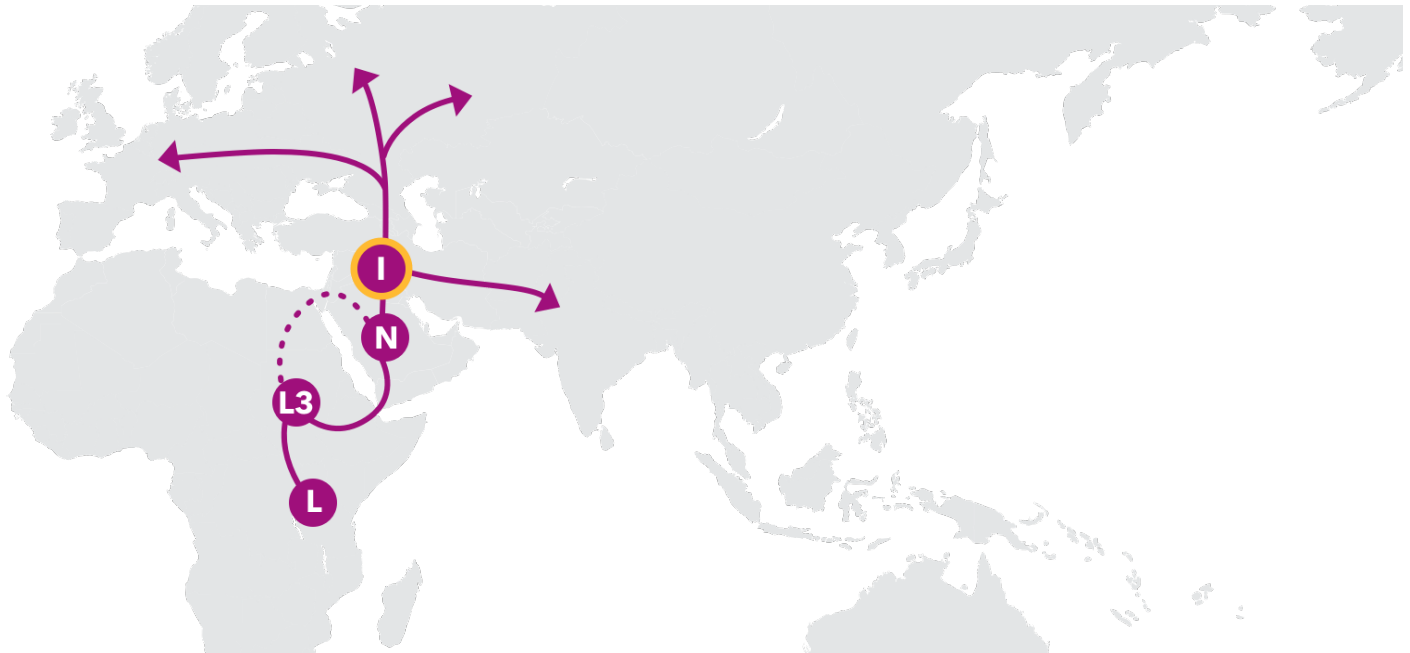
You descend from a long line of women that can be traced back to eastern Africa over 150,000 years ago. These are the women of your maternal line, and your maternal haplogroup sheds light on their story.



### John, your maternal haplogroup is I1a1.

As our ancestors ventured out of eastern Africa, they branched off in diverse groups that crossed and recrossed the globe over tens of thousands of years. Some of their migrations can be traced through haplogroups, families of lineages that descend from a common ancestor. Your maternal haplogroup can reveal the path followed by the women of your maternal line.

## Migrations of Your Maternal Line



180,000 Years Ago

### Haplogroup L

If every person living today could trace his or her maternal line back over thousands of generations, all of our lines would meet at a single woman who lived in eastern Africa between 150,000 and 200,000 years ago. Though she was one of perhaps thousands of women alive at the time, only the diverse branches of her haplogroup have survived to today. The story of your maternal line begins with her.

65,000 Years Ago

### Haplogroup L3

Your branch of L is haplogroup L3, which arose from a woman who likely lived in eastern Africa between 60,000 and 70,000 years ago. While many of her descendants remained in Africa, one small group ventured east across the Red Sea, likely across the narrow Bab-el-Mandeb into the tip of the Arabian Peninsula.

59,000 Years Ago

### Haplogroup N

Your story continues with haplogroup N, one of two branches that arose from L3 in southwestern Asia. Researchers have long debated whether they arrived there via the Sinai Peninsula, or made the hop across the Red Sea at the Bab-el-Mandeb. Though their exact routes are disputed, there is no doubt that the women of haplogroup N migrated across all of Eurasia, giving rise to new branches from Portugal to Polynesia.

21,000 Years Ago

### Haplogroup I

One of those branches is haplogroup I, which traces back to a woman who likely lived in the Middle East or the Caucasus Mountains about 21,000 years ago. Her descendants appear to have migrated into northern Europe after the Ice Age, and then through southwestern Asia as far as Pakistan with the expansion of agriculture about 8,000 years ago.

5,500 Years Ago

### Origin and Migrations of Haplogroup I1a1

Your maternal line stems from a branch of haplogroup I called I1a1. The members of I1a1 all descend from a woman who lived approximately 5,000 years ago. She likely lived in the Middle East, perhaps in the area of Iran. During the New Stone Age, also called the Neolithic, waves of people migrated from the Middle East into Europe, bringing with them agricultural technology and new cultures and art. Women bearing I1a1 spread across Europe with these migrations, reaching all the way to the Atlantic Ocean.

In modern times, I1a1 has been found from northeastern Europe and Siberia to Germany, Scandinavia, and the British Isles.

Today

### I1a1 is frequent among 23andMe customers.

Today, you share your haplogroup with all the maternal-line descendants of the common ancestor of I1a1, including other 23andMe customers.

1 in 170

23andMe customers share your haplogroup assignment.

## Haplogroup I may have been carried to Iceland by the Vikings.



Viking Longship at Sunset

Some Icelanders also bear haplogroup I, a suggestion that their ancestry traces back to British and Irish women who were taken away from their homes by Viking raiders during the 9th and 10th centuries AD. But haplogroup I also appears to have been present in Scandinavia during the Viking era. Ancient DNA belonging to the haplogroup was extracted from skeletal remains at an early Christian cemetery in Denmark.

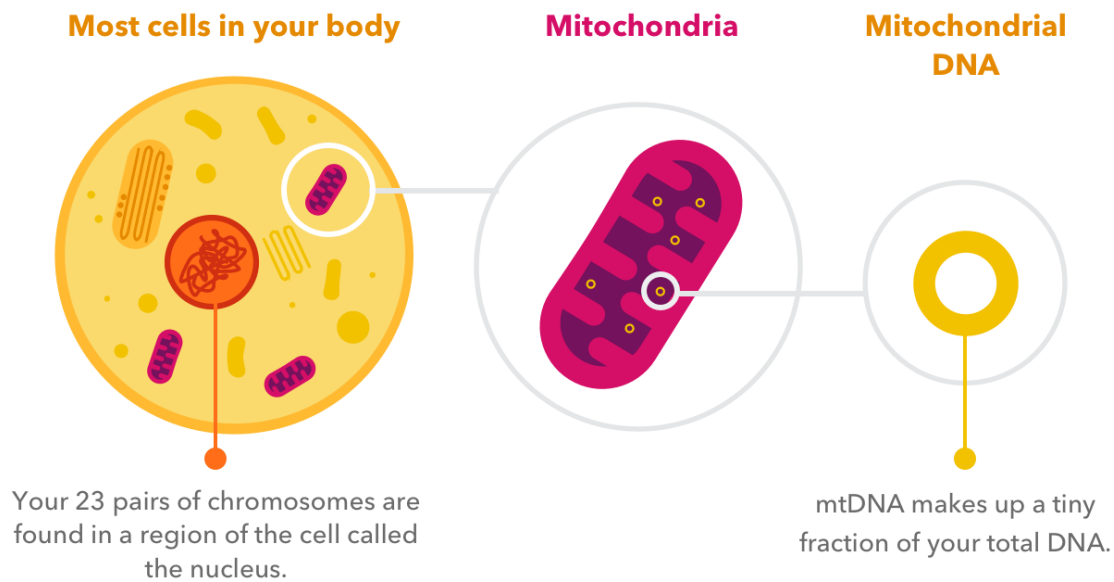
Today, haplogroup I is very rare in Denmark. But it is found at a level of about 4% in Finland and 2% in other parts of Scandinavia.

## The Genetics of Maternal Haplogroups

### Mitochondrial DNA

Maternal haplogroups are determined by sets of genetic variants in a tiny, unusual loop of DNA called mitochondrial DNA (mtDNA). As the name suggests, mtDNA is found in the mitochondria, small but mighty structures inside our cells that turn fuel from the food we eat into energy.

Mitochondria evolved over billions of years from an independent bacterial cell that was engulfed by another cell. Instead of becoming lunch, the bacterium helped its new host use oxygen to produce energy. Over time it completely lost its independence and became an integrated part of the larger cell.

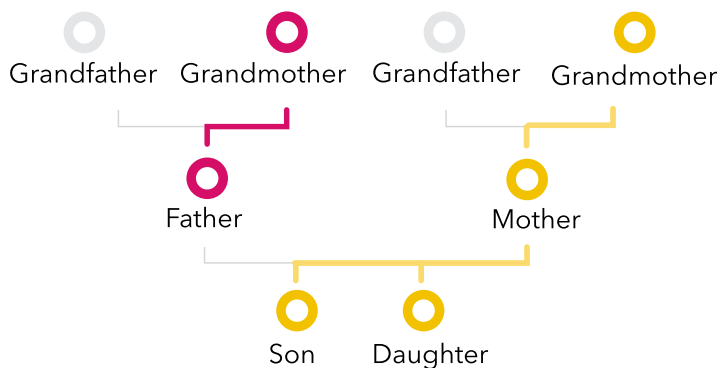


## Maternal Inheritance

MtDNA is a powerful tool for tracing the history of maternal lines because of the way it is inherited: everyone has mtDNA, but only mothers pass it down to their children. So, you inherited a copy of your mother's mtDNA, who inherited it from her mother, who inherited it from hers, and so on through the generations along an unbroken line of women.

The copies passed down are not always perfectly identical, however. Small typos in the mtDNA sequence occasionally occur, creating new genetic variants. Over many generations, these variants stack up in unique patterns that are carried by different maternal lines around the world.

## Only mothers pass their mtDNA down to their children

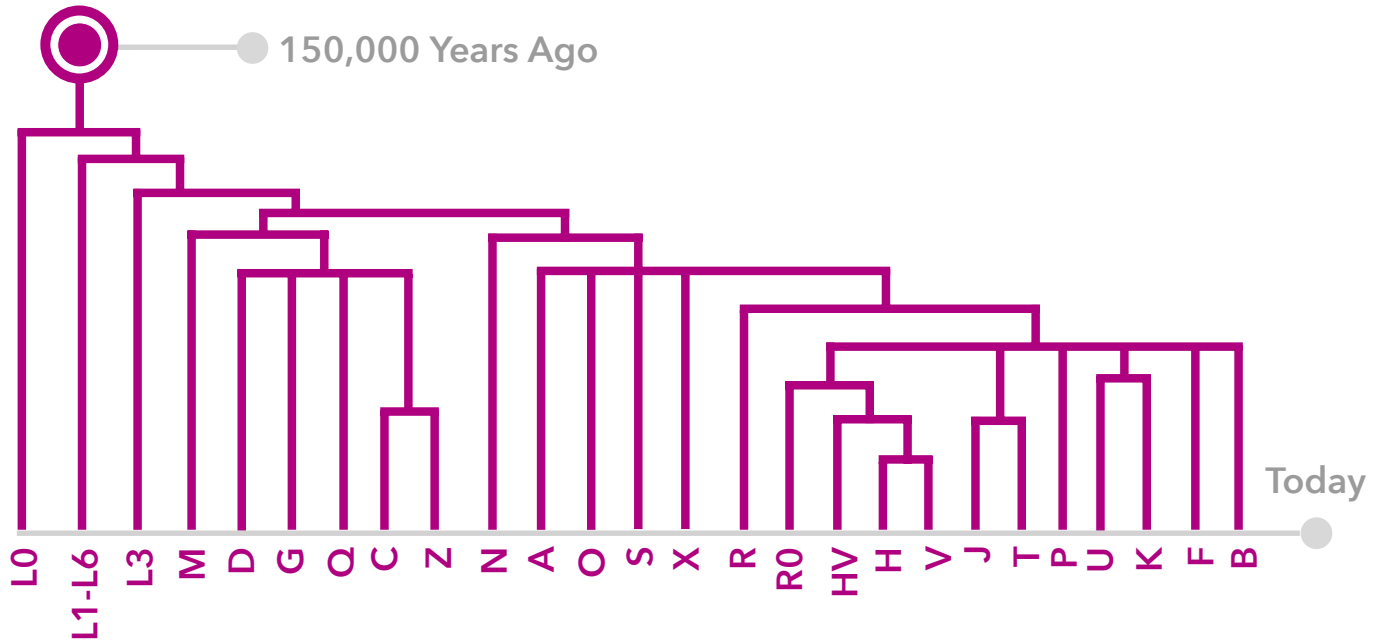


## Maternal Haplogroup Tree

By comparing the mtDNA patterns from around the world, researchers identify families of maternal lines. All the lines within each family trace back to a single common ancestor, and share a set of mtDNA variants that they inherited from her.

In fact, when we look very far back in time, all the maternal lines around the world trace back to one woman! Along with her ancestors, she forms the root of a great tree that shows how all maternal lines are related. Each sub-family in this tree is called a "haplogroup" and named with a sequence of letters and numbers that reflect its location in the tree.

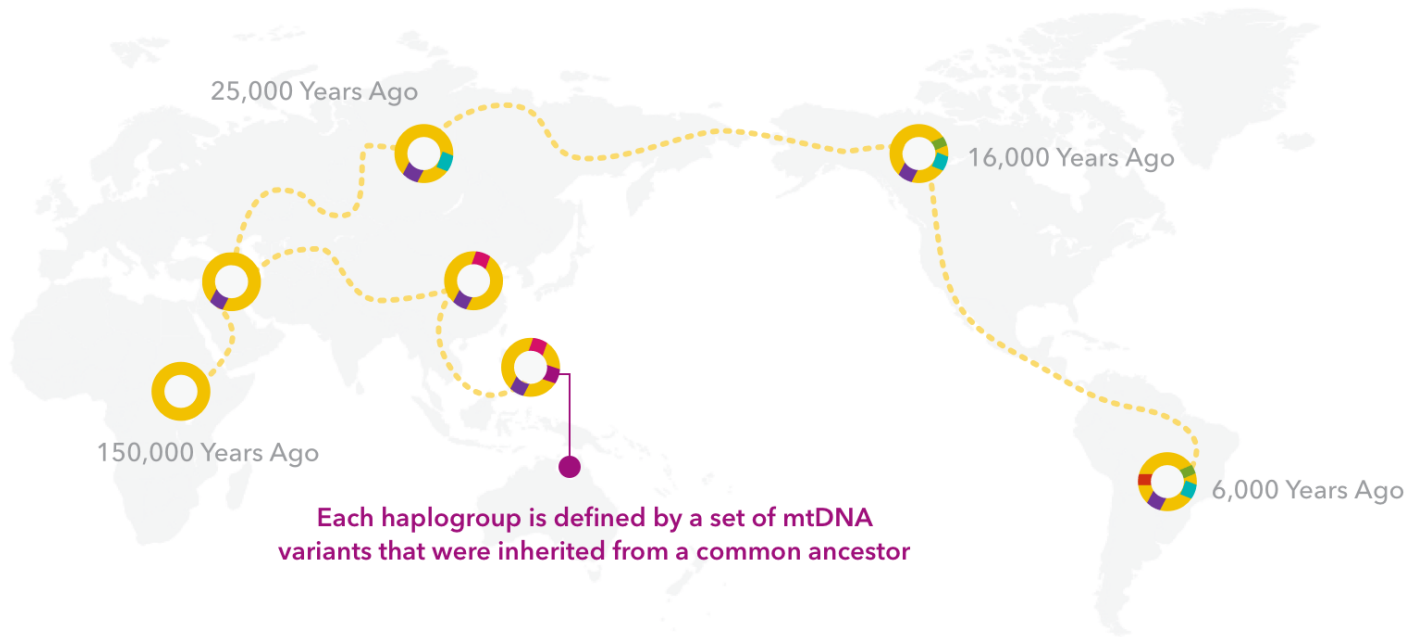
See your line in the tree of all maternal haplogroups.



### Tracing Female Migrations

Next, geneticists study the relationships between haplogroups and compare them with the distribution of each group around the world. Because closely related haplogroups tend to share geographic roots, researchers can play a sophisticated version of connect-the-dots to estimate the origins and migration patterns of particular haplogroups.

Finally, combining this genetic evidence with data from other fields of study helps researchers place the story of each maternal line within the broader context of human history.



## Do more with your Haplogroup results.

- Contribute to research and help us understand patterns of genetic variation around the world.
- Visit DNA Relatives to identify relatives that may be on your maternal line.
- Visit the Forums to meet other customers interested in discussing haplogroups.

## Scientific Details

### Your haplogroup is determined by your mitochondrial DNA.

Each generation, mothers pass down copies of their mitochondrial DNA (mtDNA) to their children. While most of your genome exists in 23 pairs of chromosomes that exchange pieces between generations in a process called recombination, mtDNA is transmitted unshuffled. Because of this unusual pattern of inheritance, mtDNA contains rich information about maternal lineages.

A small number of DNA changes, called mutations, generally occur from one generation to the next. Because mtDNA does not recombine between generations, these mutations accumulate in patterns that uniquely mark individual lineages. Scientists can compare the sequence differences that result by constructing a tree. This tree shows how maternal lineages relate to one another, including the observation that they all share a most recent common ancestor approximately 150,000 to 200,000 years ago.

The term "haplogroup" refers to a family of lineages that share a common ancestor and, therefore, a particular set of mutations. We identify your haplogroup by determining which branches of the mtDNA tree correspond to your DNA. Because more closely related lineages tend to share geographic roots, your haplogroup can provide insight into the origins of some of your ancient maternal-line ancestors.

Maternal haplogroups are named with sequences of letters and numbers that reflect the structure of the tree and how the branches relate to one another.

## References

1. Achilli A et al. (2007). "Mitochondrial DNA variation of modern Tuscans supports the near eastern origin of Etruscans." *Am J Hum Genet.* 80(4):759-68. [<https://www.ncbi.nlm.nih.gov/pubmed/17357081>]
2. Baig MM et al. (2004). "Mitochondrial DNA diversity in tribal and caste groups of Maharashtra (India) and its implication on their genetic origins." *Ann Hum Genet.* 68(Pt 5):453-60. [<https://www.ncbi.nlm.nih.gov/pubmed/15469422>]
3. Behar DM et al. (2012). "A "Copernican" reassessment of the human mitochondrial DNA tree from its root." *Am J Hum Genet.* 90(4):675-84. [<https://www.ncbi.nlm.nih.gov/pubmed/22482806>]
4. Bermisheva MA et al. (2004). "[Phylogeographic analysis of mitochondrial DNA Nogays: the high level of mixture of maternal lineages from Eastern and Western Eurasia]." *Mol Biol (Mosk).* 38(4):617-24. [<https://www.ncbi.nlm.nih.gov/pubmed/15456133>]
5. Bodner M et al. (2012). "Rapid coastal spread of First Americans: novel insights from South America's Southern Cone mitochondrial genomes." *Genome Res.* 22(5):811-20. [<https://www.ncbi.nlm.nih.gov/pubmed/22333566>]
6. Brandstätter A et al. (2007). "Migration rates and genetic structure of two Hungarian ethnic groups in Transylvania, Romania." *Ann Hum Genet.* 71(Pt 6):791-803. [<https://www.ncbi.nlm.nih.gov/pubmed/17532745>]
7. Chan EK et al. (2015). "Revised timeline and distribution of the earliest diverged human maternal lineages in southern Africa." *PLoS One.* 10(3):e0121223. [<https://www.ncbi.nlm.nih.gov/pubmed/25807545>]
8. Derbeneva OA et al. (2002). "Traces of early Eurasians in the Mansi of northwest Siberia revealed by mitochondrial DNA analysis." *Am J Hum Genet.* 70(4):1009-14. [<https://www.ncbi.nlm.nih.gov/pubmed/11845409>]
9. Fadhlouli-Zid K et al. (2004). "Mitochondrial DNA heterogeneity in Tunisian Berbers." *Ann Hum Genet.* 68(Pt 3):222-33. [<https://www.ncbi.nlm.nih.gov/pubmed/15180702>]
10. Fernandes V et al. (2012). "The Arabian cradle: mitochondrial relicts of the first steps along the southern route out of Africa." *Am J Hum Genet.* 90(2):347-55. [<https://www.ncbi.nlm.nih.gov/pubmed/22284828>]
11. Fu Q et al. (2016). "The genetic history of Ice Age Europe." *Nature.* 534(7606):200-5. [<https://www.ncbi.nlm.nih.gov/pubmed/27135931>]
12. González AM et al. (2003). "Mitochondrial DNA affinities at the Atlantic fringe of Europe." *Am J Phys Anthropol.* 120(4):391-404. [<https://www.ncbi.nlm.nih.gov/pubmed/12627534>]
13. Hill C et al. (2006). "Phylogeography and ethnogenesis of aboriginal Southeast Asians." *Mol Biol Evol.* 23(12):2480-91. [<https://www.ncbi.nlm.nih.gov/pubmed/16982817>]
14. Kayser M. (2010). "The human genetic history of Oceania: near and remote views of dispersal." *Curr Biol.* 20(4):R194-201. [<https://www.ncbi.nlm.nih.gov/pubmed/20178767>]
15. Kivisild T et al. (2004). "Ethiopian mitochondrial DNA heritage: tracking gene flow across and around the gate of tears." *Am J Hum Genet.* 75(5):752-70. [<https://www.ncbi.nlm.nih.gov/pubmed/15457403>]
16. López S et al. (2015). "Human Dispersal Out of Africa: A Lasting Debate." *Evol Bioinform Online.* 11(Suppl 2):57-68. [<https://www.ncbi.nlm.nih.gov/pubmed/27127403>]
17. Llamas B et al. (2016). "Ancient mitochondrial DNA provides high-resolution time scale of the peopling of the Americas." *Sci Adv.* 2(4):e1501385. [<https://www.ncbi.nlm.nih.gov/pubmed/27051878>]
18. Majumder PP. (2010). "The human genetic history of South Asia." *Curr Biol.* 20(4):R184-7. [<https://www.ncbi.nlm.nih.gov/pubmed/20178765>]

19. Malaspinas AS et al. (2016). "A genomic history of Aboriginal Australia." *Nature*. 538(7624):207-214. [https://www.ncbi.nlm.nih.gov/pubmed/27654914]
20. Malyarchuk BA et al. (2003). "Mitochondrial DNA variability in Bosnians and Slovenians." *Ann Hum Genet*. 67(Pt 5):412-25. [https://www.ncbi.nlm.nih.gov/pubmed/12940915]
21. Mellars P et al. (2013). "Genetic and archaeological perspectives on the initial modern human colonization of southern Asia." *Proc Natl Acad Sci U S A*. 110(26):10699-704. [https://www.ncbi.nlm.nih.gov/pubmed/23754394]
22. Metspalu M et al. (2004). "Most of the extant mtDNA boundaries in south and southwest Asia were likely shaped during the initial settlement of Eurasia by anatomically modern humans." *BMC Genet*. 5:26. [https://www.ncbi.nlm.nih.gov/pubmed/15339343]
23. Pereira L et al. (2000). "Diversity of mtDNA lineages in Portugal: not a genetic edge of European variation." *Ann Hum Genet*. 64(Pt 6):491-506. [https://www.ncbi.nlm.nih.gov/pubmed/11281213]
24. Plaza S et al. (2003). "Joining the pillars of Hercules: mtDNA sequences show multidirectional gene flow in the western Mediterranean." *Ann Hum Genet*. 67(Pt 4):312-28. [https://www.ncbi.nlm.nih.gov/pubmed/12914566]
25. Quintana-Murci L et al. (2004). "Where west meets east: the complex mtDNA landscape of the southwest and Central Asian corridor." *Am J Hum Genet*. 74(5):827-45. [https://www.ncbi.nlm.nih.gov/pubmed/15077202]
26. Richard C et al. (2007). "An mtDNA perspective of French genetic variation." *Ann Hum Biol*. 34(1):68-79. [https://www.ncbi.nlm.nih.gov/pubmed/17536756]
27. Richards M et al. (2000). "Tracing European founder lineages in the Near Eastern mtDNA pool." *Am J Hum Genet*. 67(5):1251-76. [https://www.ncbi.nlm.nih.gov/pubmed/11032788]
28. Rito T et al. (2013). "The first modern human dispersals across Africa." *PLoS One*. 8(11):e80031. [https://www.ncbi.nlm.nih.gov/pubmed/24236171]
29. Soares P et al. (2009). "Correcting for purifying selection: an improved human mitochondrial molecular clock." *Am J Hum Genet*. 84(6):740-59. [https://www.ncbi.nlm.nih.gov/pubmed/19500773]
30. Stoneking M et al. (2010). "The human genetic history of East Asia: weaving a complex tapestry." *Curr Biol*. 20(4):R188-93. [https://www.ncbi.nlm.nih.gov/pubmed/20178766]
31. Yao YG et al. (2004). "Different matrilineal contributions to genetic structure of ethnic groups in the silk road region in china." *Mol Biol Evol*. 21(12):2265-80. [https://www.ncbi.nlm.nih.gov/pubmed/15317881]

## Change Log

Your report may occasionally be updated based on new information. This Change Log describes updates and revisions to this report.

| Date          | Change  |
|---------------|---|
| May 8, 2017   | The standalone Maternal Haplogroup report was created, featuring new design elements and content. |
| Oct. 21, 2015 | Haplogroups report created.   |

John Campbell's Report, printed on 2020-09-07 UTC





© 2020 23andMe, Inc. All Rights Reserved.