

Jewish motifs  
Felice Bedford

Simple version

1) Our basic Sephardic/Converso T2e signature within T2e1 (T2e1a) from

Bedford, F. L. (2012) Sephardic Signature in Haplogroup T mitochondrial DNA. *European Journal of Human Genetics*, 20,4, 441-448 and

Bedford, F. L., Yacobi, D., Felix, G., & Garza, F. (2013). Clarifying mitochondrial DNA subclades of T2e from Mideast to Mexico. *Journal of Phylogenetics and Evolutionary Biology*, 2, 4, 1-8

**41C@ 2308G 15499T 16114T 16192T** (rCRS)

- We have identified at least 6 different branches with this basic motif
- Note only unique mutations within T2e1 are shown; for all mutations for each sequence, see the complete entries below (“Genbank entries”)
- Note the back mutation at position 41 from T to C (mutation from C to T at position 41 is defining for T2e1)
- This signature is found in Sephardim (Ottoman countries) and presumed Conversos in Mexico (Coahuila, Nuevo León, and Tamaulipas), USA, Brazil, Portugal.

2) Our basic Jewish (Sephardic/Ashkenazi) signature within T2e1 (T2e1b) from

Bedford, F. L., Yacobi, D., Felix, G., & Garza, F. (2013). Clarifying mitochondrial DNA subclades of T2e from Mideast to Mexico. *Journal of Phylogenetics and Evolutionary Biology*, 2, 4, 1-8

**9181G**

A prominent subclade (T2e1b1) has **9181G 15787C**

- We have identified a total of at least 7 branches with the basic motif.
- Note only unique mutations within T2e1 are shown; for all mutations for each sequence, see the complete entries below (“Genbank entries”)
- This signature is found in Ashkenazi and self-identified Sephardic Jewish individuals from a variety of different regions including Czech Republic, Lithuania, the Netherlands, Poland, and Romania. *We have never found it any non-Jewish individual.*

More details:

Below is table 2 from the 2013 paper showing the different branches of the two Jewish signatures. Bold refers to having 3 or more instances of the branch. Mannis van Oven of Phylotree accepted many of our bold labels for these subgroups for build 16, with one more coming for build 17, but for one branch, they have instead assigned an (in our opinion) erroneous label that will cause trouble down the line (our subclade T2e1a1a5, which we believe contains a back mutation and is not earlier in the tree as it may appear at first glance).

Haplogroup	Mutation positions
<b>T2e1a</b>	2308G
<b>T2e1a1</b>	15499T
<b>T2e1a1a</b>	41C@-16114T-16192T
T2e1a1a1	16221T
T2e1a1a2 *	16067T
T2e1a1a3 *	16291T
T2e1a1a4	195C
T2e1a1a5?	16114C@ ?
<b>T2e1a1b</b>	247A-4924A-8864C- 10682T-16183C-16189C
T2e1a1b1	6570T
T2e1a1c	736T-14180C-16189C
T2e1a2	3744G-7828G-16093C
<b>T2e1b</b>	9181G
<b>T2e1b1</b>	15787C
T2e1b1a	13696G-13803T-13945G
T2e1b1b	215R**
T2e1b2	195Y**
T2e1b3	10321C-13148T
T2e1b4	4936Y**

**From Table 2 in Bedford, F. L., Yacobi, D., Felix, G., & Garza, F. (2013). Clarifying mitochondrial DNA subclades of T2e from Mideast to Mexico. *Journal of Phylogenetics and Evolutionary Biology*, 2, 4, 1-8**

## Abstracts for the papers

**Bedford, F. L., Yacobi, D., Felix, G., & Garza, F. (2013). Clarifying mitochondrial DNA subclades of T2e from Mideast to Mexico. *Journal of Phylogenetics and Evolutionary Biology*, 2, 4, 1-8**

<http://www.esciencecentral.org/journals/clarifying-mitochondrial-dna-subclades-of-te-from-mideast-to-mexico-2329-9002-1-121.php?aid=20717>

### Abstract

We report on two of the oldest mitochondrial DNA clusters in existence with Jewish affiliation. Both are in haplogroup T2e1. Four unrelated individuals from the Mexico mtDNA project were found to have the control region mutations that characterize a Sephardic signature previously reported (motif 16114T-16192T within T2e). Full genomic sequencing found the identical coding region mutations as Sephardic individuals which provides genetic evidence for founders of Northern Mexico that were both female and Sephardic Jewish. This is in contrast to a more common finding of European male, but local female founders and additionally lends biological support to anecdotes and historical reports of Crypto-Jewish founding of the Coahuila, Nuevo León, and Tamaulipas regions of Mexico and influx to Southern Texas, USA. The haplotype is nested in an old tree with mutations at positions 2308 and 15499, presently of uncertain geographic origin. The second cluster, a Bulgarian Sephardic founding lineage (9181G within T2e) previously reported, was found here in a population of largely Americans of European descent, but only among Jewish individuals. The non-synonymous mutation in ATPase 6 was found among both Ashkenazi and Sephardic Jews from diverse regions of Czech Republic, Lithuania, the Netherlands, Poland, and Romania. Full genomic sequencing found great coding region variability with several haplotypes and suggested a Near East origin at least 3000 years old. This predates the split between Jewish groups, but more recent admixture between Sephardim and Ashkenazim cannot be ruled out. Together the two Jewish-affiliated clusters account for all the genetic distance found in branch T2e1 and much of T2e. The findings suggest reexamination of the origins of mitochondrial DNA haplogroup T2e as Levantine or early back migration to the Near East. New subclades of T2e are identified.

**Bedford, F. L. (2012) Sephardic Signature in Haplogroup T mitochondrial DNA. *European Journal of Human Genetics*, 20,4, 441-448. (DOI: 10.1038/ejhg.2011.200) <http://www.nature.com/doifinder/10.1038/ejhg.2011.200>**

A rare combination of mutations within mitochondrial DNA subhaplogroup T2e is identified as affiliated with Sephardic Jews, a group that has received relatively little attention. Four investigations were pursued: Search of the motif in 250 000 control region records across 8 databases, comparison of frequencies of T subhaplogroups (T1, T2b, T2c, T2e, T4, T\*) across 11 diverse populations, creation of a phylogenic median-joining network from public T2e control region entries, and analysis of one Sephardic mitochondrial full genomic sequence with the motif. It was found that the rare motif belonged only to Sephardic descendents (Turkey, Bulgaria), to inhabitants of North American regions known for secret Spanish–Jewish colonization, or were consistent with Sephardic ancestry. The incidence of subhaplogroup T2e decreased from the Western Arabian Peninsula to Italy to Spain and into Western Europe. The ratio of sister subhaplogroups T2e to T2b was found to vary 40-fold across populations from a low in the British Isles to a high in Saudi Arabia with the ratio in Sephardim more similar to Saudi Arabia, Egypt, and Italy than to hosts Spain and Portugal. Coding region mutations of 2308G and 14499T may locate the Sephardic signature within T2e, but additional samples and reworking of current T2e phylogenetic branch structure is needed. The Sephardic Turkish community has a less pronounced founder effect than some Ashkenazi groups considered singly (eg, Polish), but other comparisons of interest await comparable averaging. Registries of signatures will benefit the study of populations with a large number of smaller-size founders.

**Non specialist summary of the mexico paper by Bedford, Yacobi, Felix, and Garza**  
appearing in

Bedford, F. L. (Dec. 22, 2013). Announcement of a new publication on Sephardic genetics.  
*eSefarad: Noticias del Mundo Sefaradi* <http://esefarad.com/?p=52355>

We found that a number of people living in parts of Mexico can be traced to a Sephardic woman. The woman appears to have come from Spain, most likely in the early 1600s at the founding of Mexican communities. She undoubtedly would have been a *converso* or crypto Jew, since outright practice of Judaism was forbidden even far from the homeland in New Spain. The evidence is based on an exact match in the DNA (the mitochondrial DNA, specifically) of contemporary Mexicans to known Sephardic individuals who trace their migration from Spain and Portugal to Ottoman Empire regions, including Turkey and Bulgaria. The regions of Mexico involved are Coahuila, Nuevo León, and Tamaulipas and South Texas in the United States. These are regions where there are numerous anecdotal and historical reports of Sephardic founders. Our work provides firm genetic evidence that indeed these stories are true. Moreover, it shows that Sephardic women were ancestors of the contemporary population, not just men. Genetic studies have more commonly found that European men and local women were the founders of many new communities. These regions of Mexico may be a European female founder hotspot. I like knowing that Sephardic DNA lives on, even when the people themselves do not preserve - or not even know of - their Sephardic heritage.

We have also found another Jewish signature within mitochondrial DNA, this one present in both Sephardic and Ashkenazi Jews. Our population here was fr Americans and strikingly, only Jewish people were found to have this variant. In addition, due to a lot of different patterns of this same basic type, the signature appears to be an ancient one that may predate the split between different Jewish groups. It may be traceable back to original Jewish tribes, if not before. It's mind bending to imagine the DNA working its way virtually unchanged as it left the Near East and dispersed eventually throughout Europe, including Bulgaria, Romania, Czech Republic, Poland, and Russia to name some of the places where we found this signature. The variant is an unusual one found only in this group that affects the ATP or energy of cells; whether this variant gave some survival advantage to Jewish individuals who possessed it has yet to be determined.

Both of these Jewish calling-cards can be found in a very specific subclade of mitochondrial DNA known as mitochondrial haplogroup T2e. For all the fun technical and other details, please refer to the article.

**Genbank entries** for the sequences in these T2e articles in rCRS format  
Note we put all these sequences on Genbank as authored by both us and by FTDNA.

**Bedford, F. L., Yacobi, D., Felix, G., & Garza, F. (2013). Clarifying mitochondrial DNA subclades of T2e from Mideast to Mexico. *Journal of Phylogenetics and Evolutionary Biology*, 2, 4, 1-8**

<http://www.esciencecentral.org/journals/clarifying-mitochondrial-dna-subclades-of-te-from-mideast-to-mexico-2329-9002-1-121.php?aid=20717>

KF657641(Mexico) Bedford ,Yacobi, Felix, & Garza T2e1a1a 29-SEP-2013 A73G C150T A263G 309.1C 315.1C G709A A750G A1438G G1888A A2308G A2706G T4216C A4769G A4917G C7028T G8697A A8860G T10463C A11251G G11719A A11812G G13368A A14233G C14766T G14905A A15326G C15452A C15499T A15607G G15928A T16126C G16153A C16192T C16294T T16519C

KF577587 (Mexico) Bedford ,Yacobi, Felix, & Garza T2e1a1a1 30-SEP-2013 A73G C150T A263G 309.1C 315.1C G709A A750G A1438G G1888A A2308G A2706G T4216C A4769G A4917G C7028T G8697A A8860G T10463C A11251G G11719A A11812G G13368A A14233G C14766T G14905A A15326G C15452A C15499T A15607G G15928A C16114T T16126C G16153A C16192T C16294T T16519C

KF577589 (south texas, USA) Bedford ,Yacobi, Felix, & Garza T2e1a1a1 30-SEP-2013 A73G C150T A263G 309.1C 315.1C G709A A750G A1438G G1888A A2308G A2706G T4216C A4769G A4917G C7028T G8697A A8860G T10463C A11251G G11719A A11812G G13368A A14233G C14766T G14905A A15326G C15452A C15499T A15607G G15928A C16114T T16126C G16153A C16192T C16294T T16519C

KJ188254(Mexico) Bedford ,Yacobi, Felix, & Garza T2e1a1a1 24-FEB-2014 A73G C150T T195C A263G 309.1C 315.1C G709A A750G A1438G G1888A A2308G A2706G T4216C A4769G A4917G C7028T G8697A A8860G T10463C A11251G G11719A A11812G G13368A A14233G C14766T G14905A A15326G C15452A C15499T A15607G G15928A C16114T T16126C G16153A C16192T C16294T T16519C

KF048033.1 (Netherlands) Bedford ,Yacobi, Felix, & Garza T2e1b 25-MAY-2013 C41T A73G C150T A263G 309.1C 309.2C 315.1C G709A A750G A1438G G1888A A2706G T4216C A4769G A4917G C7028T G8697A A8860G A9181G T10463C A11251G G11719A A11812G G13368A A14233G C14766T G14905A A15326G C15452A A15607G G15928A T16126C G16153A C16294T T16519C

KF564292 (Jewish) Bedford ,Yacobi, Felix, & Garza T2e1b 30-SEP-2013 C41T A73G C150T T195Y A263G 309.1C 315.1C G709A A750G A1438G G1888A A2706G T4216C A4769G A4917G C7028T G8697A A8860G A9181G T10463C A11251G G11719A A11812G G13368A A14233G C14766T G14905A A15326G C15452A A15607G G15928A T16126C G16153A C16294T T16519C

KF577588 (Ashkenazi) Bedford ,Yacobi, Felix, & Garza T2e1b 30-SEP-2013 C41T A73G C150T A263G 309.1C 315.1C G709A A750G A1438G G1888A A2706G T4216C A4769G

A4917G C7028T G8697A A8860G A9181G T10463C A11251G G11719A A11812G G13368A  
A14233G C14766T G14905A A15326G C15452A A15607G G15928A T16126C G16153A  
C16294T T16519C

KF577586 (Ashkenazi) Bedford, Yacobi, Felix, & Garza T2e1b1 30-SEP-2013 C41T A73G  
C150T A215R A263G 309.1C 309.2C 315.1C G709A A750G A1438G G1888A A2706G  
T4216C A4769G A4917G C7028T G8697A A8860G A9181G T10463C A11251G G11719A  
A11812G G13368A A14233G C14766T G14905A A15326G C15452A A15607G T15787C  
G15928A T16126C G16153A C16294T T16519C

KF564289 (Romania-Sephardic) Bedford, Yacobi, Felix, & Garza T2e1b1 05-NOV-2013 C41T  
A73G C150T A263G 309.1C 309.2C 315.1C G709A A750G A1438G G1888A A2706G T4216C  
A4769G A4917G C7028T G8697A A8860G A9181G T10463C A11251G G11719A A11812G  
G13368A A14233G C14766T G14905A A15326G C15452A A15607G T15787C G15928A  
T16126C G16153A C16294T T16519C

KF564293 (Ashkenazi, Czech republic) Bedford, Yacobi, Felix, & Garza C41T A73G C150T  
A263G 309.1C 309.2C 315.1C G709A A750G A1438G G1888A A2706G T4216C A4769G  
A4917G C7028T G8697A A8860G A9181G T10463C A11251G G11719A A11812G G13368A  
A14233G C14766T G14905A A15326G C15452A A15607G G15928A T16126C G16153A  
C16294T T16519C

KM007555 (The Netherlands) Bedford, Yacobi, Felix, & Garza T2e1a1 C41T A73G C150T  
G247A A263G 315.1C G709A A750G A1438G G1888A A2308G A2706G T4216C A4769G  
A4917G G4924A C6570T C7028T G8697A A8860G T8864C T10463C A10682T A11251G  
G11719A A11812G G13368A A14233G C14766T G14905A A15326G C15452A C15499T  
A15607G G15928A T16126C G16153A A16183- T16189C 16193.1C C16294T T16519C

**Bedford, F. L. (2012) Sephardic Signature in Haplogroup T mitochondrial DNA. *European Journal of Human Genetics*, 20,4, 441-448. (DOI: 10.1038/ejhg.2011.200)**  
<http://www.nature.com/doi/10.1038/ejhg.2011.200>

JN819272 (Turkey Sephardic) Bedford T2e1a1a1 28-NOV-2011 A73G C150T A263G  
309.1C 315.1C G709A A750G A1438G G1888A A2308G A2706G T4216C A4769G A4917G  
C7028T G8697A A8860G T10463C A11251G G11719A A11812G G13368A A14233G C14766T  
G14905A A15326G C15452A C15499T A15607G G15928A C16114T T16126C G16153A  
C16192T C16221T C16294T T16519C

JN828512 Bedford T2e1a1 08-NOV-2011 C41T A73G C150T G247A A263G  
315.1C G709A A750G A1438G G1888A A2308G A2706G T4216C A4769G A4917G G4924A  
C7028T G8697A A8860G T8864C T10463C A10682T A11251G G11719A A11812G G13368A  
A14233G C14766T G14905A A15326G C15452A C15499T A15607G G15928A T16126C  
G16153A A16183- T16189C 16193.1C C16294T T16519C