

Instructions for extracting mitochondrial DNA sequences from the Sorenson Molecular Genealogy Foundation mitochondrial DNA database

1. Go to the Sorenson Molecular Genealogy Foundation's list of the top 50 mutations found at [http://www.smgf.org/mtdna/common\\_mutations.aspx](http://www.smgf.org/mtdna/common_mutations.aspx).
2. Print off the list of the 50 mutations shown on that page and save it for reference. It would be best if you were to copy the table that lists the 50 mutations into Excel or some other similar spreadsheet program and then sort the table by the "Location" column before you print the table.
3. Go to the Sorenson Molecular Genealogy Foundation mitochondrial DNA database at <http://www.smgf.org/mtdna/search.aspx>.
4. In the "Parameters" box select the DNA testing company as "Relative Genetics".
5. In the "Parameters" box click on the boxes in front of "HVR1", "HVR2", and "HVR3" on the line where you are asked to select the HV (hypervariable) region.
6. In the "Parameters" box select "Search by Surname" and enter the Mennonite surname you are planning to search for. Bear in mind that you need to enter the surname of a maternal grandmother, great grandmother, or great great grandmother who was born prior to 1906 of the person for whom you are trying to extract the results for. You don't need to enter the surname of the earliest known maternal ancestor. Any of the surnames of a maternal ancestor will work as long as the ancestor was born prior to 1906 and as long as that person's results are currently in the database.
7. In the "Parameters" box click on the boxes in front of "All Maternal-line Surnames" on the line where you are asked to whether the display results should include the country and/or all of the maternal line surnames. It is not necessary to click on the box in front of "Country" in order to extract the data, but you can also click on this box if you are so inclined.
8. In the "Values" box click on "Clear Values".
9. Click on the "Search" button at the bottom of the screen.
10. If a person (or persons) of Mennonite ancestry with the surname you are searching for has mitochondrial DNA data in the SMGF database a screen should appear that says "Mitochondrial Search Results" and a row of blue numbers arranged vertically will be shown. There will be a row of purple boxes beneath these numbers. The numbers shown on the screen are the locations on the mitochondrial DNA loop for each base in that person's mitochondrial DNA that differs from the Cambridge Reference Sequence. Most of the numbers will be whole numbers, but some numbers (such as 901.1) will not be whole numbers. When a number such as 901.1 appears this indicates that there is an insertion of an extra base at that location in the person's mitochondrial DNA that doesn't appear in the Cambridge Reference Sequence.
11. Click on the small button that looks like a small pedigree chart on the left side of the screen just below "Pedigree" for each person whose surname matches the surname of the person you are searching for until you have found the pedigree chart of the person you would like to extract the mitochondrial DNA results for.
12. Close the pedigree screen.
13. Record in a spreadsheet or elsewhere the numbers appearing in blue for which there is a purple box beneath the number in the row of the person for whom you would like to extract the results on the "Mitochondrial Search Results" screen. Also make note of the capital letters that appear in gray beneath each of the numbers that you recorded.
14. Click on the "Search Again" button, which should take you back to the "Search the Mitochondrial Database" screen.
15. In the "Values" box enter the numbers you recorded in Step #13. You must place each number into the appropriate HVR section. For instance, if you recorded 16189 in Step #13 you need to enter this number in one of the boxes under HVR1. If you recorded 257 in Step #13 you need to enter this number in one of the boxes under HVR2. In similar fashion enter all of the numbers you recorded in Step #13 in the appropriate HVR section. The background will appear red for each of the boxes at this point. If the numbers 523 or 524 were among the numbers recorded in Step #13 then enter "523d" and/or "524d" into the "Values" box. These are likely deletions.
16. Review the list of the top 50 mutations mentioned in Steps #1 and #2. Attempt to find each number you entered in the "Values" box in Step #14. If the number in the "Values" box is found in the list of the top 50 mutations enter the capital letter of the base that location has mutated to in

the "Values" box after the appropriate number. For instance, if you entered 16189 in the "Values" box in the HVR1 section then enter "C" after "16189" in the "Values" box in the HVR1 section. In similar fashion enter the appropriate capital letter of the base that location has mutated to after each number that appears in the "Values" box. The background in each box should change from red to white if you have entered the number of the location and its corresponding base correctly. If all the numbers in the "Values" box appear in the list of the top 50 mutations then skip Step #17 and go to Step #18.

17. If some numbers that you have entered in the "Values" box have no corresponding mutation mentioned in the list of the top 50 mutations, then you need to guess as to what the base that location mutated to. If the letter of the base found in gray underneath the number as referred to in Step #13 was a "C" then enter "T" after the number in the "Values" box. If the letter of the base found in gray underneath the number as referred to in Step #13 was a "T" then enter "C" after the number in the "Values" box. If the letter of the base found in gray underneath the number as referred to in Step #13 was an "A" then enter "G" after the number in the "Values" box. If the letter of the base found in gray underneath the number as referred to in Step #13 was a "G" then enter "A" after the number in the "Values" box. These guesses will be right at least 80% of the time.
18. Click on the "Search" button again.
19. Record in a spreadsheet or elsewhere the letters of the bases for the numbers which match for each of the numbers that appear on the screen for the person you are extracting the data for. The bases for the numbers which match will have a pink box beneath them in the row of boxes. If there are still some numbers that don't have a matching base the boxes underneath them will still appear in purple. If all of the boxes in the row have changed to pink then you have completed the extraction of the data for that person. If one or more of the boxes is still purple continue with Steps #20 to #27 until all the boxes have changed to pink.
20. Click on the "Search Again" button, which should take you back to the "Search the Mitochondrial Database" screen.
21. Change the letter of the base for any of the numbers in the "Values" box for which the base did not match on the last search. If you tried using "T" after the number in the "Values" box in the last search but this was not correct, then enter "A" after the number in the "Values" box instead. If you tried using "C" after the number in the "Values" box in the last search but this was not correct, then enter "G" after the number in the "Values" box instead. If you tried using "G" after the number in the "Values" box in the last search but this was not correct, then enter "C" after the number in the "Values" box instead. If you tried using "A" after the number in the "Values" box in the last search but this was not correct then enter "T" after the number in the "Values" box instead. Don't change the letters after the numbers for any of the numbers where there was a correct match in the previous search.
22. Click on the "Search" button again.
23. When the "Mitochondrial Search Results" screen appears make note of any additional numbers for which there is a matching base as indicated by the box for that number changing from purple to pink. If all of the numbers now have pink boxes then the sequence has been completely extracted. If one or more numbers still don't match as indicated by a purple box for one or more of the markers go to Step #24.
24. Click on the "Search Again" button, which should take you back to the "Search the Mitochondrial Chromosome Database" screen.
25. Once again, change the letter of the base for any of the numbers in the "Values" box that did not match on the last search. If you tried using "T" after the number in the "Values" box in the last search but this was not correct, then enter "C" after the number in the "Values" box instead. If you tried using "C" after the number in the "Values" box in the last search but this was not correct, then enter "T" after the number in the "Values" box instead. If you tried using "G" after the number in the "Values" box in the last search, but this was not correct then enter "A" after the number in the "Values" box instead. If you tried using "A" after the number in the "Values" box in the last search but this was not correct then enter "G" after the number in the "Values" box instead. Don't change the letters after the numbers for any of the numbers where there was a correct match.
26. Click on the "Search" button again.

27. When the "Mitochondrial Search Results" screen appears make note of any additional numbers for which there is a matching base as indicated by the box for that number changing from purple to pink. At this point all the boxes in the row you are searching should appear in pink. If not, you must have made an error in one of the steps. No more than 4 searches should be required to extract all the mitochondrial DNA data for any one person. If you can't figure out the base for one or more of the numbers in any given person's sequence contact Glenn Penner or Tim Janzen for additional assistance.
28. The results for some people in the SMGF mitochondrial database may be incomplete if the SMGF hasn't yet tested all 1121 bases in the 3 hypervariable regions of that person's mitochondrial DNA. At this time the SMGF has tested over 80% of the 1121 bases in the hypervariable regions of the mitochondrial DNA for the people found in the mitochondrial DNA database. It will be necessary to check the mitochondrial database a year or two later to make sure that there aren't additional bases in that person's mitochondrial DNA that differ from the Cambridge Reference Sequence if the SMGF hadn't tested all 1121 bases in the 3 hypervariable regions at the time the database was first checked for any given person's results.
29. If you know at least some of the bases that differ from the Cambridge Reference Sequence for the person you are trying to determine the data for from another source (such as Family Tree DNA or another lab), then enter the numbers of the locations and their corresponding bases you know from that source in the "Values" box in the appropriate HVR sections. If you do the search using results from Family Tree DNA as the basis for your initial search then make sure that you set the lab standard to "Family Tree DNA" in the "Parameters" box on the main search screen at <http://www.smgf.org/mtdna/search.jspx>.
30. Bear in mind that the Sorenson Molecular Genealogy Foundation web site only allows you to do 20 searches of the mitochondrial database per day. Thus, if you have exhausted your 20 searches on a particular day you must wait 24 hours to do additional searches to complete your extraction of the results for a specific person.