THE TIMES OF ISRAEL | www.timesofisrael.com

The 'road map' in your DNA

Researchers in Israel and California have come up with a way to figure out who you really are, and where you are really from

By DAVID SHAMAH | August 26, 2012, 10:26 am |

Scientists at Tel Aviv University have discovered yet another use for DNA, beyond catching criminals or diagnosing diseases: Your DNA is actually a "road map" of the geographical movement of your ancestors. The term "genetic mapping" can now be used to refer not only to the makeup of a person's DNA, but the spot on the globe where that DNA originates.

A study published in the journal Nature Genetics based on research by Prof. Eran Halperin and a team from UCLA describes the methodology, which involves evaluating points in the human genome called SNPs that are manifested differently in each individual. These points mutated sometime in the past and the mutation was then passed to a large part of the population in a particular geographic region. Thus, by studying the mutations in the genes of people in current generations, it is possible to see where their ancestors hail from, Halperin said.

"It's true that many people have family traditions that recall their lives in the 'old country,' but many people don't," Halperin told The Times of Israel. "But there's no guarantee that those traditions are accurate."

Besides that, with today's nuclear-family lifestyle, the traditions of the extended family are often forgotten, and perhaps even more often misremembered. "Even young people know that their families originated from Africa, Asia, or Europe, but that's often all they know. In many cases, especially in places like the US, parents and grandparents have only a very general idea of their family traditions.

"We wanted to ask, for example, about the probability of having the genetic mutation 'A' in a particular position on the genome based on geographical coordinates," Halperin said. "When you look at many of these positions together in a bigger picture, it's possible to group populations with the same mutation by point of origin."

To test the system, Halperin and his fellow researchers studied DNA samples from 1,157 people from across Europe. Using a probabilistic mathematical algorithm based on mutations in the genome, they were able to accurately determine their ancestral point or points of origin using only DNA data and the new mathematical model, unraveling genetic information to ascertain two separate points on the map for the mother and father. The daat is accurate to within several hundred kilometers, which may or may not be a wide swath, depending on the region.

"In Spain, you could be within the same region even within an area of a few hundred kilometers,

but in Holland, for example, you would be in another country," he said.

Nevertheless, the method should make it possible to track down ancestry even more accurately, especially if and when genetic anomalies that represent a particular region, or perhaps even a village, are discovered.

Another current limitation is how far back the method works. "Our experiment was based on going back a single generation, which was easy to corroborate. We believe that we can extend the method to examine ancestry going back even four and five generations, however."

Success will depend, in part, on the DNA being analyzed, the population group, and the computational power being applied.

Will this do anyone any good, other than enabling people to more accurately proclaim where they are from? Halperin believes it will. The new method could provide information that has applications in population genetic studies, such as studying a disease that impacts a particular group, Halperin said. Researchers will also be able to track changes in different genomic traits across a map, such as the tendency for southern Europeans to have a mutation in a gene that causes lactose intolerance, a mutation missing from that gene in northern Europeans.

And the system could eventually be used to analyze DNA from thousands of years ago, to get a better idea of migration patterns in the ancient world, and how people ended up where they are. Besides, said Halperin, "this is a great application of DNA information. It's interesting in and of itself."

Halperin is from Tel Aviv University's Blavatnik School of Computer Science and Department of Molecular Microbiology and Biotechnology.