

## New Light on Origins of Ashkenazi in Europe

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A new look at the DNA of the Ashkenazi Jewish population has thrown light on its still mysterious origins.

Until now, it had been widely assumed by geneticists that the Ashkenazi communities of Northern and Central Europe were founded by men who came from the Middle East, perhaps as traders, and by the women from each local population whom they took as wives and converted to Judaism.

But the new study, published online this week in *The American Journal of Human Genetics*, suggests that the men and their wives migrated to Europe together.

The researchers, Doron Behar and Karl Skorecki of the Technion and Ramban Medical Center in Haifa, and colleagues elsewhere, report that just four women, who may have lived 2,000 to 3,000 years ago, are the ancestors of 40 percent of Ashkenazis alive today. The Technion team's analysis was based on mitochondrial DNA, a genetic element that is separate from the genes held in the cell's nucleus and that is inherited only through the female line. Because of mutations - the switch of one DNA unit for another - that build up on the mitochondrial DNA, people can be

Looking at other populations, the Technion team found that some people in Egypt, Arabia and the Levant also carried the set of mutations that defines one of the four women. They argue that all four probably lived originally in the Middle East.

A study by Michael Hammer of the University of Arizona showed five years ago that the men in many Jewish communities around the world bore Y chromosomes that were Middle Eastern in origin. This finding is widely accepted by geneticists, but there is less consensus about the women's origins.

David Goldstein, now of Duke University, reported in 2002 that the mitochondrial DNA of women in Jewish communities around the world did not seem to be Middle Eastern, and indeed each community had its own genetic pattern. But in some cases the mitochondrial DNA was closely related to that of the host community.

Dr. Goldstein and his colleagues suggested that the genesis of each Jewish community, including the Ashkenazis, was that Jewish men had arrived from the Middle East, taken wives from the host population and converted them to Judaism, after which there was no further intermarriage with non-Jews.

The Technion team suggests a different origin for the Ashkenazi community: if the women too are Middle Eastern in origin, they would presumably have accompanied their husbands. At least the Ashkenazi Jewish community might have been formed by families migrating together.

Dr. Hammer said the new study "moves us forward in trying to understand Jewish population history." His own recent research, he said, suggests that the Ashkenazi population expanded through a series of bottlenecks - events that squeeze a population down to small numbers - perhaps as it migrated from the Middle East after the destruction of the Second Temple in A.D. 70 to Italy, reaching the Rhine Valley in the 10th century.

But Dr. Goldstein said the new report did not alter his previous conclusion. The mitochondrial DNA's of a small, isolated population tend to change rapidly as some lineages fall extinct and others become more common, a process known as genetic drift. In his view, the Technion team has confirmed that genetic drift has played a major role in shaping Ashkenazi mitochondrial DNA. But the linkage with Middle Eastern populations is not statistically significant, he said.

Because of genetic drift, Ashkenazi mitochondrial DNA's have developed their own pattern, which makes it very hard to tell their source. This differs from the patrilineal case, Dr. Goldstein said, where there is no question of a Middle Eastern origin.