New genetic data show “Back to Africa” migration in Neolithic times

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Newly reported human DNA from a cave in Ethiopia supports previous evidence that a major migration of Eurasians back to Africa occurred sometime between 3,000 and 4,000 years ago (Llorente et al., “Ancient Ethiopian genome reveals extensive Eurasian admixture throughout the African continent,” *Science*, 12 October 2015). The study by an international team of 19 researchers was based on a genetic sample from a human skeleton, the remains of a hunter-gatherer man, found in a cave, known as Mota, in highland Ethiopia.

The man lived approximately 4,500 years ago, based on radiocarbon assay. Genetic analysis demonstrated that “Mota Man” was closely related to the modern Ari population living in the same area. The particular importance of this find is that it yielded no indication of Eurasian genetic admixture. It lacks 4 to 7 percent of the genetic material found in modern Ari. This result provides firmer dating for previous evidence that a significant “backflow” of people into Africa occurred after the original “Out of Africa” migration of modern humans more than 40,000 years ago.

Until now, the study of ancient human DNA has largely been restricted to samples from temperate and Arctic regions, due to the generally poorer preservation of the molecule in hot and humid climates. Consequently, the genetic history of humans in Africa has, heretofore, had to rely on extrapolations based on the characteristics of very recent populations. The Mota specimen, recovered from a dry, high-altitude cave, retained its DNA and thus affords a datable “baseline” for geographic and chronological comparisons.

It has long been known that Neolithic farmers from the Near East and Anatolia, where agriculture had developed following the end of the last glacial period, roughly 10,000 years ago, had moved into Europe around 8,000 years ago. It was also known that a similar migration had taken place into Africa, based on the presence of Eurasian genes in modern African populations. However, the timing and scale of this movement were poorly understood.

By using the DNA from the Mota specimen, which had no indication of Eurasian genes, researchers drew the conclusion that the backflow had to have occurred later than its age of 4,500 years ago, thus supporting the previous estimates for this migration event dated back to between 4,000 and 3,000 years ago.

In addition, the researchers conducted further genetic studies on contemporary African populations. This analysis demonstrates that, although the Eurasian admixture was greatest in East Africa (i.e., closest to the Near East), it reached all the way into western and southern Africa as well. Furthermore, they found that the genetic contribution from the immigrants overall was greater than had previously been thought. Even relatively isolated African populations, such as the Yoruba and Mbuti, had 7 percent and 6 percent Eurasian admixture, respectively.

This new evidence complicates the use of modern African genomes as a “baseline” to define the ancestral genetic makeup of modern humans. Africa was the “cradle” of anatomically modern humans, at least 80,000 to 100,000 years ago. They began to migrate into Eurasia more than 40,000 years ago. Subsequent population movements within Eurasia are known to have taken place, based on archaeological, genetic, and linguistic data.

Among the principal motivators of such migrations was the development of agriculture in the Near East, Southeast Asia, and elsewhere. The growing populations permitted by farming would have, over time, prompted territorial expansion in the search for additional fertile land, subsuming or displacing resident

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hunter-gatherers or those with less productive agricultural practices in Europe, interior Asia, and Africa.

The new findings do not necessarily indicate that Eurasian individuals themselves spread across the whole of Africa. More likely, the actual movement of people was confined to the northeastern part of the continent, where the highest proportions of Eurasian genes are found. Subsequent internal migrations or interactions between resident populations would have spread the new genes to the rest of the continent. However, the relatively high proportion of foreign genetic material even in the farthest reaches of Africa implies the movement of large numbers of individuals. This process may also have spread new agricultural crops, though agriculture was already being practiced there.

In recent years, DNA analysis has demonstrated that as modern humans moved into Eurasia they intermingled with resident populations, including Neanderthals. Modern Eurasians contain a small component, 2 to 3 percent, of Neanderthal DNA, while modern Africans were said to have none. The research by Llorente and his colleagues found that there is, in fact, a minute, yet detectable percentage of Neanderthal genetic material present in post-reflux African populations. This further supports the interpretation that some modern humans, having spent time in Eurasia and intermingling with the existing populations there, returned to Africa and contributed genetically to the modern population of that continent.

Using a single genetic sample to characterize the modern human African genome prior to the Eurasian "reflux" should be viewed with some caution. The authors recommend that even earlier African genetic samples should be sought to further elucidate the history of ancient human migrations.

In addition to its valuable scientific contribution, these new data and analysis reinforce the understanding of the overwhelming genetic unity of modern humans. From the beginning of the genus *Homo*, adaptation to new environments, increasingly permitted by technological and other cultural innovations, has led humans to move across the landscape and eventually populate the globe. The movement of populations and the genetic intermixing that inevitably followed were accelerated by the development of agriculture. The Mota study is a reminder that this movement did not take place only in one direction or at a single time.

The relatively minor genetic diversity that exists among humans in modern times is merely a momentary "snapshot," a slice in time, which is the result of millennia of mixing and remixing of populations, a mosaic produced by the dialectic of stability and change. The variations in skin color and other superficial characteristics we currently observe are far outweighed by this fundamental genetic unity.

This new study once again demonstrates that racist ideas alleging the existence of significant biological and intellectual differences between different human populations, supposedly based on long-standing genetic differentiation, have no scientific support.

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