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Africans Have World's Highest Genetic Diversity, Study Finds

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Africans are more genetically diverse than the inhabitants of the rest of the world combined, according to a sweeping study that carried researchers into remote regions to sample the bloodlines of more than 100 distinct populations.

The report, published yesterday in the journal *Science Express*, suggests that, because of historical migrations and genetic mixing across the continent, it will be hard for African Americans to trace their ancestry in fine detail. African American genealogies are increasingly popular and commercialized, but the authors of the new study cast doubt on how precise such searches can be, given the complexity of the genetic makeup of Africans.

"It may be very challenging to trace back ancestry to particular tribes or ethnic groups," said Sarah Tishkoff, a University of Pennsylvania geneticist who led the international research team.

The first anatomically modern humans originated in Africa about 200,000 years ago, and all humans today are their direct descendants. The study points to an area along the Namibia-South Africa border, the homeland of the San people, as the starting point for a southwest-to-northeast migratory route that carried people through Africa and across the Red Sea into Eurasia.

Tishkoff said the new findings will help medical researchers tailor drug treatments for different groups of Africans rather than treating them as homogenous.

"This is an absolute landmark. It's incredible," said Alison Brooks, a professor of anthropology and international affairs at George Washington University. "It's the most comprehensive document ever published describing the very complex issue of African genetic variation." She added, "There's been so much genetic analysis that's been so Eurocentric."

Tishkoff, who until last year was a professor at the University of Maryland, did much of her fieldwork in remote areas reachable only with four-wheel-drive vehicles. She had to haul centrifuges, for processing blood samples, into villages without electricity, often running her devices by connecting them to her car battery.

"Some people had never seen a fair-skinned person before," Tishkoff said. "Many of these groups have been studied by linguists and anthropologists, and we've known nothing about their genetic history. Until now."

One of her collaborators, Muntaser Ibrahim of the University of Khartoum, said indigenous people were eager to help the research. "They would like to know about their past as much as everybody else," he said. "The notion that people in remote areas are not interested in genetics is not true."

Although the study's main focus was on Africa, Tishkoff and her colleagues studied DNA markers from around the planet, identifying 14 "ancestral clusters" for all of humanity. Nine of those clusters are in Africa. "You're seeing more diversity in one continent than across the globe," Tishkoff said.

Her team looked at 98 African Americans from North Carolina, Baltimore, Chicago and Pittsburgh. The researchers determined that, on average, 71 percent of their genes could be traced to the far-flung African linguistic group Niger-Kordofanian, 8 percent to other African groups and 13 percent to Europe, with a smattering of genetic markers pointing to other places on the globe.

But the percentages vary widely from individual to individual. In a conference call with reporters, Tishkoff said the 13 percent figure for European genetic markers may be a slight underestimate; other studies have found numbers closer to 20 percent.

Her findings provide a kind of caveat to the increasingly popular gene-based genealogical searches among African Americans. Tishkoff studied very short snippets of nuclear DNA; some commercial research companies focus only on the Y chromosome or on a type of DNA known as mitochondrial DNA. These latter techniques can offer a kind of thread into the past to a single ancestor, rather than to the full complement of ancestors.

"There is no relevance to what we do at African Ancestry," said Rick Kittles, scientific director of that company. "We do not use nuclear markers like Sarah did in this study."

Brooks, of George Washington University, said the report will help resolve academic debates among archeologists and linguists: "The study shows that single sources of

data, whether from archaeology, oral history, genetics or linguistic similarity, are not sufficient to understand the complex history of an African region -- one can be transmitted without the others, and each has a different story to tell about the past."

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