Genetic ancestral testing cannot deliver on its promise, study warns

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For many Americans, the potential to track one's DNA to a specific country, region or tribe with a take-home kit is highly alluring. But while the popularity of genetic ancestry testing is rising - particularly among African Americans - the technology is flawed and could spawn unwelcome societal consequences, according to researchers from several institutions nationwide, including the University of California, Berkeley.

"Because race has such profound social, political and economic consequences, we should be wary of allowing the concept to be redefined in a way that obscures its historical roots and disconnects from its cultural and socioeconomic context," says the article to be published today (Thursday, Oct. 18) in the journal *Science*.

The article recommends that the American Society of Human Genetics and other genetic and anthropological associations develop policy statements that make clear the limitations and potential dangers of genetic ancestry testing.

Among the potentially problematic byproducts of widespread genetic ancestry testing: questionable claims of membership to Native American tribes for financial or other benefits; patients asking doctors to take ancestry tests into consideration when making medical decisions; and skewed census data due to people changing ethnicity on government forms.

Moreover, many Americans are emotionally invested in finding an

ancestral homeland, and thus vulnerable to a test that can produce mixed results at best and false leads at worse. "This search for a homeland is particularly poignant for African Americans, who hope to recapture a history stolen by slavery," the study points out.

"It can give them false hope," said UC Berkeley sociology professor Troy Duster, who coauthored the study with researchers from the University of Texas, Harvard University, New York University, Yale University, Wellesley College, Arizona State University, University of North Carolina, University of Wisconsin, Loyola University, Hamline University Law School and UC Santa Cruz.

Last year, Harvard historian Henry Louis Gates Jr. hosted a four-part Public Broadcasting Service (PBS) documentary series, "African American Lives," that traced the ancestral roots of eight prominent African Americans, including talk show host Oprah Winfrey, music producer Quincy Jones and actress and comedienne Whoopi Goldberg.

After taking the test, Gates Jr. jokingly asked if he still qualified as chairman of African American Studies because at least half of his DNA is traced to Europe. But the search for roots can be a serious matter, as Duster pointed out in a February 2006 article in the Chronicle of Higher Education.

According to the researchers, the Seminole Nation of Oklahoma, for example, which won a land settlement now worth $56 million, requires one-eighth Seminole blood for members to receive benefits. In 2000, it changed its constitution to exclude black members of the tribe who do not meet blood-quantum requirements.

The descendants of these "Seminole Freedmen," or freed slaves, sought DNA testing in hopes to regain tribal benefits, despite the tribe's rejection of genetic ancestry testing as evidence of enrollment. Their

expulsion was found to be a violation of the federal treaty, and they were re-enrolled in 2003.

"I hope to never see a day when genetic ancestry tracing with its inconclusive, continent-based affiliations supersedes treaties between specific nations and citizenship criteria that require documentation of named ancestors," said Kimberly TallBear, co-author of the article and a UC President's Postdoctoral Fellow with joint appointments in UC Berkeley's Departments of Gender and Women's Studies; Rhetoric; and Environmental Science, Policy, and Management.

More than two dozen companies sell genetic ancestry tests, which range in cost from $100 to $900. Nearly a half-million consumers have purchased these tests, and the tests' popularity shows no sign of abating.

"While some companies carefully explain what genetic ancestry tests can and cannot tell a test-taker, other companies provide less information about the limitations and assumptions underlying the tests," said Deborah Bolnick, assistant professor of anthropology at the University of Texas and lead author of the article.

For example, there are mitochondrial DNA tests, which trace the mother's lineage, and Y-chromosome tests which track paternal ancestry. The test-taker swipes the saliva inside his or her cheek, and sends the swab to the lab. The DNA is extracted and compared to samples from a reference database of haplotypes - a set of inherited, linked genetic markers - to see if there's a match.

Because these tests trace only one bloodline, however, they exclude most ancestors. Moreover, they cannot pinpoint where these ancestors lived. "Each test examines less that one percent of the test-taker's DNA and sheds light on only one ancestor each generation," the study says.

A third option, known as AncestryByDNA, or admixture testing, is more promising in that it examines non-sex chromosomes inherited from both parents, chromosomes that contain DNA segments from all ancestors. To a limited extent, this test can track the geographical movements of ancestors by examining single nucleotide polymorphisms (SNPs), some of which influence such traits as skin color and resistance to regional diseases. That said, the same SNPs may be found among several populations around the world, and thus can produce false leads.

"Worldwide patterns of human genetic diversity are weakly correlated with racial and ethnic categories because both are partially correlated with geography," the study says.

Moreover, the success of genetic matching depends largely on the number of samples in a company's database. "Even databases with 10,000 to 20,000 samples may fail to capture the full array of human genetic diversity in a particular population or region," the study says.

Furthermore, the study says, AncestryByDNA tests rely on "ancestry informative markers" (AIMs), which show genetic differences between what are assumed to be four biologically distinct populations: Africans, Europeans, East Asians and Native Americans.

But "the AIMs that characterize 'Africans,' for example, were chosen on the basis of a sample of West Africans. Dark-skinned East Africans might be omitted from the AIMS reference panel of 'Africans' because they exhibit different gene variants," the study points out.

The AncestryByDNA test also reads certain markers found in people from the Middle East, India and the Mediterranean region to be diagnostic of Native American ancestry, for which there is no historical, archeological or genetic evidence, according to the study.

Indeed, the article gives very little credence to these tests, which it concludes "cannot pinpoint the place of origin or social affiliation of even one ancestor with exact certainty."

Source: University of California - Berkeley