

Research team shows cultural practices can cause biological evolution

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(PhysOrg.com) -- When most people think of evolution, they think of animals growing bigger or smaller over generations due to food types or source, bacteria evolving resistance to drugs, or of humans losing their fur and walking upright; in other words, it's usually about physical changes coming about as a result of a response to the physical environment. But that may not always be the case, according to a group of historians and anthropologists who have been studying several tribes of people in South America. In their paper, published in the *Proceedings of the National Academy of Sciences*, they say that cultural practices have led to evolved physical traits for one tribe that has caused them to have a unique appearance compared other tribes in the area.

There are many people living in various tribes throughout South America that were there long before the arrival of white people from Europe and other parts of the world. Such people tended to band into tribes where they lived, in many cases, pretty much the same way they had for thousands of years. Such an environment has proven useful to anthropologists who study them to see if anything about them can be used to provide a deeper understanding of human beings in general. In the case of this recent study, the team looked at the physical characteristics of six different tribes that lived in relative close proximity to one another, and found that one, the Xavánte differed significantly in appearance from the other groups in several ways. They had larger heads, for example, and their faces were taller and narrower and their noses were broader.

In looking into why, the team found that the Xavánte differed from the other tribes in another important way as well, they tended to marry, and thus reproduce based on the wealth or status of the male members of the tribe, rather than through other means as other tribes did. The result was that single lines of men had throughout a historical period sired many more offspring than others, leading the tribe as a whole to take on some of their most basic attributes. Perhaps more importantly, these changes all appear to have come about in as little as 1,500 years; the time since their tribe diverged from others in the area, which the team calculated to be 3.8 times as fast as the other groups were evolving independent traits.

Also, because the environment that the Xavánte live in is very nearly identical to that of the other tribes in the area, the team has ruled out environmental factors as a contributor to the apparent [evolution](#) of the tribe's unique features.

The authors conclude by suggesting that it appears that social custom can have just as much impact on physiological evolution as does environment.

More information: Cultural diversification promotes rapid phenotypic evolution in Xavánte Indians, *PNAS*, Published online before print December 19, 2011, [doi: 10.1073/pnas.1118967109](https://doi.org/10.1073/pnas.1118967109)

Abstract

Shifts in social structure and cultural practices can potentially promote unusual combinations of allele frequencies that drive the evolution of genetic and phenotypic novelties during human evolution. These cultural practices act in combination with geographical and linguistic barriers and can promote faster evolutionary changes shaped by gene–culture interactions. However, specific cases indicative of this interaction are scarce. Here we show that quantitative genetic parameters obtained from cephalometric data taken on 1,203 individuals analyzed in combination

with genetic, climatic, social, and life-history data belonging to six South Amerindian populations are compatible with a scenario of rapid genetic and phenotypic evolution, probably mediated by cultural shifts. We found that the Xavánte experienced a remarkable pace of evolution: the rate of morphological change is far greater than expected for its time of split from their sister group, the Kayapó, which occurred around 1,500 y ago. We also suggest that this rapid differentiation was possible because of strong social-organization differences. Our results demonstrate how human groups deriving from a recent common ancestor can experience variable paces of phenotypic divergence, probably as a response to different cultural or social determinants. We suggest that assembling composite databases involving cultural and biological data will be of key importance to unravel cases of evolution modulated by the cultural environment.

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