



Press Release

Ancient DNA evidence for two previously unknown genetic exchanges between North and South America

An international team of researchers has revealed unexpected details about the peopling of Central and South America in an ancient DNA study

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The first high quality ancient DNA data from Central and South America – 49 individuals some as old as 11,000 years – has revealed a major and previously unappreciated early population turnover. The study shows that a distinctive DNA type associated with the first widespread archaeological culture of North America (Clovis), was also found in Chile, Brazil and Belize 11,000-9,000 years ago but is missing in later South Americans, documenting a continent-wide population replacement that began at least 9,000 years ago.

Unprecedented details about the peopling of Central and South America have been uncovered by a new study in the journal *Cell*, led by researchers at Harvard Medical School, the Howard Hughes Medical Institute, the Max Planck Institute for the Science of Human History, the University of California Santa Cruz, the Pennsylvania State University, the University of New Mexico, the University of São Paulo, and other institutions, including members of the University of Tübingen's DFG Center for Advanced Studies "Words, Bones, Genes, Tools". The researchers analyzed genome-wide data from 49 individuals from Central and South America, some as old as 11,000 years. Previously, the only genomes that had been reported from this region and that provided sufficient quality data to analyze were less than 1,000 years old. The researchers obtained official permits to excavate and conduct analysis on ancient human remains, and consulted with local governmental agencies and indigenous communities. Work conducted by the Tübingen team focused on the high-altitude rockshelter site of Cuncaicha in the Peruvian Andes, where several human remains were recovered in excavations led by Kurt Rademaker of the University of Tübingen and Michigan State University. By comparing these and other ancient and modern genomes from the Americas and other parts of the globe, they were able to obtain

qualitatively new insights into the early history of Central and South America.

Link between a Clovis culture-associated individual and the oldest Central and South Americans

“A key discovery was that a Clovis culture-associated individual from North America dating to around 12,800 years ago shares distinctive ancestry with the oldest Chilean, Brazilian and Belizean individuals,” explains co-lead author Cosimo Posth of the Max Planck Institute for the Science of Human History. “This supports the hypothesis that the expansion of people who spread the Clovis culture in North America also reached Central and South America.”

These individuals from Chile, Brazil and Belize date to more than 9,000 years ago. However, younger individuals and present-day people in South America do not share the Clovis culture-associated ancestry that characterizes the oldest individuals. Says co-senior author David Reich from Harvard Medical School and the Howard Hughes Medical Institute, “This is our second key discovery: we have shown that there was a continent-wide population replacement that began at least 9,000 years ago.”

After the population replacement, there was striking genetic continuity between ancient individuals dating to up to 9,000 years ago and modern people from multiple South American regions. This contrasts with West Eurasia and Africa where there are few places with such long-standing continuity.

California Channel Island-associated ancestry in the Andes

The second previously unknown spread of people revealed itself in an analysis showing that ancient Californians from the Channel Islands have a distinctive shared ancestry with groups that became widespread in the southern Peruvian Andes by at least 4,200 years ago. This is unlikely to reflect population spread specifically from the Channel Islands into South America. Instead, the researchers hypothesize that the connection between these regions is the result of spreads of people that occurred thousands of years earlier, and that such ancestry became more widespread in the Andes after subsequent events within South America.

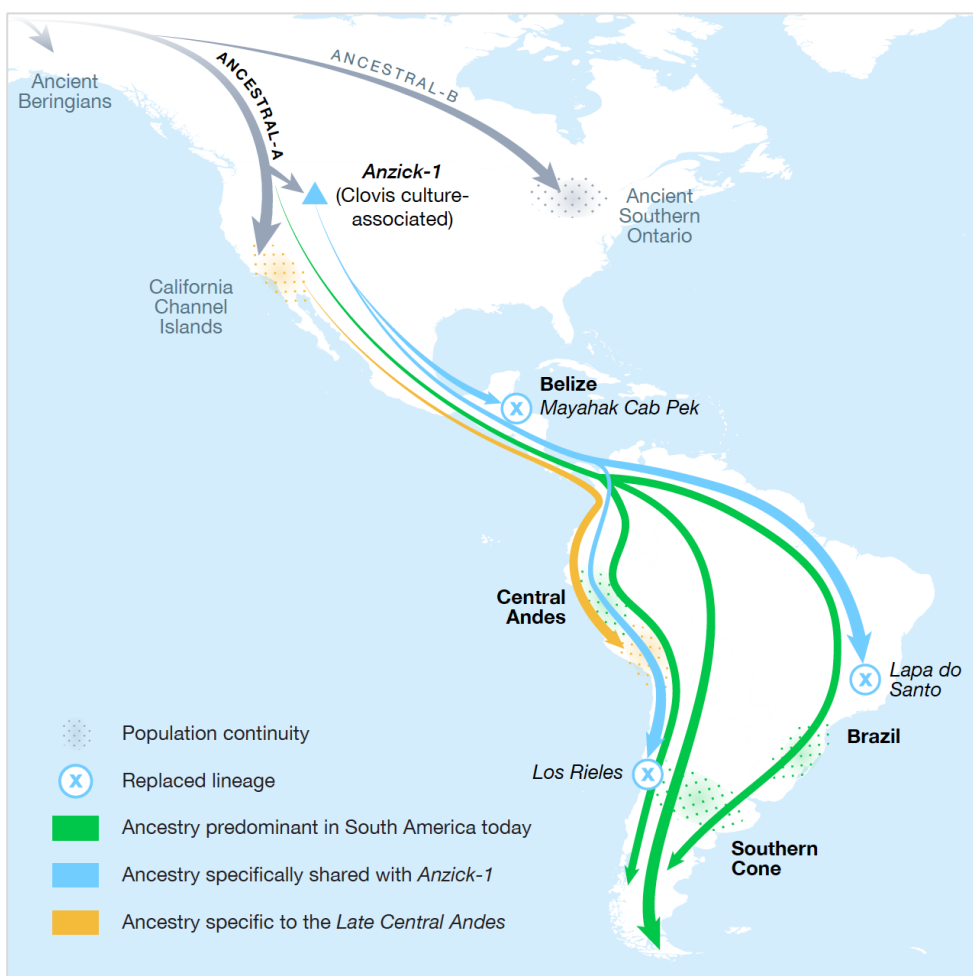
Says Nathan Nakatsuka of Harvard Medical School, co-lead author of the study, “It could be that this ancestry arrived in South America thousands of years before and we simply don’t have earlier individuals showing it. There is archaeological evidence that the population in the Central Andes area greatly expanded after around 5,000 years ago. Spreads of particular subgroups during these events may be why we detect this ancestry afterward.”

“We are excited to explore the Californian-Andean connection further with language data, since such connection has previously been suggested by historical linguists” adds Hugo Reyes-Centeno, co-author of the study and Scientific Coordinator at the DFG Center for Advanced Studies “Words, Bones, Genes, Tools” in Tübingen.

The promise of ancient DNA research in the Americas

The researchers emphasize that their study gives only a glimpse of the discoveries that may come through future work. To learn about the initial movements of people into Central and South America, it would be necessary to obtain ancient DNA from individuals dating to before 11,000 years ago. Additionally, even for the period between 11,000 and 3,000 years ago that is best covered in this study the picture is far from complete. “We lacked ancient data from Amazonia, northern South America and the Caribbean, and thus cannot determine how individuals in these regions relate to the ones we analyzed,” explains Reich. “Filling in these gaps should be a priority for future work.”

“We are excited about the potential of research in this area,” states co-senior author Johannes Krause of the Max Planck Institute for the Science of Human History. “With future, regionally focused studies with large sample sizes, we could realize the potential of ancient DNA to reveal how the human diversity of this region came to be the way it is today.” Adds co-author Katerina Harvati, co-principal investigator of the DFG Center for Advanced Studies in Tübingen, “This work is only possible with the collaboration of researchers from multiple disciplines, involving linguists, anthropologists, geneticists, and archaeologists.”



Movements and mixtures of ancient humans documented in this study. *Credit:* Graphic: Michelle O'Reilly; Posth, Nakatsuka et al. 2018. Reconstructing the Deep Population History of Central and South America. *Cell*. DOI: 10.1016/j.cell.2018.10.027



University of Tübingen excavation team in the Cuncaicha rockshelter of Peru. Credit: Kurt Rademaker, 2015.

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