

Groundbreaking Study Extracts Human DNA from Ancient Artifacts

(Cambridge, August 21, 2007) A multi-institutional team of archaeologists and scientists led by Dr. Steven LeBlanc, Director of Collections, Peabody Museum of Archaeology and Ethnology, Harvard University, and Thomas Benjamin, Harvard Medical School has shown that human mitochondrial DNA (mtDNA) can be extracted from non-human ancient artifacts and can extend the use of DNA technologies to address archaeological population studies. The use of DNA technologies has previously been limited to human bones, teeth, or rarely tissue. The availability of samples from specific times and places can be limited by the absence or paucity of human remains, poor state of preservation, laws restricting the testing or study of human remains, and the willingness of holding institutions to allow sampling. According to project co-director, Steven LeBlanc, “the success of this study not only adds to the human DNA evidence available from bone, but also opens up the possibility of utilizing a much larger variety of human-handled artifacts such as sandals, textiles, and cane cigarettes to extract ancient DNA evidence.”

The study sampled forty-eight quids (chewed fibrous materials) from four southwestern archaeological sites and eighteen aprons (or thongs) from Canyon de Chelly to determine whether human mtDNA could be extracted for the study of population migration. Samples ranged from 800 to 2400 years old. Findings of the study are published in the September Issue of the *Journal of Field Archaeology* 32.2, 2007, now available.

Over 2,000 thousand years ago, Native Americans began to grow corn in what is now southeastern Utah and northern Arizona. They sometimes sat in the shade of rock shelters chewed stripped fiber from the leaves of yucca plants until they were soft and moist and formed small wads of fibers called “quids.” The chewing left saliva on the fibers and the saliva contained small amounts of DNA from the person who chewed the fiber. The dry conditions of the rock shelter preserved the DNA. Discarded in these cave-like living places by the hundreds, archaeologists have been collecting such quids for over a century, saving them in the hope that someday they may be able to learn something from them. Aprons are a woven- or shredded-fiber women’s garment, consistently stained with blood, presumably menstrual blood. Quids and aprons have been recovered by the hundreds from caves and rock shelters from California to Texas and from Utah to Central Mexico.

The study was a collaborative project between the Peabody Museum and the Medical School at Harvard University with labs at the University of California, Davis, and the University of Utah and also involved artifacts housed at the Brooklyn Museum and Northern Arizona University. Some of the artifacts have been stored for over 100 years.

As the team leader Dr. Steven A. LeBlanc notes: “ I think the team was a surprised as everyone else that we could learn something about a possible migration over 2,000 years ago from ancient spit. Every artifact that we recover from such ancient sites now needs to be thought of in a new light and handled in new ways to ensure we preserve this DNA for future studies.”

The conclusions of the research were two-fold. Methodologically, the study demonstrates that sampling ancient artifacts for human DNA is a viable and valuable line of research for extending and confirming results from bone. Archaeologically, recovery of ancient mtDNA from quids provides empirical evidence supporting the suggestion of an early migration by Uto-Aztecan-speaking corn farmers from Mesoamerica into the Southwest. Numerous quids, aprons, and other appropriate artifacts recovered from many other contexts in the Southwest should permit testing and refinement of these preliminary findings. With quids available from Mesoamerica to Oregon in the western United States and throughout the Southwest, this methodology extends to many more sites and many other research questions heretofore beyond reach.

This study was supported by the Provost's Fund for Interfaculty Collaboration at Harvard University and the Peabody Museum of Archaeology and Ethnology. The Brooklyn Museum of Art, the Southwest Museum, Northern Arizona University, and the Peabody Museum of Archaeology and Ethnology, Harvard University made the samples available, and David Glenn Smith at the University of California, Davis made his lab available and offered advise.

Research Team

Steven A. LeBlanc (Ph.D. 1971, Washington University) is currently director of collections at the Peabody Museum of Archaeology and Ethnology, Harvard University. His research interests are on the prehistoric American Southwest and ancient warfare.

Thomas Benjamin (Ph.D. 1966, California Institute of Technology) is a professor of Pathology at Harvard Medical School. His research interests are in experimental cancer research.

Quids—Peabody Museum of Archaeology and Ethnology

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Lori S. Cobb Kreisman (A.L.M. 2006, Harvard University) is currently senior staff scientist in the Department of Pathology, Case Western Reserve University, School of Medicine. Her research centers on the biochemical mechanisms governing adaptive immune recognition of bacterial polysaccharides.

Anna N. Dhody (M.A. 1999, George Washington University) is the curator of the Mutter Museum of the College of Physicians of Philadelphia. Her research interests are cranial morphology, forensics, genetics, and the history of medicine.

Brian M. Kemp (Ph.D. 2006, University of California, Davis) is currently a research associate in the Department of Anthropology at Vanderbilt University. His research focuses on using ancient and modern genetic evidence to address questions about the entrance of humans into the Americas and the ensuing ~15,000 years of prehistory.

Francis E. Smiley (Ph.D. 1985, University of Michigan) is currently professor of Anthropology in the Department of Anthropology, Northern Arizona University. His research interests are in the archaeology of early farming societies, archaeological chronometry, and the prehistory of the American Southwest.



Prehistoric quids from dry caves in the southwestern United States.



Boomerang Shelter in southeastern Utah.