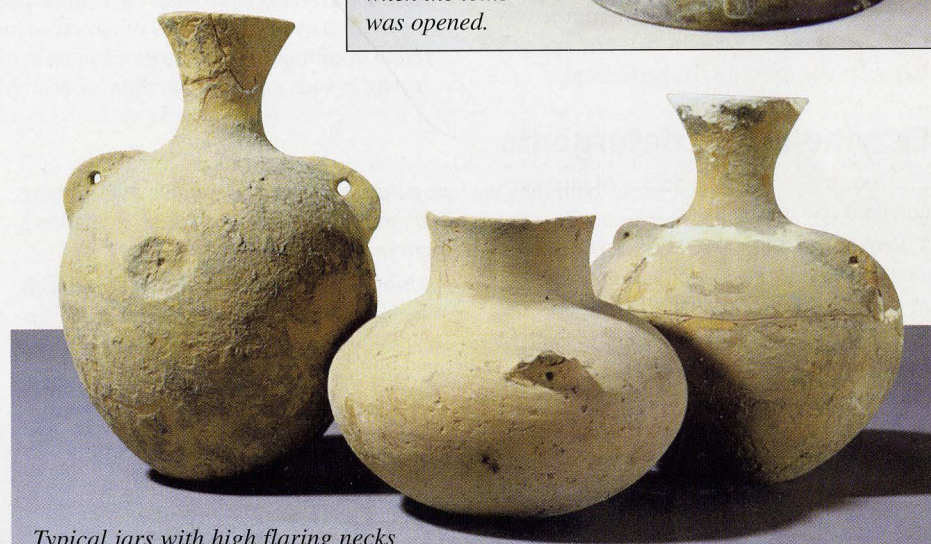


Fermented beverages from ancient China

Robert A. Moreau and Alberto Nuñez

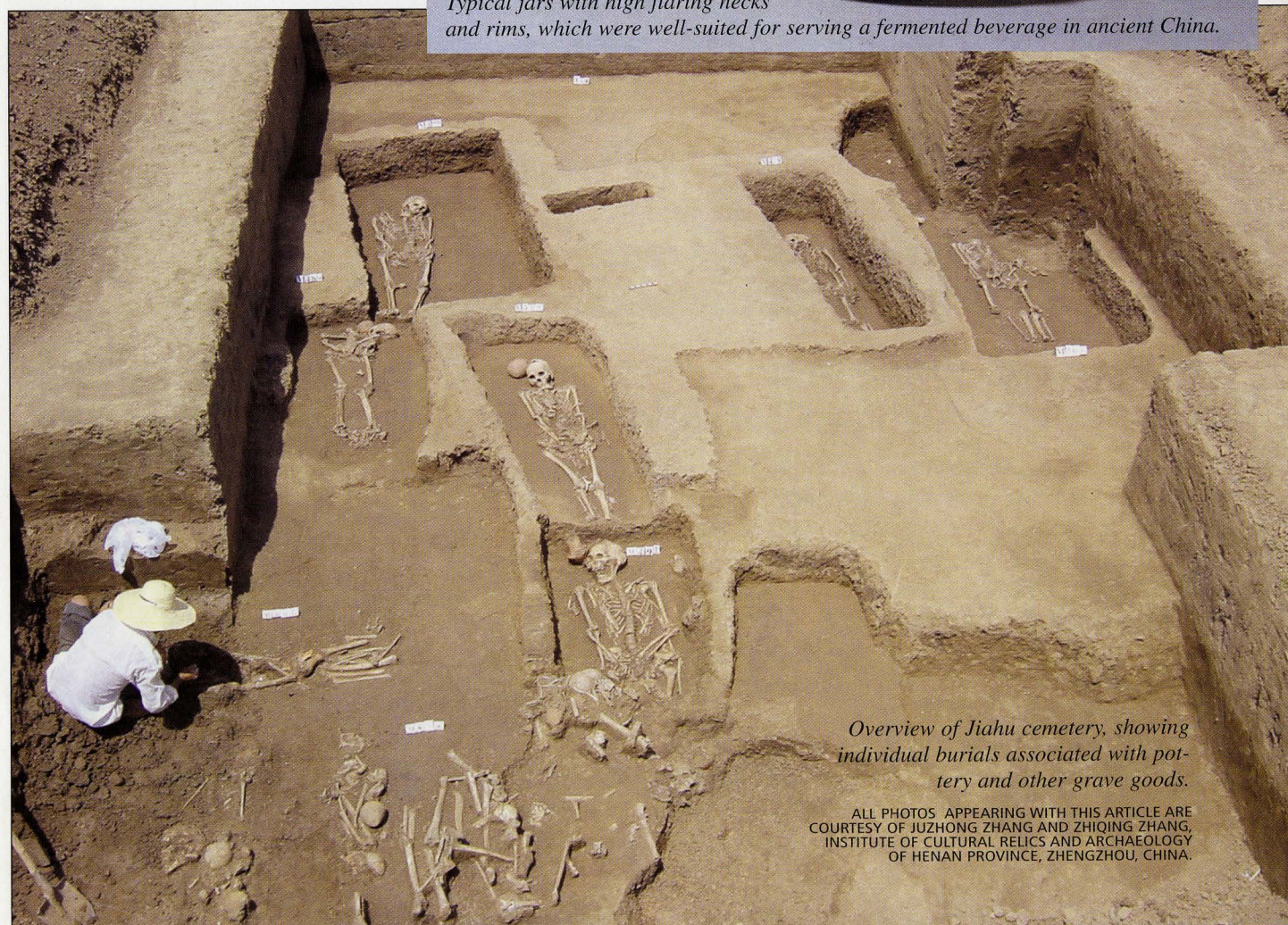
A recent report by an international team of researchers has provided the first direct chemical evidence for early fermented beverages in ancient Chinese culture.

The first site was the Early Neolithic (about 7000–6000 B.C.) village of Jiahu, in Henan Province in Northern China. Chemical analysis of extracted pottery shards revealed that they probably contained a beverage made from rice, honey, and fruit. This is the first evidence of a fermented beverage in ancient China, at approximately the same time that barley beer and grape wine were initially being made in the Middle East. We believe that fermented beverages developed independently in the two regions as there is no evidence, as yet, of contact between them.



Typical jars with high flaring necks and rims, which were well-suited for serving a fermented beverage in ancient China.

This lidded wine jar was one of more than 90 bronze vessels associated with an elite burial in China; 52 jars still contained liquid when the tomb was opened.



Overview of Jiahu cemetery, showing individual burials associated with pottery and other grave goods.

ALL PHOTOS APPEARING WITH THIS ARTICLE ARE COURTESY OF JUZHONG ZHANG AND ZHIQING ZHANG, INSTITUTE OF CULTURAL RELICS AND ARCHAEOLOGY OF HENAN PROVINCE, ZHENGZHOU, CHINA.

Amazingly preserved liquid samples from tombs at two later sites, dated to the Shang/Western Zhou Dynasties (about 1250–1000 B.C.), also in Henan province, were also analyzed. The liquids were obtained from tightly lidded bronze vessels of well-known types considered to have been used in religious and funeral services. One of the tombs was an upper class burial in the famous capital city of Anyang, near the Yellow River. The second tomb in Luyi county, also within the Yellow River basin, yielded more than 90 bronze vessels, 52 of which still contained between a quarter and a half of the original volume of liquid. The lids eventually corroded, hermetically sealing the vessels and preventing evaporation. Chemical analyses indicated that these beverages were rice and millet “wines” flavored with herbs, flowers, and/or tree resins.

The lead researcher on the project, Patrick McGovern, an archeological chemist from the University of Pennsylvania Museum of Archaeology and Anthropology in Philadelphia, contacted us and requested that we use our expertise in food lipid analysis (and our state-of-the-art analytical instruments at the Eastern Regional Research Center), to help provide chemical analyses for this archeological study. Because both samples were beverages, we did not expect to find any traditional “fats or oils,” so we focused our attention on searching for other types of lipids that would provide clues about the ingredients in these beverages.

Our high-performance liquid chromatography-mass spectrometry (HPLC-MS) analyses of the Jiahu pottery extracts revealed the presence of ferulate phytosteryl esters, which are common phytosterol (plant sterol) derivatives found in grains such as corn, rice, wheat, and rye. Because of the previous archeological evidence for rice in this region, the presence of ferulate phytosteryl esters suggested that rice was probably used to make this beverage. Gas chromatography-mass spectrometry results by other members of the team provided chemical evidence that the sample also contained beeswax, which provided evidence that honey was used to sweeten the beverage. Fruit—either grapes or hawthorn fruit—could have provided both sugar and yeast to carry out the fermentation.

In the liquid samples dating 5000–6000 years later there was no evidence of beeswax or ferulate phytosteryl esters. However, our HPLC-MS results indicated the presence of two triterpenes (β -amyrin and oleanolic acid), which is best explained as deriving from the Burseraceae (elemit) family of frant trees, perhaps by steeping the leaves in the beverage or adding the resin. The latter helps to explain the fragrant aroma of the liquid.

The authors are with the Eastern Regional Research Center of the U. S. Department of Agriculture. Contact them at Eastern Regional Research Center, USDA, ARS, 600 East Mermaid Lane, Wyndmoor, PA 19038 USA. ■

information

- You can learn more about the beverage samples from these two Chinese archeological sites by reading the journal article that contains the detailed chemical information (McGovern, P.E., Zhang, J., Tang, J., Zhang, Z., Hall, G.R., Moreau, R.A., Nuñez, A., Butrym, E.D., Richards, M.P., Wang, C-S., Cheng, G., Zhao, Z., and Wang, C., Fermented Beverages of Pre- and Proto-historic China, *Proc. Natl. Acad. Sci. USA* 101:17,593–17,598, 2004).
- Additional information about this research can be found online at netlink: www.museum.upenn.edu/new/research/Exp_Rese_Disc/masca/jiahu/jiahu.shtml