Determining Ancient Maya Cuisine and Vessel Function at Cerro Maya, Belize

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Abstract
To determine what foods were prepared with ancient Maya pottery and ground stone, different methods of residue analyses can be used to investigate ancient food production tools. Artifacts from the Cerro Maya collection were evaluated for possible residue testing, and four ceramic vessels were selected for preliminary analysis. Samples taken from the interior of the vessels were collected and extracted in preparation for mass spectrometry testing. Results from the first vessel to undergo ultra high performance liquid chromatography-high resolution mass spectrometry (UHPLC-HRMS) testing, a small tripod cup dating to the Postclassic Period, revealed the presence of chemical biomarkers for cacao, indicating that it once contained chocolate.

Introduction
Increasingly, residue analysis is being used to investigate the function of Maya vessels and tools in order to determine what substances they may have held and processed. Residues may be visible or not, and may consist of burned, carbonized food, microscopic remains or chemical compounds adhering to the surface or absorbed into the walls of the vessel. Absorbed food residues within the pottery walls and ground stone tools can survive and can include plant and animal fats and oils, waxes, resins and other organic chemical compounds such as alkaloids (see Evered, 2009). Studies of these residues by gas chromatography-mass spectrometry (GC-MS) and liquid chromatography-mass spectrometry (LC-MS) and stable carbon isotope analysis can, under certain conditions, be used for species identification. Compounds identified to specific plants and food products are called biomarkers, and function as a “chemical fingerprint”. Increasingly, these biomarkers are proving useful in the archaeological study of past foodways and technology, and pottery is proving to be a valuable source of these substances.

When selecting archaeological specimens for possible residue testing, there are multiple factors to consider. First is the archaeological context of the artifact, including where the item was physically located. Knowing whether it was found exposed on the surface, in a sealed burial, in a structure, or in a house or other room, will be critical to investigating what items were found in that area and in that vessel. In addition to context, residue analysis will also yield information on the vessel types such as vessel form and function, and is asking more complex questions such as how food was procured, produced, transported, and prepared.

Selection Criteria
When selecting archaeological specimens for possible residue testing, there are multiple factors to consider. First is the archaeological context of the artifact, including where the item was physically located. Knowing whether it was found exposed on the surface, in a sealed burial, in a structure, or in a house or other room, will be critical to investigating what items were found in that area and in that vessel. In addition to context, residue analysis will also yield information on the vessel types such as vessel form and function, and is asking more complex questions such as how food was procured, produced, transported, and prepared.

Food Preparation Tools

Cooking Pot from Cerro Maya, Belize

Collecting Residue from tripod cup

Analysis
Four pottery vessels from Cerro Maya, Belize were selected for residue chemical mass spectrometry analysis. Each of these items represented different time periods, preservation and context conditions. Each specimen underwent targeted analysis for specific compounds based on the most likely use of the vessel.

Tripped Cup (SF105-1): A small, unslipped cup that is unwashed and from a Postclassic context (Circa A.D. 1300). This vessel underwent UHPLC-HRMS testing to look for the chemical markers of cacao and chill peppers, which are ingredients commonly used for beverages by the Maya. Results were positive for caffeine, theobromine and theophylline compounds found in cocoa.

Chili Grinder (CM170454): A fragment of incised, slightly curved footed vessel from a Terminal Classic/Early Postclassic phase deposit (A.D. 650-1150). Samples from this vessel will be tested by GC-MS for evidence of cacao and chill peppers.

Beer Mug (SF 029): A complete drinking vessel recovered from the Late Preclassic/Late Tolu phase (50 B.C.-A.D. 200) burial of a young child. This vessel will be tested by UHPLC-MRM for evidence of cacao and chill peppers that may have been used to create beverages.

Cooking Pot (SF 130): A reconstructed, round-bottomed pot with external rim-blinking indicating its use for cooking. It was recovered from a Late Preclassic/Late Tolu phase (50 B.C.-50 B.C.) dedicatory cache in one of the village structures. This vessel will undergo lipid analysis by GC-MS to look for cholesterol and other fats.

Extraction Method: Samples were collected by scraping the interior of each vessel with a solvent-rinsed stainless steel dental scraper. Samples were placed in glass vials and taken to the Organic Geochemistry lab in the Department of Anthropology at the University of Florida. The samples were washed, placed in filter vials, and extracted via an Accelerated Solvent Extractor using a heated solvent mixture of 2:1 chloroform-methanol. After extraction, samples were placed in solvent-washed vials and evaporated in a Turbo-Vap warm water bath until a fine of cured turpentine free. After evaporation, 250 µL of Hexane was added to each vial. Samples were stored refrigerated or frozen while awaiting testing.

Discussion and Future Directions
In trying to understand cuisine, food preparation and vessel function, we are also trying to understand the people and the society that produced it. We are looking at the decisions affecting the use of pottery vessels and stone grinding tools through ethnography has helped in archaeological interpretation, as has experimental archaeology in understanding the physical and visual effects of different procedures on ceramic vessels and stone tools. Building on earlier foundations, residue analysis has moved beyond simple carbon-13 as not the only indication of what foods were processed, but is asking more complex questions such as how food was procured, processed, combined and consumed.

For many reasons, food preparation tools and vessels are good vehicles for archaeological inquiry addressing sub-complexes, vessel form and function, context and interactions. Pottery and ground stone can be the product of one individual, a small family, a large community or even an entire society. They can be local items or exotic trade goods, a routine household item, a finely crafted elite object, a fineware example or a very rare, one-of-a-kind vessel. Some artifacts are more than one of these functions and are the product of many uses and interactions. To be successful archaeologists and archaeologists must learn to understand the vessel functions over the course of their use-life. This is certainly true at Cerro Maya where a humble, utilitarian cooking pot or metal can end up in a burial or a cache. As technology expands the reach of archaeology into more detailed approaches to materials goods, such as residue analysis, the subtle traces of prior use become more apparent and give a more nuanced interpretation of the past.

References:

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