

BIOMOLECULAR AND FUNCTIONAL APPROACHES TO ATLANTIC COAST CERAMIC VESSELS (4300 TO 1500 BCE)

End of the Neolithic and Early Bronze Age, from Finistère headland to the Gironde estuary

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Abstract : This PhD research project focuses on the characterisation of lipid residues preserved in ceramics from two complementary standpoints: methodological and archaeological. More than 1,500 samples were analysed to improve the method and adapt the identification protocols, as well as to answer archaeological questions regarding a large number of vessels (around 500) from the Iroise Sea to the Gironde Estuary on the French Atlantic coast, over a broad chronological period from the Middle Neolithic to the Early Bronze Age (4300-1500 BCE). This period was marked by multiple climatic, environmental and social changes, forging a complex picture, sometimes hard to pin down, of the daily life of the people who settled in the coastal areas and marshlands of Europe's far west between 6,000 and 4,000 years ago. Pottery, as a technical and useful object for everyday life, cooking, crafts as well as funerary rituals, is a unique artefact for investigating these multiple changes. The issues addressed through the prism of pottery function deal with the exploitation of natural substances, artisanal production and food practices.

The methodological part was designed to support the archaeological approach by facilitating the identification of certain substances or ranges of molecules in the laboratory (GC-FID, GC-MS), by analysing reference material (e.g. littoral plants, molluscs and fish), by adapting the extraction protocol (DCM/MeOH; MeOH/H₂SO₄) and then by diversifying the analyses, in particular by Compound Specific Isotope Analysis (CSIA; GC-c-IRMS). Several experiments have been carried out on the degradation of lipids in buried contexts, on their preservation once extracted from the archaeological context, and on the production of thermal transformation markers from various fish species.

Moreover, an in-depth study of the ORA (Organic Residue Analysis) in archaeology published literature led to the creation of the AROLDdatabase tool, part of which is accessible in open-access online:

<https://www.cepam.cnrs.fr/datas/arold.php>.

In addition to archaeological issues, the sampling of artefacts also requires considering several issues related to the environment studied and to the conservation conditions. Therefore, the number of samples, as well as the protocols, are adapted from one site to another. The analysis of the results reveals a degree of constancy in the use of the environment throughout the cultural changes, although the substances identified in the ceramics were more varied than those found in the rest of Europe. The Atlantic coast is unique in its recurrent use of epicuticular wax plants, and in the absence of fish processing markers in ceramics even if there is evidence of fishing. Overall, the results attest to the use of pottery to heat animal fats, in particular ruminant meat and dairy products, often linked with livestock farming. The characterisation of these contents when related to pottery shape, did not allow us to clearly distinguish functional categories within the common tableware. This is particularly interesting when related to the chrono-cultural context studied; it offers an unprecedented insight into some degree of stability and unity within the diversity of the Atlantic coast culture and biodiversity at the end of the Neolithic period.

In this chrono-cultural and geographical context, this PhD work represents the first serial study to analyse lipids in ceramic vessels. It provides numerous references for comparisons and offers new horizons for further investigation.

