

Investigating Archaeological food remains by Analytical Chemistry



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The archaeology of food commodities is a wide field that includes the study of iconography, ceramic vessels, and various botanical and animal remains such as seeds and bones. Other remains, usually referred to as amorphous organic residues may also provide valuable information of food processed, stored or served in ancient pottery. They are present as charred residues visible on the inner surface of ceramic vessels and amphorae but they can also correspond to non visible organic matter that has been absorbed into the porous clay matrix of the containers. They arise from a large variety of natural substances, namely subcutaneous animal fats, dairy products, vegetable oils, beeswax or honey, wine, etc.

The identification of such residues represents a real analytical challenge. Indeed, archaeological organic remnants are generally preserved in small amount and contain a wide variety of molecular constituents including lipids, terpenoid derivatives, proteins, polysaccharides and polyphenols. They are made of complex molecular mixtures altered through time and are characterized by a large range of molecular weight distribution, including solvent-soluble volatile and non-volatile components, as well as, high-molecular weight polymers.

Due to their highly complex molecular composition and their degree of alteration, these remains must be studied using a multi-step methodology combining chromatographic and mass spectrometric analyses.

In this lecture, we will first present the amorphous organic residues that may be preserved in various archaeological contexts. The analytical methodology will then be detailed (figure 1), from sampling on the field until sample preparation, analysis in the laboratory and interpretation of the data from both a chemical and archaeological standpoint.

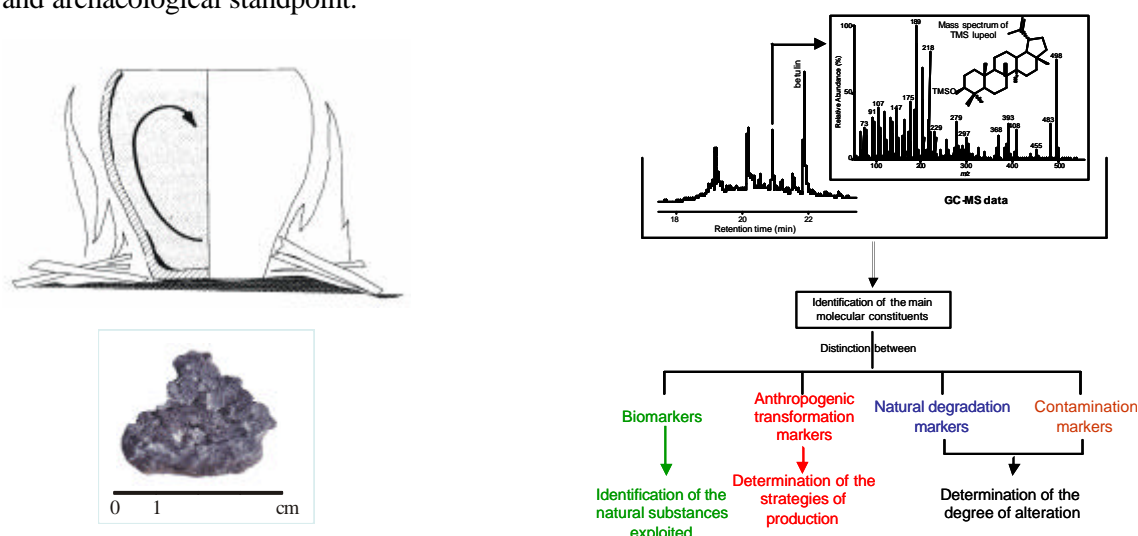


Figure 1 – From pot to organic content: scheme of the interpretation processes, based on the distinction between four categories of molecular markers, used for the identification of the natural substances processed in archaeological vessels. From Regert, 2007 in press.

From recent prehistory (neolithic period) until Roman Antiquity, we will then provide an overview of the results obtained on culinary recipes or commodities (figure 2), including dairy products, honey stew, vegetable oils and resinated wine that could be identified owing to a set of molecular biomarkers and degradation markers such as fatty acids, triacylglycerols, sterols, long-chain esters and diterpenoid markers together with polyphenols. We will also emphasize on some alteration processes that occur in the sediment and that greatly alter the initial composition of the organic matter.

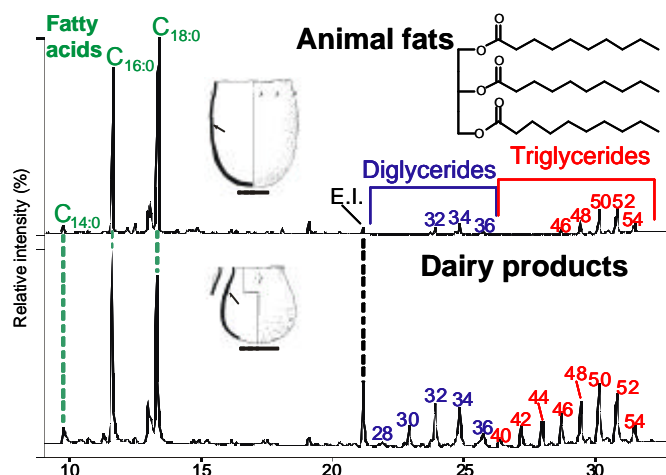


Figure 2 – Gas chromatograms of animal fats and dairy products preserved in neolithic ceramic vessels .

In conclusion, we will show that developing methodologies at the frontier between analytical chemistry and archaeology is a powerful way for enhancing our knowledge on the alteration of natural substances and on the exploitation and preparation of culinary commodities through time.

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