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ISOTOPE RATIO MASS SPECTROMETRY: OLD AND NEW PROXIES IN CULTURAL HERITAGE RESEARCH

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Isotope ratio mass spectrometry (IRMS) is an analytical technique whose practice continuously spreads in disciplines such as medicine, geology, biochemistry, food authenticity, ecology and forensic science. Alongside, cultural heritage researches benefited from the introduction of these isotopic proxies which increased the awareness on environments and human activities in the ancient times. Climatic and environmental reconstruction, human diet and movement, crop management practices, pottery use are some of the new trend topic in archaeological research that have been advanced thank to IRMS.

Both compound specific isotopic analysis (GC-C-IRMS) and bulk isotopic analysis (EA-IRMS) are conducted in our Laboratory. The former, for example, helped to reconstruct the diet [1,2] or rituals [3,4] in different archeological sites.

Essential to understand past diet and mobility is to know how isotopic signals are transferred from the environment through the trophic levels. EA-IRMS model studies on selected cultivation permitted to assess if archaeological findings were wild or watered crops [5] which helps in elucidating the onset of agriculture, a key moment in the human past.

Petroleum products such as bitumen or asphalt were exploited by ancient populations for several uses such as to repair broken pottery up to build the huge Birs Nimrud ziggurat. Together with the more archaeologically significant bitumen deposits in the Near and Middle East [6], there are several seepages in Central Mediterranean which deserve more attention with respect to their utilization and circulation in Antiquity. Biomarker based approaches were successfully used to provenance bitumens both directly [7] and after principal component analysis [8]. EA-IRMS has also been used along with biomarkers to succeed this task [7,9]. However, a misuse of stable isotope is possible. Our work on Neolithic and Bronze Age bitumens, indeed, showed that the isotopic signature on selected fractions cannot be uncritically used as parameters to genetically correlate source rocks and provenance bitumens. On the contrary they represent a new proxy in cultural heritage research highlighting use or processing [10].

References

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