

## NON-TRADITIONAL STABLE ISOTOPES – A NEW HORIZONS

### IN AUTHENTICITY CONFIRMATION AND TRACING THE GEOGRAPHICAL ORIGIN OF FOOD

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A new analytical strategy based on combined non-traditional stable isotopes and trace elements determination by ICP-MS is presented. The benefits of combining information from two isotopic systems one tracing the soil (Sr), and the other tracing environmental ambient pollution (Pb, Hg), now allows to obtain exceptional new information about traceability and authenticity selected food matrixes: prestigious wines, dry-cured ham and tea.

Wine: Samples of Bordeaux wines, wines from Slovenia, USA and China were analysed in terms of specifying their geographical origin. Sr isotope composition of wines was found very specific in small regional scale, able to separate distinguish different chateaux in the Bordeaux region and Slovenia. In contrast, in large territorial dimension lead isotopic trend is more distinctive due to global lead environmental extension (example for China and USA). Using this approach, the counterfeit of high value Bordeaux Grand Cru wine was detected in comparison with authentic wine.

Tea: Authentic teas from Japan, China, South Korea, India, Shi Lanka, Vietnam, Turkey and Rwanda were studied. The teas with similar origin (South Korea, Japan) have shown a specific Sr isotope composition, while only Chinese teas were characterized by the large variability of these values due to a large geological variability. The distinctive trend of Pb-isotope ratio has been observed for the different geochemical regions of China and were found close to lead isotopic signatures in local atmosphere, ore deposit and geological sources. Pb-isotope composition of Japan and South Korean tea reproduced those in atmospheric aerosols in these countries and very distinct from Chinese tea.

Ham: The attention is drawn to an important evidence, that food processing features can be also traced by isotope analysis and became an important signature in proving of food authenticity. In fact, salting process plays a dominant role in the formation of strontium isotopic signatures of dry-cured ham. Comparison between Iberian, Italian and Portugal hams (have been salted with pure sea salt) and French Bayonne hams (have been salted with rock salt from local salt mine) show that the Sr isotope ratios in hams are close to those of corresponding salt source. Additional information about trace metals and REE content can be helpful to distinguish between hams salted by the salt the same source (sea or mine) but different origin.

The combined isotopic discrimination strategy demonstrated drastic discrimination improvements compared to a single isotopic signal in all discussed application. This new analytical approach can be used to authenticity determination and food origin traceability. Combining isotope ratios information with elemental analysis data gives a complete tool to

detect food frauds, including adulteration of high value products with cheaper substitutes, forgery and falsification.