ISO Fd Food ERA Chair

Safety
Quality
Traceability

2nd ISO-FOOD

Symposium FROM

FOOD SOURCE TO HEALTH

BOOK of ABSTRACTS

Portorož, Slovenia **April 24 – 26, 2023**

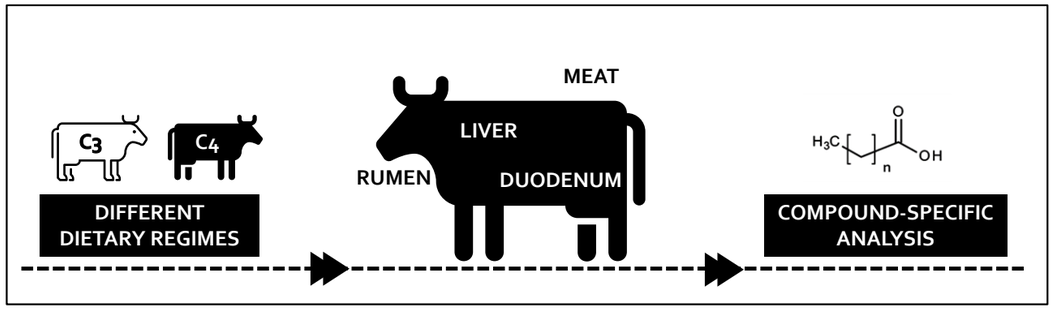
Institut
"Jožef Stefan"
Ljubljana, Slovenija

MEDNARODNA PODIPLOMSKA ŠOLA JOŽEFA STEFANA LJUBLJANA SLOVENIJA 2004

GC-C-IRMS on Single Fatty Acids and EA-IRMS on Bulk Lipid to Study the Fractionation Processes in Bovine Organism and to Detect Differences in Four Matrices of Simmental Cows Fed on C3 and C4 Diets

S. Pianezze[1],*, M. Corazzin[2], M. Perini[1], F. Camin[1,3], M. Paolini[1], A. Sepulcri[2], E. Saccà[2], C. Fabro[2], E. Piasentier[2]

(1) Fondazione Edmund Mach, Via Mach 1, 38098 San Michele All'Adige, Italy, (2) Department of Agricultural, Food, Environmental and Animal Sciences, Via Sondrio 2A, Udine, Italy, (3) International Atomic Energy Agency, Vienna International Centre, Wagramer Str. 5, 1220 Vienna, Austria
*silvia.pianezze@fmach.it



Fatty acids (FAs), carboxylic acids with a long aliphatic chain, detectable in both adipose tissue and muscle of animals, strongly contribute to different aspects of meat quality and are central to the nutritional value of this product [1].

Focusing of bovine meat, we must consider that the FAs may derive either from the animal diet only, as is the case with essential linoleic and linolenic acid, or from *de novo* endogenous synthesis, or both [2]. As for the biosynthetic pathway the FAs follow in cow organism, dietary FAs undergo substantial transformations into the digestive tract before depositing into the tissues. First, the hydrolyzation of complex lipids deriving from the diet, carried out by bacteria and protozoa in the rumen, produces long chain fatty acids (LCFAs) and other organic compounds [3]. Then, the free FAs released during hydrolysis are converted to saturated ones, primarily stearic and secondarily palmitic acid through biohydrogenation [3]. On exiting the rumen, the FAs flow into the duodenum, where the absorption takes place. Furthermore, the FAs reach the liver carried by the blood, whose flow, together with the FAs concentration, influences their supply to this organ [5].

In this work, two groups of multiparous cull cows fed according to two different dietary regimes (based on products deriving from plants characterized by either C3 or C4 photosynthetic cycle) were considered. The different paths C3 and C4 plants follow for CO_2 fixations result in discriminating carbon isotopic ratios ($\delta^{13}C$). Therefore, the ability to distinguish between animals directly comes from the isotopic differences in the feeding regimes. Different cow compartments (rumen, duodenum, liver and meat) led to the diet-based discrimination of the animals.

The presented results were obtained by analysing the $\delta^{13}C$ of both the bulk lipidic extract through EA-IRMS and six FAs through GC-IRMS in each compartment.

Furthermore, it is worth considering that several chemical reactions resulting in isotopic fractionation take place in the bovine organism. On this basis, the compound-specific analysis of the fatty acids in the different compartments of all cows gave the opportunity to compare the fractionation processes taking place in the bovine organism and to highlight differences depending on the dietary regime of the cows, whether C3- or C4- based.

Acknowledgements

Start-up 2018, project, Department of Agricultural, Food, Environmental and Animal Sciences, University of Udine, funded this research.

References

[1] J. D. Wood, M. Enser, A. V. Fisher, G. R. Nute, P. R. Sheard, R. I. Richardson, S. I. Hughes, F. M. Whittington (2008) *Meat Science*, 78 (4), 343-358.

[2] C. Galli, P. Risé (2006) *European Journal of Lipid Science and Technology*, 108 (6), 521-525.

[3] A. Buccioni, M. Decandia, S. Minieri, G. Molle, A. Cabiddu (2012) *Animal Feed Science and Technology*, 174 (1-2), 1-25.

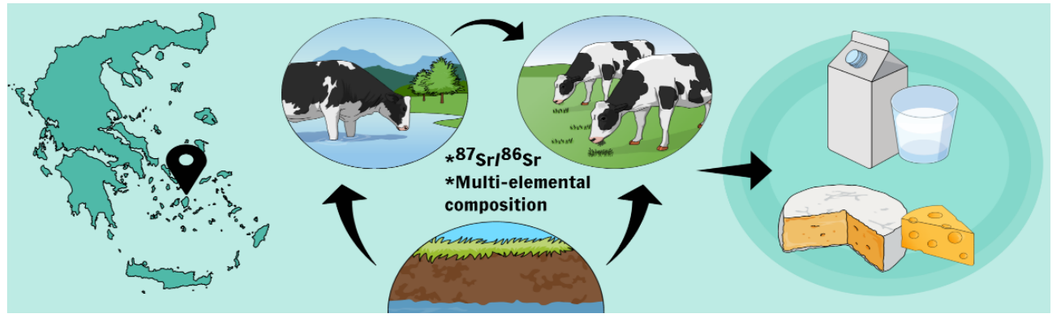
[4] W. W. Christie, X. Han (2012) *Lipid Analysis*, 3-19.

[5] J. F Hocquette, D. Bauchart (1999) Reproduction, Nutrition, Development, 39 (1), 27-48.

Linking Multi-Elemental and Sr Isotopic Data of Milk, Cheese, Water, Soil and Forage

M. Nikezić[1], P. Chantzi[2,3], I. Giannenas[2], T. Zuliani[1,4]*

(1) Jožef Stefan International Postgraduate School, Jamova 39, 1000 Ljubljana, Slovenia, (2) Laboratory of Animal Nutrition, School of Veterinary Medicine, Aristotle University of Thessaloniki, University Campus, 54124 Thessaloniki, Greece, (3) Union of Agricultural Cooperatives of Naxos, Cyclades 843 00, Greece, (4) Department of Environmental Sciences, Jožef Stefan Institute, Jamova 39, 1000 Ljubljana, Slovenia
*tea.zuliani@ijs.si



The strontium isotope ratio analysis is underused, relatively new approach that has shown to be a suitable tool for the designation of origin of many food commodities [1-3]. This potential stems from the fact that $^{87}Sr/^{86}Sr$ ratio is not modified during the uptake of the plant, but rather transferred unchanged to the living organisms in the food chain [4]. Furthermore, Sr isotope ratio is determined by the type of bedrock and soil, rather than human activities, climate, and changes in production season, thus precisely reflecting the geological composition of the soil where forage is grown. Milk and cheese composition depend primarily on the feeding of animals, and therefore on the surrounding environment [5].

In the presentation the results of a study on linking multi-elemental composition and Sr isotope ratios of soil, water, feed, milk and cheese from Naxos, Greece will be presented. Geologic setting of the island reflects the inorganic pattern of food produced there, such as widely-recognized PDO cheeses. The aim of the study was to determine the contributions of multi-elemental and Sr isotope compositions of water, soil and feed on milk and cheese, which would allow a more accurate characterisation of the milk and cheese provenance and provide an integrated overview on links between studied matrices and areas.

For the study purpose, multi-elemental composition and Sr isotope ratio were determined in samples of different types of milk and cheese, water, soil and feed. Samples were collected at different farms, during summer and winter season, through two years of production. The contribution of Sr isotope ratio from water and feed in the milk and cheese Sr isotope ratio was evaluated.

The elemental composition of the samples was determined by inductively coupled mass spectrometry (ICP-MS) after microwave digestion of samples, while Sr isotope ratio was determined by multi-collector ICP-MS, after performing Sr isolation from the matrix procedure.

Acknowledgements

This research was funded by Slovenian Research Agency – ARRS Program (P1-0143) and by the European Regional Development Fund of the European Union and Greek national funds through the Operational Program Competitiveness, Entrepreneurship, and Innovation, under the call RESEARCH – CREATE – INNOVATE (project code: 2EDK-02988 entitled "Monitoring of the environmental fingerprint in Graviera Naxou PDO product for certification of authenticity and geographical origin").

References

[1] S. Hamzić Gregorčič et al. (2021) *Foods*, 10, 1729.

[2] E. Epova et al. (2019) *Food Chemistry*, 294, 35-45.

[3] M. Cardin et al. (2022), *Foods*, 11 (21), 3379.

[4] J. Griboff et al. (2019) *Food Chemistry*, 283, 549-558.

[5] D. Potočnik et al. (2020) *Food Chemistry*, 326 (3), 126958.