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Geochemical fingerprint of Sr, Pb and Zn isotopic signatures to assess the origin of food: a case study focusing on cows from southern Belgium.

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The main goal of our project is to explore the possibility of using isotopic tools as a new way to assess the healthiness and origin of cows, and therefore the quality of beef meat. To achieve this goal, in addition to the Metal Trace Element (MTE) concentrations, we use the Strontium (Sr), Lead (Pb) and Zinc (Zn) isotopic signature in animal blood to characterize the environment of origin for Belgian cows. Ratios of radiogenic Sr and Pb isotopes in the cow blood are mainly controlled by the radioactive decay of their parent isotopes, offering a sensitive fingerprint of their initial reservoir (geological substrate) that can be compared with each environment compartment involved in the food chain (from the soil, spelt, mineral and food supplements, water and aerosols, to the cow). In contrast, Zn isotopes can be fractionated by biological processes and additionally, like Pb isotopes, can give information about the metal pollution in the environment [1].

Preliminary data from a first site located in south of Belgium gave similar Sr and Zn concentrations and depletion in Pb relative to the blood Seronorm L-3 standard. Blood samples show similar MTE patterns compared to spelt cultivated on the same soil as that used for cow's pastures. Results in Pb isotopes indicate overlapping of the 206Pb/207Pb and 208Pb/206Pb signatures of cow blood samples, spelt and the bedrock. In contrast, food supplements (salts and dietary supplements) display distinctive isotopic signatures. Strontium isotopic composition of hay present similar values with blood samples. To confirm these first results, we selected three other farms located on different geological bedrocks in south of Belgium. For each farm, 10 to 12 cows were selected. For each animal, blood was collected twice a year to evaluate how the different diets given to animals according to the seasons can impact the blood MTE and isotope compositions. During the winter, the cows are fed mainly on feed supplements and silage (usually coming for in/outside the site), in contrast to the grass (and salt) diet of the summer pastures.

[1] Beier et al. 2013. Contributions to Min. Petrol., doi:10.1007/s00410-012-0837-2.