Stable carbon isotope fractionation may be diet dependent

S. De Smet¹, K. Raes¹, E. Claeys¹ and P. Boeckx²

¹Laboratory for Animal Nutrition and Animal Product Quality, Ghent University, Proeftreinstraat 10, 9090 Melle, Belgium
²Laboratory of Applied Physical Chemistry-ISOFYS, Coupure Links 653, 9000 Gent, Belgium

Background

- Stable isotope analysis of animal tissues has potential for discriminating between diets, e.g. the δ¹³C value is known to reflect the proportion of C₃ and C₄ plants in the diet.
- During metabolism, depletion of ¹³C occurs (fractionation), resulting in δ¹³C values in animal samples that differ from the corresponding dietary values (trophic shift).
- This trophic shift is often assumed to be constant for a given tissue.

Material and methods

- Data from four trials with different animal types and diets differing in the proportion of C₄ plant material (maize).
- Determination of δ¹³C values of plasma and dietary samples by ANCA-SL elemental analyser, connected to an isotope ratio mass spectrometer (PDZ-Europa, UK). Ratios ¹³C/¹²C are expressed as δ¹³C values in per mill (‰) relative to VPDB standard. Values for fractionation = plasma – dietary values.
- Plasma samples had been taken after at least two months following a dietary change, so that equilibrium could be assumed.

Objective

- Verify whether the fractionation of ¹³C in plasma is constant or depends on the dietary δ¹³C value

Results

- Across trials and treatments, mean plasma δ¹³C fractionation was +1.4‰, ranging between -1.3‰ and +3.8‰.
- There was a significant linear decrease in fractionation with increasing (less negative) dietary δ¹³C values and increasing proportions of C₄ plant material in the diet.
- However, this dietary effect on plasma δ¹³C fractionation appeared in two trials, whereas it was not obvious in two other trials.
- A non-constant trophic shift may have implications for back-calculation of diets, as was shown by Focken (2004).

Conclusions

- Stable carbon isotope fractionation may depend on the diet. Across trials, there was a significant linear decrease in fractionation with increasing (less negative) dietary δ¹³C values.

Acknowledgements

This research was financially supported by the Institute for the Promotion of Innovation by Science and Technology in Flanders (IWT), Brussels.

References