



# *Book of Abstracts*

# Stable isotope analysis to detect differences in four compartments of Simmental cull cows fed on C3 and C4 diets

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**Summary:** *The isotopic analysis of the fat (EA-IRMS) and the fatty acids (GC-C-IRMS) of 13 multiparous Italian Simmental cull cows made it possible to discriminate between animals fed on different feeding regimes (either C3-based or C4-based) and to collect information about the metabolic pathway of the FAs in the bovine organism.*

**Keywords:** *fatty acids, isotope ratio mass spectrometry, gas chromatography*

## 1. Introduction

Fatty acids (FAs) are long chain carboxylic acids that can be found in the adipose tissues and the muscles of bovines. They may derive from the diet only, as for the essential FAs (such as linoleic and linolenic acid), and/or from de novo endogenous synthesis [1]. The FAs metabolic pathway starts in the rumen, where the hydrolysis of dietary complex fats into long chain FAs occurs [2]. Then, the FAs released during this process are converted into saturated FAs through biohydrogenation reactions [3]. The FAs reach the liver carried by the blood, whose flow, together with the FAs concentration, influences their supply to this organ [4]. The deposition of the FAs into the animal tissue can be considered as the final step of their metabolism.

## 2. Results and Discussion

The aim of this study was to discriminate between two groups (nTOT = 13) of Italian Simmental cull cows fed on different diets and to widen the knowledge about the FAs metabolic path in the bovine organism. The first group was fed on a C3 products-based diet ( $\delta^{13}\text{C}_{\text{C3\_BULK\_DIET}} = -32.55\text{‰}$ ) while the second one was fed on a C4 products-based one

( $\delta^{13}\text{C}_{\text{C4\_BULK\_DIET}} = -18.74\text{‰}$ ). Beside the diet, three compartments of the animals were considered: rumen, liver and meat. The fat extracted from the four matrices was both analysed through EA-IRMS (elemental analysis-isotope ratio mass spectrometry), as a bulk sample, and through GC-C-IRMS (gas chromatography-combustion-isotope ratio mass spectrometry), after a derivatization process which made it possible to measure the  $\delta^{13}\text{C}$  of five FAs (C16:0, C18:0, C18:1n-9, C18:2n-6 and C18:3n-3). A good discrimination between C3 and C4 groups was achieved. Moreover, different trend of  $\delta^{13}\text{C}$  passing from the diet to the loin were found as for C3 and C4 groups.

## 3. Conclusions

The  $\delta^{13}\text{C}$  analysis of the bulk fat and the FAs helped in shedding light on the metabolic path that the FAs follow in the bovine organism and on how this path changes depending on the diet. Nevertheless, the metabolic path of the FAs is still far from being completely understood. Therefore, more studies focusing in particular on the various chemical reactions taking place into the rumen, should be carried out.

## References

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