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To cite this version:
Romain Tessier, Juliane Calvez, Nadezda Khodorova, Alain Quinsac, Romain Kapel, et al.. Confrontation of the “Dual Tracer” Indirect Method With Direct Ileal Sampling for Indispensable Amino Acid Digestibility of Sunflower Isolate in Humans. Nutrition 2021, Jun 2021, online, United States. 10.1093/cdn/nzab048_019. hal-03296232
Confrontation of the “Dual Tracer” Indirect Method With Direct Ileal Sampling for Indispensable Amino Acid Digestibility of Sunflower Isolate in Humans

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Objectives: The direct assessment of ileal samples of amino acid (AA) digestibility is invasive in humans. A less invasive but indirect method, namely “dual tracer” was recently developed. It relies on the plasma isotopic enrichment ratio of two labeled protein, a reference protein or alternately AAs labeled with ¹³C and the test protein labeled with ¹⁵N. This recent method has not yet been challenged against direct measurement of ileal digestibility.

Methods: Seven healthy volunteers were intubated with naso-ileal tube. Every 30 min for 4 h, they ingested sunflower biscuits containing a total of 25 g of ¹⁵N intrinsically labeled sunflower protein isolate. They also ingested 60 g chocolate containing a total of 400 mg of a mix of ¹³C algal individual AAs. Ileal contents were collected continuously for 8 h following the first meal and plasma was sampled every 30 min for 4 h and hourly between 4 and 8 h. ¹⁵N and ¹³C indispensable amino acid (IAA) ileal digestibility were determined by measuring ¹⁵N and ¹³C enrichment in AAs by GC-C-IRMS and AA content by UHPLC in ileal effluent. Plasma and meal ¹⁵N and ¹³C IAA enrichment were measured by GC-C-IRMS. Isotopic ¹⁵N/¹³C ratio were determined using area under the curve value for each isotope.

Results: Using direct ileal sampling, average IAA ileal digestibility was: (i) 88.5 ± 5.0% for sunflower isolate (¹⁵N) with values ranged from 85.8 ± 5.1% for threonine to 91.1 ± 5.8% for methionine, and (ii) 97.6 ± 1.7% for free AAs (¹³C) with values ranged from 95.9 ± 2.3% for lysine to 98.8 ± 0.8% for phenylalanine. With the “dual tracer” method, digestibility of isoleucine, leucine, threonine and valine was significantly lower than with ileal determination (from 7.9% for threonine to 24.3% for leucine). Methionine and phenylalanine values were aberrant (over 100%) for lysine, the difference between the two methods was not statistically different (4.7%, p = 0.49).

Conclusions: With our methodological conditions, the “dual tracer” method provides physiological values for most IAA except methionine and phenylalanine. However, values were low compared to ileal digestibility (about 10%) and interindividual variability was high. This less invasive method is promising but requires methodological improvements.

Funding Sources: French Research National Agency (ANR), financial support of SOFIPROTEOL under the FASO Project PRODIAL.