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Real ileal digestibility of sunflower protein and amino acids in humans

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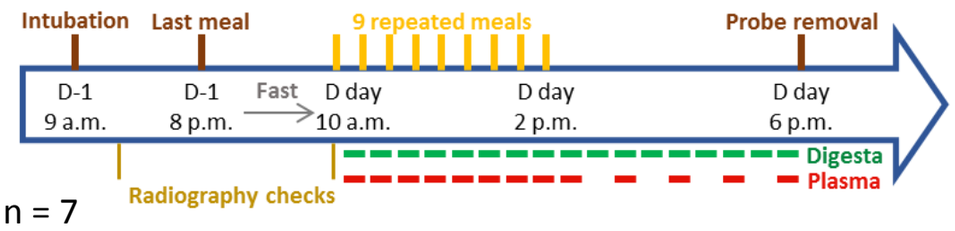
Introduction and Objective

- Despite a relatively good amino acid composition[1], sunflower protein is not used in human nutrition.
- Studies in pigs, on sunflower cake or seeds, showed ileal digestibility ranging from 73%[1] to 83%[2].
- Bioavailability of sunflower isolate has never been measured in humans.

The aim of this study is to determine the ileal digestibility of protein and amino acids (AA) from a ^{15}N labelled sunflower isolate in healthy volunteers

Materials and Methods

Experimental protocol



- n = 7
- 156g of biscuit i.e. 25g of ^{15}N labelled sunflower protein isolate divided in 9 meals
- Polyethylene glycol 4000 perfusion as non-absorbable marker

Analytical methods

- PEG assay by turbidimetric method
- Amount of nitrogen (N) and ^{15}N enrichments in ileal contents and plasmatic proteins determined by EA-IRMS
- Ileal indispensable amino acid ^{15}N enrichments by GC-C-IRMS
- Quantification of AA in ileal contents by UHPLC

Calculations

Total N in ileal contents (mmol/30min):
With ileal flux in mL/30min

$$N_{tot} = \frac{\%MS \times \%N}{14 \times 10} \times \text{ileal flux}$$

Exogenous N in ileal contents (mmol/30min):
With APE as atom percent excess (in %)

$$N_{exo} = N_{tot} \times \frac{APE_{\text{digesta or plasmatic protein}}}{APE_{meal}}$$

Protein and IAA digestibility (% of ingested):

$$\text{Protein digestibility} = \frac{N_{ing} - N_{exo}}{N_{ing}} \times 100$$

$$\text{IAA digestibility} = \left(1 - \frac{\text{mass } AA_{digesta} \times \frac{APE_{digesta}}{APE_{meal}}}{\text{mass } AA_{ing}}\right) \times 100$$

Digestible Indispensable Amino Acid Score (DIAAS):

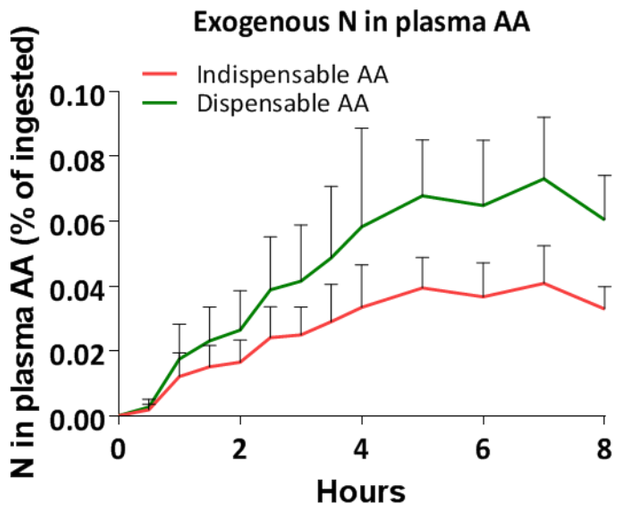
$$DIAAS = \frac{\text{mg digestible dietary IAA in 1g of the dietary protein}}{\text{mg of the same dietary IAA in 1g of the reference protein}}$$

Results

Anthropometric data

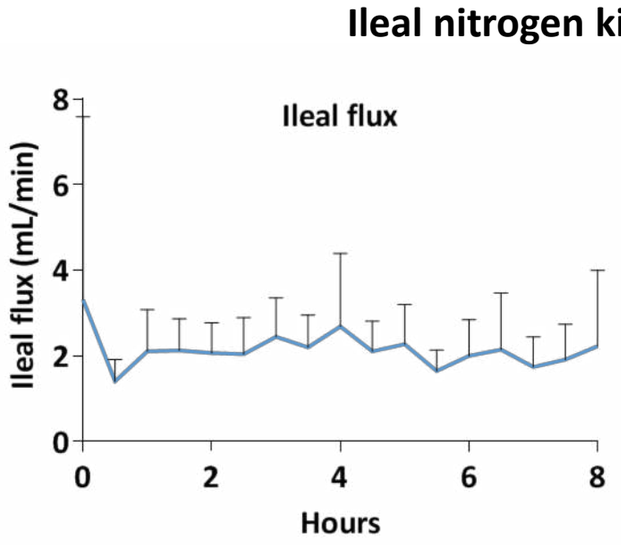
	Subjects (n=7)
Sex ratio (W/M)	85.7
Age (years)	42.6 ± 10.0
BMI (kg/m²)	24.8 ± 2.5

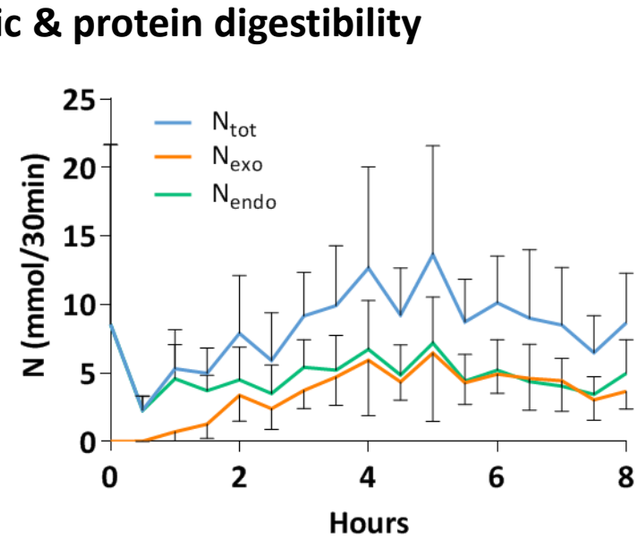
^{15}N incorporation in plasma amino acids



- Dietary nitrogen in AA increased after meal ingestion until 5h
- Started to decreased after 7h
- Incorporation was greater in dispensable AA than in IAA

Ileal nitrogen kinetic & protein digestibility

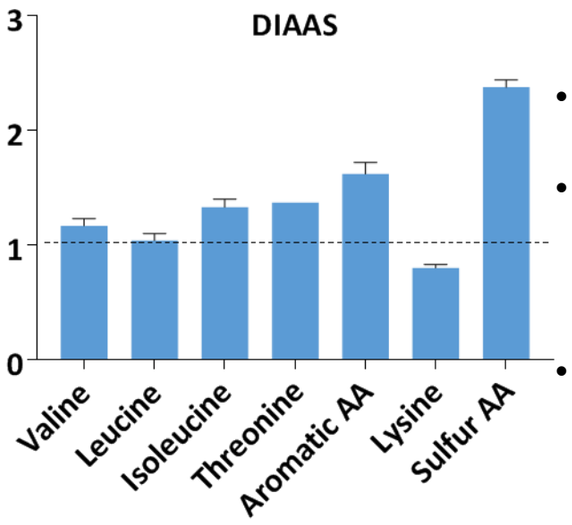




- Total nitrogen in ileum increased after meal ingestion
- Endogenous nitrogen (N_{tot} – N_{exo}) was relatively constant during time
- Protein digestibility was **86.0 ± 4.0 %**

IAA ileal digestibility (% of ingested) (n=3)	
Alanine	83.9 ± 4.4
Leucine	85.7 ± 4.5
Isoleucine	82.8 ± 4.6
Threonine	75.3 (n=1)
Phenylalanine	87.1 ± 5.3
Lysine	75.4 ± 2.4
Methionine	90.0 ± 2.3
Mean IAA	82.9 ± 5.6

IAA digestibility & DIAAS



- Ileal digestibility varied between IAA
- In average IAA digestibility was lower than protein digestibility
- DIAAS was 0.8 for lysine

Discussion

- Ileal digestibility of sunflower isolate was relatively low compared to other protein isolate studied in the same conditions (91% in soy[3], 90% in wheat[4]) but similar to another oilseed isolate (84% in rapeseed[5])
- Sunflower is deficient in lysine as the DIAAS was 0.8, a value close to our previous data in a rat model (unpublished)

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Bibliography:

[1] *Liu et al., Asian-Australas J Anim Sci, 2014*

[2] *Almeida et al., J Anim Sci, 2014*

[3] *Mariotti et al., J Nutr, 1999*

[4] *Bos et al., Am J Clin Nutr, 2005*

[5] *Bos et al., J Nutr, 2007*

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