

Utilisation of doubly stable isotope labelled *Lactobacillus johnsonii* in humans

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Introduction

- *Lactobacillus johnsonii* (La1), a probiotic *lactobacillus* strain of human origin, is able to adhere to the intestinal mucosa.
- One of the important properties of probiotics is the ability to survive in the intestine.
- For evaluation of this phenomenon, La1 was used for doubly labelling with ^{15}N and ^{13}C to investigate the digestion of orally administrated dLa1 in humans.

Aim of the Study

- Investigation of the metabolic fate of doubly ^{13}C -, ^{15}N -labelled *Lactobacillus johnsonii* (dLLa1)
 - the $^{13}\text{CO}_2$ -exhalation,
 - the urinary and faecal ^{13}C - and ^{15}N -excretion, respectively,
 - and the corresponding isotopic enrichment of specific blood plasma fractions.
 - Furthermore, the data were correlated to the oro-caecal transit time (OCTT).

Material and Methods

- Universal labelling of La1 with ^{13}C and ^{15}N by fermentation (Biostad, Braun, Melsungen, Germany) in a medium containing
 - $[\text{U-}^{15}\text{N}]$ yeast extract (prior labelled by $[\text{U-}^{15}\text{N}]\text{H}_4\text{Cl}$) and
 - $[\text{U-}^{13}\text{C}_6]$ glucose (Campro Scientific, Berlin)
- dLa1- and raffinose-administration
 - 10 healthy subjects, mean age 25.9 years, mean BMI: 23.4
 - 8.00 a.m. together with breakfast
 - dosage: 90 mg wet vital dLa1/ kg body weight + 10 g raffinose
- Sample collection
 - Breath (14 h), urine (48 h), faeces (48 h), blood (2 h)
- ^{13}C - and ^{15}N -measurement by IRMS (Tracer-mass 20-20, SerCon, Crewe, U.K., FANci2, Fischer ANalysen Instrumente Leipzig)
- Evaluation of OCTT by a raffinose H_2 -breath test (Stimotron, Wendelstein, Germany)



Fermentor Biostad B, B. Braun Melsungen

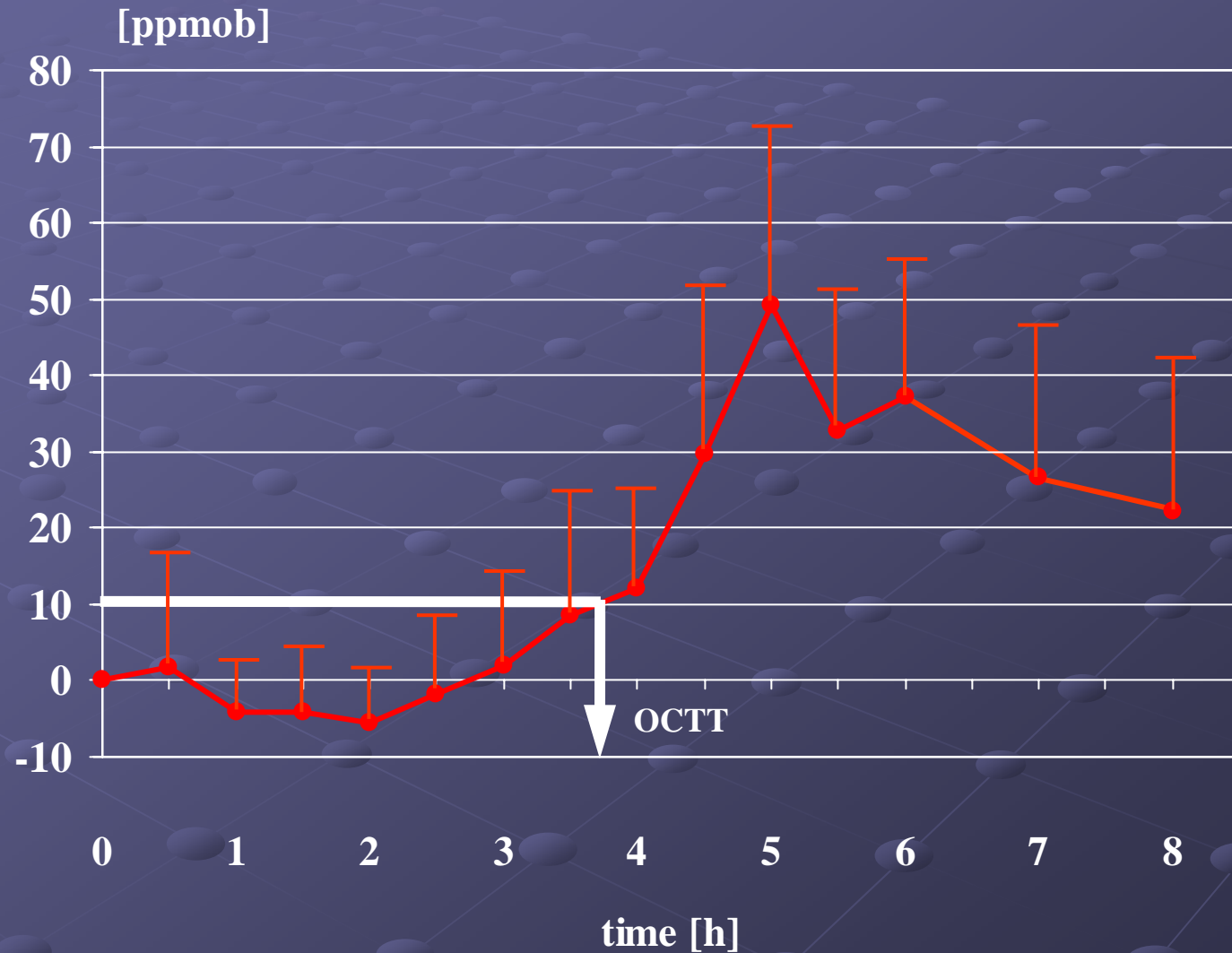




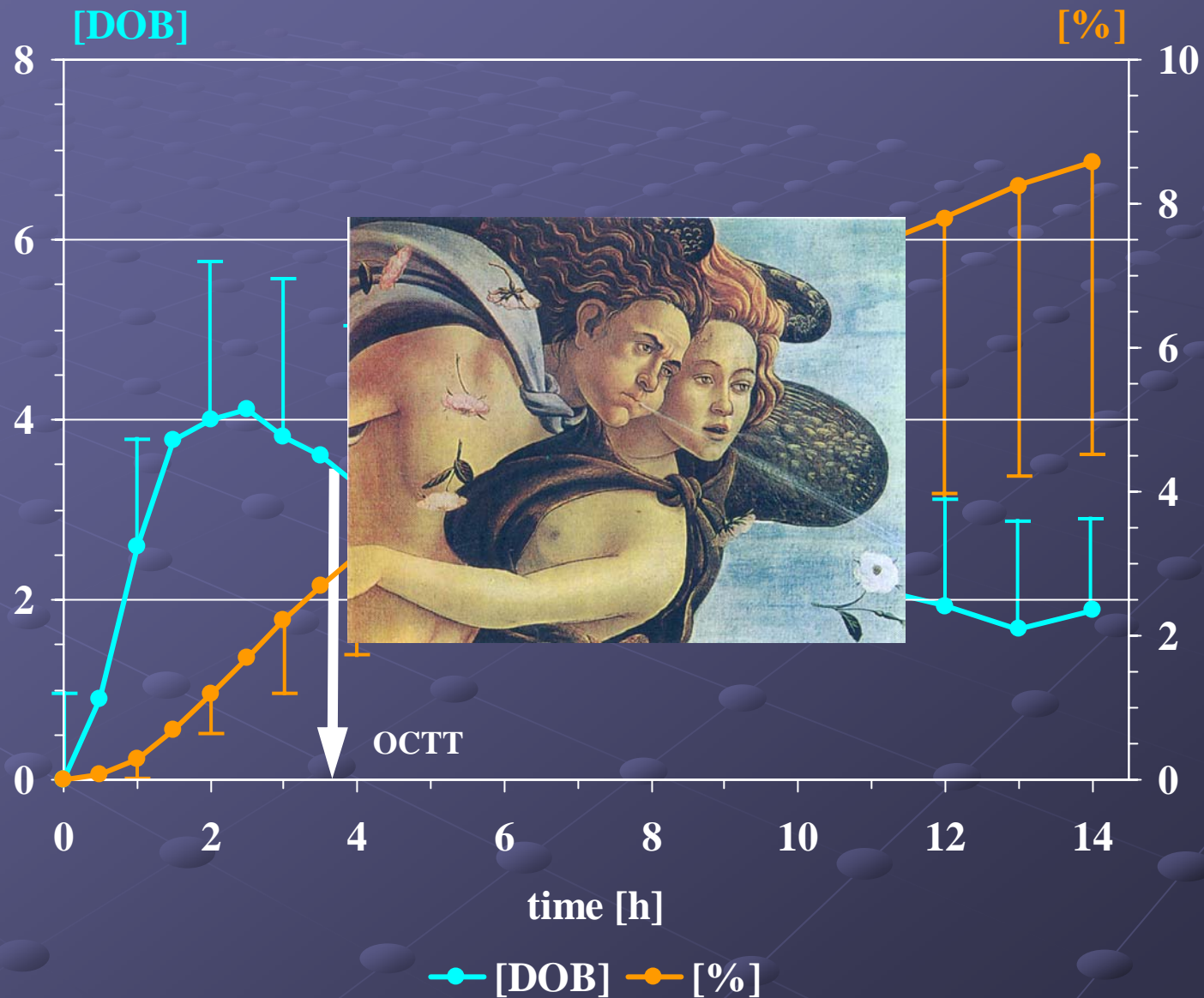


Results

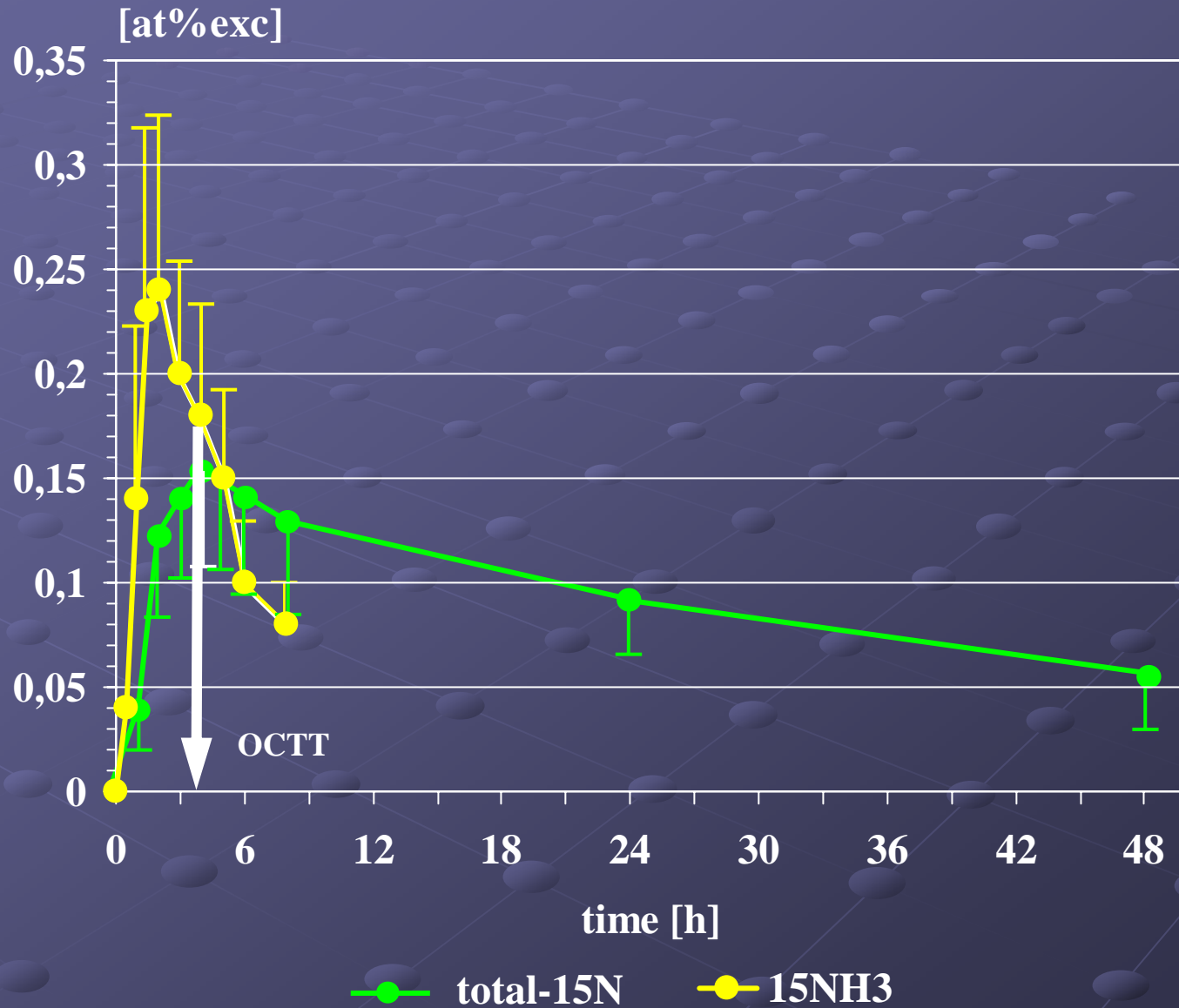
OCTT measurements by a raffinose-H₂-breath test



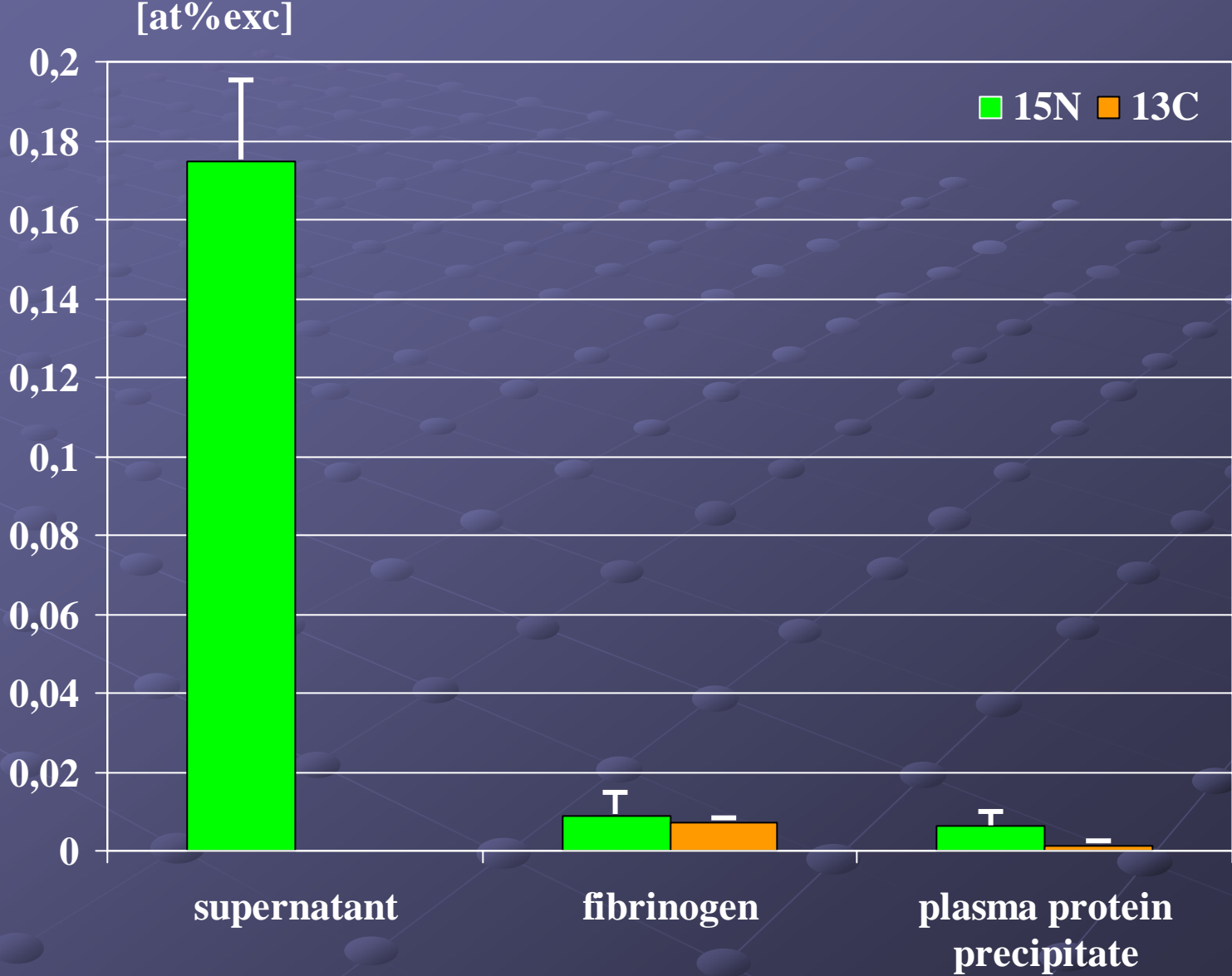
$^{13}\text{CO}_2$ -Enrichment and cumulative percentage exhalation



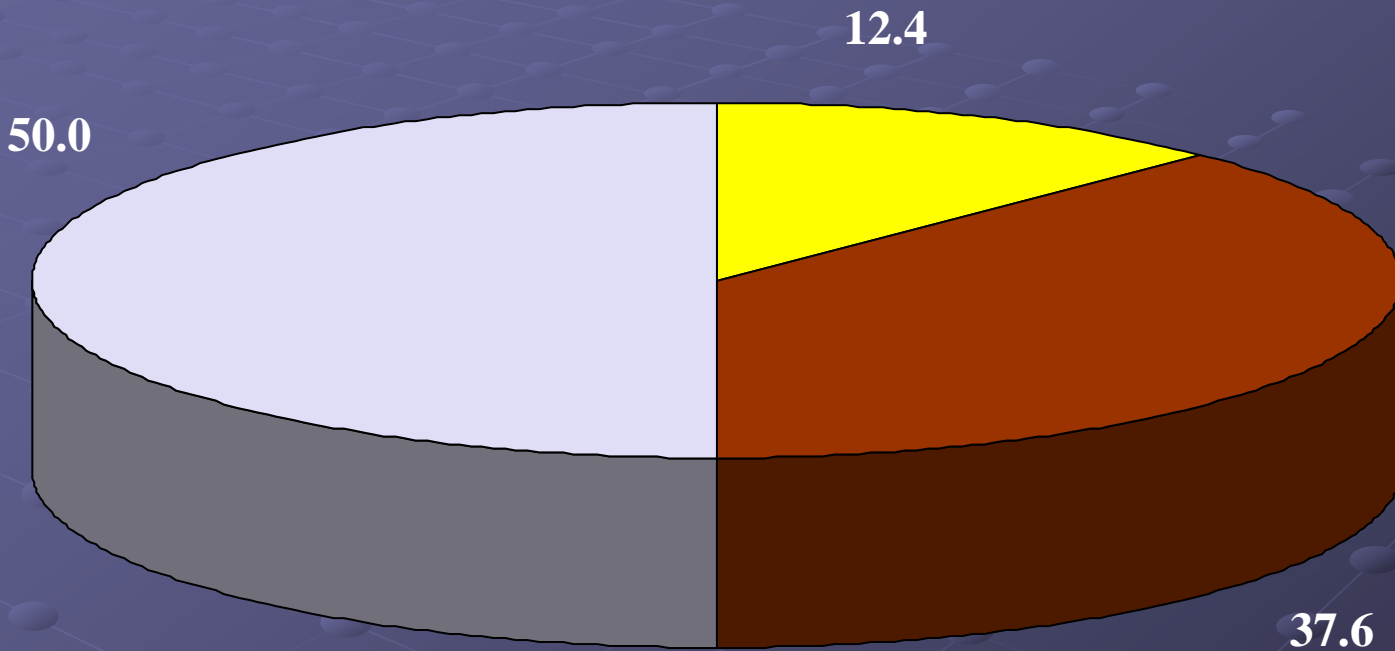
^{15}N -enrichment of urinary total-N and urinary ammonia



Isotope enrichment in different fractions of the blood

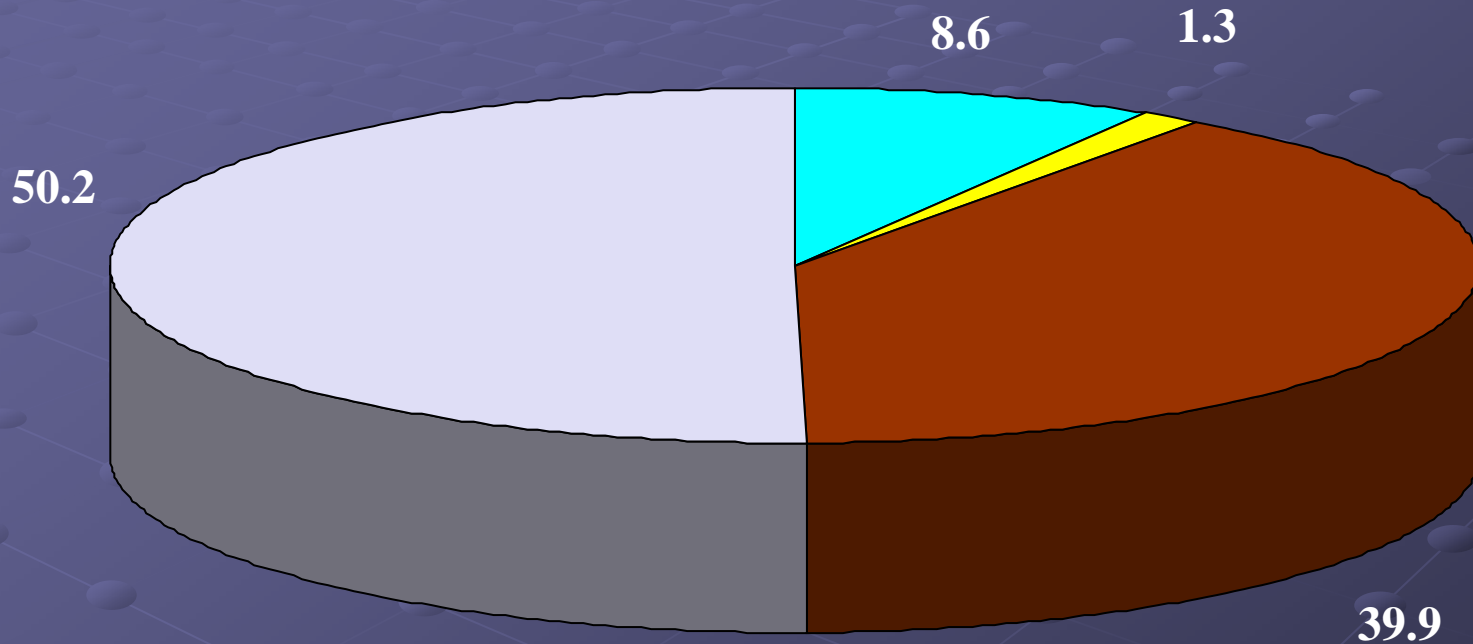


Percentage total ^{15}N -excretion and ^{15}N -incorporation



■ renal ■ faecal ■ incorporation

Percentage total ^{13}C -excretion and ^{13}C -incorporation



■ expiratory ■ renal ■ faecal ■ incorporation

Conclusion

- In comparison to the OCTT of 3.7 h both stable isotopes appear after 30 min in breath and urine indicating that dLla1 is rapidly digested in the small bowel before reaching the caecum.
- This is confirmed by ^{13}C - and ^{15}N -enrichments of blood plasma fractions.
- The ingestion of dLla1 led to an excretion of 50% of both stable isotopes.
- Our combination of measuring the expiratory, urinary and faecal excretion of ^{13}C - and ^{15}N -enriched metabolic degradation products of doubly labelled *Lactobacillus johnsonii* in correlation to the oro-caecal transit time is a novelty.
- Wutzke & Oetjens: Eur J Clin Nutr 2005, Jul 20 [Epub ahead of print], doi:10.1038/sj.ejcn.1602227