Effects of yogurt and bifidobacteria supplementation on the colonic microbiota in lactose-intolerant subjects

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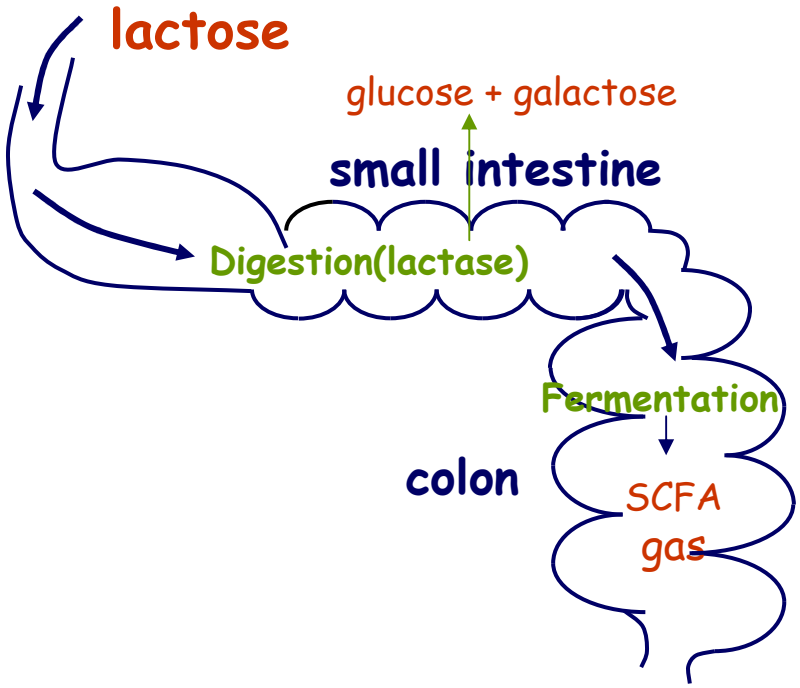
Lactose intolerance (LI)

- gastrointestinal symptoms caused by incomplete digestion of lactose
- occurring in a large part of the world population
- the origin of the symptoms is not well understood

Colonic fermentation may play a role in LI



- Variance in symptoms in subjects with similar (low) lactase activity

  (Vonk. R.J, *et al.* Eur J Clin Invest 2003;33:70-5)

- Differences in fermentation of lactose by fecal bacteria from lactose-tolerant and -intolerant subjects *in vitro*

  (He T., *et al.* J Nutr 2006;136:58-63)

modulation of the colonic microbiota may influence LI

Modulation of the colonic microbiota

by probiotics, prebiotics and synbiotics

An intervention study

Effects of yogurt and bifidobacteria supplementation on the colonic microbiota in lactose-intolerant subjects

Study design

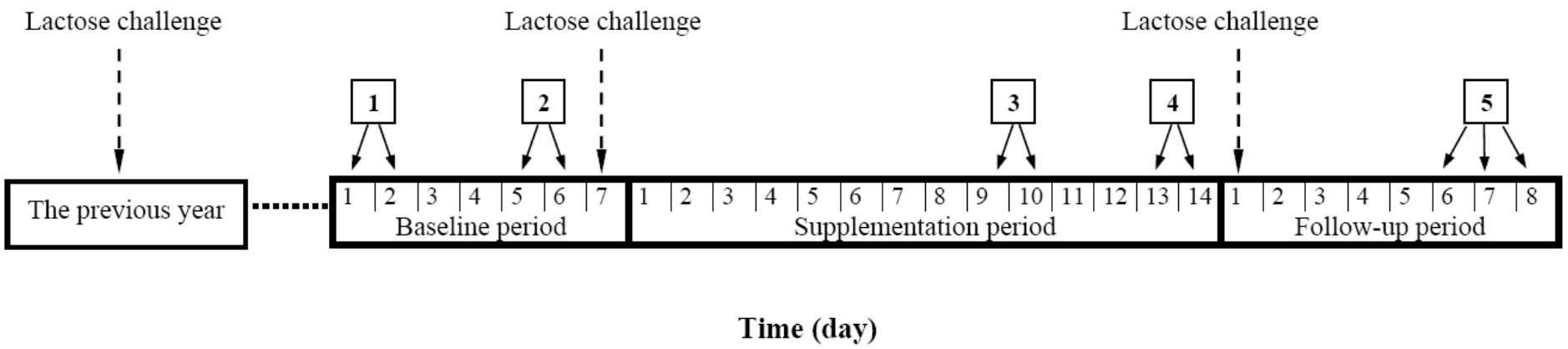
Subjects:

11 lactose-intolerant Chinese subjects (severe symptoms)

Dietary supplementation

- 'Danone' yogurt: 125g, 3 times/day
  ($4x10^{10}$ *B. animalis* DN-173010, 12 g lactose)
- 'Bifina' capsules: 3 capsules, 3 time/day
  ($2x10^{9}$ *B. longum*)

Study design



1-5: collection of fecal samples

Lactose challenge: blood and breath samples
symptom recording

Study design

Fecal samples

- bacteria (fluorescent *in situ* hybridization, FISH)
- *Bifidobacterium* (denaturing gradient gel electrophoresis, DGGE)
- ß-galactosidase activity (enzyme assay)

Breath samples

oro-cecal transit time (OCTT) (H_2 concentration)

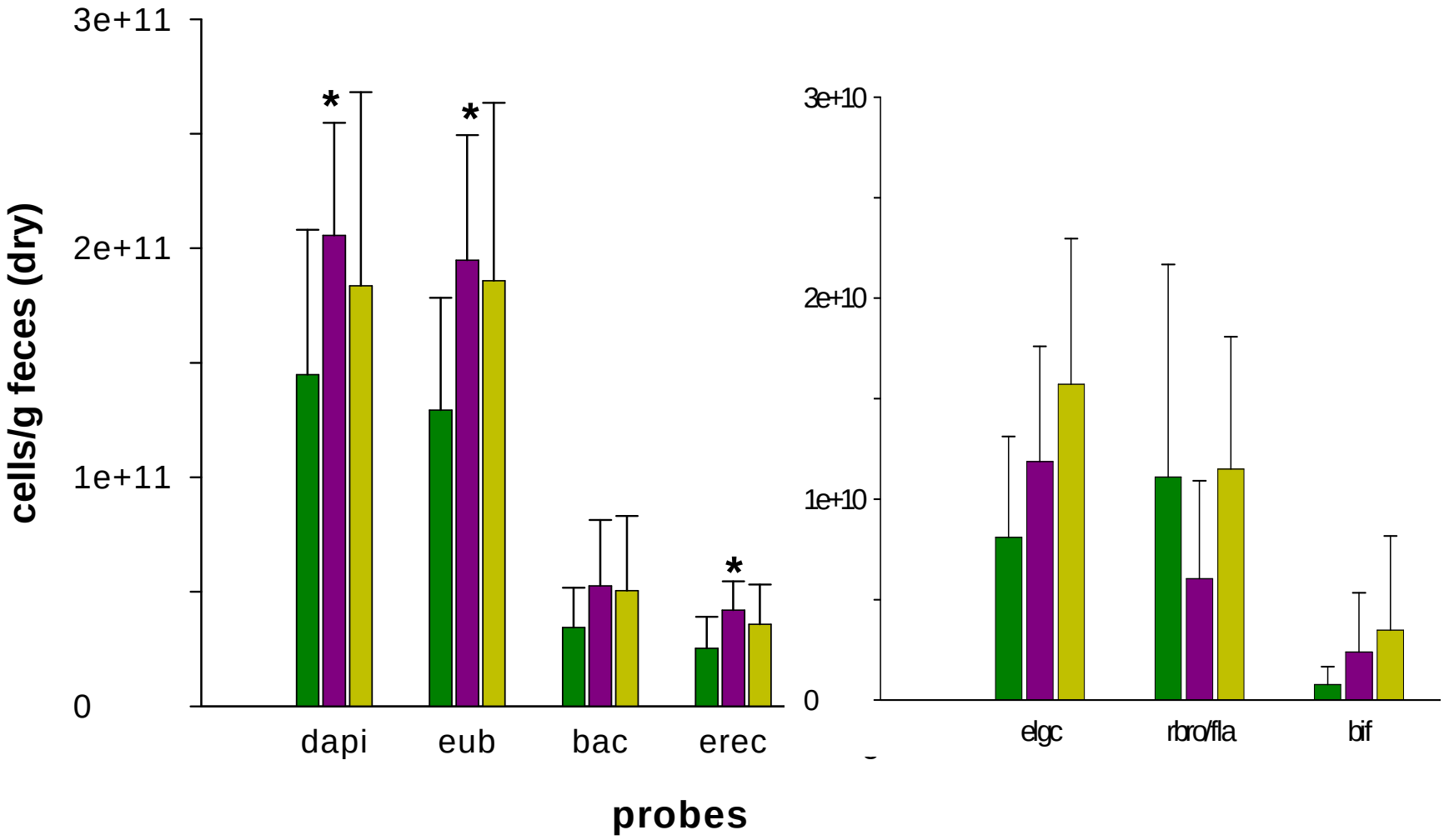
Blood samples

lactose digestion index (LDI) ($^{13}C/^{2}H$-glucose test)

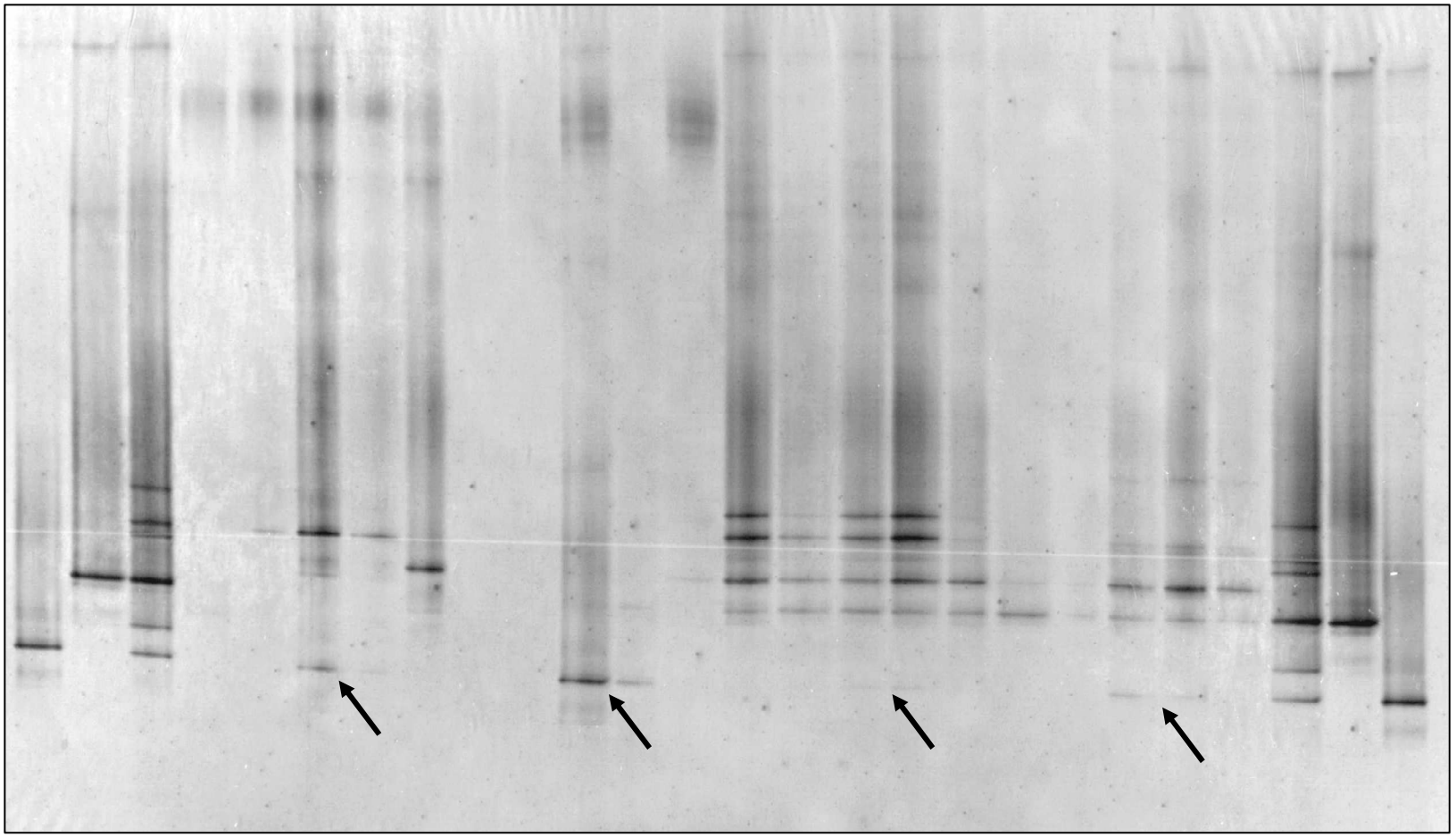
6-h symptom score (SSC)

flatulence, abdominal cramp, diarrhea

Effects on the amount of bacteria in feces (FISH)



Effects on bifidobacteria in feces (DGGE,FISH)



Numbers of bifidobacteria (10^9, FISH)

0 0 0 0 1.6 | 0 0 0 0 0 | 2.7 0.6 3.2 2.5 0.9 | 0 0 0.3 4.6 0.5

Effects on fecal ß-galactosidase activity, LDI, OCTT and SSC

	Baseline	Supplementation	Follow-up
ß-galactosidase (U/mg feces)	6.4 ± 6.3	10.6 ± 8.3*	8.9 ± 9.0
LDI	0.39 ± 0.14	nd[1]	0.38 ± 0.20
OCTT (min)	81 ± 38	nd[1]	68 ± 27
SSC	16 ± 10	nd[1]	7 ± 6**

Values are means ± SD. For OCTT, n=8; for the rest, n=11

[1] Not determined

* $P = 0.01$ compared to baseline period

** $P = 0.02$ compared to baseline period

Conclusions

- Supplementation of yogurt and bifidobacteria modifies the amount and metabolic activities of the colonic microbiota
- The changes in the colonic microbiota might be among the factors modified by the supplementation which lead to alleviation of lactose intolerance

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