Suppressive effect of *Lactobacillus gasseri* OLL 2716 (LG21) on *Helicobacter pylori* infection in humans

Ichiko Sakamoto\(^a, b\), Muneki Igarashi\(^b\), Katsunori Kimura\(^a\), Atsushi Takagi\(^b\), Takeshi Miwa\(^b\) and Yasuhiro Koga\(^a\)*

Departments of \(^a\)Infectious Diseases and \(^b\)Internal Medicine, Tokai University School of Medicine, Isehara, Kanagawa 259-1193, Japan; \(^c\)Food Functionality Research Institute, Meiji Milk Products Co. Ltd, Higashimurayama, Tokyo 189-8530, Japan

To examine the efficacy of *Lactobacillus gasseri* OLL2716 (LG21) as a probiotic for *Helicobacter pylori* in humans, 31 subjects infected with the bacterium ingested yogurt containing LG21 daily for an 8 week period. The \(^{13}\text{C}\)urea breath test and assays of serum pepsinogens revealed a significant improvement following LG21 treatment. LG21 was thus determined to be effective in both suppressing *H. pylori* and reducing gastric mucosal inflammation.

**Introduction**

The eradication of *Helicobacter pylori* by the administration of oral antimicrobial agents results in resolution of *H. pylori*-associated gastroduodenal disease. However, such treatment is not always successful in eradicating the bacterium and may be associated with adverse effects.\(^1\) In a previous study using a gnotobiotic murine model,\(^2\) we found that orally administered lactobacilli can efficiently eradicate *H. pylori*. Based on that study, we screened 203 strains of lactobacilli to select strains that exhibited high levels of binding to gastric epithelium and resistance to gastric acidity, and selected strain *Lactobacillus gasseri* OLL2716 (LG21) as the most suitable for trials in humans (unpublished data). In the present study, we examined the efficacy of this lactobacillus strain as a probiotic against *H. pylori* in infected individuals.

**Materials and methods**

The subjects consisted of 29 males and two females aged 50.1 ± 7.4 (mean ± s.d.) years without any evidence of other gastroduodenal disease. Infection with *H. pylori* was diagnosed on the basis of both positive serology and a \(^{13}\text{C}\)urea breath test (UBT).

The exclusion criteria included antecedent therapy with antibiotics in the previous month, prior treatment with acid-suppressive anti-inflammatory drugs or a history of gastric surgery. Informed consent was obtained and the study was approved by the ethics committee of our university.

The study was conducted in two parts. In the first part, 90 g of yogurt was consumed by the subjects twice daily for 8 weeks. In the second phase, which commenced 1 week following the completion of the first part, subjects received 90 g of yogurt containing LG21 twice daily for a further 8 weeks. The numbers of LG21 in this product were within the range 1–1.4 × 10\(^7\) cfu/g immediately after preparation. LG21-containing yogurt was consumed within 1 week of preparation. Numbers of LG21 in yogurt decreased by approximately 50% following 1 week of storage.

Serum pepsinogen (PG I) and II determination was performed, using a radioimmunoassay, on three occasions—before the start of the study (week 0), 1 week after finishing the first part of the study (week 9) and 1 week after finishing the second part of the study (week 18). Levels of PGI and PGII are significantly higher in individuals with gastric mucosal inflammation, with the rise in PGII greater than that of PGI.\(^3\) UBTs were also performed on overnight-fasted subjects at these times. A baseline sample of expiratory air was obtained just before the ingestion of 100 mg of \(^{13}\text{C}\)urea diluted in 20 mL water and another sample obtained 10 min later. Excess \(^{13}\text{CO}_2\) was measured by isotope mass spectrometry. Values >5 were considered as a positive result.\(^4\) In addition, specimens of gastric antrum were obtained at endoscopy during weeks 9 and 18 from six randomly selected subjects. The paired Wilcoxon signed rank test was used for statistical analysis and \(P < 0.05\) was considered statistically significant.

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*Corresponding author. Tel: +81-463-93-1121 Ext: 2591; Fax: +81-463-94-2976; E-mail: yasuhiro@is.icc.u-tokyo.ac.jp

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Results and discussion

The treatment regimen was well tolerated and subjects did not complain of any gastrointestinal symptoms whilst receiving LG21-containing yogurt. The density of *H. pylori* colonization in the stomach is of importance in the pathogenesis of infection associated with this bacterium. Khulusi et al.\(^5\) reported that no duodenal ulceration was present in subjects with antral *H. pylori* densities of <10\(^5\) cfu/mg tissue protein and that there was a correlation between bacterial viable counts and the severity and activity of *H. pylori*-associated gastritis. PG1/II ratios and UBT, as used in the present study, also provide semi-quantitative assessments of the density of *H. pylori* colonization of gastric mucosa.\(^5,6\)

Serial UBTs were performed on 29 subjects (Figure 1). Whilst there was no significant difference in the results obtained at weeks 0 and 9, the results obtained at week 18 were significantly lower than those for the earlier weeks. However, three subjects whose excess 13CO\(_2\) levels were <5 at week 18, had levels >5 3 months later, suggesting that *H. pylori* had not been eradicated completely (or that reinfection had occurred). PG1/II ratios were determined in 30 subjects. There was a significant change in PG1/II ratio following LG21 treatment, which was not observed following consumption of non-LG21-supplemented yogurt (Figure 2). Examination of antral biopsies showed two- to 100-fold decreases in the numbers of *H. pylori*, but in no case were bacteria eliminated completely.

Recently, Michetti et al.\(^4\) reported that a whey-based culture supernatant of *Lactobacillus acidophilus* La1 has a partial, acid-independent, long-term suppressive effect on *H. pylori* in humans. In the present study, suppression of *H. pylori* as determined by UBT and antral biopsy was similarly incomplete. Nevertheless, significant improvements in the degree of gastric inflammation as demonstrated by PG1/II levels were observed and further investigations into the role of probiotics in the therapy of *H. pylori*-associated gastroduodenal infection are indicated.

References


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**Figure 1.** UBT. The circles indicate the value for each individual and the closed circles at week 18 indicate no detection of *H. pylori* (<5%). Values for the same individual are connected by lines. The bars represent the mean. NS, not significant.

**Figure 2.** Serum PG/II ratio. The circles indicate the value for each individual. Values for the same individual are connected by lines. The bars represent the mean. NS, not significant.