

**Antimicrobial Activity of Fermented Maillard Reaction Products on Asymptomatically Gut-inhibiting Gram-Positive Foodborne Bacteria**

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## Abstract

Recently, fermented Maillard reaction products made of milk proteins (FMRPs) have been studied for their physiological effects, such as antihypertensive effects and prevention of cardiovascular diseases, and are recommended as novel synbiotics based on their functionalities. However, there is a lack of research on their antimicrobial activity against pathogenic bacteria. Thus, the objective of this study was to evaluate the antimicrobial effects of FMRPs on pathogenic bacteria (*Listeria monocytogenes* and *Clostridium perfringens*) and to elucidate antimicrobial modes of FMRPs on the bacteria using physiological and morphological analysis. Antimicrobial effects of FMRPs [whey protein plus galactose fermented by *Lactobacillus rhamnosus* 4B15 (Gal-4B15), and *Lactobacillus gasseri* 4M13 (Gal-4M13), whey protein plus glucose fermented by *L. rhamnosus* 4B15 (Glc-4B15) and *L. gasseri* 4M13 (Glc-4M13)] on pathogenic bacteria were examined by evaluating growth patterns of bacteria exposed to FMRPs. Iron chelation activity analysis, propidium iodide uptake assay, and morphological analysis with field emission scanning electron microscope (FE-SEM) were conducted to elucidate the modes of antimicrobial activities of FMRPs. When the bacteria were exposed to FMRPs, the growth of both *L. monocytogenes* and *C. perfringens* significantly decreased ( $p < 0.05$ ) by Gal-4M13; Gal-4M13 showed high iron chelation activity ( $23.87 \pm 1.16$  %). In addition, with propidium iodide uptake assay, bacterial cellular damage was seen to increase in Gal-4M13-treated *L. monocytogenes* and Gal-4B15-treated *C. perfringens*. Moreover, cell wall damage in *L. monocytogenes* and *C. perfringens* was observed by FE-SEM. These results indicate that Gal-4B15 and Gal-4M13 can potentially be used to inhibit harmful intestinal bacteria.