

Probiotic *Lactobacillus paracasei* effect on cariogenic bacterial flora

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Abstract *Lactobacillus paracasei* has been demonstrated to inhibit the growth of many pathogenic microbes such as *Streptococcus mutans*, in vitro. However, its clinical application remains unclear. Here, we examined whether a novel probiotic *L. paracasei* GMNL-33 may reduce the caries-associated salivary microbial counts in healthy adults. Seventy-eight subjects (aged 20 to 26) had completed this double-blinded, randomized, placebo-controlled study. A probiotic/test ($n=42$) and a control group ($n=36$) took a *L. paracasei* GMNL-33 and a placebo oral tablet three times per day for 2 weeks, respectively. Bacterial counts of salivary *S. mutans*, lactobacilli, and salivary buffer capacity were measured with chair-side kits at the beginning (T1), the completion (T2) of medication, and 2 weeks after medication (T3). The results did not show differences in the counts of *S. mutans* and lactobacilli between probiotic and control groups at T1, T2, and T3. Nevertheless, within the probiotic group, an interesting probiotic effect was noticed. Between T1 and T2, no inhibitory effect against *S. mutans* was observed. However,

a significant count reduction in the salivary *S. mutans* was detected between T2 and T3 ($p=0.016$). Thus, a 2-week period of medication via oral administration route may be needed for *L. paracasei* GMNL-33 to be effective in the probiotic action.

Keywords Probiotic · *Lactobacillus paracasei* · *Streptococcus mutans* · Lactobacilli · Salivary buffer capacity

Introduction

The definition of “probiotics” has been adopted by the International Scientific Association and the World Health Organization: “Live microorganisms, if administered in adequate amounts, confer a health benefit on the host” [1]. Recently, a lot of studies focused on the effect of the probiotic for oral health. Among previous human clinical studies, *Lactobacillus rhamnosus* GG, ATCC 53103 (LGG) and *L. rhamnosus* LC 705 [2], *Lactobacillus reuteri* [3–6], and *Bifidobacterium* [7, 8] could inhibit the oral cariogenic bacteria such as *Streptococcus mutans*. LGG and *L. rhamnosus* LC 705 could reduce the prevalence of yeast counts in elder persons [9]. *Lactobacillus salivarius* TI 2711 could reduce *Porphyromonas gingivalis* counts [10]. *L. reuteri* could reduce gingivitis and plaque scores [11]. *Weissella confusa* CMU [12] and *Streptococcus salivarius* K12 [13] could reduce halitosis in human study.

Lactobacillus paracasei isolated from healthy humans showed antibacterial and anticandidal activities against oral pathogens such as *S. mutans*, *S. salivarius*, *Streptococcus sanguis*, *Staphylococcus aureus*, *Actinomyces viscosus*, *P. gingivalis*, *Candida albican*, *Candida tropicalis*, and *Candida grabata* [14]. The strongest antimicrobial activity

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