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Efficacy of *Lactobacillus fermentum* Biosurfactants on Remineralization Biofilm-Coated Hydroxyapatite

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Remineralizing agents have been widely used for preventive and non-invasive care of non-cavitated carious lesions to restore minerals to demineralized enamel. Nanohydroxyapatite (nHAp) and sodium fluoride (NaF) are among the most effective and commercially available caries-preventing remineralizing agents. Biosurfactants produced by oral bacteria *Lactobacillus* have been shown to inhibit biofilm formation. However, there is limited evidence of *Lactobacillus* biosurfactants' effects on remineralization process. Thus, this research aimed to investigate the emulsifying and antibiofilm activities of the *L. fermentum* biosurfactant (LFB) against *Escherichia coli* biofilm and the effects of LFB in combination with nHAp and NaF on remineralization of initial caries. The emulsifying and biofilm-inhibiting properties of LFB were investigated by oil-spreading and antibiofilm assays, respectively. The remineralization treatments were examined on *E. coli* biofilm-coated and acid-demineralized hydroxyapatite (HA) discs as artificial initial caries. Analysis of microbial growth on the surface of HA discs was performed using the WST-8 assay and SEM-EDX. The results showed that LFB efficiently acted as emulsifiers and significantly reduced biofilm formed by *E. coli* in the co-incubation experiments. Treatments of nHAp and NaF with added LFB were shown to reduce microbial viability in short-term biofilm-precoating experiments. In addition, LFB were demonstrated to form emulsion-based nanoparticles containing nHAp and NaF as revealed by TEM-EDS. Remineralization treatments with preformed nanoparticles increased calcium-phosphorus ratios on the surface of HA discs in biofilm-precoating and co-incubation experiments. These results would suggest further studies on using LFB as antibiofilm agents along with nHAp and NaF for prevention and treatments of initial caries.

Keywords: Biosurfactant, *Lactobacillus fermentum*, Biofilm, *Escherichia coli*, Remineralization