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Remineralization Effects of Nanohydroxyapatite-Containing Dentifrice: a pH-Cycling Study Using Supernatant

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Objective: to compare the effects of a dentifrice containing nano-hydroxyapatite (nHA) with a fluoride dentifrice on the remineralization of artificial enamel caries-like lesions, using a supernatant of each dentifrice preparation (the method commonly employed to assess the remineralization effect of fluoride, which is believed to occur at an ionic level) in a pH cycling model.
Methods: Sound extracted third molars with artificial lesions, 100-120μm deep, were cut into sections 100-150μm thick. Each specimen was studied using polarized light microscopy and microradiography to evaluate the lesion depth (LD) and the mineral content of the lesions before and after 10 days of pH cycling. Each cycle involved three hours of demineralization twice a day, with two hours' immersion in a remineralizing solution approximating human saliva between demineralization, and another 16 hours similar immersion overnight. One-minute treatments with a supernatant of the selected dentifrice preparations were performed thrice daily, before the first demineralization and before and after the second demineralization. Thirty-three sections were randomly divided into three groups, Group 1: 950ppm NaF dentifrices; Group 2: dentifrices with no active ingredients (-ve control) and Group 3: 10% nHA dentifrices.
Results: After 10 days pH cycling, the lesion depth decreased by 23% and 15% in Groups 1 and 3, respectively, while those in Group 2 showed an obvious increased in lesion depth by 78%. Groups 1 and 3 were significantly different from Group 2 ($p<0.001$, ANOVA and SNK test). No significant difference was found between Groups 1 and 3 ($p>0.05$, ANOVA and SNK test).
Conclusion: Based on the data obtained from this pH cycling model, using supernatant preparations of dentifrices, the dentifrice that contained 10% nHA showed no significant difference in healing efficacy from the dentifrice that contained 950ppm NaF. This study was supported by Sangi Co., Ltd. Japan.

Group	Dentifrice	LD(μm)±SD Before	LD(μm)±SD After	% change ±SD
1	950ppm NaF (+ve control)	104±3	80±9	-23%±8 ★***
2	No active ingredients(-ve control)	103±3	183±25	78%±26 ▲***
3	10% nHA	106±2	90±11	-15%±10 ★**

** $p<0.01$, *** $p<0.001$, paired-*t*-test
Different symbols indicate a difference among groups ($p<0.001$, ANOVA and SNK).

Depth of Demineralized lesions (LD)