

# In Situ Remineralization of Early Caries Lesions by Nano-hydroxyapatite Dentifrice

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**Objective:** The aims of this in situ study were to investigate the efficacy of nano-hydroxyapatite (nHAP) dentifrices on (1) remineralization of early caries lesions, and (2) inhibition of demineralization of sound enamel surface.

**Methods:** Three demineralized enamel blocks and one sound block were cut from each of 30 human molars used. A slice was cut from each block and analyzed with transverse microradiography (TMR) to establish baseline lesion parameters of mineral loss ( $\Delta z$ ) and lesion depth (ld). Thirty healthy adults enrolled in this double blind crossover study underwent four treatment periods separated by 7-day washout period and each lasting 28 days. During three of the four study periods, subjects wore modified orthodontic brackets bearing demineralized enamel blocks, and brushed three times daily with either one of two dentifrices of varying nHAP concentrations (A, B) or 1100ppm fluoride dentifrice (C). On one of the four treatment periods (D), subjects wore sound enamel specimens and brushed with nHAP dentifrice B. After each period, brackets were removed and specimens were analyzed using TMR. Data were analyzed by paired t-test ( $\alpha=0.05$ ) using 20% trimmed means with 95% confidence intervals.

**Results:** All pairwise comparisons of Baseline versus Test in A, B, and C demonstrated significant ( $p<.001$ ) reduction in  $\Delta z$ , with mean (vol%. $\mu\text{m}$ ) differences (95% CI): A 440.5 (337.9 to 563.2); B 389.5 (335.8 to 442.6); C 346.3 (258.9 to 447.9). No significant differences were found among the three products with respect to percent mineral gain: A 31.4%; B 28.6%; C 29.2%. Similar trend was observed with the lesion depth. Microradiograms of sound enamel specimens following exposure to nHAP dentifrice in period D showed no evidence of demineralization.

**Conclusion:** nHAP dentifrice caused remineralization of early caries lesions comparable to fluoride dentifrice, and inhibited caries development, thus suggesting nHAP dentifrice may be an effective alternative to fluoride toothpaste.

Table: The mean percentage change in mineral loss and lesion depth in the three treatment groups

Response variable	% Change			df	F	<i>P</i> Value†
	Group A (n = 29)	Group B (n = 29)	Group C (n = 29)			
$\Delta Z$	32.9 (17.1)	28.5 (11.5)	30.3 (16.3)	28	0.92	0.40
LD	14.1 (11.0)	10.1 (9.4)	10.2 (15.6)	28	0.72	0.48