

Enhanced Enamel Fluoride Uptake from NovaMin®-Containing Fluoride Dentifrices

A.H. Stone¹, B.R. Schemehorn², and A.K. Burwell¹

1. NovaMin Technology, Inc, Alachua, USA, 2. Dental Products Testing, Indianapolis, USA



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Objective: NovaMin® (calcium sodium phosphosilicate, Bioglass®) releases calcium, phosphorus, sodium, and silicon ions into aqueous solutions thereby increasing the remineralization potential in the oral environment. Fluoride uptake onto tooth surfaces is driven by calcium and phosphate concentrations in saliva. NovaMin® releases calcium and phosphorus and therefore has the potential to increase activity of fluoride. Fluoride release and enamel fluoride uptake from three fluoride dentifrices containing different concentrations of NovaMin® were tested according to FDA monograph methods.

Methods: Three silica-based sodium monofluorophosphate (SMFP) dentifrices were evaluated: A) USP Reference Standard (0%NovaMin+1000ppmF as SMFP), B) 5%NovaMin+1000ppmF as SMFP, and C) 7.5%NovaMin+1000ppmF as SMFP. Enamel fluoride uptake (EFU), total fluorine (TF; 1:100 dilution), and total soluble available fluoride (TSAF; 1:10 dilution), were measured using FDA methods #40, #3, and #16, respectively. Results were analyzed using ANOVA and Newman-Keuls methods ($p < 0.01$).

Results: Data are presented as Mean±S.E.M with $n=12$. EFU results (increase in enamel fluoride concentration) were: A) 686 ± 15 ppmF, B) 929 ± 26 ppmF, and C) 901 ± 29 ppmF. EFU for both NovaMin-containing dentifrices was significantly greater than the USP reference standard ($p < 0.01$). TF results were: A) 1055 ± 4 ppmF, B) 936 ± 7 ppmF, and C) 935 ± 9 ppmF. TSAF results were: A) 1023 ± 7 ppmF, B) 927 ± 2 ppmF, and C) 914 ± 8 ppmF. All dentifrices met the FDA requirement for TF (850-1150ppmF) and TSAF (≥ 800 ppmF) in fresh silica-based SMFP dentifrices.

Conclusion: When tested using standard FDA monograph methods, adding NovaMin® to fluoride dentifrices significantly enhanced fluoride uptake into artificial carious lesions in enamel surfaces. NovaMin®-containing fluoride dentifrices also met all FDA requirements for fluoride availability and release. Current results indicate that NovaMin®-containing fluoride dentifrices may have a greater potential to fluorinate tooth surfaces than conventional fluoride-only dentifrices. A synergistic relationship between NovaMin® and fluoride is demonstrated in which NovaMin® provides the supplemental calcium and phosphorus needed for fluoride uptake into tooth surfaces therefore increasing potential for remineralization.

Key Words: Enamel, Remineralization, Caries, Fluoride, NovaMin

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