Dentinal Tubule Occlusion with Stannous Fluoride Dentifrices
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ABSTRACT
SnF₂ efficacy for the control of hypersensitivity is driven by occlusion of patent dentinal tubuli. The rate of tubule blockage can affect response of patients to treatments.

Objectives: This study examined dentinal tubule occlusion effects of stannous fluoride dentifrices and their mechanical and chemical durability in vitro.

Methods: Etched coronal dentin specimens were prepared from extracted human third molars. Specimens were randomized for average patent tubule diameter and density and allocated to dentifrice treatment groups (N=8) including sodium fluoride (Colgate® Total™ NaF); sodium monofluorophosphate (Colgate® Regular, SNF1); stannous fluoride - hexametaphosphate (Crest Pro-Health™ SNF2), stannous and fluoride dentifrice (Crest Pro Health – China SNF2). Specimens were brushed with dentifrice for 5 brushing-cycles comprised of 2 minute paste applications followed by 1 hour of saliva washing under agitation. Post-brushing (PB) samples were gently agitated 16-hours in saliva to test smear layer physical durability (SW). Following saliva agitation specimens were challenged with acidic cola beverage for 1 minute to examine chemical durability (AW). Surfaces were imaged by light microscopy after 1 brushing cycle (PB1), 5 brushing cycles (PBS), saliva wash (SW) and acid wash (AW). Specimens were graded (blind to treatment) on a 6-point scale: 0: open tubuli; 1: most tubule open (~90%); 2: tubuli are occluded 50%; 3: most tubuli occluded, tubuli outlines visible; 4: mostly covered, few tubuli visible; 5: no open tubuli, intact smear layer.

Results: PB1: NaF:1.5a; SMFP:1.5a; SNF1:2.9b; SNF2:2.5b; PBS: NaF:1.6a; SMFP:1.6a; SNF1:3.4b; SNF2:2.5b; SW: NaF:1.6a; SMFP:1.4a; SNF1:2.3b; SNF2:2.4b; AW: NaF:1.3a; SMFP:0.6a; SNF1:2.3b; SNF2:2.2b (a=b p < 0.05 Students t comparison).

Conclusions: Stannous fluoride containing dentifrices produced more rapid onset of tubule occlusion than NaF or SMFP. SnF₂ smear layers were durable to physical and chemical challenge.

INTRODUCTION
One of the more effective approaches to the treatment of dentinal hypersensitivity includes application of topicals to occlude exposed dentinal tubuli at the gingival margin.1-3 Stannous fluoride has proven effective for producing tubule obturation in vitro and clinical studies have confirmed the clinical effectiveness of SnF₂.3,4 Most recently, multifluit SnF₂ dentifrices have been developed providing simultaneous clinical effectiveness for the most common clinical needs of patients. This study used an in vitro Tubule Occlusion Brushing Assay (TUBA) model to compare the effects of multifluit SnF₂ dentifrices to NaF and SMFP dentifrices for the formation of smear layers and for durability of formed layers to mechanical and chemical (acid) stress.

MATERIALS AND METHODS

RESULTS

CONCLUSIONS
Dentifrices containing stannous fluoride showed efficacy in rapid onset of smear layer occlusion superior to NaF or SMFP dentifrices. Tubule occlusion provided by stannous fluoride dentifrices showed excellent durability to both mechanical and chemical (acid) environmental challenges. Stannous fluoride dentifrices have exhibited clinical efficacy in providing rapid onset relief of pain from stimuli matching these model predictions.6

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