Effects of Hexametaphosphate Dentifrice on Stain Removal and Calculus
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ABSTRACT
Hexametaphosphate dentifrices have been clinically proven to provide efficacy in tooth whitening (extrinsic stain removal and prevention) as well as in prevention of accumulation of calculus deposits. HMP is a ‘calcium surface active builder’ – meaning its solution calcium binding efficiencies are complemented by surface reactivity with minerals permitting intraoral retention. Objectives: In these studies the reactive actions of HMP on extrinsic stain removal and on prevention or calculus deposition were evaluated in specialized protocols in vitro.

MATERIALS AND METHODS
Calcium phosphate surface active builders include molecules which show calcium binding properties in both solution and on intramural mineral surfaces. CPSABs, such as pophosphate and hexametaphosphate show clinical efficacy for reduction of dental calculus formation and removal/prevention of extrinsic dental stains. Crest® Vivid White® dentifrice contains sodium hexametaphosphate in a silica bearing base formulated with sodium fluoride for caries prevention. These studies were directed toward demonstrating the physical chemical mechanisms responsible for CWF’s clinical efficacy for the loosening of dental stains and calculus prevention.

INTRODUCTION
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MATERIALS AND METHODS
Treatments:
- Crest Cavity Protection CCF (NaF, silica-abrasive)
- Crest Tartar Control CTC NaF (silica-abrasive, sodium pyrophosphate)
- Crest Dual Action Whitening CDWW (NaF, silica, sodium hexametaphosphate)
- Crest® Vivid White® CVW (NaF, silica, sodium hexametaphosphate)
- Crest® Vivid White® Night CVWN (NaF, silica, sodium hexametaphosphate)

RESULTS
HAP Powder Stain:
- Stain prevention: BioRad HAP chromatography grade pre-treated with supernatants of dentifrice/water slurries, centrifuged, washed and then treated with concentrated tea solution.

Stain removal: HAP pre-treated with concentrated tea solution then post treated with supernatants of dentifrice/water slurries, centrifuged, washed. Powder color compared visually and by digital color analysis (Pig HC-1000 C/D high resolution digital camera with standard lighting).

mPGM Plaque Calcification Tartar Control Assessment:
- Evaluation for anticalculus activity followed the modified Plaque Growth and Mineralization methodology published previously J Clin Dent 13: 33-37, 2002. Dentifrice slurry treatments of saliva developed plaque biofilm on glass slides is cycled with supernatants of dentifrice/water slurries, centrifuged, washed. HMP calcium % inhibition showed: CCP control (0); Crest Tartar Control – pyrophosphate 29.8; CVWN ½ treat – 54.0; CVW (standard Vivid White) treatment – 69.5. All mPGM different significantly. p = 0.05.

Stain Loosening In Vitro:
- Stained bovine enamel (PCR) were prepared as described by Stookey – J Dent Res 61: 1236-1239, 1982. Stain color was measured with a Fuji X-2000 in CIELAB coordinates and specimens were stratified with respect to initial L* color.

CONCLUSION
HMP shows stain loosening actions on PCR dental stain simulating overnight clinical actions. CVWN demonstrated anticalcific efficacy with simulation of 1x/day dosing. HAP powder treatments confirm HMP surface chemical anti-stain actions.