Laboratory Assessment of Tartar Control Efficacy of Fluoridated Pyrophosphate Dentifrices

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696

ABSTRACT

Laboratory testing protocols (profiles) are routinely used to validate likely clinical activity of minor formulation changes in tartar control and fluoridated dentifrices. The efficacy of tartar control formulations can be specifically assessed in the mPGM plaque biofilm calcification model (*J Dent Res* 71: 173 (#543-544) 1992). **Objectives:** This study examined the comparative efficacy of fluoridated tartar control dentifrices toward reducing plaque mineralization susceptibility of biofilms *in vitro*. **Methods:** Plaque biofilms were prepared and mineralized by alternate immersion of glass rods in human saliva and artificial mineralization solution supersaturated with respect to HAP, OCP, and DCPD (White *et al.*, *J Dent Res.* 70; 276 (#84) 1991). Treatments of 25% w/w dentifrice water slurries were carried out for 60 seconds daily for 6 days, between saliva and mineralization solution immersions. Plaque calcium levels were determined by digestion and inductively coupled plasma optical emission spectroscopy. Test formulations included: i) Crest® Regular NaF (control); ii) Crest Tartar Control (5.0 % Pyrophosphate), iii) Crest Whitening + Scope (5 % Pyrophosphate); iv) Crest Whitening + Scope Liquigel (5 % Pyrophosphate); v) Crest Rejuvenating Effects Paste (5 % Pyrophosphate). **Results:** Results of the study (expressed as % reduction in mineralization vs. control producing 1779 ± 132 µg calcium/mg plaque wt.) - ab Students paired t: i) 0.0, a; ii) 45.1, b; iii) 47.0, b; iv) 53.7 b; v) 52.6, b. **Conclusions:** Newly commercialized pyrophosphate dentifrices were similarly effective in reducing plaque susceptibility to calcification associated with precursor steps of dental calculus formation.

INTRODUCTION

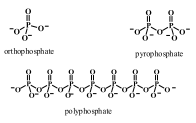
An important component of multibenefit trends in dentifrices is the provision of tartar control benefits. Supragingival dental calculus formation can be prevented/reduced through the activity of calcium phosphate surface active builders such as pyrophosphate, tripolyphosphate or sodium hexametaphosphate. Multiple clinical studies have established the generic efficacy of these types of ingredients incorporated into dentifrices. Laboratory studies of dentifrice effects can serve as surrogates to ensure clinical efficacy of formulation variations. The Modified Plaque Growth and Mineralization technique (mPGM) is a biofilm based model which provides quantitative assessments of formulation tartar control activity.

Supragingival Dental Calculus

Clinical Removal of Calculus

Clinical Control of Calculus

CPSAB Condensed Phosphates



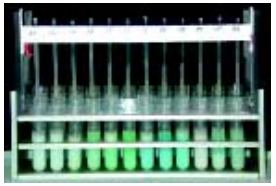
MATERIALS AND METHODS

DAY 1

Polished glass rods are used as the substrate for plaque formation by dipping 2 rpm in pooled human saliva using a modified incubator.

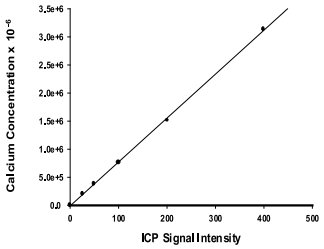
DAYS 3-10

The plaque biofilm is treated 1x per day with a 25% dentifrice slurry with subsequent 12 hour exposures to mineralization solution (daily) and saliva (overnight).



DAY 11

Calcium concentration of digested plaque is measured via Inductively Coupled Plasma-Optical Emission Spectroscopy.



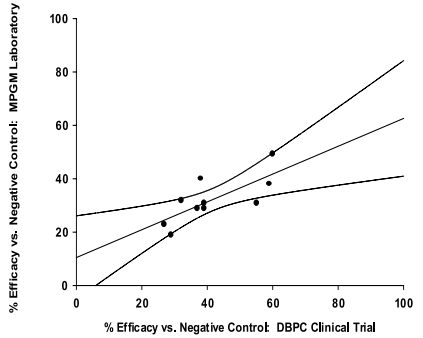
Study Treatments

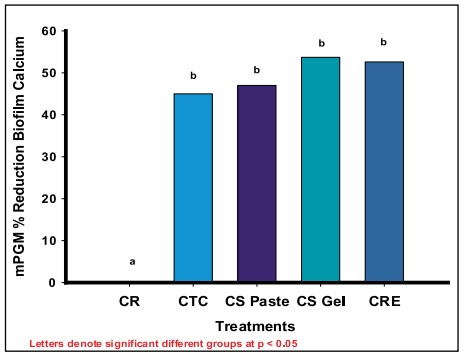
- Crest Regular Cavity Protection (negative control)
- Crest Tartar Control (positive control)
- Crest Whitening plus Scope
- Crest Whitening plus Scope Liquigel
- Crest Rejuvenating Effects

TC Agent	
CR	None
CTC	5% Pyrophosphate
CS paste	5% Pyrophosphate
CS gel	5% Pyrophosphate
CRE	5% Pyrophosphate

RESULTS

Correlation of mPGM biofilm calcium inhibition to clinical efficacy of dentifrice formulations in the prevention of dental calculus formation (White, JDR, 1998).





CONCLUSION

- Standard tartar control positive control produced significant reduction in plaque mineralization – validating mPGM study
- Crest Whitening + Scope Paste and Liquigel produced significant tartar control activity in biofilm mineralization assessment
- Crest Rejuvenating Effects paste produced significant tartar control activity in biofilm mineralization assessment