In vitro dentine occlusion by an experimental stannous fluoride formulation

Hall PJ[1], Willson RJ[2], Spradbery PS[1], Evans M[1], Davies LJ[1], Howarth EM[1], Khan S[3].
J Dent Res 96 (Sp Iss A) Abstract 1541 (2017) presented at IADR San Francisco, USA, 22-25 March 2017.

[1]Intertek Clinical Research Services, Hooton, UK. [2]Modus Laboratories Ltd, Reading, UK. [3]Research & Development, GlaxoSmithKline Consumer Healthcare, Weybridge, UK.

Aim

To investigate *in vitro* the ability of an experimental 0.454% stannous fluoride test dentifrice to occlude dentine tubules, compared with a commercially available control dentifrice.

Study Products

- **Test dentifrice** – experimental dentifrice containing 0.454% stannous fluoride (Sensodyne Rapid Relief).
- **Control dentifrice** – commercially available dentifrice containing 8% arginine/calcium carbonate (Colgate Sensitive Pro-Relief).

Methods

- A 4-day dentine occlusion model[1] was utilised in the three *in vitro* studies to assess the effect of daily treatment with the test dentifrice on tubule occlusion (human dentine). Dentine samples were immersed in artificial saliva for 1 hour prior to first treatment.

Study 1:

Once-daily brushing for 4 days – study dentifrice was applied to the dentine sample with a toothbrush. The samples were then rinsed and returned to the artificial saliva for 24 hours, before drying, then imaging.

+

Acid challenge on Day 4 – after the final treatment on Day 4, each sample was immersed in Cola for 2 minutes before drying, then imaging.

Study 2:

Once-daily dab-on application for 4 days – as Study 1, except the dentifrice was applied by dabbing onto the dentine using a finger.

+

Acid challenge on Day 4 – as Study 1.

Study 3:

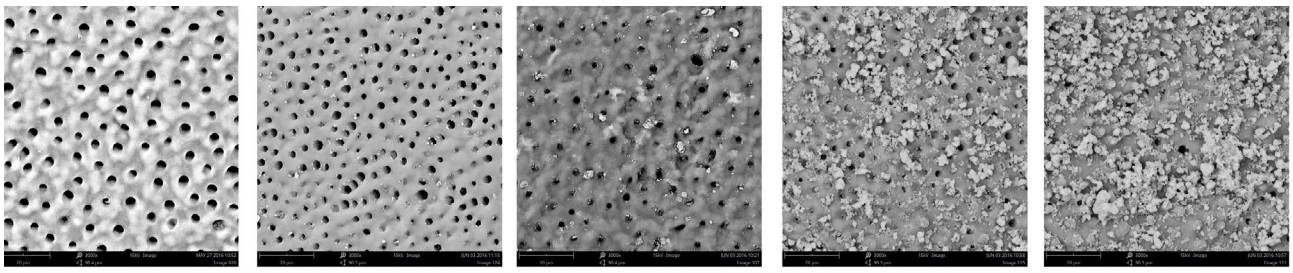
Twice-daily brushing for 4 days – study dentifrice was applied to dentine samples using a toothbrush. The samples were then rinsed (as Study 1) and returned to the artificial saliva for 1 hour, followed by a second brushing. After incubation for a further hour, samples were removed, rinsed, allowed to dry and withdrawn for imaging.

+

Acid challenge on Days 3 & 4 – after the second saliva incubation, prior to imaging, the samples were immersed in grapefruit juice for 5 minutes.

- Dentine samples from each treatment group were analysed using a Scanning Electron Microscopy (SEM) pre-treatment (baseline) and 24 hours after each treatment.
- Degree of occlusion was graded, scored and converted to a percentage.

Typical SEM Images (graded 5 to 1 from left to right)



Results

In all three studies there were significant differences in mean dentine tubule occlusion between test and control. Following acid challenge, in two out of three tests, the experimental dentifrice was significantly better than control.

Figure 1: Mean % dentine tubule occlusion for study 1

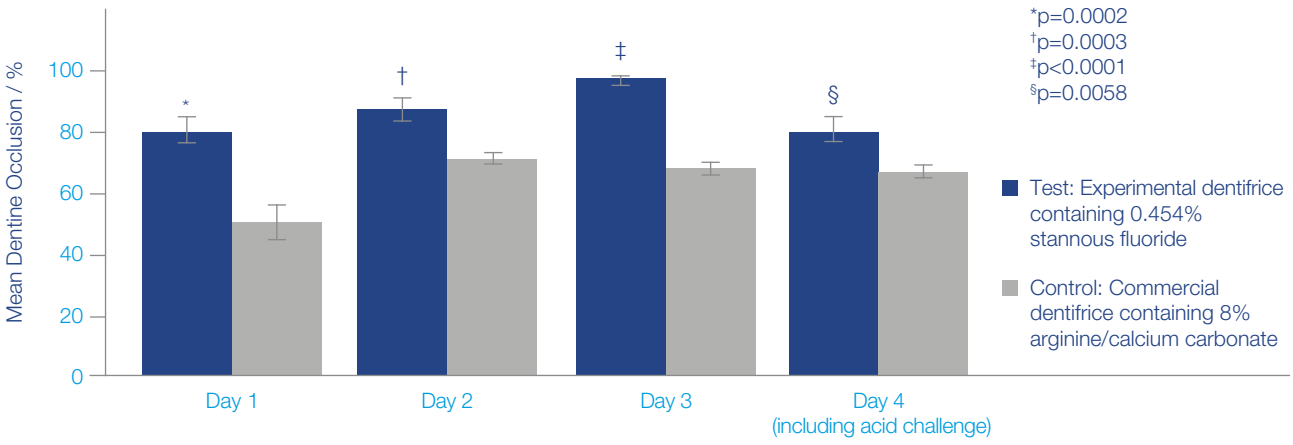


Figure 2: Mean % dentine tubule occlusion for study 2

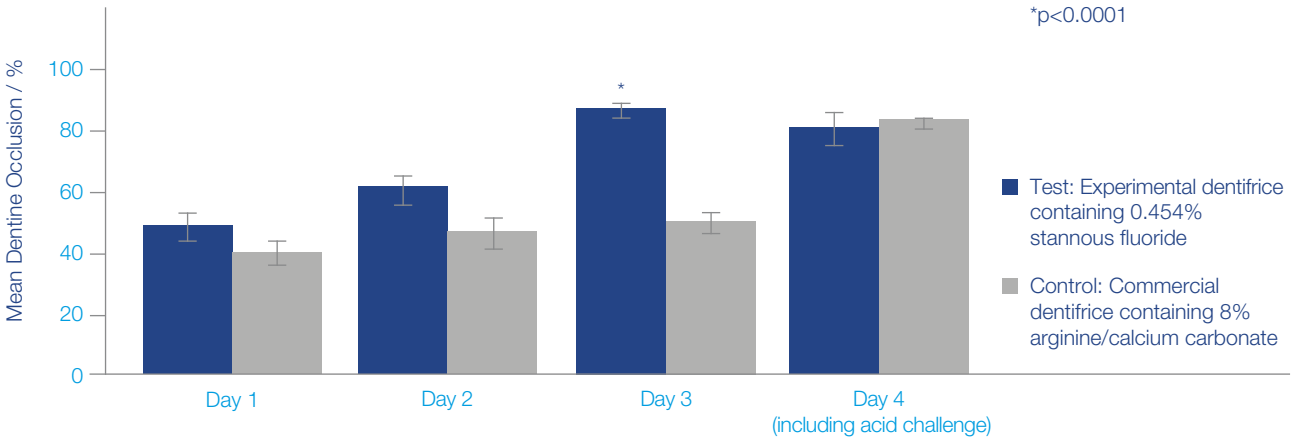
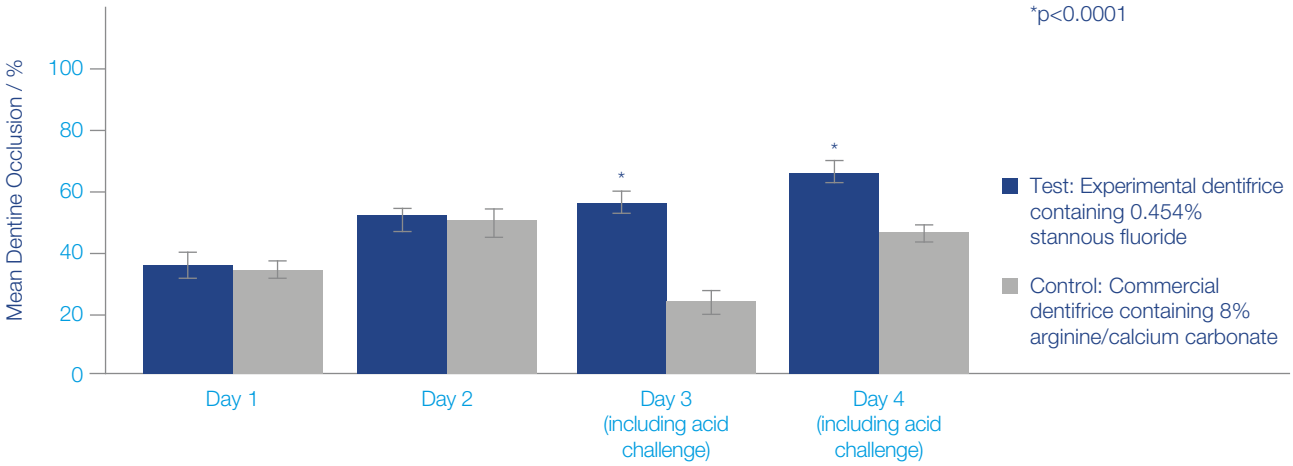


Figure 3: Mean % dentine tubule occlusion study 3



Conclusions

Overall, greater occlusion was observed for an experimental 0.454% stannous fluoride dentifrice, compared to a commercial 8% arginine/calcium carbonate dentifrice. The results indicate the experimental dentifrice has potential benefit in the treatment of dentinal hypersensitivity.

Reference:

1. Parkinson CR, Butler A & Willson RJ. Development of an acid challenge-based in vitro dentin disc occlusion model. J Clin Dent 2010; 21(2): 31-36.