In Vitro Study of the Effect of a Dentifrice Containing 8% Arginine, Calcium Carbonate, and Sodium Monofluorophosphate on Acid-Softened Enamel

Aarti Rege  Rod Heu  Michael Stranick  Richard J. Sullivan
Colgate-Palmolive Technology Center
Piscataway, NJ, USA

Abstract

- **Objective:** To investigate the possible mode of action of a dentifrice containing 8% arginine and calcium carbonate (Pro-Argin™ Technology), and sodium monofluorophosphate in delivering the benefits of preventing acid erosion and rehardening acid-softened enamel.

- **Methods:** The surfaces of acid-softened bovine enamel specimens were evaluated after application of a dentifrice containing 8% arginine, calcium carbonate, and sodium monofluorophosphate in vitro. Scanning Electron Microscopy (SEM), Electronic Spectroscopy for Chemical Analysis (ESCA), and Secondary Ion Mass Spectrometry (SIMS) were used to characterize the enamel surfaces.

- **Results:** Exposure of pristine enamel surfaces to citric acid resulted in clear roughening of the surface. Multiple applications of a dentifrice containing 8% arginine, calcium carbonate, and sodium monofluorophosphate to the surface of the enamel resulted in the disappearance of the microscopic voids observed by SEM as a function of treatment applications. The ESCA analysis demonstrated that both the nitrogen and carbonate levels increased as the number of treatments increased, which provides evidence that arginine and calcium carbonate were bound to the surface. Observance of arginine’s signature mass fragmentation pattern by SIMS analysis confirmed the identity of arginine on the enamel surface.

- **Conclusion:** A series of in vitro experiments has demonstrated a possible mode of action by which a dentifrice containing 8% arginine, calcium carbonate, and sodium monofluorophosphate delivers the benefits of preventing acid erosion and rehardening acid-softened enamel. The combination of arginine and calcium carbonate adheres to the enamel surface and helps to fill the microscopic gaps created by acid, which in turn helps repair the enamel and provides a protective coating against future acid attacks.

(J Clin Dent 2014;25(Spec Iss A):A3–6)