<Journal of Dental Research, Vol.87, Special Issue B(Toronto Abstracts), 2008>

Potassium Nitrate Enhances Occlusion of Dentinal Tubules by Nano-Hydroxyapatite

H. KAWAMATA, K. OHTA, T. SAITO, and R. HAYMAN
SANGI Co., Ltd, Tokyo, Japan

Objectives: Hypersensitivity occurs when exposed dentinal tubules are subject to stimuli such as tooth brushing, heat or cold, and the stimuli are transmitted to nerves via fluid in the dentinal tubules. Tooth bleaching, an effective method of whitening the teeth, is also often accompanied by problems of hypersensitivity. We previously reported that nano-hydroxyapatite (nano-HAP) forms a protective layer on the dentin surface and occludes exposed dentinal tubules. Potassium nitrate (KNO3), used in commercially available anti-hypersensitivity toothpastes, is known to relieve hypersensitivity by releasing potassium ions, which block neural transmission. However KNO3 has not been associated with tubule occlusion. We examined the effect on the exposed dentinal surface of test dentifrice formulations combining KNO3 and nano-HAP.
Methods: Specimens were prepared by polishing sections of extracted human teeth on one face to produce a flat dentin surface with cleanly exposed dentinal tubules, and masking the non-polished faces with nail-enamel. Each specimen was then dipped in one of four test dentifrice solutions (low-concentration nano-HAP, higher concentration nano-HAP, low-concentration nano-HAP with 5% KNO3, or higher concentration nano-HAP with 5% KNO3) for 9 minutes daily at 37 degrees Celsius for 5 days. Between dippings, specimens were stored in humid conditions at 37 degrees Celsius. After 5 days, treated surfaces were examined both directly and in cross section by FE-SEM (S-4500, Hitachi).
Results: Surface coating and occlusion of dentinal tubules were observed in all specimens. However coating and occlusion were more marked in specimens dipped in higher concentration nano-HAP test solutions than in low concentration solutions, and greater in specimens dipped in KNO3-containing solutions than in those without KNO3.
Conclusions: We concluded that coating of the dentin surface and occlusion of dentinal tubules by nano-hydroxyapatite is both concentration-dependent and enhanced by the addition of potassium nitrate.

(86th General Session & Exhibition of the IADR, July 2-5, 2008)