

The Development of a Novel Treatment for Dentinal Hypersensitivity Based on Colloidal Microgels

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Dentinal hypersensitivity has always been an annoying problem for many patients. This can be defined as “pain arising from exposing dentin to thermal, tactile, chemical or osmotic stimuli”. Furthermore, some patients suffer from developmental anomaly where the cement and enamel covering the dentin do not meet, causing the dentin to be exposed and hence increase the chance of dentinal hypersensitivity. Usually, dentinal hypersensitivity is caused by more than one factor; these factors cause the opening of the dentinal tubule and hence expose the internal pulp of the tooth to the external environment. Lots of methods are used for the treatment of dentinal hypersensitivity; such as nerve desensitization, anti-inflammatory agents, covering or plugging the dentin tubules (0.9-2.5 μm diameter) using different materials, dentin sealers, periodontal soft tissue grafting, crown placement or restorative material and laser treatment [1]. This work aims at developing a new method of treatment for dentinal hypersensitivity using microgels, these are cross linked polymers that are highly affected by the surrounding environmental conditions and thus undergo conformational changes (smart materials) altering the particle size and surface charge density [2]. Poly N-isopropylacrylamide (polyNIPAM) based microgels with a hydrodynamic diameter of 200-600 nm display swelling/deswelling properties, which enable them to change their size in response to various stimuli such as temperature and pH, depending on the monomer composition used. In their deswelled state, polyNIPAM based microgels tend to flocculate; these flocks are aimed at blocking the dentinal tubules and thus protect the internal pulp of the tooth from being exposed to external stimuli.

References:

[1] PM Bartold, Australian Dental Journal; 2006; 51(3):212-218.

[2] Peter A. Williams; Handbook of industrial water soluble polymers