

Evaluation of the Physical Properties of Cockle Shell-derived Bioceramic Pulp Capping Material: A Pilot Study

Salinla Likhitpreeda¹, Busayarat Santiwong¹, Thanakorn Wasanapiarnpong², Pairoj Linsuwanont³

¹Department of Pediatric Dentistry, Faculty of Dentistry, Chulalongkorn University, Thailand

²Department of Materials of Science, Faculty of Science, Chulalongkorn University, Thailand

³Department of Operative Dentistry, Faculty of Dentistry, Chulalongkorn University, Thailand

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Corresponding Author: **Associate Professor Dr. Pairoj Linsuwanont**, Department of Operative Dentistry, Faculty of Dentistry, Chulalongkorn University, Bangkok 10330, Thailand. (E-mail: linspairoj@gmail.com)

Abstract

Objectives: To investigate the physical properties of cockle shell derived tricalcium silicate pulp capping material (C-Cap).

Methods: C-Cap was manufactured by processing cockle shell and rice husk ash under specific conditions, and various additives were added to gain the desirable physical properties. C-Cap consisted of two parts: a powder (mixture of cockle shell-derived tricalcium silicate, zirconium silicate and silicon dioxide) and a liquid (methyl salicylate and N-Butyl benzene sulfonamide). The mixing of the materials was performed via loading powder and liquid into a plastic capsule and put into an amalgamator for 8 seconds at a speed of 4,000 vibrations/minute. Life and Dycal[®] were tested for their physical properties and compared with C-Cap. The setting time, flowability and solubility tests were conducted in accordance with the modified ISO 6876:2012. pH was assessed at 3 hours, 1, 3, 7, 14 and 28 days. Statistical analysis was performed using Two-way repeated measures ANOVA analysis, One-way ANOVA with Tukey's test and repeated measures ANOVA analysis with Bonferroni test ($p < 0.05$).

Results: C-Cap, Dycal[®], and Life had setting times in the range of 1-2 minutes. C-Cap provided the highest flowability. The solubility test showed no significant difference among groups (10.6-12.4 % by weight). In comparison to Dycal[®] and Life, C-Cap showed the highest alkaline properties (with the pH of 9.9-10.5 over the period of 28 days).

Conclusions: C-Cap exhibited suitable physical properties for use as pulp capping material.

Keywords: biomaterials, cockle shell, pulp capping, tricalcium silicate