

# Efek Perubahan Komposisi Kimia Semen Kalsium Silikat Pre-Mixed Putty Terhadap Diferensiasi Odontogenik Sel Punca Pulpa (Analisis In-Vitro Ekspresi DSSP dan Deposisi Mineral hDSPC) = Effect of Changes in Chemical Composition of Pre-Mixed Putty Calcium Silicate Cement on Odontogenic Differentiation of Pulp Stem Cells (In-Vitro Analysis of DSSP Expression and Mineral Deposition in hDPSC)

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## Abstrak

Latar Belakang: Perawatan pulpa vital telah mengalami perubahan paradigma menuju perawatan regeneratif endodontik. Beberapa tahun terakhir material bioaktif terus berkembang dengan perubahan komposisi kimia untuk meningkatkan sifat fisik, kimia, dan biologisnya. Perkembangan material tersebut, seperti semen berbasis kalsium silikat, terus dikembangkan untuk merangsang regenerasi kompleks pulpa dentin sebagai tujuan akhir dari perawatan pulpa vital. Perubahan komposisi kimia berdampak pada perubahan semen ini dari sediaan powder/liquid menjadi pre-mixed putty. Salah satu penanda regenerasi kompleks pulpa dentin adalah analisis diferensiasi odontoblast human dental pulp stem cell (hDPSC) yang dapat diidentifikasi dengan peningkatan ekspresi Dentin Sialoposphoprotein (DSPP) dan deposisi mineral hDSPC. Tujuan: Membandingkan efek perubahan komposisi kimia semen berbasis kalsium silikat pre-mixed putty terhadap diferensiasi odontogenik hDSPC. Metode: Semen berbasis kalsium silikat premixed putty dihaluskan dan disterilisasi (ISO 10993-5:2009). Sel punca pulpa (hDPSC) merupakan hasil kultur primer yang telah 80% confluent (telah melalui uji stem cell marker CD90 98%, CD105 99,7% , CD73 94% dan LinNeg 0,5%) dan mencapai P2-3 dilakukan serum starvation 24 jam. Kelompok penelitian ini terdiri dari 7 kelompok, hDSPC dikultur pada media osteogenik dengan penambahan; Biodentin® konsentrasi 1:1, 1:2, 1:5, BIO-C® Repair konsentrasi 1:1, 1:2, 1:5 dan kontrol negatif (DMEM + media osteogenik). Kemudian dilakukan uji ELISA diferensiasi hDSPC melalui ekspresi DSPP pada hari ke-7 dan 14 dan uji kualitatif pewarnaan Alizarin Red pada hari ke-21. Hasil: Semen berbasis kalsium silikat pre-mixed putty konsentrasi 1:5 pada waktu observasi 7 hari, dan konsentrasi 1:2 dan 1:5 pada waktu observasi 14 hari meningkatkan ekspresi DSPP dan deposisi mineral hDSPC. Kesimpulan: Perubahan komposisi kimia semen berbasis kalsium silikat pre-mixed putty meningkatkan ekspresi DSPP dan deposisi mineral hDSPC sehingga terbukti dapat menginduksi diferensiasi odontoblas.

.....Background: Vital pulp treatment has undergone a paradigm shift towards endodontic regenerative treatment. In recent years, bioactive materials have continued to evolve with changes in chemical composition to improve their physical, chemical and biological properties. The development of these materials, such as cement-based calcium silicate, continues to be developed to stimulate the regeneration of the dentin pulp complex as the ultimate goal of vital pulp treatment. Changes in chemical composition have an impact on changing this cement from powder/liquid preparation to pre-mixed putty. One of the markers of regeneration of the dentin pulp complex is the analysis of odontoblast differentiation of human dental pulp stem cells (hDPSC) which can be identified by increased expression of Dentin Sialoposphoprotein (DSPP) and mineral deposition of hDSPC. Objective: To compare the effect of changes in the chemical composition of cement based on calcium silicate pre-mixed putty on hDSPC's odontogenic differentiation.

Method: Cement based on premixed putty calcium silicate is pulverized and sterilized (ISO 10993-5:2009). Pulp stem cells (hDPSC) are the result of primary cultures that are 80% confluent (have gone through the stem cell marker test CD90 98%, CD105 99.7%, CD73 94% and LinNeg 0.5%) and reach P2-3 by serum starvation 24 hours. This research group consisted of 7 groups, hDPSC was cultured on osteogenic media with the addition of; Biodentin® concentrations of 1:1, 1:2, 1:5, BIO-C® Repair concentrations of 1:1, 1:2, 1:5 and negative control (DMEM + osteogenic media). Then an hDPSC differentiation ELISA test through DSPP expression was performed on days 7 and 14 and a qualitative test of Alizarin Red staining on day 21.

Results: Cement based on pre-mixed putty calcium silicate with a concentration of 1:5 at 7 days of observation, and concentrations of 1:2 and 1:5 at 14 days of observation increased DSPP expression and mineral deposition of hDPSC.

Conclusion: Changes in the chemical composition of pre-mixed putty calcium silicate-based cement increased the expression of DSPP and mineral deposition in hDPSC so that it was proven to be able to induce odontoblast differentiation.