

# Perubahan Kadar Alkali Fosfatase dan Osteokalsin dalam Medium Kultur Sel Osteoblas setelah Pajanan Elusi Hidroksiapatit-Gelatin-Propolis (In Vitro) = Changes in Alkaline Phosphatase and Osteocalcin Levels in Osteoblast Cell Culture Medium after Exposure to Hydroxyapatite-Gelatin-Propolis Elution (In Vitro)

Putri Rachmaniah Nur Hanisa, author

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## Abstrak

Latar Belakang: Defek tulang yang besar membutuhkan pendekatan regenerasi tulang. Material hidroksiapatit (HA) dan gelatin telah banyak diteliti dan dikombinasikan karena sifatnya yang saling melengkapi dan meningkatkan aktivitas regenerasi tulang. Penambahan zat alami seperti propolis yang salah satunya memiliki kandungan Caffeic Acid Phenethyl Esters (CAPE) dapat menstimulasi pertumbuhan jaringan dan meningkatkan kadar biomarker pertumbuhan tulang. Oleh karena itu kombinasi biomaterial HA-gelatin-propolis yang belum pernah dilakukan sebelumnya, diharapkan dapat meningkatkan aktivitas regenerasi tulang yang dapat dilihat dari kadar alkali fosfatase (ALP) dan osteokalsin (OC) yang disekresikan oleh osteoblas.

Tujuan: Menganalisis kadar ALP dan OC pada medium kultur biakan sel osteoblas setelah dipajan elusi hidroksiapatit, gelatin, dan propolis 6% .

Metode: Human Osteoblast Cell line MG-63 dibiakan dan dibagi menjadi 6 kelompok pajanan yaitu kontrol, HA, propolis 6%, HA-gelatin, HA-propolis 6%, dan HA-gelatin-propolis 6%. Kadar ALP dan OC dianalisis pada medium kultur 7, 14, dan 21 hari setelah pemajanan kemudian dikuantifikasi menggunakan Uji ELISA.

Hasil: Kadar ALP dan OC seluruh kelompok mengalami peningkatan pada hari ke-7 dan 14 serta mengalami penurunan pada hari ke-21. Tidak terdapat perbedaan bermakna pada kelompok pajanan HA-gelatin-propolis 6% dibandingkan dengan kelompok kontrol. Kelompok HA, propolis 6%, dan HA-gelatin menunjukkan kadar yang lebih tinggi dari kontrol. Perbedaan yang bermakna secara statistik ( $p < 0,05$ ) terdapat pada kelompok propolis 6%. Kenaikan kadar ALP berkorelasi positif sedang dengan kenaikan kadar OC ( $r = 0,385$ ,  $p = 0,001$ ).

Kesimpulan: Tidak terdapat perbedaan bermakna aktivitas proliferasi dan diferensiasi sel osteoblas yang dilihat dari kadar biomarker ALP dan OC pada pajanan elusi HA-gelatin-propolis 6% dibanding kelompok kontrol.

.....Background: Large bone defects require a bone regeneration approach. Hydroxyapatite (HA) and gelatin have been widely studied and combined because of their complementary properties and increasing bone regeneration activity. The addition of natural substances such as propolis, one of which contains Caffeic Acid Phenethyl Esters (CAPE) can stimulate tissue growth and increase levels of bone growth biomarkers. Therefore, the combination of HA-gelatin-propolis biomaterial that has never been done before, is expected to increase bone regeneration activity which can be seen from the levels of bone growth biomarkers alkaline

phosphatase (ALP) and osteocalcin (OC) secreted by osteoblasts.

**Objective:** To analyze the levels of bone formation biomarkers such as ALP and OC in osteoblast cell culture medium after exposure to hydroxyapatite, gelatin, and propolis 6% elution.

**Methods:** This research is an in vitro laboratory study. Human Osteoblast Cell line MG-63 was cultured and divided into 6 groups, namely control, HA, propolis 6%, HA-gelatin, HA-propolis 6%, and HA-gelatin-propolis 6%. ALP and OC levels were analyzed on culture medium 7, 14, and 21 days after exposure and then quantified using the ELISA test.

**Results:** ALP and OC levels in all groups increased on the 7th and 14th days and decreased on the 21st day. There was no significant difference in the HA-gelatin-propolis 6% exposure group compared to the control group. The 6% propolis and HA-gelatin groups showed higher levels than the control and a statistically significant difference ( $p < 0.05$ ) was found in the 6% propolis group. An increase in ALP levels was positively correlated with an increase in OC levels ( $r = 0.385$ ,  $p = 0.001$ ).

**Conclusion:** There was no significant difference in the proliferative and differentiation activity of osteoblasts as seen from the levels of biomarkers of ALP and OC in the HA-gelatin-propolis 6% elution exposure compared to the control group.