

INTISARI

Percepatan pergerakan gigi secara ortodonti dapat distimulasi dengan pemaparan *light emitting diode* (LED). *Blue-light emitting diode* memberikan efek fotobiomodulasi dengan penyerapan foton oleh sitokrom c oksidase sehingga dapat meningkatkan produksi ATP untuk metabolisme sel yang terlibat dalam remodeling tulang. Peningkatan aktivitas osteoblas selama pembentukan tulang akan disertai peningkatan kadar alkalin fosfatase (ALP). Penelitian ini bertujuan untuk mempelajari pengaruh lama dan durasi pemaparan *blue-LED* terhadap kadar ALP cairan sulkus gingiva sisi tertarik pada pergerakan gigi secara ortodonti.

Dua puluh empat ekor marmut (*Cavia cobaya*) jantan berusia 3-4 bulan dengan berat 300-500 gram dibagi menjadi empat kelompok (kelompok I tanpa pemaparan, kelompok II pemaparan 25 detik, kelompok III pemaparan 30 detik, dan kelompok IV pemaparan 35 detik). Gaya ortodonti 35 gram diaplikasikan pada inter insisivus rahang bawah menggunakan *open coil spring*. Pemaparan sinar menggunakan *blue-LED* intensitas 1000 mW/cm² setiap hari selama 7 hari. Pengambilan cairan sulkus gingiva menggunakan *paper point* untuk dievaluasi kadar ALP pada hari ke 0, 3, dan 7 menggunakan spektrofotometer (405 nm). Analisis statistik menggunakan uji Anava dua jalur dan uji *post hoc LSD* $p < 0,05$.

Hasil penelitian menunjukkan kadar ALP kelompok pemaparan berbeda signifikan dengan kontrol. Kelompok pemaparan 30 detik memiliki kadar ALP paling tinggi. Kadar ALP semua kelompok mengalami peningkatan dari hari ke-0, 3, dan 7. Kesimpulan penelitian ini adalah pemaparan *blue-LED* 25, 30, dan 35 detik meningkatkan kadar ALP cairan sulkus gingiva sisi tertarik pada pergerakan gigi marmut (*Cavia cobaya*) secara ortodonti. Pemaparan *blue-LED* selama 30 detik merupakan waktu optimal dalam meningkatkan kadar ALP dibandingkan waktu pemaparan 25 dan 35 detik. Pemaparan *blue-LED* dari hari ke-0, 3, dan 7 meningkatkan kadar ALP cairan sulkus gingiva sisi tertarik pada pergerakan gigi marmut (*Cavia cobaya*) secara ortodonti.

Kata kunci: *blue-LED*, percepatan pergerakan gigi ortodonti, alkalin fosfatase.

ABSTRACT

The acceleration of orthodontic tooth movement can be conducted by light-emitting diodes (LEDs) irradiation. The blue-LED provides a photobio-modulation effect by the absorption of photons by cytochrome c oxidase to increase the production of ATP for the metabolic processes of cells involved in bone remodeling. Increased osteoblast activity during bone formation will be accompanied by increased levels of alkaline phosphatase (ALP). This study aimed to investigate the effect of blue-LED irradiation time and duration on ALP levels in the gingival crevicular fluid on the tension side of the orthodontic tooth movement.

Twenty-four male *Cavia cobaya* aged 3-4 months with bodyweight between 300-500 grams were divided into four groups (group I non-irradiated, group II 25 seconds irradiation, group III 30 seconds irradiation, and group IV 35 seconds irradiation). The orthodontic force of 35 grams was applied to the inter incisor of the mandible using an open coil spring. The irradiated group was given blue-LED exposure with an intensity of 1000 mW/cm² every day for 7 days in the center of the resistance area of the mandibular incisor root. Gingival crevicular fluid was obtained using a paper point to evaluate ALP levels on days 0, 3, and 7 using a spectrophotometer (405 nm). For statistical analysis, we used the two-way Anava test and the post hoc LSD test with $p < 0.05$.

The results showed that the ALP levels in the treatment group was significantly different with the control group. The 30 second irradiated group has the highest ALP levels than the 25 and 35 seconds group. The ALP levels of all groups increase from days 0, 3, and 7. The conclusion of the research is blue-LED irradiation of 25, 30, and 35 seconds was increased ALP levels in the tension side gingival crevicular fluid to *Cavia cobaya*'s orthodontic tooth movement. Blue-light emitting diode irradiation for 30 seconds was the optimal time to increase ALP levels compared to exposure times of 25 and 35 seconds.

Key words: blue-LED, acceleration of orthodontic tooth movement, alkaline phosphatase.