

INTISARI

Osteomielitis merupakan infeksi pada jaringan tulang yang dapat disebabkan oleh bakteri patogen, salah satunya *Pseudomonas aeruginosa* yang memiliki kemampuan membentuk biofilm serta resistensi terhadap antibiotik. Pendekatan regeneratif menggunakan membran biodegradabel dengan sifat antibakteri menjadi salah satu strategi yang dikembangkan untuk mendukung penyembuhan tulang sekaligus menghambat infeksi. Penelitian ini bertujuan mengetahui pengaruh substitusi ion perak (Ag^+) pada *Carbonated Hydroxyapatite* (CHA) terhadap aktivitas daya hambat bakteri membran *Poly Lactic Acid* (PLA) berlapis polyvinyl alcohol (PVA) dan CHA terhadap *Pseudomonas aeruginosa*.

Penelitian eksperimental laboratoris *in vitro* menggunakan metode difusi agar Kirby–Bauer. Pengujian aktivitas antibakteri terhadap *P. aeruginosa* dibagi menjadi lima kelompok, yaitu kontrol negatif yang merupakan membran PLA/PVA/CHA tanpa substitusi Ag^+ , tiga kelompok perlakuan dengan substitusi Ag^+ pada CHA masing-masing 1%, 1,5%, dan 2%, serta kontrol positif berupa cakram antibiotik *ciprofloxacin* dengan dosis 5 mcg. Diameter zona hambat diukur menggunakan *sliding caliper* setelah inkubasi 24 jam pada suhu 37°C. Analisis data dilakukan menggunakan uji normalitas, uji homogenitas, dilanjutkan uji *Welch ANOVA* dan *Post Hoc Games–Howell*.

Hasil analisis *Welch ANOVA* menunjukkan terdapat pengaruh rata-rata diameter zona hambat yang signifikan secara statistik antar kelompok pengujian. Hasil analisis uji *Post Hoc Games–Howell* menunjukkan adanya pengaruh antar kelompok pada konsentrasi 2% dan kelompok kontrol positif yaitu cakram *ciprofloxacin*. Kesimpulan penelitian ini adalah substitusi ion perak pada *carbonated hydroxyapatite* berpengaruh terhadap aktivitas daya hambat bakteri membran PLA berlapis PVA dan CHA terhadap *Pseudomonas aeruginosa*.

Kata kunci: *carbonated hydroxyapatite*, ion perak, *poly lactic acid*, *polyvinyl alcohol*, *Pseudomonas aeruginosa*, antibakteri.

ABSTRACT

Osteomyelitis is an infection of bone tissue that can be caused by pathogenic bacteria, one of which is Pseudomonas aeruginosa, which can form biofilms and exhibit resistance to antibiotics. A regenerative approach using biodegradable membranes with antibacterial properties has been developed as a strategy to support bone healing while inhibiting infection. This study aimed to determine the effect of silver ion (Ag^+) substitution in Carbonated Hydroxyapatite (CHA) on the antibacterial activity of Poly Lactic Acid (PLA) membranes coated with polyvinyl alcohol (PVA) and CHA against Pseudomonas aeruginosa.

This study was an in vitro experimental laboratory study using the Kirby–Bauer agar diffusion method. The antibacterial activity against P. aeruginosa was divided into five groups: a negative control consisting of PLA/PVA/CHA membranes without Ag^+ substitution, three treatment groups with Ag^+ substitution in CHA at concentrations of 1%, 1.5%, and 2%, and a positive control using ciprofloxacin antibiotic discs at a dose of 5 mcg. The inhibition zone diameter was measured using a sliding caliper after 24 hours of incubation at 37°C. Data were analyzed using normality and homogeneity tests, followed by Welch ANOVA and Games–Howell post hoc tests.

The Welch ANOVA results indicated a statistically significant difference in the mean inhibition zone diameter among the test groups. The Games–Howell post hoc analysis showed significant differences between the 2% concentration group and the positive control group (ciprofloxacin disc). In conclusion, silver ion substitution in carbonated hydroxyapatite affects the antibacterial activity of PLA membranes coated with PVA and CHA against Pseudomonas aeruginosa.

Keywords: carbonated hydroxyapatite, silver ions, poly lactic acid, polyvinyl alcohol, *Pseudomonas aeruginosa*, antibacterial activity.