

## INTISARI

Prevalensi cacat atau kerusakan tulang akibat osteoporosis maupun kecelakaan semakin meningkat tiap tahunnya. Kerusakan yang parah pada tulang dapat mengganggu fungsi tubuh, estetika, maupun aktivitas manusia. *Injectable Bone Substitute* (IBS) sebagai bahan pengganti tulang diketahui lebih efektif dibandingkan dengan bahan pengganti tulang lainnya. Penambahan hidrogel pada bahan pengganti tulang diharapkan dapat meningkatkan biokompatibilitas dan kualitas bahan pengganti tulang tersebut. Kombinasi alginat dan hialuronat dalam hidrogel diduga dapat mengurangi sitotoksitas IBS dan meningkatkan kualitas IBS. Penelitian ini dilakukan untuk mengetahui perbandingan efek hidrogel alginat dan hidrogel alginat hialuronat sebagai komponen dari IBS terhadap viabilitas fibroblas *Vero cell line*.

Hidrogel alginat dibuat dari larutan natrium alginat 7% ditambahkan dengan larutan *cross-linking* yang terdiri dari  $\text{CaCl}_2$  dan  $\text{Ce}(\text{NO}_3)_3$ . Hidrogel alginat hialuronat dibuat dari campuran larutan natrium hialuronat 0,5% dengan larutan natrium alginat ditambah dengan larutan *cross-linking*. Kedua macam hidrogel dengan konsentrasi 0,1  $\mu\text{g}/100 \mu\text{L}$ , 0,2  $\mu\text{g}/100 \mu\text{L}$ , 0,3  $\mu\text{g}/100 \mu\text{L}$ , 0,4  $\mu\text{g}/100 \mu\text{L}$ , 0,5  $\mu\text{g}/100 \mu\text{L}$ , 0,6  $\mu\text{g}/100 \mu\text{L}$ , 0,7  $\mu\text{g}/100 \mu\text{L}$ , 0,8  $\mu\text{g}/100 \mu\text{L}$ , 0,9  $\mu\text{g}/100 \mu\text{L}$ , dan 1  $\mu\text{g}/100 \mu\text{L}$  dimasukkan kedalam sumuran yang berisi sel fibroblas jenis *Vero cell line* secara triplet. Setelah diinkubasi 24 jam, prosedur dilanjutkan dengan uji MTT untuk mengetahui persentase viabilitas fibroblas *Vero cell line*. Absorbansi pada  $\lambda$  570 nm kemudian data dianalisis dengan *Two Way Anova* ( $p < 0,05$ ).

Hasil uji *Two Way Anova* diketahui terdapat perbedaan bermakna antara efek penambahan hidrogel alginat dan hidrogel alginat hialuronat terhadap viabilitas fibroblas *Vero cell line* ( $p = 0,002$ ), tetapi hasil tidak bermakna pada perbandingan semua konsentrasi ( $p = 0,103$ ). Disimpulkan bahwa penambahan hidrogel alginat hialuronat sebagai komponen IBS meningkatkan persentase viabilitas fibroblas *Vero cell line* dibandingkan hidrogel alginat.

Kata Kunci : hidrogel alginat, hidrogel alginat hialuronat, viabilitas, fibroblas, sintesis tulang

## ABSTRACT

*The prevalence of bone defect due to osteoporosis or accidents is increasing every year. Severe damage to the bone can disrupt body functions, aesthetic, as well as human activity. Injectable Bone Substitute (IBS) as a bone substitute materials known to be more effective than other bone substitute materials. Hydrogel addition in the bone substitute material is expected to improve biocompatibility and quality of the bone substitute material. The combination of alginate and hyaluronate in the hydrogel could be reduced the IBS cytotoxicity and improve IBS quality. This study was conducted to determine the effect of alginate hydrogel and alginate hyaluronate hydrogel as a component of IBS on fibroblast Vero cell line viability.*

*Alginate hydrogel was made of a 7% solution of sodium alginate that added with cross-linking solution which consists of  $\text{CaCl}_2$  and  $\text{Ce}(\text{NO}_3)_3$ . Alginate hyaluronate hydrogel was made from a mixture of 0.5% sodium hyaluronate solution with sodium alginate solution and cross-linking solution. Both kinds of hydrogels with a concentration of 0,1  $\mu\text{g}/100 \mu\text{L}$ , 0,2  $\mu\text{g}/100 \mu\text{L}$ , 0,3  $\mu\text{g}/100 \mu\text{L}$ , 0,4  $\mu\text{g}/100 \mu\text{L}$ , 0,5  $\mu\text{g}/100 \mu\text{L}$ , 0,6  $\mu\text{g}/100 \mu\text{L}$ , 0,7  $\mu\text{g}/100 \mu\text{L}$ , 0,8  $\mu\text{g}/100 \mu\text{L}$ , 0,9  $\mu\text{g}/100 \mu\text{L}$ , dan 1  $\mu\text{g}/100 \mu\text{L}$  was added to wells containing Vero cell types of fibroblast cell line in triplicates. After a 24 hour incubation, the procedure followed by MTT test to determine the percentage of cell viability of fibroblasts Vero cell line. Absorbance at  $\lambda$  570 nm, then the data were analyzed with Two Way Anova ( $p < 0,05$ ).*

*Two Way Anova test result demonstrated that there were significant differences between the effects of alginate hydrogel and alginate hyaluronate hydrogel towards fibroblast Vero cell line viability ( $p = 0.002$ ), but the results in comparison of all concentrations were not significant ( $p = 0.103$ ). It was concluded that the addition of alginate hyaluronic hydrogel as a component of IBS increase percentage of fibroblast Vero cell line viability compared to alginate hydrogel.*

*Keywords : alginate hydrogel, alginate hyaluronic hydrogel, viability, fibroblast, Vero cell line, bone synthesis*