ABSTRAK

Latar belakang. Intervensi bedah dengan material pengganti tulang masih dibutuhkan untuk mempercepat proses pembentukan tulang baru. Kombinasi kitosan-gelatin dan *bovine* hidroksiapatit (K-G/BHA) dapat menghasilkan sebuah *scaffold* yang memiliki sifat serupa dengan jaringan fisiologis tulang. *Scaffold* yang diaplikasikan dengan *bone marrow mesenchymal stem cells* (BM-MSCs) dapat menjanjikan sebuah pembentukan tulang baru. **Tujuan.** Mengetahui potensi *scaffold* K-G/BHA 20:80 (w/w) sebagai standard biomaterial rekayasa jaringan tulang, viabilitas, perlekatan dan aktifitas *alkaline phosphatase* (ALP) pada BM-MSCs tikus. **Metode.** Pengujian karakteristik *scaffold* K-G/BHA 20:80 (w:w) dilakukan untuk mengetahui ukuran pori, rasio *swelling*, *water content percentage* (WCP) dan tingkat degradasi. BM-MSCs didapatkan melalui isolasi langsung dari femur tikus. Pengujian viabilitas hari ke-1 dan ke-3 terhadap BM-MSCs dilakukan menggunakan metode MTT, pengujian perlekatan hari ke-1 dan ke-3 dilakukan menggunakan SEM dan aktifitas ALP pada hari ke-3, ke-7 dan ke-14 menggunakan metode ELISA. **Hasil.** Hasil karakterisasi *scaffold* K-G/BHA 20 (w:w) pada ukuran pori sebesar 254.44 μm, rasio *swelling* hari ke-1; 3; dan 7 sebesar 0.910±0.116; 1.250±0.227; dan 2.108±0.141, WCP hari ke-1; 3; dan 7 sebesar 47.487±3.088%; 55.204±4.274%; dan 67.770±1.451% dan tingkat degradasi hari ke-1; 3; dan 7 sebesar 13.200±1.830%; 19.238±1.786%; dan 22.507±1.517%. Persentase sel yang hidup pada hari ke-1 dan 3 adalah 77.294±0.715% dan 86.016±0.642%. Terdapat peningkatan perlekatan BM-MSCs pada hari ke-1 dan 3. Aktifitas ALP hari ke 3; 7; dan 14 sebesar 0.1663±0.0043 mmol/L; 0.1317±0.0041 mmol/L; dan 0.1210±0.0054 mmol/L. **Kesimpulan.** Karakteristik *scaffold* K-G/BHA 20:80 (w:w) memenuhi standar sebagai biomaterial rekayasa jaringan tulang. *Scaffold* K-G/BHA dapat meningkatkan persentase sel hidup dan perlekatan BM-MSCs serta menginduksi pembentukan tulang.

Kata kunci: *scaffold* K-G/BHA, viabilitas, perlekatan sel, *alkaline phosphatase*.

ABSTRACT

Background. *Surgical interventions using bone replacement materials are still needed to accelerate the new bone formation. The combination of chitosan-gelatin and bovine hydroxyapatite (K-G/BHA) can produce a scaffold that has similar properties with physiological bone. Scaffolds applied with bone marrow mesenchymal stem cells (BM-MSCs) can promise a new bone formation.* ***Purpose.*** *To discover the scaffold K-G/BHA 20:80 (w/w) potential as a standard biomaterial for bone tissue engineering, viability, attachment and alkaline phosphatase (ALP) activity in rat BM-MSCs.* ***Methods.*** *The scaffold K-G/BHA 20:80 (w:w) characteristic test was performed to determine the pore size, swelling ratio, water content percentage (WCP) and degradation rate. BM-MSCs are obtained through direct isolation from the rat femur. The 1st and 3rd day viability test of BM-MSCs was performed using MTT method, the 1st and 3rd day attachment test was performed using SEM and ALP activity on the 3rd, 7th and 14th day using ELISA.* ***Results.*** *The result of scaffold K-G/BHA 20 (w:w) characterization at the pore size was 254.44 μm, the swelling ratio at 1st; 3rd; and 7th day were 0.910±0.116; 1.250±0.227; and 2.108±0.141, the WCP at 1st; 3rd; and 7th day were 47,487±3,088%; 55.204±4.274%; and 67,770±1.451% and the degradation rate at 1st; 3rd; and 7th day were 13,200±1.830%; 19.238±1.786%; and 22,507±1.517%. Percentage of viable cells at 1st and 2nd day were 77.294±0.715% and 86,016±0.642%. There is an increase in BM-MSCs attachment on 1st and 3rd day. ALP activity at 3rd; 7th; and 14th day were 1663±0.0043 mmol/L; 0.1317±0.0041 mmol/L; and 0.1210±0.0054 mmol/L.* ***Conclusion.*** *The scaffold K-G/BHA 20:80 (w:w) characteristics were suitable as a standard for bone tissue engineering biomaterials. Scaffold K-G/BHA increased the percentage of viable cells and attachment of BM-MSCs and induced bone formation.*

Keywords: *Scaffold K-G/BHA, Viability, Cell attachment, Alkaline phosphatase.*