

Agrippina Waya Rahmaning Gusti<sup>1</sup>, 2020. **Perbandingan Efektivitas Komposit Freeze-Dried Bovine Hydroxyapatite (BHA)-Sekretom Normoksia dan Hipoksia sebagai Kandidat Graf Tulang, Studi Eksperimental *in Vivo***. Tesis di bawah bimbingan Dr. Ferdiansyah, dr., Sp.OT(K)<sup>2</sup> dan Dr. Prihartini Widiyanti, drg., M.Kes.<sup>1</sup>

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## ABSTRAK

Tingginya jumlah operasi kasus defek tulang di seluruh dunia menyebabkan peningkatan penggunaan graf tulang. Pada kasus defek tulang yang parah seperti *critical-sized bone defect*, dapat disembuhkan dengan *scaffold* yang dikombinasikan dengan faktor osteogenik sehingga dibutuhkan graf tulang yang bersifat osteokonduktif dan osteoinduktif. Penelitian ini dilakukan untuk mengetahui perbandingan efektivitas komposit *freeze-dried bovine hydroxyapatite* (BHA)-sekretom normoksia dan hipoksia sebagai kandidat graf tulang. BHA dan sekretom disintesis terlebih dahulu, kemudian BHA direndam dalam sekretom normoksia maupun hipoksia lalu dilakukan *freeze-dried*. *Scaffold* yang telah disintesis kemudian dilakukan uji karakterisasi secara *in vitro* dan *in vivo*. *Scaffold* yang disintesis memiliki porositas, gugus fungsi, viabilitas sel, persentase degradasi dan rasio *swelling* yang sesuai untuk aplikasi graf tulang. Sampel yang telah dilakukan uji karakterisasi secara *in vitro* selanjutnya diimplankan pada kelinci putih jantan New Zealand selama 4 minggu dan dilakukan pengamatan terhadap jumlah *woven bone* melalui uji histopatologi anatomi (HPA). Berdasarkan uji HPA, jumlah *woven bone* pada sampel kontrol BHA saja  $371,89 \pm 62,09/\mu\text{m}^2$ ; sampel komposit BHA-sekretom normoksia  $524,69 \pm 81,21/\mu\text{m}^2$ ; dan sampel komposit BHA-sekretom hipoksia  $963,06 \pm 279,60/\mu\text{m}^2$ . Sampel *freeze-dried* komposit BHA-sekretom hipoksia memiliki jumlah *woven bone* tertinggi karena dengan adanya pre kondisi hipoksia diharapkan dapat membantu regenerasi tulang melalui peningkatan proliferasi MSC.

**Kata kunci:** hidroksiapatit, defek tulang, sekretom, normoksia, hipoksia, *woven bone*

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Agrippina Waya Rahmaning Gusti<sup>1</sup>, 2020. **Comparison of the Effectiveness of Freeze-Dried Bovine Hydroxyapatite (BHA)-Normoxic and Hypoxic Secretomes Composites as Bone Graft Candidates, Experimental Studies in Vivo.** This thesis is under the guidance of Dr. Ferdiansyah, dr., Sp.OT(K)<sup>2</sup> and Dr. Prihartini Widiyanti, drg., M.Kes.<sup>1</sup>

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## ABSTRACT

The high number of surgical bone defect cases worldwide is increasing the use of bone grafts. In cases of severe bone defects such as critical sized bone defects, it can be cured with a scaffold which is combined with osteogenic factors so that an osteoconductive and osteoinductive bone graft is needed. This study was conducted to see the comparison of freeze-dried bovine hydroxyapatite (BHA)-normoxic and hypoxic secretomes composites as candidates for bone graft. BHA and secretome are synthesized first, then BHA is immersed in normoxic and hypoxic secretomes and then freeze dried the scaffold. The synthesized scaffold was done in vitro and in vivo characterization tests. The synthesized scaffold has good porosity, match functional group, good cell viability, degradation proportion and swelling ratio which is suitable for bone graft applications. Samples that have been carried out in vitro characterization tests were then implanted in male New Zealand white rabbits for 4 weeks and the number of woven bone was observed through histopathological anatomy (HPA) tests. Based on the HPA test, the amount of woven bone in the BHA control sample alone is  $371.89 \pm 62.09 / \mu\text{m}^2$ ; composite BHA-secretom normoxia  $524.69 \pm 81.21 / \mu\text{m}^2$ ; and BHA-hypoxic secretom composite sample  $963.06 \pm 279.60 / \mu\text{m}^2$ . BHA-secretom hypoxic composite freeze-dried sample had the highest number of woven bone because the pre-hypoxic conditioning was expected to help bone regeneration through the increasing of MSC proliferation.

**Keywords:** hydroxyapatite, bone defect, secretome, normoxic, hipoxic, woven bone

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