

Miftakhul Jannah, 2016. **Fiber Scaffold Berbasis Kitosan-PVA-HAp sebagai Kandidat Regenerasi Kerusakan Jaringan Articular Cartilage**. Skripsi di bawah bimbingan Andi Hamim Zaidan, M.Si., Ph.D. and Dr. Dwi Gustiono, M.Eng., Program Studi S1 Teknobiomedik, Fakultas Sains dan Teknologi, Universitas Airlangga.

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## ABSTRAK

*Osteoarthritis* (OA) merupakan keadaan patologis yang melibatkan degenerasi *articular cartilage*. Pada tahun 2004 terdapat 151.400.000 jiwa di seluruh dunia menderita OA. OA juga merupakan penyakit nomor lima penyebab *Years of Life Disability* pada wanita dan negara maju. *Self healing* dari *articular cartilage* sangatlah terbatas. Untuk menggantikan dan meregenerasi kerusakan *cartilage*, para peneliti mulai mengaplikasikan *scaffold*. Pada penelitian ini dilakukan sintesis *fiber scaffold* berbasis kitosan dan *poly vinyl alcohol* (PVA) dengan penambahan Hidroksiapatit (HAp) dengan variasi komposisi 0 wt%, 4 wt%, 6 wt%, dan 8 wt% menggunakan metode elektrospinning. Tujuan penelitian ini adalah mengetahui pengaruh variasi komposisi HAp terhadap karakteristik dari *fiber scaffold* dan mengetahui komposisi HAp optimal. Hasil uji tarik didapatkan nilai *Ultimate Tensile Strength* (UTS) dari *fiber scaffold* terus meningkat dengan adanya penambahan komposisi HAp yaitu  $2,35 \pm 0,723$  MPa;  $4,36 \pm 0,898$  MPa;  $8,95 \pm 4,390$  MPa dan  $10,16 \pm 1,666$  MPa. *Fiber scaffold* dengan penambahan 6 wt%, dan 8 wt% masuk dalam range nilai UTS *cartilage tissue engineering* (5,27-85 MPa). Pada hasil uji morfologi SEM hanya *fiber scaffold* dengan penambahan HAp 6wt% yang terlihat jelas morfologi *fiber* dan diperoleh ukuran diameter *fiber* yaitu 1,43 - 21,43  $\mu\text{m}$ . Hasil uji sitotoksitas MTT Assay didapatkan nilai persentase sel hidup antara  $77,89\% \pm 5,70\%$  -  $91,87\% \pm 3,42\%$  sehingga membuktikan *fiber scaffold* tidak toksik. Hasil uji degradasi selama 28 hari menunjukkan bahwa degradasi sampel akan menurun seiring dengan penambahan komposisi HAp. Berdasarkan hasil karakteristik tersebut, *fiber scaffold* kitosan PVA HAp memiliki potensi sebagai kandidat regenerasi kerusakan jaringan *articular cartilage*.

Kata kunci: *fiber scaffold*, elektrospinning, *articular cartilage*, *poly vinyl alcohol*, kitosan, hidroksiapatit

Miftakhul Jannah, 2016. **Chitosan-PVA-HAp-based Fiber Scaffold as a Candidate of Articular Cartilage Tissue Damage Regeneration**. Thesis, under guidance of Andi Hamim Zaidan, M.Si., Ph.D. and Dr. Dwi Gustiono, M.Eng., Biomedical Engineering, Faculty of Science and Technology, Airlangga University.

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### ABSTRACT

Osteoarthritis (OA) is a pathological condition that involves degeneration of articular cartilage. In 2004 there are 151.4 million people around the world suffered from OA. OA also become 5th leading cause of Years of Life Disability in women and developing countries. Articular cartilage has a very limited capacity for self-healing. To replace and regenerate cartilage damage, the researchers begin to apply the scaffold. In this research, synthesis of chitosan-based fiber scaffold and poly vinyl alcohol (PVA) were conducted by using electrospinning method with the addition variation of the composition hydroxyapatite (HAp) 0 wt%, 4 wt%, 6 wt% and 8 wt%. The purpose of this research was to determine the effect of variation of the HAp composition to the fiber scaffold characteristics and determine the optimal HAp composition. The result of tensile test was obtained that Ultimate Tensile Strength (UTS) values of the fiber scaffold continue to increase with the addition of HAp composition, i.e.  $2.35 \pm 0.723$  MPa;  $4.36 \pm 0.898$  MPa;  $8.95 \pm 4.390$  MPa and  $10.16 \pm 1.666$  MPa. By adding 6 wt% and 8 wt% HAp, fiber scaffold included in the range of values UTS cartilage tissue engineering (5.27 to 85 MPa). In the SEM morphology test results only fiber scaffold with the addition of HAp 6wt% were clearly visible morphological fiber and obtained the fiber diameter is 1.43 to 21.43  $\mu\text{m}$ . The result of MTT Assay Cytotoxicity indicated the percentage value of living cells between  $77.89\% \pm 5.70\%$  -  $91.87\% \pm 3.42\%$  thus proving fiber scaffold is not toxic. During the 28 days, degradation test results showed that the degradation of the sample decreases with the addition of HAp composition. Based on the results of these characteristics, chitosan-PVA-HAp-based fiber scaffold has the potential as a candidate for the regeneration of articular tissue damage cartilage.

Keywords: articular cartilage, chitosan, electrospinning, fiber scaffold, hydroxyapatite