

Sari, Titin Widya Anjar. 2018. **Regenerasi Tulang Femur Kelinci (*Lepus negricollis*) Melalui Penggunaan Bone Graft Nano – Hidroksiapatit / Kitosan / Carboxymethyl Cellulose**. Skripsi ini dibawah bimbingan Dr., Ir. Aminatun M.Si., dan Dr., Sri Puji Astuti Wahyuningsih M.Si. Program Studi Teknik Biomedis, Departemen Fisika, Fakultas Sains dan Teknologi, Universitas Airlangga.

ABSTRAK

Kerusakan tulang perlu penanganan tepat menggunakan *bone graft* supaya regenerasi jaringan terjadi dengan sempurna. Penelitian ini bertujuan mengetahui komposisi *bone graft* dan pengaruh waktu implantasi terhadap respons jaringan tulang. Telah dilakukan sintesis *bone graft* berbasis Nano – Hidroksiapatit / Kitosan / CMC. Karakterisasi in vitro meliputi uji morfologi, uji porositas, uji *compressive strength*, uji degradasi, uji sitotoksitas dan karakterisasi in vivo menggunakan kelinci. Nano hidroksiapatit disintesis dengan melarutkan hidroksiapatit ke dalam larutan PVA. Campuran tersebut ditambah kitosan dan CMC dengan perbandingan 50% : 25% : 25% wt. Hasil uji morfologi menggunakan SEM menunjukkan range diameter pori yang terbentuk adalah 1,113 – 4,575 μm . Hasil uji porositasnya 41,66 \pm 0,11 (%) dengan nilai *compressive strength* 14,99 \pm 1,29 (MPa). Uji degradasi mendapatkan hasil 14,69 \pm 0,0026 (%). Uji sitotoksitas memberikan hasil 125,58 \pm 0,10 (%). Uji in vivo dilakukan dengan memasang *bone graft* pada tulang *femur* dan dibiarkan hidup selama periode 28 hari dan 56 hari. Pengamatan terhadap sel *osteoblast*, sel *osteoclast*, *woven bone* dan *lamellar bone* pada preparat HPA terlihat pada preparat hari ke 28 deretan sel *osteoblast* berjumlah (14,33 \pm 7,50) dan sel *osteoclast* (1,67 \pm 1,50) yang menandai proses regenerasi jaringan tulang sedang berlangsung, terlihat adanya *woven bone (immature bone)* dan mulai terbentuknya *lamellar bone (mature bone)*. Pada preparat hari ke 56 terlihat masih adanya sel *osteoblast* (22,17 \pm 8,56), sel *osteoclast* (2,17 \pm 1,60) serta lebih banyak *woven bone* dan *lamellar bone* yang semakin sempurna bentuknya. Dapat disimpulkan bahwa *bone graft* Nano – Hidroksiapatit / Kitosan / Carboxymethyl CMC memenuhi syarat awal untuk aplikasi pada jaringan tulang.

Kata kunci : *bone graft*, nano-hidroksiapatit, kitosan, *carboxymethyl cellulose*, kelinci.

Sari, Titin Widya Anjar. 2018. **Regeneration of Femur Rabbit Bone (*Lepus negricollis*) By Using Bone graft Nano - Hydroxyapatite / Chitosan / Carboxymethyl Cellulose.** This thesis is under guidance of Dr., Ir., Aminatun, M.Si., and Dr., Sri Puji Astuti Wahyuningsih, M.Si. Biomedical Engineering, Physics Departement, Faculty of Science and Technology, Airlangga University.

ABSTRACT

Bone damage needs proper handling using bone graft in order that tissue regeneration occurs perfectly. This study aims to determine the composition of bone graft and the effect of implementation time on bone tissue response. Synthesis and characterization of Nano-Hydroxyapatite / Chitosan / CMC bone graft has been carried out successfully. Synthesis of Nano hydroxyapatite was done by dissolving hydroxyapatite in PVA solution. The mixture was added by chitosan and CMC with a ratio of 50%: 25%: 25% wt. In vitro characterization included morphological test, porosity test, compressive strength test, degradation test, cytotoxicity test and in vivo characterization was carried out by placing the bone graft on rabbit's femur. Morphological test results using SEM showed the range of pore diameters formed were 1,113 - 4,575 μm . The results of the porosity test were 41.66 ± 0.11 (%) with a compressive strength value of 14.99 ± 1.29 (MPa). The degradation test got the results of 14.69 ± 0.0026 (%). Cytotoxicity test yields 125.58 ± 0.10 (%). The in vivo test was carried out by placing the bone graft on the femur bone and allowed to live for a period of 28 days and 56 days. Observation of the presence of osteoblast cells, osteoclast cells, woven bone and lamellar bone in HPA preparations can be seen in the 28th day preparations of osteoblast cells ($14,33 \pm 7,50$) and osteoclast cells ($1,67 \pm 1,50$) which mark the ongoing process of bone tissue regeneration, visible woven bone (immature bone) and lamellar formation bone (mature bone). On the 56th day preparations, there were still osteoblast cells ($22,17 \pm 8,56$) osteoclast cells ($2,17 \pm 1,60$) and more woven bone and lamellar bone which were more perfect in shape. It can be concluded that Nano-Hydroxyapatite / Chitosan / Carboxymethyl CMC bone graft fulfill the initial requirements for bone tissue application.

Keywords: *bone graft*, nano-hydroxyapatite, chitosan, carboxymethyl cellulose, rabbits.