ABSTRAK

Latar belakang : Cedera tulang belakang akan mengakibatkan morbiditas dan mortalitas terutama pada penurunan sensorik, motorik atau otonom pada tingkat dan di bawah lokasi cedera, hingga saat ini pemulihan parameter neurologis pasca cedera tulang belakang masih menjadi sebuah tantangan. Transplantasi sel induk memiliki potensi untuk manajemen SCI. Perancah akan menyediakan tempat untuk mendorong proliferasi, pertumbuhan, dan diferensiasi sel. Produksi perancah dengan struktur mikroskopis dan makroskopis yang ideal berpotensi mendorong proses penyembuhan cedera tulang belakang.

Tujuan : Peneilitian ini bertujuan untuk mengevaluasi perancah Poly Vinyl Alcohol (PVA) dan Kitosan (CH) secara biomaterial dan biologis.

Metode : Penelitian eksperimental murni dengan menghasilkan model 3 dimensi scaffolding sumsum tulang belakang berbahan dasar PVA/kitosan melalui proses electrospinning dan dilanjutkan dengan pengujian biomaterial dan biologi. Penelitian akan dimulai dari pembuatan perancah dengan model 3 dimensi yang direncanakan. Kemudian dilanjutkan dengan evaluasi biomaterial berupa SEM, FTIR dan uji kekuatan mekanik. Terakhir, pengujian dilanjutkan dengan beberapa uji biologis in vitro seperti uji biodegradabilitas, uji MTT, uji perlengketan dan proliferasi untuk mengetahui biokompatibilitas perancah sumsum tulang belakang terhadap sel.

Hasil : Produksi scaffold berbahan PVA/kitosan melalui proses electrospinning menunjukkan jaringan nanofiber dengan diameter rata-rata 382,93 ± 21,73 nm. Hasil FTIR mengkonfirmasi kelompok kimia yang menyusun perancah tersebut. Hasil uji tegangan mekanik menunjukkan adanya variabilitas kuat tekan berdasarkan volume produksi. Hasil biodegradabilitas menunjukkan rata-rata degradasi sebesar 58,69% hingga hari ke 21. Pada uji viabilitas sel, jumlah sel yang hidup >50% dan mampu berkembang biak.

Kesimpulan : Perancah sumsum tulang belakang 3 dimensi berbahan PVA/Kitosan memenuhi ukuran nano dan biokompatibel dengan sel dapat dibuat melalui proses electrospinning memiliki hasil evaluasi biomaterial dan biologis yang baik.

Kata kunci : Cedera Tulang Belakang, Scaffold 3 Dimensi, Stem Cell

ABSTRACT

Background : Spinal cord injury will result morbidity and mortality mainly in sensory, motor or autonomic deteroriation at a level and below the injury site, up until now, recovery on neurological parameter after spinal cord injury (SCI) become a challenge. Stem cell transplantation has potential for SCI management. Scaffolds will provide a place to promote cell proliferation, growth and differentiation. The production of scaffolds with ideal microscopic and macroscopic structures has the potential to promote healing process of spinal cord injuries.

Objective: This research aims to evaluate Poly Vinyl Alcohol (PVA) and Chitosan (CH) scaffolds biomaterially and biologically.

Methode : The research method that we propose is a purely experimental study by producing a 3-dimensional model of spinal cord scaffolding made from PVA/chitosan through an electrospinning process and followed by biomaterial and biological testing. The research will start from the manufacture of scaffolding with a planned 3-dimensional model. Then proceed with the evaluation of biomaterials in the form of SEM, FTIR and mechanical strength tests. Finally, the test was continued with several in vitro biological tests on the such us biodegradibility test MTT, attachment and proliferation assay to determine the biocompatibility of the spinal cord scaffolds to cells.

Result : The results of the production of scaffolds made of PVA/chitosan through the electrospinning process showed a network of nanofibers with an average diameter of 382.93 ± 21.73 nm. FTIR results confirmed the chemical groups that make up the scaffold. The results of the mechanical stress test showed variability of compressive strength based on the production volume. The biodegradability results showed an average degradation of 58.69% up to day 21. In the cell viability test, the number of cells that were alive > 50% and capable to proliferate.

Conclusion : A 3-dimensional spinal cord scaffold made from PVA/Chitosan that meets the nano size and is biocompatible with cells can be made through an electrospinning process with good biomaterial and biological evaluation results.

Keywords : *Spinal Cord Injury*, 3 dimensional scaffold, stem cell