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PRODUCTION OF A DECELLULARIZED SPINAL CORD BIOMATERIAL FOR APPLICATION IN NERVOUS SYSTEM INJURIES

Fauth, B.R.(1); Dos Santos, M.G.(1); Sperling, L.E.(1); Pranke, P.(2);
(1) UFRGS/IPCT; (2) UFRGS/ IPCT;

Neurodegenerative disorders and nervous system injuries represent an increasing percentage of diseases nowadays. However, the nervous tissue has very poor regenerative capacity. For that reasons new approaches are required to support and improve neuronal regeneration. The use of biomaterials such as hydrogels represent a possible way to increase the regeneration and the healing process. The purpose of this study was to produce a hydrogel using a rat decellularized spinal cord for the treatment of SCI. The spinal cord tissue of the animals was harvested, cut in small segments and submitted to a decellularization process with different sodium dodecyl sulfate (SDS) concentrations (0.5%, 1%, 5%) and varying the total time of decellularization (9 hours, 12 hours and 18 hours). The DNA content of each sample was quantified in order to assess the efficiency of decellularization. Histological sections of fixed samples were stained with DAPI and analyzed in fluorescence microscope or stained with hematoxylin and eosin. After determining the optimal SDS concentration and the best decellularization time, the tissue samples were digested with 0.1M of clorhidric acid containing pepsin to create the hydrogel. The cytocompatibility of the hydrogel was tested with the MTT assay using PC12 cells cultivated on top of the hydrogel. PC12 cells are a neural model derivate of rat tumor. The DNA quantification showed that the most efficient SDS concentration for decellularization was 1% and a total time of 9 hours, presenting 19,026.40 ng of genomic DNA/mg tissue, meanwhile the control presented 194,734.38 ng of DNA/mg tissue. The DAPI-stained histological sections showed evident nuclei only when 0.5% SDS was used. The hematoxylin and eosin staining showed the presence of sparse nuclei on the decellularized samples. After the decellularization procedure, a high viscosity hydrogel was produced by treating the tissue with pepsin. The MTT test showed that the PC12 cells cultivated on top of the hydrogel presented lower viability and adherence when compared to the control cells cultivated on the tissue plate. The results suggest that the ideal time for spinal cord tissue decellularization is of 9 hours and the best SDS concentration is of 1%. The production of a hydrogel was possible from the decellularized tissue using the enzymatic treatment with pepsin.