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PRODUCTION OF A BIOINK CONTAINING DECELLULARIZED SPINAL CORD AND CELL VIABILITY TESTING AFTER THE BIOPRINTING

Dos Santos, M.G.(1); Sperling, L.E.(1); Pranke, P.(1); Teixeira, C.(1); Sommer, L.(1);
(1) UFRGS;

Spinal cord injury (SCI) is an extremely debilitating neurological syndrome that compromises the motor function and body sensitivity of patients and for whom there is no efficient therapy. New and innovative approaches of regenerative medicine have been proposed, including bioinks containing cells and/or drugs for bioprinting. Bioinks are mixtures of cells and biomaterials that produce three-dimensional structures and they represent a possible strategy for improving the healing process and functional recovery of patients. The aim of this study was to produce a bioink using lyofilized decellularized spinal cord tissue of rats as a possible biomaterial for the treatment of SCI. The spinal cord tissue of the animals was collected, cut in 1 cm length segments and submitted to the decellularization process with 1% sodium dodecyl sulfate (SDS) with a total time of 9hours for the process. To assess the efficiency of the descellularization, the genomic DNA content was quantified using Nanodrop 2000- Thermo Fisher Scientific. The tissue samples were digested by the proteolytic enzyme pepsin in 0.1 M chloridric acid to produce a hydrogel. The hydrogel was lyophilized to allow the production of a bioink with a defined acellular tissue concentration. A bioink was produced combining 4% alginic acid, 3% gelatin, 1% the acellular lyophilized tissue and PC12 cells. The PC12 cell line is a neuronal cell model, derived from a rat pheochromocytoma. The bioink was used to perform a bioprinting of a disc with cell density of 1,5X106 cells per mL of bioink with an Octopus bioprinter (3DBS). The cytocompatibility of the bioink was analyzed by MTT assay. After the decellularization process, the total genomic DNA content was quantified and a 10-fold reduction of the genomic DNA content was observed when compared to the control spinal cord tissue. After the tissue decellularization, the treatment with pepsin led to a hydrogel with high viscosity. With the produced bioink a 3D structure representing a disc of 0.3 mm height and 10 mm diameter with a total volume of 50 µL was printed. The MTT test indicate that the bioprinted material presented lower viability and adherence in comparison to the control cells cultivated on a tissue plate. However, the bioprinted cells presented higher viability in comparison to the cells the bioink not submitted to the bioprintig process. To conclude, it was possible to produce a bioink with the combination of alginic acid, gelatin, PC12 cells and the lyofilized decellularized tissue and this bioink was used to perform bioprinting. This bioink may be an easy-available cell carrier for SCI treatment.