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IV SIMPÓSIO SOBRE NANOBIOTECNOLOGIA E SUAS APLICAÇÕES

EFFECT OF STRUCTURAL FEATURES IN CRYOPRESERVATION POLYCAPROLACTONE NANOFIBERS FOR REGENERATIVE MEDICINE

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Introduction: The electrospinning method is a technique used to produce nanoscale fibers, which may be implemented as a cellular scaffold, mimicking the extracellular matrix for use in tissue engineering. These scaffolds can be produced from biocompatible and biodegradable synthetic polymers, including poly (ε-caprolactone) (PCL). A scaffolds bank with cryopreserved cells facilitates the use of biomaterials immediately after thawing for use in patients in the area of regenerative medicine. Aims: The purpose of this study was to produce poly (ε-caprolactone) nanofibers by electrospinning technique and perform cryopreservation tests. Methodology: A protocol for scaffold production with 15% PCL in tetrahydrofuran:methanol (3:1) by the electrospinning technique was established. The parameters were optimized and 1.2ml of the polymer solution was used with an injection rate of 1.41ml/h, distance of 15cm between the needle tip and the collector plate and supply voltage adjusted to 20kV. The scaffolds produced were transferred to cryovials with solution containing FBS as follows: 1) without cryoprotectant 2) 5% DMSO, 3) 10% DMSO, 4) 5% glycerol, 5) 10% glycerol, 6) 5% ethylene glycol and 7) 10% ethylene glycol. The cryotubes were frozen using a Mr Frosty container and transferred to a liquid nitrogen tank, where they were kept for 48 hours. Thawing took place and the vials were washed with a 20ml cold saline solution. The biomaterials were photographed for macroscopic evaluation and dehydrated to perform scanning electron microscopy (SEM). Results: The produced scaffolds proved to be satisfactory, without the presence of beads or deformations, indicating that the optimization of the parameters is

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appropriate. Treatment with cryoprotectant solutions did not alter the biomaterial macroscopically after freezing and thawing. Through the evaluation of the diameter of the nanofibers by SEM, no significant differences were found between the various tested cryoprotectants. The mean diameter and the standard deviation of the groups: without CP, 5% DMSO, 10% DMSO, 5% glycerol, 10% glycerol, 5% ethylene glycol and 10% ethylene glycol were, respectively, 1.140±0.567, 1.300±0.684, 1.138±0.794, 1.165±0.681, 1.255±0.793, 1.352±0.885 and 1.336±0.932µm (n=30 per treatment). Conclusion: The PCL scaffolds produced by electrospinning can be cryopreserved with different cryoprotectant solutions without significant changes in their structure. The results demonstrated the adaptability of biomaterials with CP solutions and to freezing and thawing, which favors the development of protocols for cell therapy with biomaterials and cells. Tests on cells are being performed to characterize their behaviour in a three-dimensional structure of the scaffolds when submitted to the cryopreservation process.
Financial support: CNPq, CAPES, FAPERGS and Stem Cell Research Institute.

Keywords: Biomaterials. Cryopreservation. Electrospinning. Poly lactide-co-glycolic acid. Tissue engineering.