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Скафолди для гіпотермічного зберігання клітин, отримані методом електропрядіння

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Electrospun Scaffolds for the Hypothermic Preservation of Cells

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In the field of tissue engineering, electrospun cell-seeded scaffolds represent a suitable approach for the regeneration of tissue defects, since the fibrous scaffolds can mimic the native extracellular matrix. Due to the limited shelf-life of biological materials such as cells, two different preservation strategies can be utilized to store the living material for a specific duration of time. Cryopreservation can be applied for a long-term storage of cells and tissues. Compared to the cryogenic storage, hypothermic preservation is sufficient to store the living material for a short term at lower technical requirements. In this regard, we fabricated polymeric scaffolds from different concentration ratios of polycaprolactone (PCL) and polylactic acid (PLA) by electrospinning. The morphological, thermal and chemical properties of the obtained fibre mats were characterized with SEM, DSC and FTIR, respectively. Additionally, we seeded human bone marrow stem cells (hBMSCs) onto the scaffolds and cultivated them up to 2 weeks. FTIR measurements of the scaffolds revealed no residual solvent and characteristic bands of the spun polymers. The electrospinning process did not affect the polymers' thermal properties. The crystallinity ranges between 44 and 71% for the PCL phase and between 40 and 50% for the PLA phase, depending on the blend ratio. Observed fibre diameters ranged from 1.68 to 4.19 μm, with random fiber alignment. PCL/PLA scaffolds were superior to pure PCL in terms of cell viability and metabolic activity. Current investigations will reveal the cytocompatibility and the preservation outcome of hypothermic and cryogenic preserved cell seeded constructs in different preservation media.

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Віддалені результати кріохірургічного та комбінованого лікування пацієнтів з глибокими пухлинами головного мозку

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Long-Term Results of Cryosurgery and Combined Treatment of Patients With Deep Brain Tumors

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Intracerebral tumors involving subcortical nodes and stem formations are not subject to total removal. One of the methods of treatment of such patients is a combination of stereotaxic tumor biopsy with its subsequent stereotactic cryodestruction.

From 2009 to 2022, we observed 38 patients with subcortical gliomas. Stereotactic biopsy was performed under the control of a CT MAX computer tomograph, cryodestruction was performed using an autonomous neurosurgical cryoprobe designed by Instutite for Low Temperature Physics and Engineering of the Academy of Sciences of Ukraine (1998). The outer diameter of the cryoprobe was 2.0 mm, the working end, 10 mm, was devoid of vacuum insulation, which covered the entire cryoprobe (120 mm long). Cryodestruction was performed within 1.5–2.0 min in 3–4 tumor sites. All patients 3–4 weeks after the operation received radiotherapy (in a total dosage of 64 Gy) and chemotherapy.

In December 2022, 3 patients survived. The average life expectancy of operated patients was 4.5 years. In the control group of patients with tumors of the basal ganglia who did not undergo surgery (6 patients), the average life expectancy ranged from 2 to 6 months. According to the Karnofsky scale quality of life (QL) indicators depend on the localization of the tumor process. When extended to median structures, QL was 30-40 points in 41% of patients. As the degree of malignancy increases, the QL indicators decrease. We also carried out a comparative assessment of QL indicators according to the Karnofsky scale depending on the terms of surgical treatment. The highest indicators of QL were observed in the group of patients operated using cryogenic technologies. QL of 40-50 points and higher was revealed in 83.4% of patients. When using microsurgical technologies after biopsy such QL indicators were observed in 45.3% of patients in a later period.

The method of choice for the treatment of patients with deep glial tumors of the brain is a stereotactic biopsy of the tumor followed by its stereotactic cryodestruction.