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Influence of electron beam irradiation onto physical and chemical properties of electrospun produced 3D matrices

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Electron beam irradiation (EBI) is widely used in industrial production for sterilization of medical products. We have evaluated the influence of EBI onto mechanical strength, chemical properties and biocompatibility of electrospun produced 3D matrices (EPM). Sheets of EPM with oriented fibers (fiber diameter 1 μm, scaffold thickness 100 μm) or tubes (inner diameter 1.7 mm, wall thickness 100 μm) were prepared from nylon 6, polylactic-co-glycolic acid, polycaprolactone (PCL) and their mixtures with gelatin. Electron accelerator ILU-6 (2.2 MeV, 400 mA, 10 Hz) was used for EBI of the materials in doses 25÷150 kGy with increment 25 kGy. Mechanical strength/structure was tested using Zwick/Roell Z100 testing machine/JSM-6460 LV scanning electron microscopy and differential scanning calorimetry. Human primary umbilical vein endothelial cells (HUVEC) and gingival fibroblasts (HGF) were used to evaluate adhesion and proliferation of cells at the surface of EPM. It was observed, EPM irradiation in a dose of 25 kGy does not affect the mechanic properties of all matrices studied. Irradiation of EPM with a dose higher than 50 kGy leads to embrittlement of all matrixes except from those produced from PCL. A dose of 100 kGy increases the proportional limit of the PCL scaffold, significantly increase adsorption of the protein on the surface of PCL fibers and allowed to introduce durable regions by irradiating EP tubes through the template with open areas. EBI of the matrices does not interfere with the capacity of EPM to support adhesion, viability and proliferation rate of HUVEC and HGF at the surfaces of EPM as it was shown by cells labeling with calcein/propidium iodine and incorporation of ethylenedioxy uridine. Thereby an electron beam irradiation of EPM was show to be a useful instrument to modify mechanic/chemical properties of EPM.

Biography

Alena O Stepanova has graduated from the Novosibirsk State University with Master's degree in Molecular Biology. She did the Research for her master's degree at the Molecular medicine Laboratory at the Institute of chemical biology and fundamental medicine Russian academy of Science in Novosibirsk. She is working at the same department with PhD Studies on the project title "The study fundamentals of the vascular prosthesis fabricated by electrospinning *in vitro* and *in vivo*"

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