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Low temperature preservation of mesenchymal stromal cells seeded in various scaffolds for tissue equivalent development

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Mesenchymal stromal cells (MSCs) can differentiate into various cell types, which make them attractive for regenerative medicine. Preservation of MSCs seeded and cultivated in scaffolds at cryogenic or hypothermic temperatures can serve as ready-to-use transplantation units for tissue repair. The aim of the study was to investigate the ability of proliferation and multilineage differentiation of MSCs within alginate microspheres (AMS) and porous scaffolds before and after different approaches of low temperature preservation. As porous scaffolds for MSCs alginate-gelatin macroporous cryogel sponges and plane demineralized chitinous skeletons of marine sponge *Ianthella basta* were used. MSCs isolated from adult human bone marrow, dermal and adipose tissues after expansion in monolayer culture had similar phenotype and growth patterns as well as ability to induce multilineage differentiation. MSCs in AMS had spherical shape and could be successfully cryopreserved by both conventional cryopreservations with 10% of dimethyl sulfoxide and vitrification protocols. Besides, encapsulation in AMS delayed cell death during storage at ambient temperatures. The response of MSCs seeded and cultivated into porous scaffolds to conventional cryopreservation protocol depended on cell adhesion and spreading as well as the structure of scaffolds *per se*. Between the observed three types of scaffold, the lowest cryoresistance had MSCs growing as sheets on chitinous marine demosponge *Ianthella basta*. After cryopreservation in various scaffolds survived MSCs retained abilities to proliferation and differentiation into osteogenic and adipogenic lineages. The data obtained indicate that cryo-banking of MSCs cultivated into tissue engineered scaffolds is feasible for the future regenerative medicine projects.

Biography

Petrenko A Yu is a Professor in Cell Biology and Cryobiology. He is the Head of Department in the Institute for Problems of Cryobiology and Cryomedicine, Professor of Kharkov University, Professor of UNESCO Chair. He is the Author of monograph *"Stem cells*: *Properties and perspectives of clinical use"* and has over 400 publications, of which about 100 are in PubMed. He is an Editorial Board Member of 3 scientific journals, a Member of several National and International societies and recipient of various awards.

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