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Protein-based biodegradable microspheres can isolate progenitor cells and support their proliferation and differentiation in suspension and serve as cell carriers for tissue regeneration

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In spite of the availability of a wide selection of different types of stem cells and the development of sophisticated biopolymers scaffolds, cells impregnated in implanted 3D structures suffocate and hardly survive and integrate in the damaged tissues following their implantation. We have presented an alternative approach using solid and slowly biodegradable fibrin microbeads (FMB) which were shown to isolate faster mesenchymal stem cell (MSC) from different sources with higher yield than conventional methods. Cells loaded on FMB can expand in-vitro in suspension culture in slow rotation without passages and then be driven to differentiate to the cells needed to repair the target organ. Eventually the slowly degrading non-immunogenic FMB could be serve as cells carriers for their minimally invasive implantation with higher survival rate. This approach has yielded promising results in bone regeneration animal models using MSC from different sources isolated by FMB to repair critical bone defects. This was also proven effective for cartilage differentiation from MSC. Progenitor cells could also be isolated efficiently with FMB from other sources such as fat. We recently showed that matrix dependent cells, including MSC, on FMB can survive for prolonged time intervals of weeks only by being sealed in atmosphere-free vials at room temperature. These findings may have major implications in regenerative medicine based on adult progenitor cells and delivery of cells from the bench to the bed-side. In addition, we propose the mechanism for cell binding to fibrin based matrices, which explains the binding of matrix dependent cells to FMB.

Biography

Professor Raphael Gorodetsky received his BSc, MSc and Ph.D form the Hebrew University, Jerusalem, followed by a postdoc and research position at UCLA Medical Center. In the last 20 years he heads the Laboratory of Biotechnology and Radiobiology at Hadassah Hospital (affiliated to the Hebrew University). Among his research interests is the field of adult stem cells based tissue regeneration. His inventions set the basis for co-founding Hapto Biotech where he served as a chief scientist (later acquired by Forticell). Published 95 papers in reputed journals and recently edited a book on Stem Cells and Tissue Repair (RSC Cambridge, UK).