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Adhesion ability of human mesenchymal stem cells over expressing VLA-4 molecules via mRNA-ITGA-4 transfection

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Introduction: Mesenchymal stem cells (MSCs) are of great interest in regenerative medicine. Their plasticity and low immunogenicity gains them credibility as therapeutic agents in tissue injured disorders. The success of clinical application of MSCs relies on their recruitment into damaged tissues. Systemic infusion of MSCs is minimally invasive method however cell migration into desired organs is inefficient. We hypothesize that induction of integrin overexpression in MSCs will enhance their adhesion and migration through the endothelial wall.

Aim: The goal of our study was to induce the expression of ITGA-4 (VLA-4 subunit) via mRNA based method and to test whether this overexpression leads to increased adhesion of human bone marrow derived MSCs (hBM-MSCs).

Methods: The naive and mRNA-ITGA4 transfected hBM-MSCs (Lonza) labeled with iron nanoparticles and Rhodamine-B was used. The microfluidic and transwell assays with surfaces coated with VCAM-1 were employed to estimate functionality of modified MSCs *in vitro*.

Results: In microfluidic assay MSCs were observed to roll, capture and arrest into microchannels. Quantitative analysis showed that the average flow speed of VLA-4 over-expressing MSCs was smaller (27.5 pixels/frame) than the flow of naive cells (76 pixels per frame). Also, the percentage of arrested MSCs was higher in case of modified cells than of control MSCs (14% vs. 2.8%). Similarly, in transwell assay we observed reduced migration of transfected MSCs compared to non-transfected cells.

Conclusions: Our *in vitro* studies have shown superior adhesive properties of mRNA-ITGA-4 engineered hBM-MSCs over their naive counterparts. Modification of adhesive proteins on MSCs surface seems to be interesting perspective in their clinical settings.

Biography

Anna Andrzejewska has completed her studies in Faculty of Biology at University of Warsaw at the age of 24. She obtained her master degree in biotechnology with specialization in molecular biology in 2012 and then started her PhD studies in Mossakowski Medical Research Centre Polish Academy of Sciences at NeuroRepair Department under supervision of Barbara Łukomska Professor of Immunology and Transplantology. She has already attended 5 conferences including 2 international conferences, where she presented short communication of her results. She has published one paper and currently 2 more publications are in preparation.

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