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Modeling of the organ-specific niche of stem cells as a necessary condition for increasing the effectiveness of stem cell treatment

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The interactions between stem cells (SCs) and their surrounding microenvironment are pivotal to determine tissue homeostasis and SCs renewal or differentiation *in vivo*. One of the way for modulation of organ-specific niches for SCs transplantation could be established by using fetal tissue extracts of organs obtained from the stage of incomplete organogenesis, then microenvironment in each of the organs must be specific and enough to generate constant signal for the final SCs differentiation. The objective of this study was to recreate the natural niche microenvironment during cell therapy. We investigated the concentrations of growth factors in tissue extracts of various fetal organs, and studied the efficacy of fetal tissue extracts (FTEs) in patients with non-healing wounds/ulcer who did not respond to previous stem cells treatment. The levels of growth factors in the skin, lung, liver, heart, brain, lung and kidney differs considerably. This may be due to differences in regulatory niches that are specific to each organ, which determines the direction of differentiation of the fetal SCs. Treatment included intravenous SCs administration; local multiple injections of SCs along obliterated arteries, around the ulcer, and in the bottom of the wound; and application of FTEs (liver, skin, and muscle) in autoplasm gel. Laser Doppler flow-metry showed the significant improvement of the micro-hemodynamic just one month after last administration of FTEs. Selective X-ray contrast arteriography showed the increase of area and expansion of the collateral arterial vasculature. Angiogenesis activation was proved by electronic microscopy, histologically and by immunohistochemistry. Wounds/ulcers have good epithelization and complete healing.

Biography

Oleksandr Kukharchuk is the Research Director of ReeLabs Pvt. Ltd. He has guided basic research and clinical study in Health Ministry of Ukraine: "In experiments and clinical study, to determine effectiveness of transplantation of stem cells, tissues of fetal and extra-fetal material and tissue therapy by Filatov in immune and onco-pathological process, pancreo- and colonogenic peritonitis, ageing and dysfunction of reproductive system". He is the Author of book "Stem cells: Experiment, Theory, Clinic, Embryonic, Mesenchymal, Neural, Hematopoietic stem cells". He was the Director of the coordination centre for transplantation of organs, tissues and cells of the Ukraine Health Ministry.

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