

Human Mesenchymal Stem Cell Studies by FT-IR Spectroscopy

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Up to date there are no reports on evaluation of human mesenchymal stem cells (MSC) from different donors, grown under different environments and at different passages by means of FT-IR spectroscopy.

Skin-derived MSC (S-MSC) from four donors were propagated in DMEM/F12 medium supplemented with 10% FBS, 1% penicillium and streptomycin, with or without HEPES buffer and grown on TCPS or chitosan coated glass slides. Cells were collected after 4, 5, 6, 7, 10, 12th or 13th passage. FT-IR spectra were registered on a microplate reader HTS-XT (Bruker, Germany). In spectra of S-MSC were identified – lipids (3050–2800 cm⁻¹, CH₂ and CH₃ groups of fatty acids), proteins (1750–1500 cm⁻¹, N–H and C=O and peptide bands), fatty acids, proteins, and nucleic acids in the mixed region at 1500–1200 cm⁻¹, polysaccharides and carbohydrates (1200–900 cm⁻¹). Quantitative analyses of S-MSC showed variations in the macromolecular composition depending on the donor, growth environment and passages. The content of total carbohydrates in S-MSC from different donors, grown under the same environment and collected after 4th passage, varied from 13.9 to 23.1 % of dry weight (dw), while the content of nucleic acids was similar (6.0-6,9 % dw), the protein content varied from 55.0 to 63.0 % dw and the lipid content from 5.8 to 6.3 % dw. The macromolecular composition of S-MSC from one donor was affected by the growth environment and passage. The content of total carbohydrates varied from 14.9 to 27.4 % dw, nucleic acids from 4.9 to 7.8 % dw, proteins from 52.4 to 60.6 % dw and lipids from 4.3 to 11.5 % dw. Consequently for rigorous assessment of the S-MSC quality or evaluation of the cell response to specific factors, like nanoparticles, a particular protocol is of essential importance.

Acknowledgments. This study was supported by the Taiwan-Latvia-Lithuania cooperation project "Mesenchymal stem cell and cancer stem-like cell response to nanoparticle treatment".