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Small molecule approach for direct reprogramming of human mesenchymal stem cells into different neuronal subtypes

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Advances in cell reprogramming technologies to generate patient-specific cells of a desired type will revolutionize the field of regenerative medicine. Over the last decade, several cell reprogramming methods such as nuclear transfer, cell fusion and transfection or transduction with pluripotent factors have been developed. However, the majority of these technologies require the exposure of cell nuclei to large reprogramming molecules via. transfection, transduction, cell fusion, or nuclear transfer. These methods raise several technical, safety and ethical issues. Chemical genetics is an alternative approach to cell reprogramming that uses small, cell membrane penetrable substances to regulate multiple cellular processes, including cell plasticity. Recently, using a chemical genetics approach (a combination of small molecule modulators of epigenetic target enzymes and neural inducing factors) we have been able to turn human mesenchymal stem cells (hMSCs) directly into neuronal progenitors that have the potential to generate different neuronal subtypes, such as dopaminergic, cholinergic and GABAergic cells when further grown in appropriate neuronal differentiation media. The therapeutic effects of these cells on several neurological disorders have been demonstrated.

Biography

Arshak R Alexanian is currently the Chief Scientific Officer at Cell Reprogramming & Therapeutics LLC and an Adjunct Associate Professor in the Department of Medicine at the Medical College of Wisconsin (MCW). Previously, he held faculty positions in the Departments of Neurosurgery at MCW (2000-2013) and in the Departments of Anatomy and Neurobiology, as well as in Biochemistry and Molecular Biology, at Colorado State University (1997-2000). He has received training at universities and centers world wide, including the Pasteur Institute and University of Montpelier in France, University of Saarland in Germany, Institute of Biochemistry in China and Russia, and Colorado State University, where he gained extensive experience in the fields of Biochemistry, Molecular Biology, Cell Biology (stem cell biology) and Neurosciences. The areas of interest of his research are the epigenetic regulation of cell fate commitment and differentiation, development of cell reprogramming technologies to produce different neuronal and glial cell types and elucidation of the therapeutic effect of these specialized cell types in several neurological disorders.

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