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EPIGENETIC CELL REPROGRAMMING APPROACH FOR NEURAL CELL GENERATION

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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.