METHODS IN MOLECULAR BIOLOGY™

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Cellular Programming and Reprogramming

Methods and Protocols

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Preface

Advances in stem cell biology are making possible new approaches to treat devastating human diseases, including cardiovascular disease, neurodegenerative disease, musculoskeletal disease, diabetes, and cancer. Such approaches may involve cell replacement therapy as well as the development of therapeutic drugs for stimulating the body's own regenerative ability to repair cells damaged by disease and injury. However, obstacles such as control of stem cell fate, immunorejection, and limited cell sources must be overcome before their therapeutic potentials can be realized. Recent studies have suggested that tissue-specific cells may overcome their intrinsic lineage-restriction to dedifferentiate or transdifferentiate upon exposure to a specific set of signals in vitro and in vivo. The ability to dedifferentiate or reverse lineage-committed cells to pluripotent/multipotent cells might overcome many of the obstacles (e.g., cell sources, immunocompatibility, and bioethical concerns) associated with using ES and adult stem cells in clinical applications. With an efficient dedifferentiation process, it is conceivable that healthy, abundant, and easily accessible somatic cells could be reprogrammed to become multipotent or pluripotent stem/progenitor cells, which can then be programmed to generate different types of functional cells for the repair of damaged tissues and organs. This series will cover the most recent technologies and their mechanistic understanding in cellular reprogramming and programming.

La Jolla, CA *Sheng Ding*

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