Generating iPSCs from Human Adipocytes for Differentiation into Nociceptive Neurons

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Induced pluripotent stem cells (iPSCs) have the ability to circumvent the issues associated with obtaining specialized cells for in vitro models, and provide a new frontier in the field of individualized medicine. Currently, issues with creating cell models include the risk of jeopardizing the patient's health while harvesting samples and the limited passage capacity of many desired cell types. This study therefore aimed to create an in vitro model of nociceptors, the neurons responsible for transmitting pain signals from the PNS to the CNS, a crucial component of research involving pain signaling and painkiller development (Woolf & Ma, 2007). To generate a sufficient in vitro nociceptor model, four transcription factors (Sox2, Oct4, Klf4, and c-Myc) (Yamanaka et al, 2007) were transfected using the Sendai virus on a primary culture of mesenchymal stem cells from a healthy donor to generate patient-derived iPS colonies. After purification, the quality of the iPSCs was assessed using immunofluorescence staining for the primary antibody Tra-1-60. Once refined iPSCs were generated, the cells were differentiated over 15 days with five small-molecule inhibitors (LDN-193189, SB431542, CHIR99021, DAPT, and SU5402) (Chambers et al, 2013). The successful differentiation of iPSCs into nociceptors was confirmed by the homogenous expression and repression of neuronal markers Tra-1-60, Nestin, TUJ1, NF, BRN3A, and Peripherin over the 15-day period using immunofluorescence imaging. This study demonstrates that it is possible to generate stable individualized iPS lines from a healthy patient that can be successfully differentiated into a desired cell type for applications in drug screening, disease modeling, and potentially for autologous cell-replacement therapies.

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