Protein-based iPS cells for personalized medicine: A case for Parkinson’s disease

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Research Abstract

The induced pluripotent stem cell (iPSC) technology pioneered by Yamanaka and his colleagues in 2006 has ignited an explosion of scientific and public interest because these cells can potentially offer an ideal cell source by providing patient- and disease-specific cells to study and treat numerous human diseases. However, widely established methods to generate iPSCs require the use of viral and/or genetic materials that likely integrate into the chromosomal DNAs with unknown genetic changes. Indeed, recent evidence demonstrated that viral-based iPS cells compromise genomic integrity and exhibit abnormal phenotypes. Thus, to realize the therapeutic and biomedical potentials of iPSCs, it is critical to develop reprogramming methods that can avoid or minimize these potential abnormalities. As a potential approach, we attempted to generate iPSCs without the use of viruses or DNA transfection by directly delivering four reprogramming proteins (Oct4, Sox2, Klf4, and c-Myc) fused with a cell penetrating peptide. We also characterized these protein-based iPSCs along with virus-based iPSCs for their molecular and differentiation properties. This presentation will discuss current limitations as well as the potential of protein-based iPSC reprogramming with the long-term goal to use them for eventual personalized medicine, using the case of Parkinson's disease as a model system.

Recent relevant publications


TuJ1 is a marker for neurons, HuC/D is a marker for human neuronal cells and TH (tyrosine hydroxylase) is a marker for dopamine neurons. This image demonstrates that protein-based hiPS cells generated mature human dopamine neurons. Image provided by Prof. Kwang-Soo Kim.