Docket #: S09-309

Using Minicircle DNAs to Generate Viral-Free Induced Pluripotent Cells

A team of Stanford researchers have developed a simple, novel, non-viral technique for generating human induced pluripotent stem cells (hiPSCs) with minicircle DNA. This technology uses a single minicircle vector that expresses four reprogramming factors. Because the vector is non-viral, there is no risk of genomic insertional mutagenesis. Furthermore, unlike other non-viral or protein-based methods, minicircles can be used with limited molecular biology expertise. Compared to plasmids, minicircle DNA has higher transfection efficiencies and longer expression. These vectors have broad applications for reprogramming cells to be used in regenerative medicine and research.

Stage of Research
The inventors have used the minicircles to reprogram human adipose stem cells (hASCs) into human induced pluripotent stem cells (hiPSCs). The advantages of using hASCs for generating hiPSCs are further described in Stanford Docket S08-438.

Applications

- **Regenerative medicine**
- Research

Advantages

- **Safe** - non-viral approach results in hiPSCs without genomic insertions
- **Fast** - reprogramming process is ~18 days
- **Simple techniques** - limited molecular biology needed, no vector excision or drug selection

- **Efficient** - 10 fold increase compared to reprogramming fibroblasts using plasmids

Publications

- "A nonviral minicircle vector for deriving human iPS cells."Jia F, Wilson KD, Sun N, Gupta DM, Huang M, Li Z, Panetta NJ, Chen ZY, Robbins RC, Kay MA, Longaker MT, Wu JC. Nat Methods. 2010 Feb 7.
- Enhanced Efficiency of Induced Pluripotent Stem Cell Generation (International Patent Application, publication number WO2011094738)

Patents

- Published Application: 20110244566
- Published Application: WO2011094738
- Published Application: 20150184131
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