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Direct Conversion of Somatic Cells Into Neurons

A team of Stanford scientists have developed a technique to rapidly convert adult somatic cells directly into functional neuronal cells without the intermediate step of generating iPS cells (induced pluripotent stem cells). This method uses a group of neural-lineage specific transcription factors to create induced neuronal (iN) cells. The technology avoids many complications of iPS cells and represents a much simpler and faster method to generate neurons. This cell culture system has potential applications for research, drug discovery, and regenerative medicine.

Stage of Research
The inventors have successfully converted mouse embryonic and postnatal fibroblasts into functional neurons in vitro. These iN cells express multiple neuron-specific proteins, generate action potentials, and form functional synapses.

Ongoing Research
The inventors are expanding this approach to generate iN cells from other mouse cell types and from human cells. They are also modifying the technique to produce specific neuronal subtypes.

Applications

- **Research**
  - basic studies of neuronal development and pathogenesis
  - cell culture models of neurological diseases
- **Regenerative medicine** - culture system for autologous cell transplantation therapies
- **Drug screening** for therapeutic agents that convert somatic cells to neuronal cells

Advantages

- **Fast and efficient** - direct conversion of somatic cells to iN cells avoids iPS cell complications regarding efficiency, safety, and timing

Publications

- Vierbuchen T, Ostermeier A, Pang ZP, Kokubu Y, Südhof TC, Wernig M., "Direct conversion of fibroblasts to functional neurons by defined factors. *Nature.* 2010 Jan 27.

Patents

- Published Application: WO2011091048
- Published Application: 20130022583
- Published Application: 20150284681
- Published Application: 20170369840
- Published Application: 20180057789
- Issued: 9,057,053 (USA)
- Issued: 9,822,338 (USA)

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