Induction of neural stem cells from fibroblasts by small molecules

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Fibroblasts can be reprogrammed into neural stem cells by transcription factors. However, clinical utilization of patient-specific neural stem cells for the treatment of human diseases remains elusive, mainly due to the risks associated with viral transduction vectors used for induction. Here we describe a more efficient method to induce mouse fibroblasts into neural stem cells using only small molecules. The small molecule-induced neural stem (SMINS) cells closely resemble neural stem (NS) cells, in morphology, gene expression patterns, self-renewal, excitability and multipotency. Furthermore, the SMINS cells are able to differentiate into astrocytes, functional neurons and oligodendrocytes. Thus, we have established a novel way to efficiently induce neural stem cells from fibroblasts using only small molecules without altering the genome. Such chemical induction removes the risks associated with current techniques such as the use of viral vectors or the introductionof oncogenic factors. This technique may therefore enable NS cells to be utilized in various applications within clinical medicine.

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