Rethinking reprogramming: A new way to make stem cells

April 7 2011

A paper published by Cell Press in the April 8th issue of the journal *Cell Stem Cell* reveals a new and more efficient method for reprogramming adult mouse and human cells into an embryonic stem cell-like state and could lead to better strategies for developing stem cells for therapeutic use.

The ability to reprogram adult cells into cells that resemble embryonic stem cells has tremendous potential for both stem cell research and regenerative medicine. "Previous studies have demonstrated the usefulness of iPSCs not only in the study of basic stem biology, but also in the ability to generate patient-specific iPSC clones, which can then be further differentiated into the cell type of choice, such as blood, heart or liver cells," explains senior study author, Dr. Edward E. Morrisey, from the University of Pennsylvania. "However, at this point the low efficiency of iPSC reprogramming is a major impediment to adapting the process to large scale studies."

Scientists already knew that microRNAs (miRNAs), small non-coding pieces of RNA that regulate gene expression, can enhance traditional cellular reprogramming methods. Dr. Morrisey and colleagues decided to look at whether miRNAs could directly reprogram mature mouse and human cells to a pluripotent stem cell state on their own, without adding any of the other reprogramming factors that are usually used to make iPSCs. Surprisingly, they found that a specific group of miRNAs can indeed reprogram mouse and human adult cells into an iPSC state by themselves, and can do so very rapidly and efficiently. The researchers

went on to show that suppression of a chromatin remodeling enzyme called Hdac2 is a necessary part of this miRNA-mediated reprogramming process.

The findings suggest that it may be possible to produce iPSCs without forcing the expression of multiple stem cell-associated transcription factors. "Taken together, our results show that miRNA and Hdac-mediated pathways can cooperate in a powerful way to reprogram somatic cells to pluripotency, without the need for pluripotent factors," concludes Dr Morrisey. "The current focus on developing miRNAs for therapeutic use could lead to a rapid miRNA/small molecule approach for iPSC reprogramming."

Provided by Cell Press