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[\[Stem Cell\] NHRI Presents Innovating iPSCs Generation Process, Producing Nononcogenic Stem Cells](#)[\[Stem Cell\] NHRI Presents Innovating iPSCs Generation Process, Producing Nononcogenic Stem Cells \(Chinese Version\)](#)

NHRI Newsletter (2010/08/06), RTI (2010/08/09) & udn.com (2010/08/10) Taiwan has made an innovating breakthrough in stem cell research. A research team of National Health Research Institutes (NHRI) has succeeded in generating nononcogenic induced pluripotent stem cells (iPSCs) with human umbilical vein endothelial cells (HUVECs). The experiments indicate that such generated iPSCs can differentiate into nononcogenic cells of nerve, skin, liver, pancreas, etc., and hence the findings of the process reprogramming somatic cells back to nononcogenic iPSCs are highly valuable. The result has been published on the website of the top journal in cardiovascular studies ATVB (Arteriosclerosis, Thrombosis, and Vascular Biology) on August 6.

The research team led by Betty Lin-Ju YEN, Assistant Investigator at the Institute of Cellular and System Medicine, NHRI, which already published the advanced cultivation and differentiation process for placental stem cells in 2005, published the first research report on iPSCs from Taiwan together with her colleague Shaw Fang YET and Dr. Men-Luh YEN at the Department of Obstetrics/Gynecology, National Taiwan University Hospital and College of Medicine National Taiwan University.

Stem cells are undifferentiated cells of a multicellular organism that is capable of giving rise to indefinitely more cells of the same type, and from which certain other kinds of cell arise by differentiation, and hence very bio-medically valuable. The widely recognized most differentiable kind of stem cells is embryonic stem cells (ESCs); however, its procurement needs the destruction of embryos, and this becomes ethically and legally controversial. On the other side, certain kinds of stem cells can be acquired from the adult, which is called "adult stem cells." The procurement of these kinds of stem cells are less controversial, and hence become the hot topic of contemporary studies. During 2006 and 2007, several scientists in Japan and the U.S. published respectively the methods reprogramming regular skin cells back to stem cells. The function/expression of this kind of induced stem cells is very close to ESCs, and is entitled "induced pluripotent stem cells" (abbreviated: iPSCs).

According to the previous findings of Dr. Shinya YAMANAKA at Kyoto University, Japan, iPSCs can be generated by introducing 4 transcription factors—c-MYC, OCT3/4, SOX2, and KLF4—in the reprogramming of somatic cells back to pluripotency. However, the succeeding studies pointed out that, among the four factors, c-MYC and KLF4 are oncogenic, making therapeutic application unfeasible.

NHRI's research team of Assistant Investigator Betty Lin-Ju YEN discovered that high endogenous expression of KLF4 in human umbilical vein endothelial cells (HUVECs) allows for generation of induced pluripotent stem cells (iPSCs) with just 2 nononcogenic factors, OCT3/4 and SOX2.

The key point to successfully generate iPSCs with OCT4 and SOX2 alone is: the high endogenous expression of KLF4 in human umbilical vein endothelial cells (HUVECs) plays similar roles of c-MYC and KLF4, namely, to activate the process of differentiation. Hence, in the environment with enough endogenous expression in HUVECs, the introduction of the two oncogenic factors c-MYC and KLF4 is not needed.

Because HUVECs can be acquired from the umbilical cords, the acquisition is easier and devoid of ethical controversy. The findings can benefit the clinical applications of iPSCs a lot. Besides, the elimination of two oncogenic factors in the process of inducing iPSCs is also regarded as a big breakthrough in adult stem cells clinical applications.

The result of the research is published on the website of ATVB: ([Click to the location of the abstract and full text](#))

Further Information:

[NHRI Newsletter 2010/08/06](#) (Chinese)

[RTI 2010/08/09](#) (Chinese)

[Udn.com 2010/08/10](#) (Chinese)

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