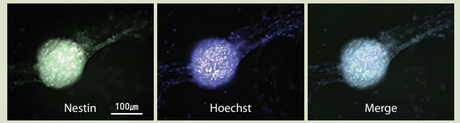
4. nEPS - Cell Differentiation Research

In the field of bioengineering, active research was conducted on tissue engineering application of stem cells and differentiation mechanism of pluripotent stem cells like embryonic stem cell and induced pluripotent stem cell, and multi-potent adult stem cells like bone marrow derived stromal cell and adipose tissue derived stem cell.

Especially, there had been studies on signaling mechanism and differentiation mechanism that induce differentiation of stem cell into specific cells as the differentiation potency of stem cell into diverse cells was discovered. There is also a tissue engineering attempt to create 3D tissues using stem cell. STC Stem Cell Treatment and Research Institute is studying differentiation of pluripotent stem cell derived from the umbilical cord into cells of different body organs, as well as new substances, protein, culture environments and technologies in which such differentiation can occur more efficiently.

Ectoderm differentiation



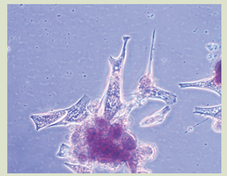
Neuron

When nEPS cell was differentiated into ectodermal cell, it was differentiated into shape of a nerve cell. Differentiation was verified by dyeing the cell with nestin, which is only expressed in nerve cells, to confirm whether the cell was differentiated into a nerve cell.

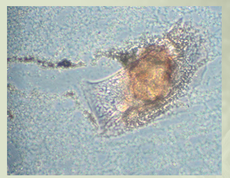
Hepatocyte

When nEPS cell was differentiated into liver cell as endodermal cell, shape of liver cell was changed. Differentiation was verified by dyeing the cell with α-fetrotein, which is only expressed in liver cells, to confirm whether the cell was differentiated into a liver cell.

Mesoderm differentiation



Certilage Cell



Osteoblast

STC nEPS cell was differentiated into cartilage cell and osteoblast as mesodermal cells. Cartilage cell consists of collagen and polysaccharide polymer substance. Differentiation into cartilage cell was verified by dyeing the cell with Alcian blue, which represents blue color through combination with polysaccharide having carboxyl sulfate unit at pH of 2.5. Since osteoblast consists of calcium and phosphorus, its differentiated was verified by dyeing the cell with Von kossa, an agent used to dye calcium.

Patent of STC-nEPS

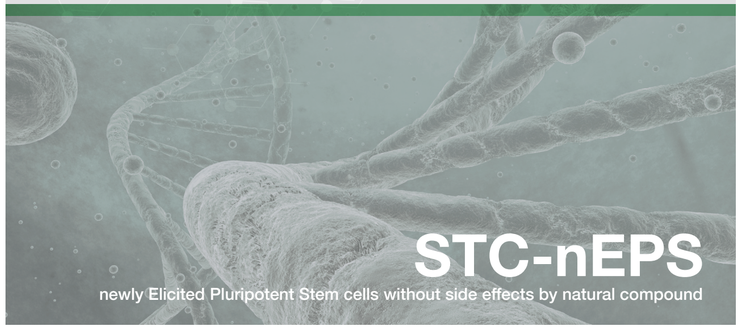
newly Elicited Pluripotent Stem cells without side effects by natural compound

1. Medium Composition for Culturing Mesenchymal Stem Cells for proliferation 10-1538969
2. Method for Differentiating Pluripotency Stem Cell Induced from Mesenchymal Stem Cell into Adipocyte 10-1542850
3. Method for Differentiating Pluripotency Stem Cell Induced from Mesenchymal Stem Cell into Chondrocyte 10-1542846
4. Method for Differentiating Pluripotency Stem Cell Induced from Mesenchymal Stem Cell into Neuron 10-1542847
5. Method for Differentiating Pluripotency Stem Cell Induced from Mesenchymal Stem Cell into Osteocyte 10-1542848
6. Method for Differentiating Pluripotency Stem Cell Induced from Mesenchymal Stem Cell into Hepatocyte 10-1542849
7. Method for Preparing Induced Pluripotency Stem Cell from Mesenchymal Stem Cell and Production thereof 10-1544195
8. Method for Preparing Induced Pluripotency Stem Cell from Mesenchymal Stem Cell Using Phlorotannin and Production thereof 10-2014-0062526
9. Method for Preparing patient-specific Induced Pluripotency Stem Cell from adipose-derived Mesenchymal Stem Cell and Production thereof 10-2014-0072427
10. Method for Preparing Induced Pluripotency Stem Cell from Mesenchymal Stem Cell and Production thereof 10-2014-0094601
11. Method for Differentiating Pluripotent Stem Cell induced from adipose-derived Mesenchymal Stem Cell into Adipocyte 10-2014-0170560
12. Method for Differentiating Pluripotent Stem Cell induced from adipose-derived Mesenchymal Stem Cell into Hematocyte 10-2014-0170561
13. Method for Differentiating Pluripotent Stem Cell induced from adipose-derived Mesenchymal Stem Cell into Osteocyte 10-2014-0170559
14. Method for Differentiating Pluripotent Stem Cell induced from adipose-derived Mesenchymal Stem Cell into Neuron 10-2014-0170558
15. Method for Differentiating Pluripotent Stem Cell induced from adipose-derived Mesenchymal Stem Cell into Chondrocyte 10-2014-0170557
16. Method for Preparing Induced Pluripotency Stem Cell from adipose-derived Mesenchymal Stem Cell and Production thereof 10-2014-0170556
17. Method for Differentiating Pluripotency Stem Cell Induced from Mesenchymal Stem Cell into Adipocyte 1PCT/KR2013/009943
18. Method for Differentiating Pluripotency Stem Cell Induced from Mesenchymal Stem Cell into Chondrocyte PCT/KR2013/009953
19. Method for Differentiating Pluripotency Stem Cell Induced from Mesenchymal Stem Cell into Neuron 1PCT/KR2013/009951
20. Method for Differentiating Pluripotency Stem Cell Induced from Mesenchymal Stem Cell into Osteocyte 1PCT/KR2013/009949
21. Method for Differentiating Pluripotency Stem Cell Induced from Mesenchymal Stem Cell into Hepatocyte PCT/KR2013/009946
22. Method for Preparing Induced Pluripotency Stem Cell from Mesenchymal Stem Cell and Production thereof PCT/KR2013/009845
23. Method for Preparing patient-specific Induced Pluripotency Stem Cell from adipose-derived Mesenchymal Stem Cell and Production thereof PCT/KR2014/005618
24. Method for Preparing Induced Pluripotency Stem Cell from Mesenchymal Stem Cell and Production thereof PCT/KR2014/007207
25. Method for Differentiating Pluripotent Stem Cell induced from adipose-derived Mesenchymal Stem Cell into PCT/KR2014/012247
26. Method for Differentiating Pluripotent Stem Cell induced from adipose-derived Mesenchymal Stem Cell into Hepatocyte PCT/KR2014/012248
27. Method for Differentiating Pluripotent Stem Cell induced from adipose-derived Mesenchymal Stem Cell into Osteocyte PCT/KR2014/012246
28. Method for Differentiating Pluripotent Stem Cell induced from adipose-derived Mesenchymal Stem Cell into Neuron PCT/KR2014/012224
29. Method for Differentiating Pluripotent Stem Cell induced from adipose-derived Mesenchymal Stem Cell into Chodrocyte PCT/KR2014/012223
30. Method for Preparing Induced Pluripotency Stem Cell from adipose-derived Mesenchymal Stem Cell and Production thereof PCT/KR2014/012222
31. Medium Composition for Culturing Mesenchymal Stem Cells for proliferation PCT/KR2015/001239
32. Method for Preparing Induced Pluripotency Stem Cell from Mesenchymal Stem Cell Using Phlorot annin Fraction PCT/KR2015/005183

72 UN Village Hanmandong Youngsan gu seoul, Korea
Tel : 82-2-3438-0670 Email : msoh@stc365.com
www.stcstri.com

STRI

STC-Stem Cell Treatment & Research Institute



STC-nEPS

newly Elicited Pluripotent Stem cells without side effects by natural compound

Introduction of STC – nEPS

STC - newly Elicited Pluripotent Stem cell without side effects by natural compound

1. Introduction of STC - nEPS

STC–nEPS(STC newly Elicited Pluripotent Stem Cell without side effects by natural Compound) is a pluripotent stem cells without side effects. Human mesenchymal stem cell (hMSC) of the umbilical cord tissue and adipose tissue was separated as a first step.

After which MSCs are cultured and then treated with small molecular compound extracted from natural products. In that case, MSCs can form many colonies. This stem cell colony have expression of protein (Figure 1, 2) and DNA gene, only found in pluripotent stem cell, and it can be differentiated into all cells that constitute human body including ectodermal, endodermal and mesodermal cells.

Figure 1. Pluripotent stem cell marker

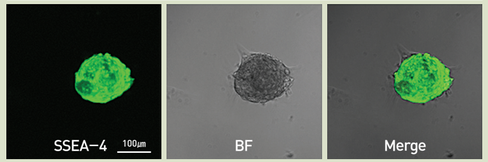
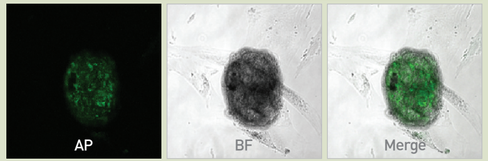


Figure 2. Pluripotent stem cell marker



Adult stem cell can only be differentiated into cells of a specific tissue, but pluripotent stem cell has a core advantage as a cell therapy product that can be differentiated into cells of all human bodily tissues.

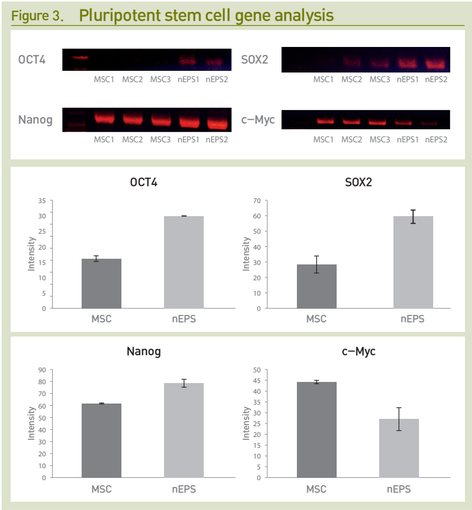
STC nEPS will be free from ethical controversy as it uses stem cell separated from adult tissues like umbilical cord and fat tissue.

It shows significantly reduced time for production (Production efficiency close to over 80%) and perhaps most importantly it is free from side effects like tumor caused by mutation of gene sequence from gene manipulation since pluripotent gene expression is increased by DNA methylation using natural products (STC – F002) (Figure 3)

nEPS can be used on anyone without immunological rejection because it can use both stem cell separated from the umbilical cord and autologous MSCs.

We characterized nEPS cell by pluripotent stem cell marker stained Alkaline Phosphate(AP), Stage specific embryonic antigen-4 (SSEA-4)), OCT4 and SOX2 and DNA was analyzed pluripotent genes (OCT4, SOX2, Nanog, C-Myc).

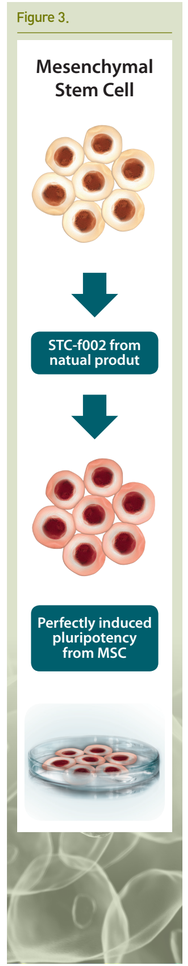
Figure 3. Pluripotent stem cell gene analysis



DNA analyzed OCT4, SOX2,Nanog and c-Myc as major genes of pluripotent stem cells expression of OCT4, SOX2 and Nanog, the core genes of pluripotent stem cells was remarkably increased.

The gene related to formation of tumor, c-Myc was reduced.

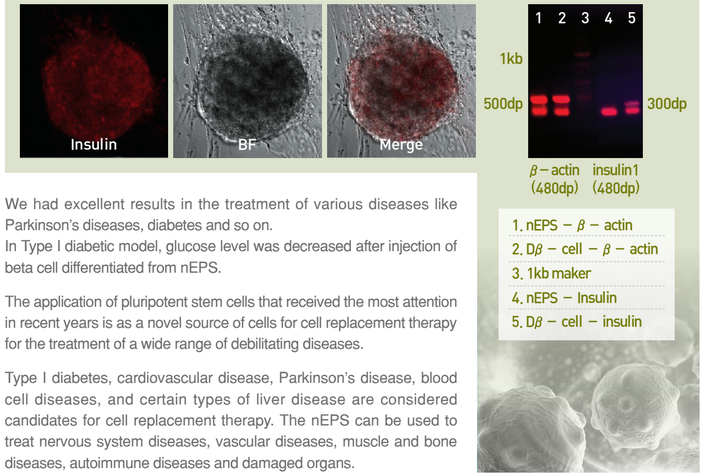
Figure 3.



2. Clinical application of nEPS

To identify differentiation of nEPS for applying any disease, we differentiated into 3 germ layer cells (ectoderm, endoderm, mesoderm) using nEPS cell line, which ectodermal cells are neuronal cells, mesodermal cells are adipocyte, osteoblast and chondrocyte and endodermal cells are hepatocyte and pancreas beta-cells. (Figure 4).

Figure 4. Pancreas β – cell differentiation



We had excellent results in the treatment of various diseases like Parkinson's diseases, diabetes and so on.
In Type I diabetic model, glucose level was decreased after injection of beta cell differentiated from nEPS.

The application of pluripotent stem cells that received the most attention in recent years is as a novel source of cells for cell replacement therapy for the treatment of a wide range of debilitating diseases.

Type I diabetes, cardiovascular disease, Parkinson's disease, blood cell diseases, and certain types of liver disease are considered candidates for cell replacement therapy. The nEPS can be used to treat nervous system diseases, vascular diseases, muscle and bone diseases, autoimmune diseases and damaged organs.

3. Developing artificial human organs using STC-nEPS

With STC-nEPS aided by 3-D printing technology, we will be able to develop artificial human organs including heart, liver, and kidney.

This is made possible because of its pluripotency which has enabled STC-nEPS to differentiate into a neurocyte, pancreatic beta cell, chondrocyte, osteoblast, adipocyte and hepatocyte.

Active researches have been conducted in the field tissue engineering to apply fibroblast cells in developing blood vessels, muscles and skin. However further progress was needed to develop a fully functional human organ and we believe STC-nEPS will be able to fulfill this functional aspect required.