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Differentiation Efficiency of Human Induced Pluripotent Stem Cell (iPSC) to Endothelial Cells in Patients with End Stage Renal Disease (ESRD)

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Objectives: Human induced pluripotent stem cell-derived endothelial cells (hiPSC-ECs) could be promising for treatment of renal disease. However, it is unclear whether hiPSC could be differentiated to endothelial cell (EC) in ESRD patients. Therefore, we first sought to generate hiPSC from peripheral blood mononuclear cell (PBMC) of ESRD patient, then compared the efficiency of hiPSC lines differentiating into ECs with healthy control.

Methods: The hiPSC-ECs were generated from differentiation of hiPSCs using vascular endothelial growth factor (VEGF) and bone morphogenetic protein-4 (BMP-4). At first, the expression of iPSC markers (NANOG, SSEA-4, and TRA-1-81) were assessed with confocal laser scanning microscopy, then hiPSC-ECs were purified based on positive expression of CD31. Subsequently, expression of endothelial markers (CD31, CD 34, and CD 133) were assessed with flow cytometric analysis.

Results: After 6 days in cell culture, stain with pluripotency markers (NANOG, SSEA-4, and TRA-1-81) on confocal image revealed iPSC were successfully generated in both healthy control and ESRD patient. Upon magnetic purification based on CD31+ expression, the hiPSC-EC population was observed to display typical endothelial surface markers in both groups (CD31, CD34, CD133, vWF, and Flt). However, hiPSC-ECs from ESRD patient showed much lower colonies of co-expression of CD31/CD34, CD31/CD133, and CD34/CD133 in FACS, compared to normal control. This was consistent with that the percentage of CD31 expression cell or co-expression of CD31/CD34 cells to total cells were much lower in ESRD group compared to that of healthy control.

Conclusions: . In conclusion, the efficiency of hiPSC differentiating into ECs in ESRD patient were diminished compared to healthy control.

Figure 1. Characterization of human-induced pluripotent stem cells (iPSCs) in uremic condition

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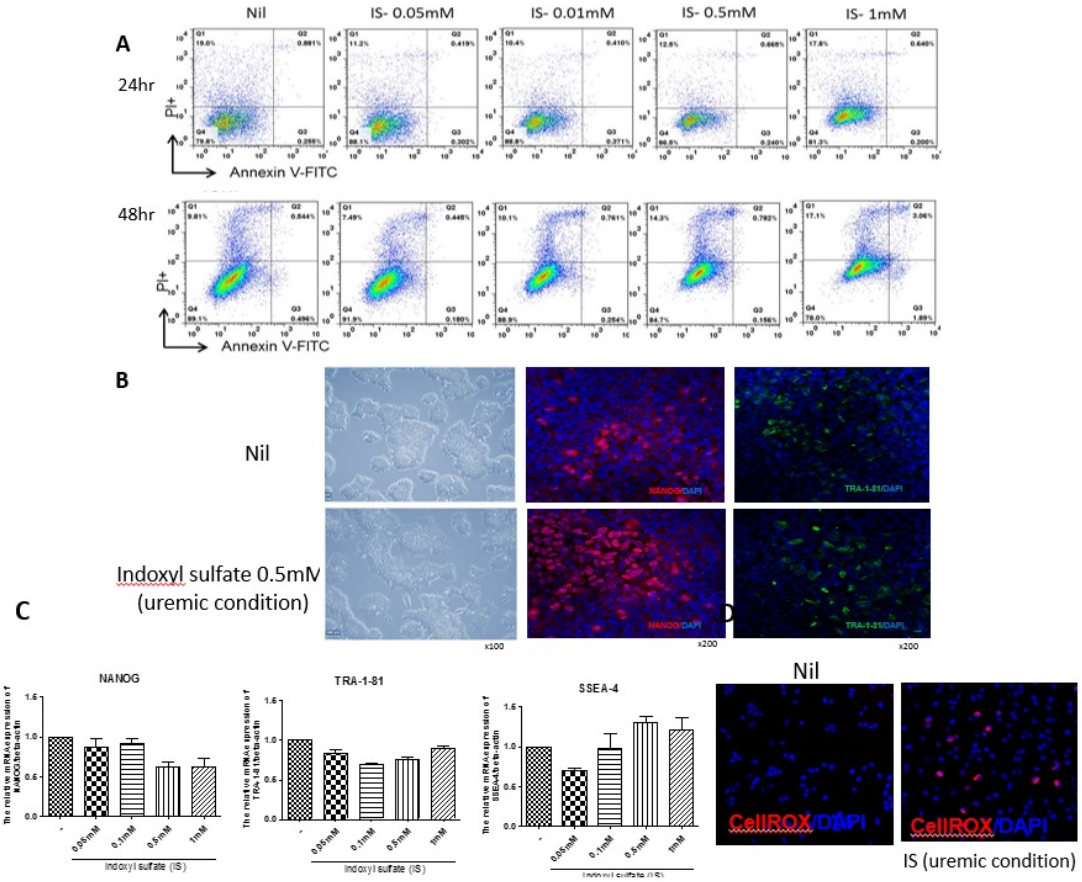

Figure 2. Endothelial differentiation of iPSCs from patient with ESRD and control

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