Optimizing the Culture Conditions for Differentiation of Human induced Pluripotent Stem Cells into Cardiac Cells

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Stem cells offer the unique potential to differentiate into many different cell types in the body during early life and growth including heart cells. This experiment tested the culture conditions for obtaining cardiac cells, in particular with the spontaneous differentiation of human induced pluripotent stem cells (hiPSC) without growth factors. After iPSCs were cultured to reach 100% confluency, three wells were cultured in different cell culture media: IMDM, DMEM, DMEM/F12, StemPro, Opti-MEM, and RPMI for nine days. As the control group I followed an established directed monolayer differentiation protocol- On half of the cells, RNA isolation was extracted followed by cDNA synthesis to get the first strand complimentary DNA of the purified RNA of the cells cultured in each medium. Next, a reverse transcriptase polymerase chain reaction (RT-PCR) was done with the cDNA to multiply the amount of cDNA so it will be visible in gel electrophoresis. Using the PCR contents, gel electrophoresis was done. The other half of the cells were used for primary and secondary antibody staining for immunohistochemistry, analyzing the proteins produced by the cells. The results of the gel electrophoresis and immunohistochemistry showed that the spontaneous differentiation of human iPS cells was influenced by media compositions implying that the differentiation of iPS cells is cell-culture medium dependent. My results show that DMEM/F12 enhances cardiac differentiation of hiPSCs compared to other universally used cell-culture media tested in the experiment at the expense of other lineages.