Neural induction

Neural induction is the process by which embryonic cells in the ectoderm make a decision to acquire a neural fate (to form the neural plate) rather than give rise to other structures such as epidermis or mesoderm.

Prior to transplantation, preclinical study of safety and efficacy of neural progenitor cells (NPCs) is needed. Therefore, it is important to generate an efficient in vitro platform for neural cell differentiation in large animal models such as pigs.

In a study of Kim et al., porcine-induced pluripotent stem cells (iPSCs) were seeded at high cell density to a neural induction medium containing the dual Sma- and Mad-related protein (SMAD) inhibitors, a TGF-β inhibitor and BMP4 inhibitor. The dSMADi-derived NPCs showed NPC markers such as PLAG1, NESTIN and VIMENTIN and higher mRNA expression of Sox1 compared to the control. The mRNA expression of HOXB4 was found to significantly increase in the retinoic acid-treated group. NPCs propagated in vitro and generated neurospheres that are capable of further differentiation in neurons and glial cells. Glioblastoma-cultured medium including injury-related cytokines treated porcine iPSC-NPCs survive well in vitro and showed more neuronal marker expression compared to standard control medium. Collectively, the present study developed an efficient method for production of neural commitment of porcine iPSCs into NPCs [1].

1)
Kim E, Kim M, Hwang SU, Kim J, Lee G, Park YS, Hyun SH. Neural induction of porcine-induced pluripotent stem cells and further differentiation using glioblastoma-cultured medium. J Cell Mol Med. 2019 Jan 4. doi: 10.1111/jcmm.14111. [Epub ahead of print] PubMed PMID: 30609263.