Progenitor Cells of the Intervertebral Disc

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Low back pain is an aging relative disease that causes a high level of disability in many countries. As one of the important roles of the challenges brought by social aging, low back pain is a growing public health concern worldwide. The development of Regeneration medicine brings hope to aging-related degenerative disease. The discovery of Nucleus Progenitor, which is angiopoietin receptor-1 (aka Tie2) positive cells, offers a fresh perspective on IVDD treatment, such as increase the NPPCs in NP niche in vivo and cells/organoids transplant based NPPCs.

The main aim of this research project was to improve the method of isolation or enrich the NPPC population in the whole NPC population. The first hypothesis is used a stemness functional assay, side population assay, to replace or cooperate with the Tie2 immunology flow cytometry. The second hypothesis is enriching the Tie2+ NPCs yield with spheroid formation assay and replace the classic monolayer culture. The third hypothesis is enriching the Tie2+ NPCs yield with molecular treatment with PPARδ agonist.

The results showed that there no side population in NPCs. Spheroids formation assay could increase the yield of Tie2+ NPCs by inhibition of Tie2- NPCs proliferation. PPARδ agonists could increase Tie2+ of NPCs, but the result was affected by several elements, like the side population doubling level relative to the primary cells, the frozen and thaw of cells, or BrdU treatment.

With a discussion of the details of the results, it reminds some further research direction. The Tie2+ did not show as side population means lack of ABC transport. ABC transport is a protection function of a lot of stem cells, the lack of ABC transport might be the reason of lost NPPCs with aging. The qPCR results of spheroid formation increased of multipotential relative genes of *NANOG* and *OCT4* reminder multi-antibody isolation might improve the accuracy of NPPCs isolation. The sensitive of Tie2- NPCs environment or molecular reminder the potential of toxicity screening of Tie2+ NPCs isolation.