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Human Induced Pluripotent Stem Cells Differentiation Into Corneal Endothelial Cells

(Timur Bikkuzin*[1,2], Yan Shi[2], Baoqi Sun[2], Hong Zhang[2], Valentin Pavlov[1])

[1]Central Laboratory of Scientific Research, Bashkir State Medical University, Ufa, Russia;

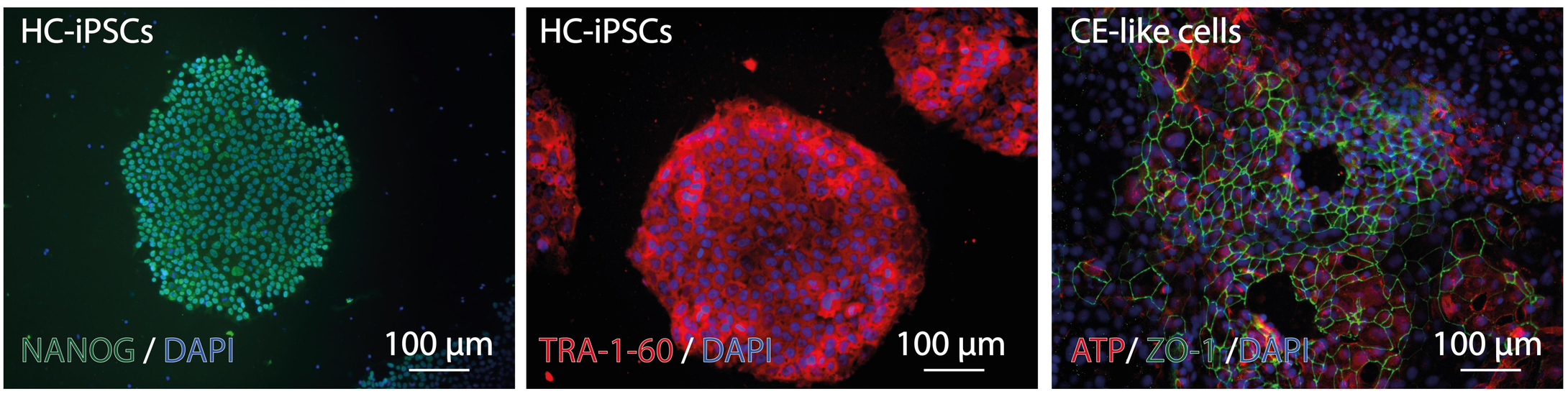
[2]Eye Hospital, First Affiliated Hospital of Harbin Medical University, Harbin, China.

Background

The discovery of induced pluripotent stem cells (iPSC) has opened up promising opportunities for the further development of regenerative medicine. Actual challenge of clinical-grade iPSC is derivation biocompatible cellular material for transplantation. In this study, we established corneal human iPSC line, that is more efficient to differentiate into the neural crest and corneal endothelial cells, which have the same natural niche.

Method

Corneal fibroblasts which were obtained from donor human corneal rim were reprogrammed into human corneal iPSCs (HC-iPSCs) by an integration-free Epi5™ Episomal iPSC Reprogramming kit. We tested the pluripotency of derived HC-iPSC clones and examined the feasibilities of epigenetic memory when comparison purchased skin-derived AC-iPSC and HC-iPSC by the example of differentiation into the neural crest (NC) like cells and corneal endothelium (CE) like cells by immunocytochemistry, RT-PCR and Weston blot analysis.



Result

The results showed that HC-iPSCs expressed pluripotent markers OCT4, REX-1, TRA-1-60, and NANOG. In addition, derived iPSCs have differentiation ability into three-germ layer (ectoderm, mesoderm and endoderm). The HC-iPSCs were differentiated into p75 and Vimentin positive NC-like cells. Next, the obtained NC-like cells were further differentiated into CE-like cells. Immunocytochemistry analysis successfully confirmed the presence of corneal endothelium specific markers: N-cadherin, ATP and ZO-1.

Conclusion

The results of this study suggest the possibility of obtaining induced pluripotent stem cells from human corneal fibroblasts, as well as the advantage of "epigenetic memory", manifested during the reverse differentiation of HC-iPSc into somatic cells of the cornea or into their precursors, for example, neural crest and endothelium cells.