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hiPSC-photoreceptors mimic human photoreceptor development *in vivo*

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Human induced pluripotent stem cells (hiPSC) have been proven to be able to generate retinal photoreceptors responsible for sight. However, it is still unclear how closely the derivatives of hiPSC mimic the naive cells so far. Thus, this study is to see whether hiPSC-derived photoreceptors recapitulate the development of human photoreceptors *in vivo.* hiPSC lines from different somatic source were used in this study. Cells were cultured on MatriGel with mTeSRTM1 medium. The procedure for inducing differentiation of hiPSCs toward a photoreceptor fate was based on a previously described protocol. Differentiating human iPSCs were followed by morphological observation and characterized by immunocytochemistry and RT-PCR with molecular markers of pluripotency and/or specific for different stages of photoreceptors. Under specific differentiation conditions and multi-step induction, hiPS cells gradually acquired expression of molecular markers characteristic of different stages of photoreceptors, including cones and rods. More interesting, rods and cones situated in the outermost layer of the retinal cups, forming outer nuclear layer like *in vivo* counterpart. TEM showed hiPS-derived PRCs developed not only inner segments but also outer segments—a key functional structure. The timeframe for acquisition of photoreceptor was very close to that of human photoreceptor embryogenesis. Our results provide strong evidence that derivatives of hiPSCs are capable of recapitulating the molecular and cellular features of human photoreceptor differentiation *in vivo*. This success provides a powerful model for the study of human photoreceptor development and opens up important possibilities for disease modeling and cell therapy.

Biography

Xiufeng Zhong is a Professor and PI at Zhongshan Ophthalmic Center, Sun Yat-Sen University, China. She received her MD from Nanchang University and PhD degree in Ophthalmology from SYSU, and did Post-doc research at Johns Hopkins University School of Medicine. Her study for the first time demonstrates that hiPSCs can generate functional retina with light-sensing photoreceptors *in vitro*, holding a huge promise for blindness. She has published 60 peer-reviewed papers, 8 patents. Her research has got many supports from NSFC, 973 Program, Science and Tech Project from Guangdong Province. She was the recipient of SYSU "Hundred-Talent Program" award.

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