CDB SEMINAR

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Friday, July 26, 2013

15:00~16:00 Seminar Room A7F

Effective transplantation of photoreceptors derived from three-dimensional cultures of embryonic stem cells

Summary

Irreversible blindness caused by loss of photoreceptors may be amenable to cell therapy. We have previously demonstrated retinal repair1 and restoration of vision through transplantation of photoreceptor precursors obtained from postnatal retinas into visually impaired adult mice2,3. Considerable progress has been made in differentiating embryonic stem cells (ESCs) in vitro toward photoreceptor lineages4-6. However, the capability of ESC-derived photoreceptors to integrate after transplantation has not been demonstrated unequivocally. In order to isolate photoreceptor precursors fit for transplantation, we have adapted a recently reported three-dimensional (3D) differentiation protocol that generates neuroretina from mouse ESCs6. In this study we show that a pure Rhodopsin.GFP population of rod precursors can integrate within degenerate retinas of adult mice and mature into outer segment–bearing photoreceptors. Notably, ESC-derived precursors at a developmental stage similar to postnatal days 4–8 integrate more efficiently compared with photoreceptors at more mature stages. We show conclusively that ESCs can provide a source of photoreceptors for retinal cell transplantation.

1. Maclaren, R. E. et al. Retinal repair by transplantation of photoreceptor precursors. Nature 444, 203–207 (2006).
2. Pearson, R. A. et al. Restoration of vision after transplantation of photoreceptors. Nature 485, 99–103 (2012).
3. Barber, A. C. et al. Repair of the degenerate retina by photoreceptor transplantation. PNAS 110, 354–359 (2013).
4. Lamba, D. A., Karl, M. O., Ware, C. B. & Reh, T. A. Efficient generation of retinal progenitor cells from human embryonic stem cells. PNAS 1–6 (2006).
5. Osakada, F. et al. Toward the generation of rod and cone photoreceptors from mouse, monkey and human embryonic stem cells. Nat Biotechnol 26, 215–224 (2008).
6. Eiraku, M. et al. Self-organizing optic-cup morphogenesis in three-dimensional culture. Nature 472, 51–56 (2011).

Host:

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