Cell-based therapy for retinal degenerative disease, R.P. Casaroli-Marano, M.A. Zarbin, editors (Karger, Basel, Switzerland) 2014. 206 pages. Price: US$ 233.00 / CHF 198.00
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This book is a collection of 15 chapters exploring the applications of stem cell therapy for the treatment of blinding retinal degenerative diseases. Age-related macular degeneration (ARMD) is the most important cause of vision loss in people over 55 years of age all over the world. The initial few chapters highlight the diseases where degeneration of photoreceptors leads to vision loss, followed by the potential uses of stem cells, their production and delivery while the regulatory issues in cell-based therapy are dealt with in the last chapter.

The book begins with a comprehensive review of ARMD including epidemiology, clinical features, histopathology and pathogenesis supported with appropriate illustrations. This chapter also includes the latest imaging modalities (adaptive optics scanning laser ophthalmoscopy, near infrared reflectance, *etc*) with the objective to pick up early ARMD changes. The next chapter on general pathophysiology of retinal degeneration briefly recapitulates the phototransduction cascade and highlights how the destruction of photoreceptors appears to be the final common pathway in a number of degenerative diseases and may thus be targeted for therapeutic purposes. The third chapter introduces juvenile-onset macular degenerative disorders causing central vision loss and discusses their clinical features, inheritance pattern, basic pathology and diagnostic modalities [electroretinogram, electrooculogram, optical coherence tomography (OCT) and fundus autofluorescence] which help clinch their diagnosis.

The fifth chapter familiarizes the readers with various stem cells for retinal repair. Stem cells for retinal repair may be derived from pluripotent or retinal pigment epithelium stem cells (RPESCs) which can replace damaged retina and provide trophic support. Alternatively, bone marrow or neural stem cells may also be used, but these only provide trophic support. Other than these, there are also the induced pluripotent stem cells (iPSCs) and the umbilical cord stem cells (UCSCs). This chapter ends with the mention of ongoing phase 2 trial for subretinal injection of UCSCs (*www.clinicaltrials.gov* No. NCT00458575), however, this study has been terminated.

For optimal cell-based ARMD therapy a number of issues need to be addressed like cell survival *in vivo,* optimal stage of disease for intervention, safe and simple surgical techniques and identification of sources of cells for transplantation. The question raised in the sixth chapter is which source of RPE-like cells is better, iPSCs or human embryonic stem cells (hESCs)? The next question yet unanswered is regarding the mode of transplantation, bolus injection of dissociated RPE cells into subretinal space versus RPE monolayer transplantation. The seventh chapter introduces various ever-changing protocols for generation of RPE cells and photoreceptor (PR)-like cells from iPSCs and hESCs, for example, using stem cells for glaucoma is thought to have a neuroprotective and neuroregenerative role. Another thought is using skin biopsy to reprogramme cells to iPSCs and then differentiate them to retinal ganglion cells (RGCs) that can be used for drug screening for optimum individualized treatment. However, there is no protocol for effective RGC production.

Both iPSC and ESC derived cells are immunoreactive after implantations thus need immunosuppression. The reprogramming itself leads to epigenetic effects in the resultant iPSCs rendering them immunogenic. To overcome rejection certain suggested methods are discussed in chapter nine. The tenth chapter deals with the question of RPE-like stem cell survival post-transplantation. It is known that less than one per cent of stem cells injected in the subretinal space eventually survive after 2-4 wk of transplantation due to shearing forces during injection and reflux of cells from injection site. The next chapter brings in the latest in scaffold delivery strategy. Various scaffold substrates can be used to grow RPE monolayer including natural biomaterials like amniotic membrane, lens capsule, explants of Bruch's membrane, *etc.* or natural polymers like extracellular matrix protein or synthetic polymers, for example, parylene, PLGA [poly(lactic-co-glycolic acid)], hydrogels, *etc.* The next chapter is dedicated to the use of an ingenious micromachined parylene-C device as an artificial Bruch's membrane for stem cell therapy. The chapter on gene or cell therapy talks about *ex vivo* gene correction followed by transplantation, which would reduce the risk of immune rejection via autologous cell therapy. However, it would also increase the mutational load of iPSCs. In the end there is mention of encapsulated cell technology for protein therapy thus delivering consistent levels of neurotrophic factors for longer periods and avoiding repeated injections. The book ends with a look into the cellular manufacturing process which ensures safety of the product that is to be administered.

This book compiles the latest in stem cell research and the reader will find an introduction to all there is to know about cell therapy. Researchers as well as ophthalmologists will find reading this book an informative experience. The book can be a useful primer for beginners and also serve as a reference guide to investigators in this area as it gives a comprehensive updated review of cell-based therapy for retinal degenerative disorders in all age groups.

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