

our vision is  
your VISION



## Professor Pete Coffey

Director of the London Project to Cure Blindness and Professor of Cellular Therapy and Visual Sciences. BSc, DPhil

Division of Cellular Therapy  
Institute of Ophthalmology  
11-43 Bath Street  
London EC1V 9EL

Tel: 020 7608 4039  
Fax: 020 7608 6810  
Email: [p.coffey@ucl.ac.uk](mailto:p.coffey@ucl.ac.uk)  
URL: [www.thelondonproject.org](http://www.thelondonproject.org)

### Summary of current research interests

Two major groups of diseases termed retinitis pigmentosa and age-related macular degeneration are the leading causes of blindness. In these diseases, loss of vision is due to progressive degeneration of the light sensitive cells of the eye or defects in the supporting cells of the eye. There is no cure for this at present although several have been suggested from studies on experimental animals, mostly rats and mice with similar diseases. One

of these involves the transplantation of cells to slow the degeneration of photoreceptors or replace photoreceptors lost by the disease. My work explores this approach with the object of finding the best conditions for transplantation, identifying events that might compromise transplant efficacy and finding solutions to their deleterious effects, and specifically an assessment of how much visual improvement might be expected from this approach. Most important it will provide the necessary science prior to the clinical application of this approach in people.

### Key achievements

- The launch of the London Project to Cure Blindness. The aim is to develop a stem cell therapy for the majority of all types of age-related macular degeneration.
- Seminal work (as described by Debrossy & Dunnett, Nature Neuroscience 2001) on retinal transplantation.
- Principal author and co-author of two landmark papers demonstrating the use of human cells to halt visual deterioration in models of Age-related macular degeneration.
- Use of human embryonic stem cells for age-related macular degeneration and retinitis pigmentosa.
- 1st international transplantation strategy for inherited macular dystrophy.
- The development of a cell based therapy for currently untreatable aged-related macular degeneration (dry AMD).

### Research Projects

#### Retinal Repair

From the mid-1990's, we have investigated the use of a number of different approaches to repairing the diseased retina in models of human retinal degeneration. Primarily, using various cell lines both animal and human, to replace dysfunctional or degenerated retinal cells. This has led to a number of published results which have shown the potential of using human immortalised cell lines to replace defective retinal pigmented epithelial cells in aged related macular degeneration (AMD). The goal now is to improve survival of the human cell lines and produce cells which may attach successfully to a damaged Bruch's membrane. Within the last year, I have also investigated the use of stems cells to replace degenerated cells in models of AMD and retinitis pigmentosa. Finally, I have investigated the potential use of trophic factors to slow or halt photoreceptor degeneration in animal models of retinal cell death.

#### Optical Imaging Spectroscopy (OIS)

The laboratory is now using optical imaging spectroscopy to describe in the non-dystrophic animals the changes in the hemodynamic response in visual cortex to various visual stimuli (gratings of different: spatial frequencies, contrasts, orientations and movement). We will then determine the changes in the hemodynamic responses in visual cortex in dystrophic animals as the retina degenerates. Finally we will use our current transplant technology to slow or repair the degenerating retina and investigate the impact this has on visual cortical and retinal function.

#### Functional analysis of retinal repair

First how is visual information transfer affected by a progressively reduced input signal during degeneration of the retina? How do central visual functions, especially those mediated by the visual cortex, respond to the slow loss of visual input with time? Do they for example show adaptive behaviour to compensate for functional deterioration? How is photoreceptor loss and reduction in acuity function correlated? Second, while it is known that transplantation can limit photoreceptor loss in animal models of retinal degeneration, can such cells prevent deterioration of visual function? If so, what are the cellular mechanisms underlying maintenance of vision? These questions are essential for the therapeutic use of these procedures for human retinal degeneration.

# Professor Pete Coffey



## Publications [Click here for complete publications list](#)

Coffey, P.J., Whiteley, S.J. and Lund, R.D. (2000).

Preservation and restoration of vision following transplantation.

Prog Brain Res 127: 489-99.

Coffey, P.J., Lund, R.D., Adamson, P., Sauve, Y., Keegan, D.J., Girman, S.V., Wang, S., Winton, H., Kanuga, N., Kwan, A.S., Beauchene, L., Zerbib, A., Hetherington, L., Couraud, P.O., and Greenwood, J. (2001). Subretinal transplantation of genetically modified human cell lines attenuates loss of visual function in dystrophic rats. Proc Natl Acad Sci U S A 98: 9942-7.

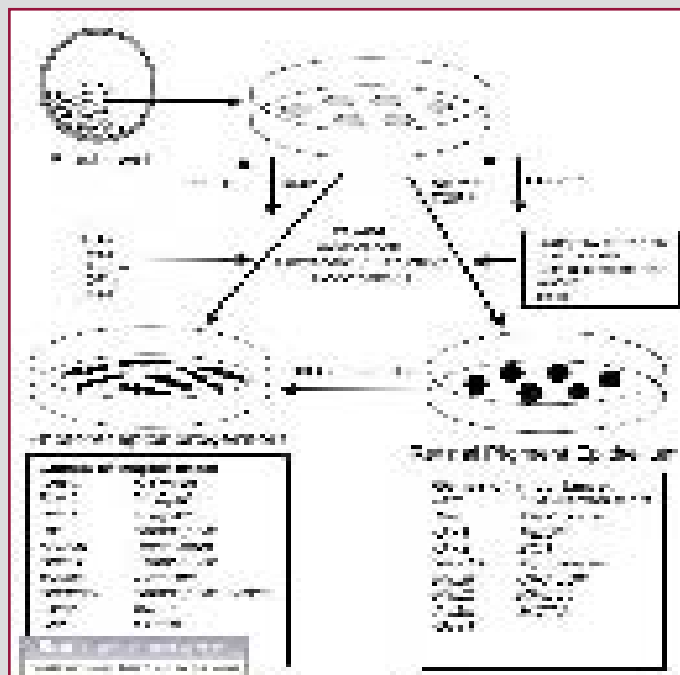
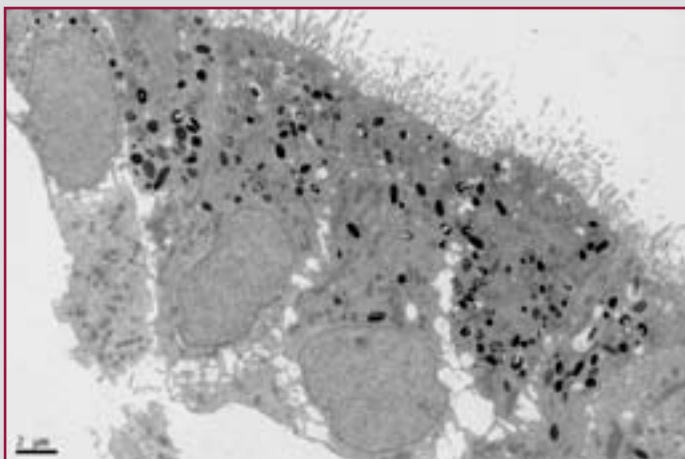
Coffey, P.J., Girman, S., Wang, S.M., Hetherington, L., Keegan, D.J., Adamson, P., Greenwood, J. and Lund, R.D. (2002).

Long-term preservation of cortically dependent visual function in RCS rats by transplantation. Nat Neurosci 5: 53-6.

Klassen H.J., Ng T.F., Kurimoto Y., Kirov I., Shatos M., Coffey P and Young M.J. (2004). Multipotent retinal progenitors express developmental markers, differentiate into retinal neurons, and preserve light-mediated behavior. Invest Ophthalmol Vis Sci 45(11):4167-4173.

Gias C., Jones, M., Keegan, D., Adamson, P., Greenwood, J., Martindale, J., Johnston, D., Berwick, J., Mayhew, J. and Coffey P.J. (2007). Preservation of visual cortical function following retinal pigment epithelium transplantation in the RCS rat using optical imaging techniques. Eur J Neurosci 25, 1940-8.

## Images:



## Funding:

•The London Project to Cure Blindness was launched following a philanthropic contribution from a U.S. donor [www.theondonproject.org](http://www.theondonproject.org)

- Pfizer
- Macular Disease Society [www.maculardisease.org](http://www.maculardisease.org)
- Fight for Sight [www.fightforsight.org.uk](http://www.fightforsight.org.uk)

## Collaborators:

### The Group:

- Mr Ahmad Ahmado
- Dr Amanda Carr
- Mr. Fred Chen
- Dr Li Li Chen
- Dr Carlos Gias
- Dr Shazeen Hasan
- Ms Amelia Lane
- Dr Jean Lawrence
- Mr Peter Lundh
- Ms Yasmyn Rybak-Rajewski
- Dr Ma-Ayan Semo
- Mr Matthew Smart
- Dr Anthony Vugler

### UK Collaborators

- Prof Peter Andrews Centre for Stem Cell Biology, University of Sheffield
- Prof Harry Moore, Centre for Stem Cell Biology, University of Sheffield
- Prof David Baker, UCL Institute of Neurology
- Prof Chris Mason, UCL Advanced Centre for Biochemical Engineering
- Mr Lyndon da Cruz, Moorfields Eye Hospital

### International Collaborators

- Prof Dennis Clegg, University of California, Center for Stem Cell Biology and Engineering.

### Commercial Collaborators

- GlaxoSmithKline
- Ruth McKernan, Pfizer
- Paul Whiting, Pfizer
- Jim Walsh, Intercytex
- Nick Higgins, Intercytex
- Paul Kemp, Intercytex