

# Lightmasks that prevent dark adaptation for non-central diabetic macular oedema: the CLEOPATRA RCT

Sobha Sivaprasad,<sup>1\*</sup> Joana Vasconcelos,<sup>2</sup>  
Helen Holmes,<sup>3</sup> Caroline Murphy,<sup>3</sup> Joanna Kelly,<sup>3</sup>  
Philip Hykin<sup>1</sup> and Andrew Toby Prevost<sup>2</sup>

<sup>1</sup>National Institute for Health Research (NIHR) Clinical Research Facility, NIHR Biomedical Research Centre, Moorfields Eye Hospital and University College London, London, UK

<sup>2</sup>Imperial Clinical Trials Unit, School of Public Health, Imperial College London, London, UK

<sup>3</sup>King's Clinical Trials Unit, King's Health Partners, King's College London, London, UK

\*Corresponding author [sobha.sivaprasad@ Moorfields.nhs.uk](mailto:sobha.sivaprasad@ Moorfields.nhs.uk)

**Declared competing interests of authors:** Sobha Sivaprasad has received research grants, personal fees and advisory board honoraria from Bayer AG (Leverkusen, Germany), Novartis International AG (Basel, Switzerland) and Allergan plc (Dublin, Republic of Ireland), research grants and advisory board honoraria from F. Hoffman-La Roche AG (Basel, Switzerland) and Boehringer Ingelheim GmbH (Ingelheim am Rhein, Germany) and advisory board honoraria from Heidelberg Engineering GmbH (Heidelberg, Germany). Sobha Sivaprasad is also on the National Institute for Health Research (NIHR) Health Technology Assessment Commissioning Committee. Philip Hykin reports grants, personal fees and non-financial support from Novartis International AG; grants, personal fees, non-financial support and other (including travel expenses and advisory board honoraria) from Bayer; and grants and personal fees from Allergan AG outside the submitted work. Andrew Toby Prevost is a member of the NIHR Public Health Research Funding Committee.

Published February 2019

DOI: 10.3310/eme06020

## Plain English summary

### The CLEOPATRA RCT

Efficacy and Mechanism Evaluation 2019; Vol. 6: No. 2

DOI: 10.3310/eme06020

NIHR Journals Library [www.journalslibrary.nihr.ac.uk](http://www.journalslibrary.nihr.ac.uk)

## Plain English summary

The extent to which a lack of oxygen causes vessels to leak to cause diabetic macular oedema (DMO) is unclear. Inhaling 100% oxygen has been shown to improve DMO in the short term. The rod photoreceptor is a type of cell in the retina that enables night vision and allows us to adapt to the dark but requires most of the oxygen supplied to the retina for this function. This study tested the hypothesis that if we prevent the rod photoreceptors from dark adaptation by sleeping at night using a lightmask that prevents the rod from functioning, the retina may use less oxygen at night and prevent or reverse the macular oedema. In this study, we tested whether or not wearing such a lightmask can improve early DMO.

Three hundred and eight participants with early DMO from 15 NHS hospitals were randomly allocated either to wearing the lightmask at night or to non-lightmask (control) arm to evaluate the clinical efficacy and safety of the lightmask at 24 months. The participants were assessed every 4 months, compliance stressed and also resupplied with the lightmasks. The study also evaluated the role of inhaling 100% oxygen and lightmasks on visual functions in a subgroup of 28 participants to understand the mechanisms of the effect of the lightmask.

The study showed that there was no difference between the lightmask arm and the non-lightmask arm at 24 months. Compliance with wearing the lightmask reduced with time. Oxygen inhalation also did not have any effect on visual function or the macular oedema.

The study revealed that a lack of oxygen may not contribute significantly to the onset and progression of DMO. The role of rod photoreceptors in diabetic eye disease needs to be evaluated further using other methods of rod suppression.

# Efficacy and Mechanism Evaluation

ISSN 2050-4365 (Print)

ISSN 2050-4373 (Online)

This journal is a member of and subscribes to the principles of the Committee on Publication Ethics (COPE) ([www.publicationethics.org/](http://www.publicationethics.org/)).

Editorial contact: [journals.library@nihr.ac.uk](mailto:journals.library@nihr.ac.uk)

The full EME archive is freely available to view online at [www.journalslibrary.nihr.ac.uk/eme](http://www.journalslibrary.nihr.ac.uk/eme). Print-on-demand copies can be purchased from the report pages of the NIHR Journals Library website: [www.journalslibrary.nihr.ac.uk](http://www.journalslibrary.nihr.ac.uk)

## Criteria for inclusion in the *Efficacy and Mechanism Evaluation* journal

Reports are published in *Efficacy and Mechanism Evaluation* (EME) if (1) they have resulted from work for the EME programme, and (2) they are of a sufficiently high scientific quality as assessed by the reviewers and editors.

## EME programme

The Efficacy and Mechanism Evaluation (EME) programme was set up in 2008 as part of the National Institute for Health Research (NIHR) and the Medical Research Council (MRC) coordinated strategy for clinical trials. The EME programme is broadly aimed at supporting 'science driven' studies with an expectation of substantial health gain and aims to support excellent clinical science with an ultimate view to improving health or patient care.

Its remit includes evaluations of new treatments, including therapeutics (small molecule and biologic), psychological interventions, public health, diagnostics and medical devices. Treatments or interventions intended to prevent disease are also included.

The EME programme supports laboratory based or similar studies that are embedded within the main study if relevant to the remit of the EME programme. Studies that use validated surrogate markers as indicators of health outcome are also considered.

For more information about the EME programme please visit the website: <http://www.nets.nihr.ac.uk/programmes/eme>

## This report

The research reported in this issue of the journal was funded by the EME programme as project number 11/30/02. The contractual start date was in January 2014. The final report began editorial review in April 2018 and was accepted for publication in August 2018. The authors have been wholly responsible for all data collection, analysis and interpretation, and for writing up their work. The EME editors and production house have tried to ensure the accuracy of the authors' report and would like to thank the reviewers for their constructive comments on the final report document. However, they do not accept liability for damages or losses arising from material published in this report.

This report presents independent research. The views and opinions expressed by authors in this publication are those of the authors and do not necessarily reflect those of the NHS, the NIHR, the MRC, NETSCC, the EME programme or the Department of Health and Social Care. If there are verbatim quotations included in this publication the views and opinions expressed by the interviewees are those of the interviewees and do not necessarily reflect those of the authors, those of the NHS, the NIHR, NETSCC, the EME programme or the Department of Health and Social Care.

© Queen's Printer and Controller of HMSO 2019. This work was produced by Sivaprasad *et al.* under the terms of a commissioning contract issued by the Secretary of State for Health and Social Care. This issue may be freely reproduced for the purposes of private research and study and extracts (or indeed, the full report) may be included in professional journals provided that suitable acknowledgement is made and the reproduction is not associated with any form of advertising. Applications for commercial reproduction should be addressed to: NIHR Journals Library, National Institute for Health Research, Evaluation, Trials and Studies Coordinating Centre, Alpha House, University of Southampton Science Park, Southampton SO16 7NS, UK.

Published by the NIHR Journals Library ([www.journalslibrary.nihr.ac.uk](http://www.journalslibrary.nihr.ac.uk)), produced by Prepress Projects Ltd, Perth, Scotland ([www.prepress-projects.co.uk](http://www.prepress-projects.co.uk)).

## NIHR Journals Library Editor-in-Chief

**Professor Ken Stein** Chair of HTA and EME Editorial Board and Professor of Public Health, University of Exeter Medical School, UK

## NIHR Journals Library Editors

**Professor Ken Stein** Chair of HTA and EME Editorial Board and Professor of Public Health, University of Exeter Medical School, UK

**Professor Andrée Le May** Chair of NIHR Journals Library Editorial Group (HS&DR, PGfAR, PHR journals)

**Professor Matthias Beck** Professor of Management, Cork University Business School, Department of Management and Marketing, University College Cork, Ireland

**Dr Tessa Crilly** Director, Crystal Blue Consulting Ltd, UK

**Dr Eugenia Cronin** Senior Scientific Advisor, Wessex Institute, UK

**Dr Peter Davidson** Consultant Advisor, Wessex Institute, University of Southampton, UK

**Ms Tara Lamont** Scientific Advisor, NETSCC, UK

**Dr Catriona McDaid** Senior Research Fellow, York Trials Unit, Department of Health Sciences, University of York, UK

**Professor William McGuire** Professor of Child Health, Hull York Medical School, University of York, UK

**Professor Geoffrey Meads** Professor of Wellbeing Research, University of Winchester, UK

**Professor John Norrie** Chair in Medical Statistics, University of Edinburgh, UK

**Professor John Powell** Consultant Clinical Adviser, National Institute for Health and Care Excellence (NICE), UK

**Professor James Raftery** Professor of Health Technology Assessment, Wessex Institute, Faculty of Medicine, University of Southampton, UK

**Dr Rob Riemsma** Reviews Manager, Kleijnen Systematic Reviews Ltd, UK

**Professor Helen Roberts** Professor of Child Health Research, UCL Great Ormond Street Institute of Child Health, UK

**Professor Jonathan Ross** Professor of Sexual Health and HIV, University Hospital Birmingham, UK

**Professor Helen Snooks** Professor of Health Services Research, Institute of Life Science, College of Medicine, Swansea University, UK

**Professor Jim Thornton** Professor of Obstetrics and Gynaecology, Faculty of Medicine and Health Sciences, University of Nottingham, UK

**Professor Martin Underwood** Warwick Clinical Trials Unit, Warwick Medical School, University of Warwick, UK

Please visit the website for a list of editors: [www.journalslibrary.nihr.ac.uk/about/editors](http://www.journalslibrary.nihr.ac.uk/about/editors)

**Editorial contact:** [journals.library@nihr.ac.uk](mailto:journals.library@nihr.ac.uk)