

**Manchester Interdisciplinary Collaboration for Research on Ageing (MICRA)
Seed corn application 2013. Contact: Iracema.Leroi@manchester.ac.uk**

Title: Is the retina truly a window to the brain? A study of a potential biomarker for dementia

Lead applicant: **Iracema Leroi**, Clinical Senior Lecturer (Institute for Brain, Behaviour and Mental Health)/Honorary Consultant (Manchester Mental Health and SC Trust);

Co-Applicants:

Paul Bishop, Professor of Ophthalmology and Matrix Biology (Institute for Human Development)/Consultant Ophthalmologist (Manchester Eye Hospital);

Alistair Burns, Prof Psychiatry (Institute for Brain, Behaviour and Mental Health)/Honorary Consultant (Manchester Mental Health and SC Trust);

Tobias Langheinrich, Consultant Neurologist (Salford Royal Foundation Trust);

Adam Greenstein, British Heart Foundation Intermediate Fellow Institute of Cardiovascular Sciences)/Honorary Consultant Geriatrician (Central Manchester Foundation Hospitals Trust);

R A Malik, Professor of Medicine (Institute of Human Development); & Consultant Physician (Centre for Endocrinology & Diabetes);

Tariq Aslam, Senior Lecturer in Ophthalmology (Institute for Human Development)/Consultant Ophthalmologist (Manchester Eye Hospital).

Background:

Brain failure or 'neurodegeneration' has been identified as a major area of unmet medical need within the UK and EU. As part of this, the early recognition and management of dementia has become a national priority (National Dementia Strategy, 2009; Prime Minister's Challenge on Dementia, 2012).

This is particularly the case since therapies that cure or slow the course of Alzheimer disease (AD) are becoming a reality, thus the need to identify suitable ways to detect the condition before it becomes clinically evident is ever more urgent. One of the ways to do this might involve an eye examination.

The blood vessels at the back of the eye, in the retina, are part of the blood vessel system supporting the brain. An important part of these retinal blood vessels is an inner lining called the 'glycocalyx', which is essential for maintaining the health of the retinal blood vessels.

A loss or thinning of the glycocalyx is thought to increase the risk for blood vessel damage beyond the retina and may even lead to cognitive impairment and eventually dementia. For example, the glycocalyx is known to be thinned in diabetes, one of the key risk factors for the development of blood vessel-related cognitive impairment.

It is now possible to visualise and measure the width of the glycocalyx of the retina. Using this new technique, we are now going to use our MICRA grant to determine how changes in the glycocalyx may be linked to cognitive changes (e.g. thinking and memory) and therefore give us a very early clue about whether more serious cognitive problems such dementia, that might be developing.

Our study team will comprise experts from the Manchester Academic Health Sciences Centre (MAHSC) in neurology, ophthalmology, psychiatry, geriatric medicine, cardiovascular medicine, and endocrinology.

Through this seedcorn application, we propose to undertake a full review of the medical literature to find all the ways in which blood vessel examinations have informed our understanding of developing cognitive impairment. This will form the basis of a larger study plan designed to find a way to help us diagnose and even manage such changes early.

References

1. <https://www.gov.uk/government/publications/living-well-with-dementia-a-national-dementia-strategy>
2. <https://www.gov.uk/government/news/prime-minister-s-challenge-on-dementia>
3. Citron M. Alzheimer's disease: strategies for disease modification. *Nature Rev* 2010; 9; 387-398
4. Lemkes BA et al. The Glycocalyx and Cardiovascular Disease in Diabetes: Should We Judge the Endothelium by Its Cover? *Diabetes Technol Therapeutics* 2012; 14: supplement 1.

Personal Profile: Dr Iracema Leroi
Clinical Senior Lecturer/ Honorary Consultant in Old Age Psychiatry
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Dr Iracema Leroi is a clinical senior lecturer and consultant in Older Adult Psychiatry, Dementia Director for the neurodegenerative research network DeNDRoN (NW region), and mental health domain clinical co-lead for Manchester Academic Health Sciences Centre (MAHSC).

Dr Leroi has a special interest in the therapeutic aspects of dementia and the mental health of patients with Parkinson's Disease (PD). She trained in the neuropsychiatry of neurodegenerative diseases at Johns Hopkins University in Baltimore, USA before joining the faculty there.

In 2002, she moved to Manchester and has worked in the field ever since. Dr Leroi lectures with the British Geriatric Society's PD Academy and was a deputy mental health representative on the NICE guidelines committee for PD. She was awarded a senior research fellowship with the PD Society to study the neural and clinical correlates of disorders of reward and motivation in PD.

Quotation:

'The MICRA award is giving us an excellent opportunity to build collaborations across disciplines in order to further our understanding of how to detect and diagnosis dementia¹.