

## Meeting for clinician scientists in training

LS Mackay

This annual meeting provides an opportunity for research trainees to present their work to peers and leading clinician scientists in their field.

The opening lecture was given by Professor Sir Leszek Borysiewicz, chief executive officer, Medical Research Council (MRC). By way of introduction, he traced the historical foundations of the MRC, highlighting the core Haldane Principle: 'that it is the right of government to fund research but that this right does not extend to the influencing of the distribution of monies'. Such legislation has ensured the direction of funding to areas of real clinical need, with the best individuals and institutions undertaking this research. With 28 Nobel prize winners in medicine, physiology and chemistry since 1913, such strategy has been of great benefit to the health and well being of society and remains central to the mission of the MRC.

The major challenges to all UK research funding bodies were highlighted, most notably the need to be responsive to the global society. With an explosion of research in Asia, and with China spending double what the UK currently spends on research each year, Professor Borysiewicz stated it vital that UK researchers rapidly adapt to this changing world. In order to enjoy continued success it was emphasised that the UK must play to its strengths, prioritising areas in which it is currently a world leader and in which it can make unique contributions. It was suggested that research priorities should include the development of biomarkers and the greater use of bioimaging. The UK should also conduct more longitudinal epidemiological studies and effectively utilise the unique resource that is the NHS. By focusing on these areas, the UK, which is currently ranked second in the research community to the USA, may maintain and improve this standing and bridge the gap in translational medicine.

In order to remain at the forefront of research, the MRC is engaging with the Department of Health, other UK research councils and industry to form effective partnerships that identify and address the UK health research needs. The need to engage and collaborate with industry was a major theme of the lecture, highlighting that effective collaboration will facilitate not only intellectual transfer but will provide access to high throughput technology and greater ability to translate the results of research into new therapeutics. A commitment to fund 'larger

scale' science was also revealed. The creation and funding of dedicated research institutes and centres illustrate ways in which the MRC has invested in the infrastructure and technology required to facilitate this. In addition, the concurrent investment in people shall fully realise the potential of this investment. There remains, however, a strong commitment to continue to fund small scale grants to recruit, retain and develop world class UK-based clinician scientists in other academic institutions. Thus even in this challenging economic period, the MRC budget is to be increased from £543 million to £605 million this year, with other research councils similarly increasing budgets by on average 17%. This commitment is testament to the value placed on high-quality science and research in the UK and assurances were given that this investment will be sustained.

A poster session then followed, providing all attending clinician scientists in training with the opportunity to present their work to peers and leading experts in their chosen specialty. Prizes were awarded in each specialty to the individual whose poster presentation was judged to be the best in category.

Following this session, the highest ranking submitted abstracts were presented in the Gordon Cumming memorial oral plenary session and the Medical Research Society Young Investigators Award. The young investigator was awarded to Dr Ferdia Gallagher from the University of Cambridge for his research employing magnetic resonance spectroscopy imaging of tissue pH.<sup>1</sup> The system utilises the endogenous extracellular buffer HCO<sub>3</sub><sup>-</sup> which maintains pH via carbonic anhydrase catalysing interconversion to CO<sub>2</sub>. He showed that utilising dynamic nuclear polarisation with <sup>13</sup>C-MRS, injection of hyperpolarised H<sup>13</sup>CO<sub>3</sub><sup>-</sup> allows tissue pH to be imaged *in vivo* from the relative concentrations of H<sup>13</sup>CO<sub>3</sub><sup>-</sup> and <sup>13</sup>CO<sub>2</sub>. Many disease states including cancer are associated with alterations in pH and it was proposed that this technique could provide novel ways in which to both detect disease and assess response to treatment. Second prize went to Dr Muzlifah Haniffa from Newcastle University who presented her work on the role of dermal macrophages in acute and chronic graft-versus-host disease.<sup>2</sup> Other work presented included the potential for using high episcopic microscopy to image congenital heart defects in the first trimester, and the use of metabolomics in cerebrospinal fluid to differentiate between neurological diseases.

The meeting was concluded with the annual Goulstonian lecture which focused on Professor Geraint Rees' research to understand the neural correlates of conscious experience in humans.<sup>3–6</sup> Professor Rees began by highlighting the importance of understanding consciousness as, on a basic level, the major goal of all therapeutics is the preservation of the ability to have common experiences. The lecture focused on conscious experience, discussing both neural activity associated with an

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This conference took place at the Royal College of Physicians (RCP) on 26 February 2009 and was organised by the Medical Research Society in association with the Academy of Medical Sciences and the RCP

individual experience and the unconscious neural activity and perception associated with that activity. Frequent spontaneous and random changes in conscious experience were achieved without change in sensory stimulation by utilising binocular rivalry, the phenomenon by which presentation of two dissimilar images to each eye results in the perception of only one of

these images and the suppression of the other. Brain activity was concurrently measured using functional magnetic resonance imaging (MRI). Via this approach, Professor Rees showed that it was possible to predict an individual's conscious experience from the pattern of responses to stimulus on the features of functional MRI alone. The implications of such groundbreaking work were also discussed, including the application of 'decoding' conscious or unconscious thoughts that could be used without an individual's knowledge or against their will. For example, the ability to predict and therefore decode other neural processes which relate to mental state may allow prediction of both conscious and unconscious attitudes, racial attitudes, criminal traits and even personal decisions. Such questions led to a fascinating ethical discussion to conclude the day although these were stressed to be hypothetical as current decoding methods are not thought to be sensitive enough to reveal such information. However, future advances in this research may provide the potential to reveal cognitive activity in patients thought to be in a persistent vegetative state. Importantly, as with all advances in medicine, there is the potential for research to be misused and the responsibility of the medical community to put in place the necessary safeguards to prevent such misuse was highlighted.

In conclusion, the clinician scientist in training meeting 2009 was an outstanding programme that showcased the excellence of current medical research in the UK. Over 100 delegates attended the meeting to learn about future goals of medical research, with the opportunity to present their own research and exchange their ideas with peers and UK scientific leaders. The meeting was inspirational and invaluable for all who attended and will continue to be the premier meeting for all clinician scientists in training.

## Acknowledgement

Thanks to Malcolm Brodlie for proofreading the manuscript.

## References

- 1 Gallagher FA, Kettunen MI, Day SE *et al*. Magnetic resonance imaging of pH in vivo using hyperpolarised <sup>13</sup>C-labelled bicarbonate. *Nature* 2008;453:940–3.
- 2 Haniffa M, Ginhoux F, Wang X *et al*. Differential rates of replacement of human dermal dendritic cells and macrophages during hematopoietic stem cell transplantation. *J Exp Med* 2009;206:371–85.
- 3 Rees G, Kreiman G, Koch C. Neural correlates of consciousness in humans. *Nature Rev Neuro* 2002;3:261–70.
- 4 Haynes JD, Rees G. Predicting the stream of consciousness from activity in human visual cortex. *Curr Biol* 2005;15:1301–7.
- 5 Sterzer P, Haynes JD, Rees G. Fine scale activity patterns in high-level visual areas encode the category of invisible objects. *J Vis* 2008; 8:10.1–12.
- 6 Haynes JD, Rees G. Decoding mental states from brain activity in humans. *Nat Rev Neuro* 2006;7:23–34.

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## Conference programme

### CAREERS LECTURE

#### The future of medical research

Professor Sir Leszek Borysiewicz, chief executive officer, Medical Research Council

### ORAL PLENARY SESSION

#### The ubiquitin E3 ligase, K5, downregulates a major TGFβ receptor signalling pathway: implication for pulmonary arterial hypertension

Dr HJ Durrington, University of Cambridge

#### High resolution episcopic microscopy in human fetal heart: potential for morphological investigation for the heart in the first and early second trimester

Dr H Matsui, Imperial College, London

#### The influence of dendritic cell function by tissue factor, a coagulation protein

Dr S Shrivastava, Imperial College, London

#### NMR-based metabolomic analysis of cerebrospinal fluid and serum in neurological diseases – a diagnostic tool?

Dr AJ Sinclair, University of Birmingham

### MRS YOUNG INVESTIGATORS AWARD FINALISTS

Introduction by Professor Steve O'Rahilly, MRS chairman

#### Coronary artery blood flow in the beating human heart is driven by a dominant suction wave from the microcirculation: application of novel 'wave intensity' analysis in health and disease

Dr J Davies, Imperial College, London

#### Imaging tumour pH and carbonic anhydrase activity in vivo using dynamic nuclear polarisation and MRI

Dr FA Gallagher, University of Cambridge

#### The fate of human dermal antigen presenting cells in haematopoietic stem cell transplantation and their role in graft-versus-host disease

Dr M Haniffa, University of Newcastle

#### The role of the low affinity Fcγ receptors, FcγRIIb and FcγRIIIb, in autoimmunity and infection

Dr LC Willcocks, University of Cambridge

### GOULSTONIAN LECTURE

#### Decoding consciousness

Professor Geraint Rees, Institute of Cognitive Neuroscience, Queen Square, London