Experimental Medicine Training Initiative

THE ROLE OF IMAGING IN DRUG DISCOVERY, DRUG DEVELOPMENT AND IN CLINICAL STUDIES

THURSDAY, 8 MARCH 2018
TRINITY HALL, TRINITY LANE, CAMBRIDGE, CB2 1TJ

UNIVERSITY OF CAMBRIDGE

Cambridge University Hospitals NHS
NHS Foundation Trust

Cambridge Biomedical Research Centre

NHS
National Institute for
Health Research

AstraZeneca

gsk GlaxoSmithKline

MedImmune

LEARNING OBJECTIVES

TO UNDERSTAND THE ROLE FOR USING IMAGING IN DRUG DISCOVERY, DRUG DEVELOPMENT AND AS PART OF CLINICAL STUDIES

OVERVIEW OF DIFFERENT IMAGING TECHNIQUES (PARTICULARLY MRI) FOR THE ASSESSMENT OF MUSCULOSKELETAL DISEASE IN EARLY PHASE CLINICAL TRIALS.

UNDERSTAND SOME OF THE CHALLENGES AND OPPORTUNITIES FOR IMAGING WITH EXAMPLES DRAWN FROM EXPERIENCE OF RHEUMATOID ARTHRITIS AND OSTEOARTHRITIS.

TO UNDERSTAND THE ROLE AND POTENTIAL OF IMAGING IN PRE-CLINICAL DRUG DISCOVERY.

TO GAIN AN OVERVIEW OF CURRENT CHALLENGES AND OPPORTUNITIES IN PHENOTYPIC DRUG SCREENING IN GENERAL.

INTRODUCTION TO KEY CONCEPTS OF MACHINE LEARNING AND TO SOME OF ITS APPLICATION IN THE FIELD OF DIGITAL PATHOLOGY.

TO UNDERSTAND HOW A PHARMACEUTICAL COMPANY CAN IDENTIFY CLINICAL CHALLENGES AND ADDRESS WITH TECHNOLOGY SOLUTIONS AND UNDERSTAND HOW METHODS ARE DEVELOPED.

GROUP BREAKOUT

CHALLENGES OF USING IMAGING IN MODERN DRUG STUDIES

RESOURCES

HTTP://WWW.EMI-TRAINING.ORG/

ROYAL COLLEGE OF PHYSICIANS CPD
ACTIVITY CODE: 116537 (6POINTS)

SCHEDULE

FIRST SESSION		LEARNING OBJECTIVES AND INFORMATION
8.30-9.00am	Registration and Refreshments	Terrace Room
9.00-9.15	Opening Remarks Dr Joseph Cheriyan/Dr Ferdia Gallagher	Lecture Theatre A summary of the learning objectives and aims of the event
9.15-9.45	Developing new imaging methods for drug trials Dr Phil Murphy Head, Experimental Medicine Imaging, GSK	• To understand how a pharmaceutical company can identify clinical challenges and address with technology solutions. • How are methods developed? How long does it take and how much does it cost? What have been the impediments to make progress and how can external research models be improved to deliver new imaging tools.
9.45-10.15	Imaging as part of cardiovascular drug studies Dr Lars Johansson Chief Science Officer, Antaros Medical	
10.15-10.35	Imaging as part of musculoskeletal drug studies Dr Jamie MacKay Musculoskeletal radiologist, Cambridge University Hospitals Trust, EMI PhD student, University of Cambridge	• Provide an overview of different imaging techniques (particularly MRI) for the assessment of musculoskeletal disease in early phase clinical trials. • Outline some of the challenges and opportunities for imaging in this area, with examples drawn from experience of rheumatoid arthritis and osteoarthritis
10.35-11.00	Break	Terrace Room
11.00-11.30	Imaging as part of decision-making tools in drug studies Dr Neel Patel Consultant Radionuclide Radiologist, University of Oxford & Experimental Medicine Imaging Physician, GSK	Lecture Theatre
11.30-12.00	Image-based high throughput screening in early drug discovery Dr Svenja Luense Senior Research Scientist, Cellular Assay Development and High-Content Analysis (HCA), Astra Zeneca, Sweden	• Provide an overview of the role and potential of imaging in pre-clinical drug discovery. • Indicate some of the current challenges and opportunities for phenotypic drug discovery in general.

Time	Session	Location / Details
12.00-12.30pm	**Machine and deep learning for the analysis of whole slide image*s*** Dr Nicolas Brieu Senior Research Scientist, Definiens AG, Germany	• Introduction to key concepts of machine learning and to some of its application in the field of digital pathology.
12.30-1.30	**Lunch**	**Terrace Room** Networking and discussion

SECOND SESSION

Time	Session	Location / Details
1.30-2.00	**Imaging in clinical trials** Dr Andy Brown Global Imaging Lead, Global Medicines Development Oncology, Astra Zeneca	**Lecture Theatre**
2.00-2.30	**Imaging in neurological drug studies** Professor Ed Bullmore Head of Department of Psychiatry, Brain Mapping Unit, Director of Functional MRI at Wolfson Brain Imaging Centre, University of Cambridge	
2.30-3.45	**Break out - Case study discussions** **Case Study 1: Challenges with small sample size studies** Dr Lars Johansson Bridgetower Room **Case Study 2: Head and Neck Cancer** Professor John Waterton Leslie Stephen Room **Case Study 3: Studies of fibrosis** Dr Phil Murphy & Dr Neel Patel Chetwode Room **Case Study 4: Setting up multi-centre trials** Dr Andy Brown Lecture Theatre	Explore challenges and pitfalls in context with a specific case study. Case study groups to discuss and consider challenges and solutions – 45 minutes Return to lecture theatre to present findings - 30 minutes (max 7minutes per group)
3.45-4.00	**Break**	**Terrace Room**
4.00-4.45	**Imaging in drug development and discovery: benefits and challenges** Professor John Waterton Professor of Translational Imaging, University of Manchester 40 minute lecture followed by a 20 minute quiz	**Graham Storey Room** • List many of the applications of in vivo imaging in drug discovery and development. • Apply the BEST (Biomarkers, EndpointS, and other Tools) Resource to the case of imaging biomarkers.
4.45-5.00	**Discussion summarising ideas and follow-up steps for each case study** **Closing remarks - Dr Ferdia Gallagher**	
5.00-5.45 5.45-7.00pm	**Drinks reception** **Networking and early supper**	**Senior Common Room** **Graham Storey Room**

SPEAKER BIOGRAPHIES IN ALPHABETICAL ORDER

Professor Ed Bullmore

Head of Department of Psychiatry, Brain Mapping Unit, Director of Functional MRI at Wolfson Brain Imaging Centre, University of Cambridge

Professor of Psychiatry in Cambridge since 1999, Ed set up the Brain Mapping Unit and is director of functional MRI at the Wolfson Brain Imaging Centre. He is also co-director of CAMEO, a new clinical service for patients with early symptoms of psychosis.

Ed is interested in understanding human brain network organization from neuroimaging data in health and disease. His recent methodological work has focused on graph theory to measure aspects of brain network topology.

Ed is also interested in better neuroscientific understanding and treatment of psychiatric disorders. He works half-time for GSK, leading a small group focused on immunological mechanisms and therapeutics for mood disorders.

Dr Nicolas Brieu

Senior research scientist, Definiens AG, Germany

Nicolas has more than 10 year's experience in the field of medical image analysis. His research area is in machine and deep learning applied to image understanding and computer vision. He joined Definiens in 2011 and has since been working on the development of algorithms to automate the analysis of digital pathology images.

Dr Andy Brown

Global Imaging Lead, Global Medicines Development Oncology, Astra Zeneca, Cambridge

Andy has over 20 years in the pharmaceutical industry applying PET, CT and MR imaging to drug development. He started working for GSK at the CUC in Cambridge. Further to this Andy helped design and build the GSK Clinical Imaging Centre at Hammersmith Hospital, where he acted as lead scientist and PI on a number of early phase imaging studies. Following the transition of GSK CIC to Imanova, Andy took on the role of Head of Imaging Projects where he was responsible for a portfolio of over 100 studies.

Andy studied pre-clinical imaging at The University of Oxford using MRI contrast agents to investigate neuroinflammation and is currently Global Imaging Lead in AZ GMD Oncology division. He leads a team of Clinical Imaging Scientists that provide expert knowledge to global study teams to drive the set-up and execution of Phase II, III and IV clinical trials across AZ's Oncology portfolio.

Dr Joseph Cheriyan

Consultant Physician & Clinical Pharmacologist at Addenbrooke's Hospital, Associate Lecturer, University of Cambridge, Director of the Cardiovascular Trials Office, Vice Chair of the Cambridge Research Ethics Committee, EMI Training Lead

Joseph is an active clinical researcher with interests in cardiovascular medicine particularly vascular function and inflammation and is uniquely the only MHRA accredited Phase I/II clinical triallist on the Cambridge Biomedical Campus working on early phase experimental medicine studies since 2006. His post combines NHS research within a University Department, in close collaboration with GSK's only remaining in house Clinical Unit, where he is seconded as a Senior Clinical Pharmacologist.

Dr Ferdia Gallagher
Cancer Research UK Clinician Scientist Fellow, University of Cambridge and CRUK Cambridge Research Institute

Ferdia is leading this EMI-Imaging Event today, bringing together experts in the field of Imaging. His specialties are oncological imaging, molecular imaging MRI and PET.

Ferdia studied medicine at both the Universities of Cambridge and Oxford before training as a radiologist at Addenbrooke's Hospital. He undertook a PhD in Biochemistry in Cambridge as part of a CRUK Clinical Research Training Fellowship; this work focused on a new form of imaging termed hyperpolarized carbon-13 MRI that allows tumour metabolism to be imaged non-invasively in real time.

Ferdia is currently a CRUK Clinician Scientist, University Reader in Molecular Imaging and an Honorary Consultant Radiologist in the Department of Radiology in the University of Cambridge. His main interest is developing new molecular imaging methods to study fundamental biological processes in tumours that can be translated into patient care. These techniques include MRI and PET. Part of this research has involved the translation of hyperpolarized carbon-13 MRI into humans and this has involved creating a bespoke pharmacy facility to assembly the consumables for the clinical hyperpolarizer. In addition, he is currently developing methods to study tumour aggressiveness using diffusional weighted imaging and to probe tissue structure and function using sodium MRI.

He is also interested in new PET tracers, such as labelled sodium fluoride to more accurately stage tumours, and cell labelling methods using 89Zr-PET. The group is also interested in the application of novel trial designs to imaging studies. He sits on the CRUK Clinical Research Committee and the CRUK New Investigators Committee. He is the Chair of the MR of Cancer Study Group within the International Society of Magnetic Resonance in Medicine 2017-18. Dr Gallagher also directs the local Academic Research Training Programme in Radiology.

Dr Svenja Luense
Senior Research Scientist, Cellular Assay Development and High-Content Analysis (HCA).Astra Zeneca, Sweden

Svenja's interest is in complex phenotypic screening, advanced cellular models and imaging.

Most of Svenja's scientific career has been spent in High-Content Analysis teams in pharmaceutical research. Svenja joined AstraZeneca in 2014 and has worked with applying subcellular imaging technology and approaches to drug discovery processes across various therapeutic areas.

Dr Lars Johansson
Chief Science Officer, Antaros Medical

Lars is an Associate Professor of Translational Imaging at Uppsala University, Sweden. He has led a large number of international multi-centre imaging trials, and has been PI and co-PI on international grants from EU, JDRF, NIH and EFSD. He has more than 120 peer-reviewed publications in the cardiovascular and metabolism field, with a primary focus on imaging, and more than 20 years' experience of the medical and pharma Industries.
During his last 10 years at AstraZeneca, he was Senior Principal Scientist, a role in which he was involved in projects ranging from pre-clinical to life cycle management. He has also led several collaborations between industry and academia. lars.johansson@antarosmedical.com

Dr Jamie MacKay
Musculoskeletal radiologist, Cambridge University Hospitals Trust, EMI PhD student, University of Cambridge.

Jamie is a second year Experimental Medicine Initiative (EMI) PhD student and musculoskeletal radiologist. His main research interest is in the development of improved imaging biomarkers of knee osteoarthritis, with a focus on novel magnetic resonance imaging (MRI) acquisition and analysis techniques.

Dr Phil Murphy
Head, Experimental Medicine Imaging, GSK

Phil heads the clinical imaging group at GSK. The group supports the application of methods from complex molecular imaging right through to multi-centre trials with standard methods. R&D programmes include oncology, immuno-inflammation, respiratory and neuroscience.

Phil has spent over 15 years at GSK and Pfizer developing and applying imaging to support pharmaceutical R&D.

Phil's background is in magnetic resonance with a PhD focused on brain tumour imaging and spectroscopy from the Institute of Cancer Research.

Dr Neel Patel
Consultant Radionuclide Radiologist, University of Oxford & Experimental Medicine Imaging Physician, GSK

Neel's Interests are PET/CT, Radionuclide radiology, Molecular imaging, Diagnostic radiology, preclinical imaging, thyroid and parathyroid imaging, emergency radiology, neuroendocrine tumours, clinical- and preclinical research and teaching.

Professor John Waterton
Professor of Translational Imaging, University of Manchester

John Waterton is Professor of Translational Imaging in the University of Manchester, and Translational Imaging Specialist at Bioxydyn Ltd. He was formerly Chief Scientist in Personalised Healthcare and Biomarkers at AstraZeneca where he was responsible for translational imaging supporting drug discovery and development. He is co-author of over 200 peer-reviewed publications and patents in the field of translational imaging. He co-leads two IMI projects on imaging biomarker validation.

Professor Ian Wilkinson
Professor of Therapeutics, Director of Cambridge Clinical Trials' Unit, Director of the Office of Translational Research, University of Cambridge

Ian has a long track record in clinical pharmacology and arterial haemodynamics. His research interest is in clinical/experimental studies designed to understand the mechanisms underlying arteriosclerosis and cardiovascular disease, and to understand the importance of novel biomarkers of arterial function in risk prediction. He directs the Cambridge Clinical Trials' Unit and is also a director of the Office of Translational Research in Cambridge. He has considerable experience of translational research, and in forming academic collaborations with Industry.

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