

Abridged Curriculum Vitae

Professor Sir Munir Pirmohamed

MB ChB (with Honours), PhD, FRCP, FRCP (Edin), FFPM (Hon), FRSB, FBPhS, FMedSci

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Higher Education and other qualifications:

M.B., Ch.B. (Hons) 1985 University of Liverpool

M.R.C.P. (U.K.) 1988 The Royal College of Physicians

Ph.D. 1993 University of Liverpool

FRCP (Edin) 1999 Royal College of Physicians of Edinburgh

FRCP 2000 Royal College of Physicians of London

FBPhS 2004. Fellow of the British Pharmacological Society

FMedSci 2013. Fellow of the Academy of Medical Sciences

FFPM (Honorary), 2017, Honorary Fellowship of the Faculty of Pharmaceutical Medicine

Clinically qualified and clinically active

Appointments

Current Post/Responsibilities:

David Weatherall Chair of Medicine from July 2013-

NHS Chair of Pharmacogenetics from Sept 2007-

Honorary Consultant Physician at the Royal Liverpool University Hospital from 1996-

Director of the MRC Drug Safety Science from July 2014

Director of the Wolfson Centre for Personalised Medicine from September 2009

Director, Mersey Yellow Card Centre for ADR Monitoring from 1995-

Previous Posts:

Associate Pro Vice Chancellor (Clinical Research) from October 2013-2018

Professor of Clinical Pharmacology at the University of Liverpool from July 2001-July 2013

Senior Lecturer and then Reader, Dept of Pharmacology, The University of Liverpool, 1996-2001

Lecturer, Department of Pharmacology, Liverpool University, 1994-1995;

Senior Clinical Research Fellow, University of Liverpool, 1992-1994;

MRC Training Fellow, University of Liverpool, 1989-1992.

Selected Awards:

MRC Clinical Training Fellowship awarded by the Medical Research Council (1989-1992)

Sir Desmond Pond Fellowship awarded by The Epilepsy Research Foundation (1992-1995)

BrAPP Prize. Awarded by The British Pharmacological Society for the Best Young Investigator, 1994

GSK Clinical Travelling Prize. Awarded by the British Pharmacological Society, 2002.

Department of Health NHS Chair of Pharmacogenetics, Awarded 2007.

Inaugural NIHR Senior Investigator Award, 2008 –

William Withering Medal, Royal College of Physicians and British Pharmacological Society, 2010

IPIT Award for Public Service, University of North Carolina, 2011

Knights Bachelor, Queen's Birthday Honours List, June 2015, for Services to Medicine

Academia Europaea, 2016, Member of Academia Europaea

Selected Prestigious Invited Lectures:

I have given over 500 invited presentations at national and international conferences, averaging about 40 per year over the last 5 years. Some of the named lectures are outlined below:

RAND Lecture, Australasian Society of Clinical and Experimental Pharmacology and Toxicology Annual Meeting 2007, Adelaide Australia, December 2007

IPIT Award Lecture. Chapel Hill, North Carolina, US, Sept 2011.

Neufeld Lecture, International Society of Cardiovascular Pharmacotherapy, Bucharest, Romania, May 2012
William Withering Lecture, Advanced Medicine Conference, Royal College of Physicians, London, Feb 2014
Andrew Duncan Lecture, Royal College of Physicians of Edinburgh Conference, Birmingham, April 2016
Plenary talk; 2nd MAQC Society annual meeting; Shanghai, February 2018
Stanley Davidson Lecture, Royal College of Physicians of Edinburgh, Edinburgh, February 2019.

Selected Professional and Public Service Duties

Chair of the MHRA Pharmacovigilance Expert Advisory Group, from 2006 –current. This is the national committee advising the MHRA and CHM on drug safety issues. Its remit also includes responsibility for the UK yellow card system, which is the spontaneous adverse drug reporting system. The committee has been responsible for providing advice on a number of drug safety issues, which have led to changes in prescribing information, and in some cases, to withdrawal of the drug from the market. I have also been chairing the **Sodium Valproate Expert Working Group** and the **Yellow Fever Vaccine working group**.

Commissioner on Human Medicines, from 2006 to current. The Commission on Human Medicines advises the MHRA on drug licensing based on quality, safety and efficacy of drugs. It reports directly to the Secretary of State for Health, and has been responsible for providing advice on drugs licensed in the UK, as well drugs withdrawn. Its remit also includes providing advice on strategic developments, such as non-medical prescribing.

President-Elect, British Pharmacological Society, 2017 to current (**President** from 2020-2021). I was clinical Vice-President from 2012 to 2016. At the end of 2016, I was elected to become President of the British Pharmacological Society from 2020, which would be preceded in 2017 and 2018 by the role of President-Elect. I am a member of the Council, and have been involved in increasing the numbers of clinical pharmacologists in the UK, by interacting key stakeholders such as NHS England. This has also led to the formation of the Clinical Pharmacology Skills Alliance (CPSA; which I co-Chair) with the ABPI, Faculty of Pharmaceutical Medicine and Health Education England. The CPSA is working towards fulfilling some of the issues facing clinical pharmacology in the NHS, academia and Industry, as highlighted by the UK Life Sciences Industrial Strategy.

MRC Council. I was elected to become a member of the Governing Council of the MRC in 2018, as all Research Councils become part of UKRI.

Non-Executive Director, NHS England. I was appointed as a Non-Executive Director for NHS England in February 2019. This is an exciting time for the NHS with the publication of the Long-Term Plan and integration of NHS England and NHS Improvement.

REF panel member (UoA1). I am member of the REFPanel, UoA1 (Clinical Medicine) and was appointed in 2018 as part of the initial group that develop the criteria for assessment and will continue on the panel until the REF exercise is completed in 2021.

Grant awarding committees. Membership of a number of funding committees, including the NIHR Research for Patient Benefit NW Region Funding Panel (2007 – 2010); Irish Grants Boards: Physiological Systems and Pharmacology Committee (2009); NIHR/MRC EME Board (2008 -2012); MRC Stratified Medicine Panel (2012-current) and the TSB Stratified Medicine Innovation Panel (2012).

Training

I led the development of the **NW England MRC Clinical Pharmacology Training scheme**, which trained 13 fellows to PhD level (many of them are clinical lecturers), supervised by academics in Liverpool and Manchester. The unique aspect of the scheme is its “without walls” training with Industry. The funding received was £3 million. Because of the success of the scheme, this has been renewed by the MRC in 2016 (with a further funding of £3.5 million), with 4 major pharmaceutical companies (UCB, Roche, Eli Lilly and Novartis) as Industry partners. We have recruited 10 fellows to date and will be recruiting another 5 fellows.

I am also the **Training Programme Director** for Clinical Pharmacology and Therapeutics for the NW Deanery. I was responsible for transforming the training programme in Mersey from 1 registrar to 9 registrars. With the introduction of the NIHR Clinical Academic Training Pathway, I have ensured that Liverpool is one of the few Clinical Pharmacology Units to be successful in obtaining both academic clinical fellowships and clinical lectureships. Many of our trainees have been successful in obtaining clinical training fellowships, PhDs and subsequently clinical lectureships, as follows:

- Mirza – MRC; currently Senior Lecturer
- Walker – MRC; now NIHR lecturer
- McWilliam (Paediatric) –MRC; now NIHR lecturer
- Yip – MRC; now NIHR lecturer
- Powell – MRC Fellow

- Turner – Lecturer, and Genomics England post-doctoral fellowship
- Stott – WT fellow
- Al-Naher – PhD Fellow funded by NIHR CLAHRC

I have also been successful in working with Paediatrics in setting up a training programme in Paediatric Clinical Pharmacology which has led to the appointment of Hawcutt as Senior Lecturer in Paediatric Clinical Pharmacology. McWilliam has also been appointed as Clinical lecturer.

I have supervised/supervising the following for higher degrees:

Higher degrees supervised

1. MPhil: Dominic Williams, (1996)
2. PhD: Dean Naisbitt, (1997)
3. PhD: Dominic Williams, (1999)
4. MPhil: Sally Morrison-Griffiths, (2000).
5. PhD: Charlotte Dodd, (2001)
6. MD: Ruth Allen, (2001)
7. PhD: Fraser Gordon, (2003)
8. PhD: Andrew Owen, (2003)
9. MD: Damitha Edirisinghe, (2004)
10. MD: Bridget Maher, (2004)
11. PhD: Lynn Owens, (2004)
12. PhD: Ana Alfirevic, (2005)
13. PhD : Simon Jones, (2005)
14. MD : Javier Vilar, (2005)
15. PhD : Joanne Foster, (2007)
16. PhD: Mohammed Al'sbou, (2007)
17. PhD: Sameh Al-zubiedi, (2009)
18. PhD: Kathryn Cobain, (2009)
19. PhD: Emma Davies, (2009)
20. PhD: Abishek Srivastava, (2010)
21. PhD: Prathibha Jose, (2010)
22. PhD: Catriona Waitt, (2011)
23. MD: Jane Mallewa, (2011)
24. PhD: Eunice Zhang, (2012)
25. PhD: Kanvel Shazadi, (2013)
26. PhD: Karthik Govindappa, (2013)
27. PhD: Mas Chaponda, (2014)
28. PhD: Jennifer Mason, (2014)
29. PhD: Azizah ab Ghani, (2014)
30. PhD: Elena Castro-Cornejo, (2014)
31. PhD: Ruairi Gallagher, (2014)
32. PhD: Mariamma Sar Sallah, (2014)
33. PhD: Steffen Radisch, (2014)
34. PhD: Maïke Lichtenfels, (2014)
35. PhD: Tim Felton, (2014)
36. PhD: Andrew Swale, (2015)
37. PhD: Amy Foulkes, (2015)
38. PhD: Alex Hodkinson, (2015)
39. PhD: Nasir Mirza, (2015)
40. PhD: Philippe Marlot, (2015)
41. PhD: Lauren Walker, (2015)
42. PhD: Louise Bracken, (2015)
43. PhD: Stephen McWilliam, (2015)
44. PhD: Rana Majid, (2016)
45. PhD: Lewis Green, (2016)
46. PhD: Cris Musumba, (2016)
47. PhD: Vincent Yip, (2016)
48. PhD: Celestine Esume, (2016)
49. PhD: Signe Thiesen, (2017)

50. PhD: Soban Sadiq (2018)
51. PhD: Carina Nakamura (2018)
52. PhD: Richard Turner (2018)
53. PhD: Benedicta Iyinbor (2018)
54. MD: Joanne Cliff (2019)
55. PhD: Alex Penrose (2019)

Current higher degree students

1. PhD: Richard Fitzgerald (submitted, awaiting viva)
2. MD: Christopher Barton
3. MD: Anastasia Konidari (submitted, awaiting viva)
4. PhD: Mohd Ikhwan Ismail
5. PhD: Antony Martin (submitted, awaiting viva)
6. PhD: Stephanie French
7. PhD: Gospel Nwikue (submitted, awaiting viva)
8. PhD: Ahmed Al-Naher
9. PhD: Audrey Hamachila
10. PhD: Anna Olsson-Brown
11. MPhil: Anita Hanson
12. PhD: Victoria Rollinson
13. PhD: Kanoot Jaruthamsophon
14. PhD: Laurence McEvoy
15. PhD: Orod Osanlou

Grant income (total amount raised >£75 million; listed in chronological order)

Investigation into the mechanisms of idiosyncratic drug reactions. Mersey Regional Health Authority (Research Scheme No. 623). £19,000. 1990. (Principal Applicant, one co-applicant).

Investigation into the involvement of cellular immunity in mediating idiosyncratic adverse drug reactions. Mersey Regional Health Authority (Research Scheme No. 641). £5,000. 1991 (equipment grant). (Principal Applicant, two co-applicants).

Investigation into the role of metabolism in mediating the efficacy and toxicity of ticlopidine, a novel anti-platelet agent. Sanofi Pharmaceuticals. £5,000. 1992. (Principal Applicant, one co-applicant).

Investigation into the molecular basis of anticonvulsant hypersensitivity and teratogenicity : working towards prospective individualisation of therapy. Desmond Pond Fellowship (Epilepsy Research Foundation). £24,000. 1992. (Principal Applicant).

Investigation into the biochemical basis of adverse drug reactions associated with anticonvulsant therapy. Mersey Regional Health Authority. £10,991. 1992. (Principal Applicant, one co-applicant).

Investigation into the role of metabolism in the cutaneous toxicity associated with lamotrigine. Wellcome Foundation. £5,000. 1992. (Principal Applicant, one co-applicant).

Restriction fragment length polymorphism analysis of the epoxide hydrolase gene in patients with anticonvulsant-induced idiosyncratic toxicity. University of Liverpool, Research and Development Fund. £4,000. 1992. (Co-applicant, two co-investigators).

An investigation into the immunological basis of alcoholic liver disease. Mersey Regional Health Authority. £19,419. 1993. (Co-applicant, two co-investigators).

Epoxide hydrolase in man: assessment of activity and its pharmacological implications. Medical Research Council. £73,000. 1993. (Co-applicant, two co-investigators).

Alcoholic liver disease: A molecular investigation of the role of cytochrome P450 2E1. University of Liverpool, Departmental Equipment Funds. £4,194. 1994. (Principal Applicant, two co-applicants).

Application of mass spectrometry to the investigation of human drug toxicity The Wellcome Trust. £219,610. 1994. (Co-applicant, three co-investigators).

Mechanisms of drug-induced agranulocytosis. Wellcome Toxicology Studentship. The Wellcome Trust. £51,000 (over 3 years). 1994. (Co-applicant, one co-investigator)

Mechanisms of sulphonamide hypersensitivity in patients with the Acquired Immune Deficiency Syndrome. University of Liverpool, Research and Development Fund. £1,500. 1995. (Principal Applicant, one co-applicant).

Investigation of the hydroxylamine hypothesis of sulphonamide hypersensitivity in patients with the Acquired Immune Deficiency Syndrome. The Medical Research Council/Regional Health Authority. £78,765 (over 2 years). 1995. (Principal Applicant, two co-applicants).

An investigation into the mechanisms of clozapine-induced agranulocytosis. Sandoz (Novartis) Pharmaceuticals. £45,000. 1995. (Principal Applicant, one co-applicant). Supplement of £10,000, 1998.

Research into and audit of alcohol-related problems. North West Regional Health Authority. £24,969. 1995. (Principal Applicant).

Adverse drug reaction reporting by practice nurses: A pilot study. North West Regional Health Authority. £44,655. 1996. (Principal Applicant, one co-applicant).

An investigation of the role of polymorphisms in glutathione transferase genes in the predisposition to epilepsy. Medical Research Council. £37,012. 1997. (Principal Applicant, two co-applicants).

Audit of alcohol misuse in primary care. Liverpool Health Authority. £25,000. 1997. (Principal Applicant). Supplement of £6,000, 1998.

Development of a clinical and molecular approach to the safer use of anticonvulsants. The Sir Jules Thorn Charitable Trust. £86,028. 1997. (Principal Applicant, 4 co-applicants).

Identification of candidate genes for alcoholic liver disease. NHS Executive North West. £83,853. 1997. (Co-applicant, two co-investigators).

Tacrine transaminitis: investigation of the role of genetic polymorphisms in drug bioactivation, detoxification and tissue injury. Parke-Davis Pharmaceuticals. £30,000. 1997. (Co-applicant, two co-investigators).

Sulphamethoxazole hypersensitivity in HIV-positive patients: working towards preventive strategies. The University of Liverpool (Departmental Equipment Funds). £7,000. 1997. (Principal Applicant, two co-applicants).

Investigation of cellular markers as predictors of drug-induced hepatotoxicity. Zeneca Pharmaceuticals. £46,725. 1997. (Principal Applicant, one co-applicant).

Investigation of the cutaneous toxicity of lamotrigine. Glaxo-Wellcome Pharmaceuticals. £89,000. 1998. (Principal Applicant, one co-applicant).

Mechanisms of toxicity of protease inhibitors. AVERT studentship. £42,000. 1998. (Principal Applicant, two co-applicants).

Utilisation of the COTOX trial to study the biological mechanisms of co-trimoxazole hypersensitivity in HIV disease. Medical Research Council. £158,140. 1998. (Principal Applicant, three co-applicants).

Chemical, clinical and molecular aspects of adverse drug reactions in man. Wellcome Trust Program Grant. £201,958. 1998. (Co-applicant, two co-investigators).

P-glycoprotein and brain entry of drugs. Pfizer Pharmaceuticals. £27,184. 1998. (Principal Applicant, 1 co-applicant).

Molecular mechanisms of drug-induced hepatotoxicity. Glaxo-Wellcome Pharmaceuticals. £87,858. 1998. Supplement £21,000 (2000) (Co-applicant, 1 co-investigator).

Lipodystrophy in Patients with HIV-1 Infection: Investigation of the Role of TNF- α . Merck Sharpe Dohme Pharmaceuticals. £18,000. 1998. (Principal Applicant, 1 co-applicant).

Development and implementation of a model to improve alcohol services in secondary care. NHS Executive North West. £78,477. 1998 (Principal Applicant, 2 co-applicants). Supplement £2,500. 2001.

Investigation of the role of tumour necrosis factor alpha (TNF- α) in ischaemic heart disease. NHS Executive North West (R&D Training Fellowship for Dr Ruth Allen). £65,150. 1998.

Investigation of the mechanisms of agranulocytosis associated with dipyrrone. Aventis Pharmaceuticals. £86,000. 2000 (Principal Applicant, 1 co-applicant).

Individual susceptibility to *Clostridium difficile* toxin disease. Royal Liverpool and Broadgreen University Hospital R&D Fund. £21,000. 2000 (Principal Applicant, 2 co-applicants).

An investigation of the functional and regulatory role of GST-pi during chemical stress. The Wellcome Trust. £343,964. 2000 (Co-applicant, 3 co-investigators).

Cell culture laboratory (grant for refurbishment of cell culture laboratory). The Wellcome Trust. £217,482. 2000 (Co-applicant, 2 co-investigators).

Investigation of the role of T- and B-cells in abacavir hypersensitivity. Glaxo-Wellcome Pharmaceuticals. £134,729. 2000 (Principal Investigator, 1 co-investigator).

An investigation into animal models of attrition. The University of Liverpool Research & Development Fund. £1550. 2000 (Co-applicant, 1 co-investigator).

Mechanisms of lipodystrophy: an investigation of the role of TNF- α and disposition of the antiretrovirals. Bristol Myers Squibb Pharmaceuticals. £71,269. 2001 (Principal applicant, 4 co-investigators).

Epidemiology of adverse drug reactions in hospitals. Medicines Control Agency. £80,000. 2001. (Principal applicant, 1 co-applicant).

LAPDAP: the knowledge base needed for its practical use. DFID. £600,000. 2001. (Co-applicant, 2 co-investigators).

The response of the liver to chemical stress, a molecular and proteomic investigation of paracetamol-induced hepatotoxicity. **Wellcome Trust. £828,022. 2001 (Co-applicant, 3 co-investigators).**

Effect of intense exercise training on body composition and biochemical parameters in patients with HIV lipodystrophy. **GSK Pharmaceuticals. £5,000. 2001 (Principal Investigator).**

TNF-alpha and related molecules, and their role in HIV-related lipodystrophy. **Bristol-Myers Squibb Pharmaceutical. £48,000. 2001 (Principal Investigator, 1 co-applicant).**

NNRTIs and adverse drug reactions in HIV-positive patients. Pfizer pharmaceuticals. £127,000. 2001 (Co-applicant, 1 co-investigator). £5,000 supplement (2004).

A pharmacogenetic case control study of drug induced Stevens-Johnson syndrome and toxic epidermal necrolysis. GlaxoSmithKline. £13,700. 2002 (Principal Investigator).

SANAD and MESS-linked DNA bank and relational database. Wellcome Trust. £369,587. 2002 (Co-applicant, 3 co-investigators).

Pharmacogenetics of adverse drug reactions. Astra-Zeneca Pharmaceuticals. £113,632. 2002 (Principal applicant, 1 co-investigator).

P-glycoprotein and efficacy of imatinib (Glivec). Royal Liverpool and Broadgreen University Hospital R&D Fund. £21,000. 2002 (Co-applicant, 2 co-investigators).

Genetics of lipodystrophy. MRC PhD Studentship. £45,000. 2002 (Principal applicant, 1 co-investigator).

Investigation of the time course of release of glutathione (GSH) from a lozenge formulation. GT Plus Ltd. £30,462. 2003 (Principal Applicant).

Genetic basis of T cell hypersensitivity. Pfizer pharmaceuticals. £59,760. 2003 (Co-applicant, 3 co-investigators).

Predictive allergy testing: development of a lymphocyte assay to determine the structural requirements for the induction of a primary immune response *in vitro*. BBSRC CASE studentship with Unilever, £60,000. 2003 (Co-applicant, 2 co-investigators).

Investigations into the mechanisms of lipodystrophy. Bristol Myers Squibb Pharmaceuticals. £112,013. 2004 (Principal applicant, 2 co-investigators).

Adverse drug reactions: the burden on hospital in-patients. RLBUHT Research & Development Funds. £27,933. 2004 (co-applicant, 1 co-investigator).

Role of T lymphocytes in pathogenesis of alcoholic liver disease. RLBUHT Research & Development Funds. £14,324. 2004 (Co-applicant, 3 co-investigators).

Pharmacogenetics of antimicrobial drug-induced liver injury. UK Department of Health. £637,550. 2004 (Co-applicant, 9 co-investigators).

Variability in response to warfarin: a prospective analysis of pharmacogenetic and environmental factors. UK Department of Health. £848,255. 2004 (Principal Applicant, 14 co-investigators).

Pharmacogenetics of GABAergic mechanisms of benefit and harm in epilepsy. UK Dept of Health. £776,554. 2004-7. (Co-applicant, 11 co-investigators).

Do transporter proteins contribute to clinical resistance to imatinib in chronic myeloid leukaemia? A combined study in Liverpool and Glasgow, correlating transporter proteins with imatinib uptake and efflux. Leukaemia Research Fund, £274,541. 2005-8 (Co-applicant, 3 co-investigators).

Quantitative high throughput proteomics for biomedical research. MRC, £313,110. 2005-8 (Co-applicant, 13 co-investigators).

Identification and characterisation of novel genetic polymorphisms associated with hepatic adverse reactions to drug therapies. Astra Zeneca Pharmaceuticals. £119,269. 2005-7 (Co-applicant, 1 co-investigator).

Investigation into the role of mycobacterial antigens in early mortality in patients treated for TB. Wellcome Trust. £314,330. 2005-8 (Training Fellowship for Dr Catriona Waitt, Co-supervisor).

Metformin and genetic polymorphisms of organic cation transporters. Royal Liverpool Hospital R & D Support Fund. £19,740. 2005-7. (co-applicant, 4 co-investigators).

PhD scholarship: definition of the role of T-cells in allergy. CONACyT (Mexican National Council for Science and Technology). £50,000. 2005-8 (co-applicant, 2 co-investigators).

Definition of the chemical and immunological signals associated with the development of contact dermatitis. British Skin Foundation. £44,541. 2006-2008 (co-applicant, 4 co-investigators).

The Pharmacology of Nevirapine in Malawian Patients: Implications for Dosing and Understanding of Hypersensitivity Reactions. The Wellcome Trust. £438,229. 2006-2009 (Training Fellowship for Dr Mas Chaponda).

The immunological consequences of metabolic drug activation by dendritic cells. The Wellcome Trust. £204,727. 2005-2008 (Co-applicant, 2 co-investigators).

Folate Augmentation of Treatment - Evaluation for Depression: a randomised controlled trial (FoIATED). NIHR Health Technology Assessment Panel. £938,833 (plus £633,511 extension; 2009). 2007-2012 (co-applicant, 7 co-investigators).

Department of Health Chair in Pharmacogenetics. The Department of Health, £3.3 million (£33,000 supplement; 2009), 2007-2012 (Principal investigator, 4 co-applicants).

Cost-effectiveness of pre-prescription pharmacogenetic testing for irinotecan. Welsh Office for Research and Development. £64,452, 2007-2009 (co-applicant, 3 co-investigators).

Adverse drug reactions in children. NIHR Programme Grant. £2 million, 2007-2012 (co-applicant, 5 co-investigators).

Biomedical Research Centre in Microbial Diseases. National Institute for Health Research. £11.5 million to the whole centre; 2007-2012. (led by Prof Peter Winstanley; I am co-applicant and theme leader for safety of interventions).

Wolfson Centre for Personalised Medicines. Wolfson Foundation. £2 million for capital funding; 2008-2013 (Principal applicant).

EURIPIDES - European Research initiative to develop Imaging Probes for early In-vivo Diagnosis and Evaluation of response to therapeutic Substances. EU FP7 framework. £399,353, 2008-2012. (local PI, 2 co-investigators, co-ordinated by Matthias Koepf).

The role of transporter proteins in the efficacy of imatinib and newer tyrosine kinase inhibitors in chronic myeloid leukaemia. Kay Kendall Leukaemia Fund. £276,959. (co-applicant, 1 co-investigator).

MRC Centre for Drug Safety Sciences. MRC. £3.7 million. 2008-2013 (Deputy Director).

Establishment of a drug safety register for the ACT consortium Bill and Melinda Gates Foundation. US\$ 857,868 (£428,934). 2008-2013 (PI for this project as part of the Consortium led by Dr David Laloo (locally) and Prof Christopher Whitty (PI)).

Genetic studies of drug-induced liver injury. Serious Adverse Event Consortium Ltd. £35,528. 2008-2009. (Principal applicant).

A pharmacogenomic approach to coumarin anticoagulant therapy (Coumarins). EU FP7 Framework programme. £439,245, 2008-2012 (local PI, co-ordinator Dr AH Maitland).

Hepatocyte phenotype project. Stem Cells for Safer Medicines. £175,000. 2008-2009. (co-applicant, 5 co-investigators).

Pharmacogenetics of statin-induced muscle toxicity: Exploration using the UK general practice research database (GRPD). MRC. £326,463; 2009-2012 (PI, 1 co-applicant).

North West Hub for Trial Methodology Research (NWHMTR). MRC. £2,634,827; 2009-2013. (co-applicant, 6 co-investigators).

Non-Attrition HAART nanoparticle therapies for HIV/AIDS Drug Delivery. EPSRC. £1,422,400; 2009-2012. (Co-applicant, 8 co-investigators).

Development of a pharmacokinetic-pharmacodynamic model for imatinib to allow individualisation of therapy for CML. Leukemia Research Fund. £195,000; 2009-2011. (Co-applicant, 3 co-investigators).

Investigation of the role of ABCB5 in corticosteroid transport and response in IBD. National Association for Crohn's and Colitis. £119,941; 2009-2011. (Principal Investigator, 4 co-applicants).

High Throughput Sequencing Hub for the North of England. MRC. £2,052,842; 2009-2014 (Co-applicant; 4 co-investigators).

Randomisation within the database: a feasibility trial evaluating the comparative effects of statins in a research network of general practices RETRO-PRO. Wellcome Trust. £516,100; 2009-2012 (Co-applicant; 5 co-investigators).

Priorities and Standards in Pharmacogenomic Research: Opportunities for a Safer and More Efficient Pharmacotherapy. EU FP7 Initial Training Network. €3,187,750 (£936,049 to Liverpool); 2010-2014 (Principal Investigator, Liverpool; **Co-ordinator:** Hiltrud Brauch, Germany).

The role of multidrug transporters in causing pharmacoresistance in epilepsy. MRC Clinical Training Fellowship for Dr Nasir Mirza (Pirmohamed and Marson as supervisors). £200,000; 2010-2013.

A retrospective cohort study of children and young people taking warfarin at Alder Hey. Children's Research Fund. £7,000; 2010-2011. (Principal Investigator).

Antiepileptic drug transport at the blood-brain barrier; more than just P-glycoprotein. ER-UK. £98,760; 2010-2013 (Co-applicant, 3 co-investigators).

Pharmacogenetics of Methadone Response. Australian MRC, £10,000. 2010-2012 (Principal Investigator; Led by Prof Somogyi Australia).

Genetics of non-steroidal anti-inflammatory drugs (NSAIDs)-induced peptic ulceration: a genome wide association study. FSF Royal Liverpool Hospital; £54,073. 2010-2011 (Co-applicant, 2 co-investigators)

Prospective registry of inflammatory bowel diseases. FSF Royal Liverpool Hospital; £14,580. 2010-2011. (Co-applicant, 3 co-investigators).

Clostridium difficile infection – developing biomarkers of pathogenicity and disease relapse. FSF Royal Liverpool Hospital; £38,053 2010-2011. (Principal Investigator, 2 co-investigators).

Optimizing the use of methadone; Mersey Care NHS Trust; £34,000; 2010-2011 (Principal Investigator).

Development of the International Consortium on Drug Hypersensitivity. Serious Adverse Event Consortium; £409,000; 2010-2013 (Principal Investigator).

North West England MRC Fellowships in Clinical Pharmacology and Therapeutics. MRC (and Industry partners including GSK, AZ, ICON); £3,012,100 (£1,598,751 from MRC). 2010-2015 (Programme Leader).

PAMPERS - Paediatric Accelerator Mass Spectrometry Evaluation Research Study. MRC ; £1.1 million; 2011-2014 (Co-applicant, 3 co-investigators)

Prospective investigation of beta-lactam allergy in patients with cystic fibrosis to define drug immunogenicity. CF Trust; £116,699; 2011-2013. (co-applicant, 4 co-investigators).

Genetic markers for carbamazepine-induced hypersensitivity syndrome. Epilepsy Research UK; £98,122; 2011-2013 (co-applicant, 3 co-investigators)

Epilepsy Pharmacogenomics: delivering biomarkers for clinical use (EpiPGX). EU FP7; £258,594; 2011-2016 (co-applicant, 3 co-investigators)

TAILoR (TelmisArtan and InsuLin Resistance in HIV): A Dose-Ranging Phase II Randomised Open-Labelled Trial of Telmisartan as a Strategy for the Reduction of Insulin Resistance in HIV-Positive Individuals on Combination Antiretroviral Therapy (cART). MRC/NIHR EME Board; £900,000, 2012-2015 (Principal Investigator, 7 co-investigators)

Type A and type B adverse drug reactions associated with antimicrobials. NIHR PhD Fellowship for Andrew Swale; £70,778; 2012-2013.

Drugs used in the treatment of alcohol dependency – a UK wide drug utilisation study. Merseycare NHS Trust; £50,000; 2013-2014 (Principal investigator).

The interactions between *Clostridium difficile*, intestinal microbiota and the host response in hospitalised patients. MRC Program Grant; £2,400,000; 2012-2017 (co-applicant, 4 co-investigators).

Inflammatory bowel disease in children. Crohns in Childhood Research Association; £25,000; 2013-2016 (Principal Investigator)

PREDICTION-ADR: Personalisation of tREatment In Cardiovascular disease through next generation sequencing in Adverse Drug Reactions. EU-FP7; £568,891; 2013-2016 (Co-investigator, 2 co-applicants).

UK Pharmacogenetics and Stratified Medicine Network. TSB; £300,000; 2013-2016 (Principal Investigator)

NIHR Senior Investigator Award. NIHR. £75,000. 2008-2013. (Principal applicant). Renewed 2013-2016 (£45,000).

Liverpool Health Partners - Drugs Theme Project Manager. Liverpool Health Partners. £40,000. 2013-2014 (Principal Applicant).

The Role of Multidrug Transporters in causing Pharmacoresistance in Epilepsy. MRC Centenary Early Career Award for Dr Nasir Mirza; £68,192. 2013-2014.

NHS informatics support to improve research recruitment. Cheshire and Merseyside Comprehensive Local Research Network. £50,418. 2013-2014.

MRC North West Hub for Trials Methodology Research. MRC; £2,321,030, (co-investigator, 18 co-applicants); 2013-2019.

MRC Centre for Drug Safety Science. MRC; £2,700,000, 2014-2019. (Director April 2014). Supplement £100,000, 2016.

Bridging and accelerating the translation of novel scientific findings for health and wealth gain. MRC Confidence in Concept; £400,000; 2014-2015. (co-applicant).

Genetic Predisposition to clozapine agranulocytosis. MerseyCare NHS Trust; £10,000, 2013-2015. (Principal Investigator)

A biomarker panel to predict, diagnose and prevent HLA-mediated serious adverse drug reactions. NIHR i4i; £352,273; 2014-2016. (Principal Investigator, 1 co-applicant).

Arthritis Research UK Experimental Arthritis Treatment Centre for Children. AR-UK; £225,000, 2014-2019. (Co-investigator, 7 co-applicants).

PROteKT - Phase IIa, Randomised, Controlled, Open-Label Trial of Rosuvastatin for the Prevention of Aminoglycoside-Induced Kidney Toxicity in Children with Cystic Fibrosis. Moulton Charitable Foundation; £258,075; 2014-2016 (Principal Applicant; 4 co-applicants). Supplement £10,000, 2017.

An investigation into bosutinib-induced diarrhoea. Pfizer Ltd; £164,779; 2014-2016 (Principal Investigator, one co-applicant).

University of Liverpool Confidence in Concept Program – Enhancing Translation. Medical Research Council; £300,000; 2015-2016 (Co-investigator, 3 co-applicants)

Applying innovative technologies to improve the benefit-risk ratio of drugs: developing a national resource underpinned by the infrastructure of the MRC Centre for Drug Safety Science. Medical Research Council Clinical Research Infrastructure Award.; £5,000,000; 2015 (Principal applicant, 4 co-investigators).

Genetic Risk Factors for Alcoholic Cirrhosis: Genome-Wide Case-Controlled Study. The Southern California Institute for Research and Education. £9389; 2014-2016 (Principal investigator).

Systems pharmacology approaches to drug-induced hypersensitivity reactions. Malaysian Government (PhD project for Mohd Ikhwan Ismail); £21,000; 2015-2018 (Principal investigator).

Paediatric Pharmacology studies. Alder Hey Children's NHS Foundation Trust; £20,055; 2014-2015; supplement £20,000 (2015-2016); (Principal investigator).

Drug induced liver injury due to tuberculosis treatment: predictive biomarkers and genetic associations. Newton Fellowship (for Karen Cohen) Department for Business, Innovation and Skills. £71,427; 2015-2018; (Principal Investigator; 2 co-applicants).

Support for the Pharmacology Research Portfolio. Royal Liverpool and Broadgreen University Hospital NHS Trust. £59,221, 2016 (Principal Investigator).

Centre for Drug Safety Science. Amgen Ltd (UK). £150,000, 2016 (Donation to CDSS).

Developing personalised renal function monitoring – joint project with the CLAHRC. Liverpool Heart and Chest NHS Foundation Trust. £52,062; 2016-2018 (Principal investigator).

Identification of efficacy predictors for clopidogrel using integrated systems pharmacology approach. Newton Fellowship (for Vanessa Fontana) Department for Business, Innovation and Skills. £66,000; 2016-2018; (Principal Investigator; 2 co-applicants).

Ubiquitous pharmacogenomics. EU H2020 Application (Co-ordinator Prof HJ Guchelaar, Netherlands); Total value of award €15,000,000 (awarded to Liverpool €1,078,195; €909,165). 2016-2021 (Principal applicant Liverpool, 1 co-investigator).

FUTURE initiative. University of Liverpool; £1,000,000; 2015-2019 (Principal applicant).

UK Pharmacogenetics and Stratified Medicine Network. NW Coast Academic Health Science Network; £20,000; 2016 (Principal applicant).

UK Pharmacogenetics and Stratified Medicine Network. UCB Pharma; £20,000; 2016 (Principal applicant). Supplement of £20,000; 2017.

UK Pharmacogenetics and Stratified Medicine Network. Northern Health Science Alliance; £5,000; 2016 (Principal applicant).

UK Pharmacogenetics and Stratified Medicine Network. Precision Medicine Catapult Ltd; £33,000; 2016 (Principal applicant).

North West England MRC Fellowships in Clinical Pharmacology and Therapeutics. MRC (and Industry partners Roche, UCB, Eli Lilly and Novartis); £3,052,098. 2016-2020 (Programme Leader).

MAGIC study. Alder Hey Children's Charity; £7,673. 2017 (Principal Applicant).

Support for the Pharmacology Research Portfolio. Royal Liverpool and Broadgreen University Hospital NHS Trust. £66,692, 2017 (Principal Investigator).

Phase IIb, randomised, double-blind, placebo-controlled, multi-centre trial of infliximab with transcriptomic biomarker and mechanism evaluation in patients with acute pancreatitis. MRC-NIHR Efficacy and Mechanism Evaluation Programme (EME 15/20/01); £1,594,000. 2017-2021. (Co-investigator)

NIHR Global Research Group on Warfarin Anticoagulation. NIHR; £1,954,156. 2017-2020. (Principal investigator)

A new generation of Crystallographic detector for Multi-user Barkla X-ray laboratory. BBSRC; £219,626. 2017 (Equipment grant; co-investigator)

Evaluating the potential for multi-drug pharmacogenomics using whole-genome sequencing to reduce drug toxicity. Health Education England (HEE) Genomics Education Programme (GEP) Research Fellowship; £142,752, 2018-2022 (Fellowship for Dr Richard Turner).

A multimodal imaging platform with real-time super-resolution for research across the life sciences. BBSRC, £507,638, 2018 (Equipment grant; co-investigator).

Development of screening approaches to assess to intrinsic immunogenicity of drugs and novel chemicals. BBSRC. £411,338, 2018-2021 (Co-investigator, 5 co-applicants).

Definition of the naturally-processed drug-peptide adducts that can act as functional T-cell antigens. MRC, £518,516, 2018-2021 (co-investigator, 4 co-applicants).

Alcohol dependence and associated disease: determinants, pathogenesis and treatment. MRC, £508,124, 2018-2021 (Principal Applicant, fellowship for Dr Andrew Thompson).

Exploring the interaction of gut microbiome, genetic and immunological factors in gastrointestinal toxicity of immune checkpoint inhibitors. MRC, £508,125, 2018-2021 (Principal Applicant, fellowship for Dr Vanessa Fontana).

The role of transporters in the uptake of AV-101. Vistagen Therapeutics, £162,687, 2018-2020 (Co-investigator, 2 co-applicants).

Industrial Strategy HEIF Allocation. Research England (UK), £36,500, 2018-2019 (Principal Applicant).

PhD studentship for Wedad Mawkili. Royal Embassy of Saudi Arabia Cultural Bureau London, £45,000, 2018-2021 (co-investigator, 1 co-applicant).

Can the SAVSNET informatics systems be used to improve signal identification and reporting of adverse drug reactions? Department for Environment, Food and Rural Affairs (UK), £89,622, 2018-2020 (co-investigator, 3 co-applicants).

MRC Centre for Drug Safety Science Renewal. MRC (UKRI), £420,000, 2019-2020 (Principal Applicant).

Observational study of clozapine in patients with schizophrenia. Zarodex Therapeutics Limited UK, £23,544, 2018-2019, (co-investigator, 1 co-applicant).

Publications

The citation indices (May 2019) for my publications are as follows:

Google scholar:	Total citations – 37,949; H-index 98
Web of science:	Total citations – 22,579; H-index 73
Scopus:	Total citations – 26,019; H-index 80

PAPERS AND EDITORIALS

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3. **PIRMOHAMED, M.**, COLEMAN, M. D., HUSSAIN, F., BRECKENRIDGE, A. M., PARK, B. K. (1991) Direct and metabolism-dependent toxicity of sulphasalazine and its principal metabolites towards human erythrocytes and leucocytes. *Br. J. Clin. Pharmacol.* **32**: 303-310.
4. **PIRMOHAMED, M.**, KITTERINGHAM, N. R., BRECKENRIDGE, A. M., PARK, B. K. (1992) Detection of an autoantibody directed against a human liver microsomal protein in a patient with carbamazepine hypersensitivity. *Br. J. Clin. Pharmacol.* **33**: 183-186.
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9. TINGLE, M. D., **PIRMOHAMED, M.**, TEMPLETON, E., WILSON, A. S., MADDEN, S., KITTERINGHAM, N. R., PARK, B. K. (1993) An investigation of the formation of cytotoxic, genotoxic, protein-reactive and stable metabolites from naphthalene by human liver in vitro. *Biochem. Pharmacol.* **46**: 1529-1538.
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11. **PIRMOHAMED, M.**, ALOTT, A., GREEN, V. J., KITTERINGHAM, N. R., CHADWICK, D., PARK, B. K. (1994) Lymphocyte microsomal epoxide hydrolase in patients on carbamazepine therapy. *Br. J. Clin. Pharmacol.* **37**: 577-581.
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