BHF 4-Year MRes/PhD Programme

The William Harvey Research Institute
Barts and the London School of Medicine and Dentistry
Charterhouse Square
London

Charterhouse Square, London EC1M 6BQ

Information for applicants

Queen Mary
University of London

Barts & The London

1. Programme Committee and contact details

Federica Marelli-Berg BHF Chair of Cardiovascular Immunology
Head of Programme

Amrita Ahluwalia Professor of Vascular Pharmacology
Programme Co-ordinator

Adrian Hobbs Professor of Cardiovascular Pharmacology
MRes Co-ordinator

Panos Deloukas Professor of Cardiovascular Genomics

Morris Brown Professor of Endocrine Hypertension

Andrew Tinker Professor of Cardiac Electrophysiology

Ken Suzuki Professor of Translational Cardiovascular Therapeutics

Co-ordinator contacts:

Prof. Amrita Ahluwalia

The William Harvey Research Institute
Barts and The London School of Medicine and Dentistry
Queen Mary University of London
Charterhouse Square
London EC1M 6BQ

Tel: +44(0) 20 7882 8377
Email: a.ahluwalia@qmul.ac.uk

Prof. Adrian Hobbs

The William Harvey Research Institute
Barts and The London School of Medicine and Dentistry
Queen Mary University of London
Charterhouse Square
London EC1M 6BQ

Tel: +44(0) 20 7882 5778
Email: a.j.hobbs@qmul.ac.uk

2. Strategic aims for the BHF 4-year PhD Programme

Addressing unmet need in cardiovascular (CV) disease is a primary research priority at Queen Mary University of London (QMUL). Delivery of this aim is focused within the unique research training environment at the William Harvey Research Institute (WHRI), with ≈500 clinicians, scientists and students focused on CV, inflammation and endocrinology translational therapeutic innovation. The WHRI was recently recognised in 2015 by the 'Putting UK Pharmacology on the Map' award from the British Pharmacological Society for Outstanding Contribution to Development of Medicines. The rebuilding of St Bartholomew's Hospital places the WHRI, one of the largest multidisciplinary pharmacological research institutes in the world, adjacent to the new £400m Barts Heart Centre which is the unified tertiary centre for North London. The localisation of the 100,000 Genomes Project, one of the key research initiatives of the current UK Government, at the WHRI is a reflection of our International leadership in genomic medicine. Together, these attributes offer a fantastic platform of 'gene to patient' for an integrated state of the art translational research training programme with the scale of one of the largest heart hospitals in Europe (80,000 patient episodes per year).

WHRI has an excellent international reputation in CV research training of MRes and PhD students. Former students and fellows include Professors at Yale, Singapore, Frankfurt, Washington, and institutions throughout the UK, as well as CEOs and R&D Directors of major companies worldwide. The platform of our Barts NIHR CV Biomedical Research Centre (BRC; 2017-2022; £6.5m) enabled us to create a Translational CV Medicine Academy. Our BHF funded PhD Students will join this academy bringing together clinicians and scientists at all training and fellowship levels creating a focused translational career support framework. Students of the highest calibre will receive training from the molecular and cellular level, through in vivo models to healthy volunteer- and patient-based studies, and also getting an opportunity to learn about and experience state of the art approaches to 'big data' encompassing genomics, bioinformatics and the potential of artificial intelligence in this setting . Together, these attributes offer a fantastic environment for a BHF PhD scheme delivering **a unique pharmacology and genomics-based, multidisciplinary MRes/PhD programme, aimed at training the next generation of experts in therapeutic innovation and future leaders in the field of CV science.**

2.1 Overview of the 4-Year Training Period

Our 4-year training programme, developed from a highly successful MRes course (in cardiac and vascular medicine), will equip MRes/PhD graduates with a breadth of scientific knowledge coupled with a strong grasp of laboratory techniques, a robust understanding of scientific method and approach and the ability to critically appraise their own and others' work. These attributes alongside our highly supportive environment will build the confidence and ambition to move to post-doctoral positions in pre-eminent groups. A cornerstone of our course will be training in integrative genomics, physiology and pharmacology, regenerative medicine and bioinformatics with the goal of therapeutic innovation connecting bench at the WHRI directly to the bedside at Barts Heart Centre.

2.1.1. Structure of the course

The 4-year Programme will involve a 12 month MRes course followed by a 3-year research project leading to a PhD degree. The Programme will benefit from our experience of running such courses over the last 15 years, including an MRC MRes/PhD in vivo programme (2002-2006, 2008-2010, 2012-2015) that has trained 28 students to MRes, of which 22 entered full PhD training, 18 within the WHRI, and

our previous and current BHF 4 year MRes/PhD programme with 8 students completed, 3 in write-up mode, 4 in their final year of their PhD, 4 students in the 2nd year of their PhD studies, 5 in their 1st year, and 4 currently studying for their MRes.

The WHRI initiated a 4 year PhD programme funded by a EU Integrated Training Network (co-ordinator, Perretti) in April 2016. The wider School of Medicine & Dentistry (SMD) also holds a 4 year MRC MRes/PhD programme with University of Southampton, and is part of the 4 year BBSRC LIDo (London Interdisciplinary Doctoral) training programme.

All laboratories and formal teaching rooms supporting this PhD programme and the multi-user facilities of the Institute (Genome Centre, Biological Services Unit, Flow Cytometry and Proteomic Facilities and in vivo designated laboratories) are located within the same building, ensuring minimum disruption to the students' training because of the need to travel.

2.1.2. Year 1, MRes

The MRes course will offer a significantly enhanced version of our current successful programme and will provide a fundamental understanding in basic and translational CV science and associated skills before students proceed to a more in-depth training programme with a strong emphasis on fundamental processes from genetics to integrated disease models and therapeutic innovation. The students' training will benefit from many interdisciplinary research strands, ranging from cardio-metabolic diseases to immunology/inflammation (taking advantage of our newly created Centre for Inflammation and Therapeutic Innovation, CITI), cancer and bioengineering, drawing upon expertise and research excellence across QMUL. All laboratories and formal teaching rooms supporting this PhD programme and the multi-user facilities of the Institute (Genome Centre, Biological Services Unit, Lipidomics Unit, Flow Cytometry and Proteomic Facilities, and in vivo designated laboratories) are located within the same building. The year is divided into distinct sections in which the first 4 months will be dedicated to acquisition of essential skills (Essential Skills Course) followed by 8 months dedicated to laboratory-based research projects. The MRes course will carry 180 credits, with 60 being allocated to the taught elements and 120 credits to the research projects. At the end of Year 1, students will be awarded an MRes degree (pass, 50%; merit 60-69%; distinction ≥70%).

<u>Essential Skills Course (October-December)</u>
The Essential Skills Course will begin with a one week Induction in which students will be provided with an overview of the research at the WHRI and training in: i) presentation skills, report writing, time and performance management, data analysis, and laboratory health and safety; students will also undertake the Home Office personal licence training course within the first few weeks of the MRes to gain formal experience and expertise in *in vivo* research. The semester is then broken up into three principal taught components: (1) Molecular mechanisms, genetics and bioinformatics (2) Inflammation, and (3) Cardiovascular physiology & pathology. These comprise lectures in genomics, vascular aspects of inflammation, pharmacology and therapeutics of CV disease with a focus upon drug discovery. Weekly journal club sessions (formerly assessed) and masterclasses through 'meet the expert' sessions are used to disseminate and critically appraise cutting edge research in cardiac and vascular medicine. Interspersed within these teaching blocks are Practical Skills sessions, providing specific training in key core laboratory methodologies including high calibre molecular biology and genomics, bioinformatics, basic cellular immunological methods (e.g. FACS analysis), hands-on animal model in vivo experience and other CV research techniques.

In addition to the above we offer workshops in discovery science. The students will attend a virtual lab meeting in which potential experimental approaches (e.g. genetic, biochemical, in vivo models etc.) to investigate a novel observation (e.g. unexpected effect of a drug) will be discussed. Each student will then contact local experts in specific experimental approaches identified to discuss practical aspects including cost, time, and facilities required, likelihood of success and risks of the chosen approach (e.g. generation of a novel transgenic mouse line). These will be presented at a second virtual lab meeting. An e-booklet will be produced from the students' work and discussions. This workshop, which the Programme Head has previously successfully run, aims at developing a 'critical experimental mind' capable of combining theoretical and experimental approaches in a practical way. This course will also provide an additional opportunity for the students to visit a number of laboratories within the organization helping to develop their multi-disciplinarity.

Research Projects (January-September)
The students will choose one (30 week) or two (15 week) projects from a wide selection presented by the named supervisors (project outlines made available mid October with decisions due mid December). Developing supervisors will act as secondary supervisors, adding a further layer of training to our programme. Students will be required to select projects in different areas and/or involving different experimental skills, with encouragement for one project to involve experimental animals building upon the training of the Home Office course. Evaluation of the projects will be based on a written project report (5,000 words), an oral presentation and a viva.

2.1.3. Years 2-4, PhD (matching students to their PhD projects)

By the beginning of May in each year the students will be presented with a portfolio of PhD projects in the form of 2 page summaries prepared by the PIs named in this application with an emphasis on interdisciplinary research. We propose to continue our successful system in which students select their projects through an iterative process of mutual agreement with supervisors then send their choices to the Programme Committee who will confer with supervisors and decide final project placements. The Programme Committee will favour studentships that promote new collaborations among PIs, and between WHRI and the wider SMD/QMUL, and those focused on therapeutic innovation. Once students and supervisors have been assigned, students will work with supervisors during a 2 week timetabled period to develop the 2 page summaries into full applications, providing students with experience in grant writing. By August the Programme Committee will forward the completed projects to the BHF for approval. Students and projects will be in place from October.

3. William Harvey Research Institute, Barts and the London School of Medicine

3.1. Cardiovascular Research at Barts and the London School of Medicine and Dentistry

Since 2000, Barts and The London School of Medicine and Dentistry (SMD) has transformed its research performance with the appointment of more than 40 new chairs, new buildings, and laboratory refurbishments including all those of WHRI. The University has made a major strategic investment of £25m in the Heart Centre for translational research and clinical studies at Charterhouse Square. The WHRI is also adjacent to the £400m rebuild of Barts Hospital that has created the integrated translational Barts Heart Centre serving a population of 6 million in north east London, an area with some of the worst rates of CV disease in the UK.

QMUL is also part of the UCL partners Academic Health Sciences System, and together with UCL will engage in the CV element of the Crick Institute. In addition, the WHRI hosts the 100,000 Genomes Project focused on rare CV disease, is part of the MRC e-Health Centre (The Farr Institute, for which we provided the CV strategy) and are establishing 4 new CV chairs at the Barts Heart Centre, providing substantial added value to this proposal. Our aim is to make Barts Heart Centre/WHRI a premier global centre for translational research and the ideal place to train the highest calibre students in CV therapeutic innovation.

In the REF2014 90% of our research was rated as world leading or internationally excellent placing us amongst the top tier of UK universities. In the period of 2013-2015 the WHRI generated £86M for CV research alone. In addition, the WHRI has recently received investment of £10.3 million in translational CV research, which is adding value and depth of supervision with new Chairs. Since 2010 the proposed supervisors have published over 24 papers in Nature Journals, Science, the New England Journal of Medicine and the Lancet and three of our faculty are amongst the Thomson Reuters Top 1% of Most Highly Cited Researchers and 6 are Fellows of the Academy of Medical Sciences. Their work has changed National and International guidelines for CV clinical care.

Taken together WHRI and QMUL provides a tremendous multidisciplinary environment and genuinely interactive scientific community with a strong focus upon innovative CV research from which the BHF Students will benefit greatly. During their PhD studentships they will be exposed to a unique combination of research skills including: gene discovery, function and the latest bioinformatics approaches to evaluating human gene knockouts and the druggable genome (Barnes, Brown, Caulfield, Deloukas, Munroe, Smedley, van Heel); heart electrophysiology (Tinker), stem cell biology and therapy (Mathur, Suzuki); deeper phenotyping, and advanced in vitro and vivo imaging in both models and humans, e.g. flow assays, intravital and confocal microscopy (Cooper, Chapple, Nourshargh, Perretti, Rot); integrated models of disease including shock and trauma, atherosclerosis, kidney disease, diabetes, metabolic disease, chronic inflammation, angiogenesis, and chimeric mouse/human models; translational healthy volunteer-and patient-based studies (Ahluwalia, Brown, Caulfield, Hobbs, Hodivala-Dilke, Korbonits, Marelli-Berg, Petersen, Thiemermann, Warner, Yaqoob). To fully realise the research platform of 80,000 patient episodes at the Barts Heart Centre we have incepted generic consent for life course longitudinal follow-up of patients, combining data from primary care, hospital episodes, registries (we now host the National Institute of CV Outcomes Research) in a single pseudonymised data centre with the option to recall for research up to 4 times per year. This offers a tremendous platform for this PhD proposal offering “big data” analytics and interrogation of artificial intelligence opportunities in this setting to allow selection of niche patient groups for PhD programmes and leveraging our MRC Electronic Health Centre “The Farr Institute” and links with the 100,000 genomes project.

The major research areas that will host the BHF MRes/PhD students are listed below.

3.1.1. Cardiovascular Genomics into Healthcare (Barnes, Brown, Caulfield, Deloukas, Kelsell, Munroe, Petersen, Tinker, van Heel)

A key strength of this PhD proposal is our genomics of CV disease programme focused on both rare and common disease. Our recruitment of Deloukas who has discovered over 60 genes for coronary heart disease, and Brown, who is internationally renowned for work on the somatic genomics and deeper phenotyping in adrenal hypertension, creates real synergy with Munroe and Caulfield. They have co-led International Consortia to the discovery of over 100 common and rare gene variants affecting blood pressure (BP) and over 50 loci for heart rate and ECG phenotypes (Tinker).

We co-lead the BHF funded UK Cardio-metabolic consortium which genotyped part of the 500,000 UK Biobank participants alongside imaging (£39m for CV Magnetic Resonance Imaging of 100,000 led by Petersen) and the East London Genes for Health next generation sequencing identifying human knockouts as a means of defining drug targets (van Heel) offering a tremendous platform for PhD studentships. This is set alongside a BHF programme in rare disease investigating the molecular bases of arrhythmogenic right ventricular cardiomyopathy and scientific leadership of the 100,000 Genomes Project (Caulfield, Kelsell, Munroe). With BHF (£1.4M) programme support, Tinker is investigating how ion channel and signalling protein function underlie cardiac arrhythmia which links through to our large clinical activity by using atrial explants and human inducible pluripotent stem cells for single cell transcriptomics and electrical behaviour analysis. Our leadership of the MRC-funded International Mouse Phenotyping CV Phenotyping programme (Munroe) to generate ~250 murine models using the latest gene editing technologies (CRISPR/Cas9) provides the opportunity to rapidly generate rare and common variant specific models alongside deeper CV phenotyping for a range of PhD projects. Our state-of-the art bioinformatics capabilities established by our NIHR CV BRU include evaluating druggability and repurposing opportunities (Barnes) and offer further opportunities for PhDs focussed upon therapeutic innovation.

3.1.2. Cardiovascular therapeutic innovation (Ahluwalia, Caulfield, Hobbs, Mathur, Suzuki, Thiemermann, Warner, Yaqoob: developing supervisors; Dalli, Henson)

Our multidisciplinary PhD environment offers opportunities to drive therapeutic innovation and translate these through early phase mechanistic studies; examples being our identification of genetic variants in pathways for NO generation and the natriuretic peptide system linked to Ahluwalia's BHF-funded preclinical and clinical characterisation of inorganic nitrate in hypertension, hypercholesterolaemia and coronary artery disease and Hobbs's development of novel mimetics for natriuretic peptide C also funded by the BHF. Our research into bioactive lipids is hugely enhanced by our recently established (£0.7M, QMUL) lipidomics unit (Dalli, Henry Dale Fellow) and work on associated anti-platelet assays (Warner). In organ protection Thiemermann and Yaqoob are repositioning existing drugs, with preclinical and clinical trials such as of the anti-malarial artesunate for ischaemia and reperfusion injury in major trauma (Wellcome Trust and Department of Health). In regenerative medicine, Suzuki is investigating the potential of stem cell transplantation for the treatment of heart failure and novel approaches to stem cell-sheet delivery (BHF programme grant). This programme complements and extends clinical research into bone marrow stem cells in heart failure and post-MI, funded by the UK Stem Cell Foundation and a new EU FP7 multicentre programme headed by Mathur (€11M).

3.1.3. Cardiovascular inflammation and angiogenesis (Hodilva-Dilke, Marelli-Berg, Mauro, Nourshargh, Perretti: developing supervisors; Cooper, Longhi, Nightingale, Whiteford, Rot)

Our CV inflammation programme offers a unique training environment with international leaders such as Nourshargh (Wellcome Trust Senior Investigator) in microvascular research who uses 4D analyses to follow cell trafficking in conditions such as, ischaemia-reperfusion injury, and determine roles for endothelial cell junctional molecules, such as PECAM-1, ICAM-2 and JAM-A. In complementary work, Perretti is researching neutrophil regulation on tissue-protective pathways, including extracellular vesicles and soluble mediators, as leads for novel anti-inflammatories (commercialised leads for melanocortin receptors) in myocardial infarction and vascular inflammation. Marelli-Berg (BHF Chair and programme grant) is investigating the pathways by which T cells reach the heart to cause inflammation and how to therapeutically modulate these in heart transplantation and myocarditis. Hodivala-Dilke (CRUK programme) offers excellent PhD opportunities in the mechanisms underlying angiogenesis, the roles of integrins, and how gene dosage affects these processes.

3.1.4. Cardiovascular device innovation (Lee, Mata, Mathur, Petersen) With £3.5m of investment from the Barts Charity this interdisciplinary PhD programme of CV research will also benefit from our plans to create an integrated one stop centre for device innovation at the Barts Heart Centre bringing our CV clinicians and bioengineers together in a single experimental environment. Students will have the opportunity to conduct projects within this new facility, gaining first-hand experience of device innovation, development and clinical translation. With researchers at the Barts Heart Centre the QMUL Institute of Bioengineering (led by Mata), coupled with computer science and engineering has led development and translation of non-contact mapping to identify triggers of atrial fibrillation enabling precision targeting of ablation dramatically improving outcomes. In addition, there are interdisciplinary opportunities for investigation of a new coronary 'smart scaffold' (combination of biologics and biodegradable stent) in de novo Coronary Artery Lesions (EU FP7 €5.3m) where we will shortly initiate a first in man trial (Mathur). This and other interdisciplinary strands will also be complemented by the QMUL Life Science Initiative, which is supporting cross cutting activity with particular relevance to this application in the areas of bioengineering, computational biology, and genomic medicine to address fundamental questions in post-genomic population health (http://www.qmul.ac.uk/lifesciences/).

4. List of named principal supervisors of the programme

Amrita Ahluwalia - Professor of Vascular Pharmacology
Co-Director of the William Harvey Research Institute
Research Field: Investigations into the role of vascular inflammation in the pathogenesis of cardiovascular disease. The biology of nitrates and the pharmacology of bradykinin receptors in controlling cell trafficking and vascular reactivity.

Email: a.ahluwalia@qmul.ac.uk

Michael R. Barnes, PhD - Director of Bioinformatics, NIHR Cardiovascular BRC
Research Field: Computational Biology and Bioinformatics focused on Drug Discovery and Translational Research, building on 14 years pharma R&D experience. Active research across multidisciplinary fields, including systems biology and pathway approaches to the analysis of genetic and genomic data for target discovery, drug repositioning and biomarker identification. Development of cardiovascular clinical databases enabling data integration for stratified medicine development. Studies of cardiovascular disease pathology and drug pharmacogenetics using next-generation sequencing technologies (RNA-seq, Exomes, Chip-seq, Whole genomes).

Email: m.r.barnes@qmul.ac.uk

Morris Brown - Professor of Endocrine Hypertension
Research Field: Investigations into pathogenesis and treatment of aldosterone-producing adenomas of the adrenal. The discovery and role of somatic mutations, and of zona glomerulosa selective gene expression.

Email: morris.brown@qmul.ac.uk

Livia Carvalho – Lecturer in Neuropsychopharmacology
Research Field: Dr Carvalho's research focuses on investigating the biological pathways involved in the role of glucocorticoid hormones and pro-inflammatory cytokines in the biological effects of stress, the pathogenesis of depression, and the molecular mechanisms of antidepressant drugs.

Email: l.carvalho@qmul.ac.uk

Mark Caulfield - Professor of Clinical Pharmacology
Co-Director of the William Harvey Research Institute
Research Field: Translational research programme is focused on elucidating the genetic basis of blood pressure and related phenotypes with the aim of identifying new therapies and translating them into clinical trials.

Email: m.j.caulfield@qmul.ac.uk

Paul Chapple - Professor of Molecular Cell Biology
Research Field: Understanding the role of molecular chaperone and other cellular protein quality machineries in human health and disease.

Email: j.p.chapple@qmul.ac.uk

Dianne Cooper - Lecturer & Arthritis UK Research Fellow
Research Field: My research is focussed on understanding the multi-faceted biological functions of galectins and their interlink with other pivotal mediators in inflammation-driven pathologies with specific emphasis on leukocyte recruitment and whether galectins have a role in the persistence of inflammatory infiltrates in chronic inflammation.

Email: d.cooper@qmul.ac.uk

Jesmond Dalli – Reader in Molecular Pharmacology & Sir Henry Dale Fellow
Research Field: My translational research is focused on the structural elucidation of omega-3 polyunsaturated fatty acid-derived bioactive lipid mediators, assessing their cellular targets and the molecular mechanisms through which these mediators exert their actions in the resolution of inflammation.

Email: j.dalli@qmul.ac.uk

Panos Deloukas - Professor of Cardiovascular Genomics

Research Field: Our group investigates the molecular basis of complex traits in humans focusing on coronary heart disease (CHD) and related cardiometabolic traits. To identify the functional variants underlying CHD risk we are integrating genetic findings with gene expression and DNA methylation QTL maps as well as open chromatin maps in relevant cell types.

Email: p.deloukas@qmul.ac.uk

Sian Henson - Senior Lecturer
Research Field: Investigations into the dysregulation T cell metabolism during senescence and how this maintains an inflammatory deleterious state. Furthermore how changes in key metabolic regulators with senescence leads to alterations in T cell trafficking.

Email: s.henson@qmul.ac.uk

Adrian Hobbs - Professor of Cardiovascular Pharmacology
Research Field: The physiological and pathological actions and interactions of guanylyl cyclases in the cardiovascular system; impact on pulmonary artery hypertension and systemic blood pressure.

Email: a.j.hobbs@qmul.ac.uk

Kairbaan Hodivala-Dilke - Professor of Angiogenesis
Research Field: Angiogenesis, the formation of new blood vessels from pre-existing ones, is essential for tumour growth and cancer spread. Modulation of angiogenesis is therefore a logical approach to cancer treatment. Our research aims to examine the molecular mechanisms underlying angiogenesis, vascular leakage and lymphangiogenesis, using a combination of endothelial-, pericyte and lymphatic endothelial-specific knock-out and knock-in systems in mouse models of cancer and other vascular diseases, and ex vivo angiogenesis assays and analysis of the cellular and molecular mechanisms behind these observations.

Email: k.hodivala-dilke@qmul.ac.uk

David Kelsell - Professor of Human Molecular Genetics
Research Field: My work is based largely on the molecular mechanisms underlying primarily inherited monogenic disease. Examples of current studies include investigating disease mechanisms in both skin and heart associated with keratoderma and sudden cardiac death.

Email: d.p.kelsell@qmul.ac.uk

Márta Korbonits - Professor of Endocrinology and Metabolism
Research Field: Studies into the clinical, biochemical and genetic characteristics of patients with endocrine disorders.

Email: m.korbonits@qmul.ac.uk

David Lee - Professor of Cell & Tissue Engineering
Research Field: Mechanobiology, involving studying the effects of mechanical forces on stem and differentiated cells. Specific focus has been placed on the signalling pathways that transduce a mechanical stimulus into a biological response with particular emphasis on reorganisation of the nucleus.

Email: d.a.lee@qmul.ac.uk

Fiona Lewis – Lecturer in Mycordial Repair and Regeneration
Research Field: Fiona's research focuses on understanding the effect of ageing on stem cell regerative potential for cardiac repair and regeneration. She is currently pursuing two major research themes: (1) Influence of donor age/disease on iPSC potential and (2) Exosomes for cardiac repair and regeneration.

Email: f.lewis@qmul.ac.uk

Paula Longhi – Reader in Dendritic Cell Biology & BHF Intermediate Fellow
Research Field: Study of the role of Dendritic cells in the control of vascular inflammation in atherosclerosis. Investigation of Dendritic cells-adipose tissue cross-talk in the control of adipose tissue inflammation and its contribution to type 2 diabetes and cardiovascular diseases.

Email: m.longhi@qmul.ac.uk

Federica Marelli-Berg - BHF Chair of Cardiovascular Immunology
Research Field: Investigations into the dynamics and mechanisms of regulatory and memory T cell trafficking.

Email: f.marelli-berg@qmul.ac.uk

Alvaro Mata - Reader in Biomaterials and Biomedical Engineering
Research Field: Investigating the effects of mechanical loading on cell function, including elucidation of the mechanisms of mechanical transfer and transduction to induce alterations in gene expression.

Email: a.mata@qmul.ac.uk

Anthony Mathur - Professor of Cardiology
Research Field: Translational cardiology targeting new biological and interventional approaches to the 'no option patient'. Stem cell therapy for cardiac disease. Development and testing of new cardiovascular devices.

Email: a.mathur@qmul.ac.uk

Patricia Munroe - Professor of Molecular Medicine
Research Field: The genetic and molecular basis of hypertension and cardiac arrhythmias.

Email: p.b.munroe@qmul.ac.uk

Suchita Nadkarni – Lecturer in Immunology and BHF Fellow
Research Field: Suchita's work focuses on the role of the maternal immune system in shaping pregnancy outcomes. Suchita is specifically interested in how maternal neutrophils can influence T-cell responses and how such interactions can regulate placental development (see image) and her main disease area of interest is pre-eclampsia In addition to their roles in placental development. Suchita is also interested in how neutrophil-T cell interactions can influence maternal cardiovascular responses during pregnancy and fetal development.

Email: s.nadkarni@qmul.ac.uk

Thomas Nightingale - Lecturer Cell Biology
Research Field: Investigations into the role, mechanism and functional significance of intracellular trafficking in endothelial cells on haemostasis and inflammation.

Email: t.nightingale@qmul.ac.uk

Sussan Nourshargh - Professor of Microvascular Pharmacology
Research Field: Investigations into the mode, dynamics and mechanisms of leukocyte transmigration as induced by physiological and pathological inflammation.

Email: s.nourshagh@qmul.ac.uk

Mauro Perretti - Professor of Immunopharmacology
Research Field: Pioneered the concept of endogenous anti-inflammatory and pro-resolving mediators and pathways, studying their impact on the immune response within the vasculature as well as the target organ (joint, heart, kidney, liver). Our lab has established expertise in the running of in-vivo models of inflammation, spanning from protocols to study leukocyte recruitment to models of ischaemia-reperfusion, Intravital microscopy, together with deep analyses of neutrophil biology in static and under flow condition. In the last years, developed an interest in the exploitation of novel ligands toward anti-inflammatory GPCRs as novel therapeutic entities, together with an interest in the biology of leukocyte-derived microvesicles.

Email: m.perretti@qmul.ac.uk

Steffen Petersen - Professor of Cardiovascular Medicine
Research Field: Clinical trials using CMR, cost-effectiveness analysis related to cardiac imaging and primary prevention, large scale population based studies using CMR (UK Biobank cardiac imaging lead) and electronic health record research that incorporates cardiac imaging data.

Email: s.e.petersen@qmul.ac.uk

Antal Rot - Wellcome Trust Investigator and Arthritis Research UK Chair in Inflammation Sciences
Research Field: Antal's research interests are related to the molecular and cellular mechanisms of inflammation and the involvement of chemokines, their classical and atypical receptors in immune response and disease pathogenesis.

Email: a.rot@qmul.ac.uk

Ken Suzuki - Professor of Translational Cardiovascular Therapeutics
Research Field: Translational research to develop novel approaches for treating heart failure, including cell-based therapy, gene therapy and regenerative therapy. Also developing interest innate immunity in the heart (i.e. TRL signalling in cardiomyocytes and alternatively activated macrophages).

Email: ken.suzuki@qmul.ac.uk

Christoph Thiemermann - Professor of Pharmacology

Research Field: Investigations into the pathophysiology of circulatory failure, systemic inflammation and organ injury dysfunction (including multiple organ failure) associated with sepsis, trauma, haemorrhage and ischaemia/reperfusion including myocardial infarction, heart failure, acute kidney injury and chronic kidney disease. In particular, investigation of the effects of aging and diabetes on outcomes (in the above disease states) and the development of novel and translatable treatment strategies to improve patient outcomes in acute MI, perioperative care, trauma-haemorrhage, sepsis, acute kidney injury, chronic kidney disease and diabetic nephropathy.

Email: c.thiemermann@qmul.ac.uk

Andrew Tinker - Professor of Cardiac Electrophysiology

Research Field: I am interested in what role potassium channels and cell signalling proteins play in cardiac (patho)physiology. The question is how these might act to reinforce normal heart rhythm or act as substrates for cardiac arrhythmia. We have specific interests in a range of potassium channels and heterotrimeric G-protein signalling in the heart and blood vessels. Technically we are using unique strains of genetically modified mice either generated by ourselves and\or provided by collaborators. We combine this with complex murine phenotyping capabilities including ex-vivo single-cell electrophysiology and imaging of cardiac myocytes (ventricular, atrial and SA nodal), in-vivo telemetry in awake conscious mice to measure heart rate, heart rate variability and document abnormal rhythm, blood pressure and in-vivo electrophysiology studies with programmed electrical stimulation to induce arrhythmia. We have an established track record in molecular and cellular studies. I have several distinctive research strands being pursued in my laboratory with work on ATP-sensitive K+ channels, G-protein gated inwardly rectifying K+ channels and cardiac channelopathies.

Email: a.tinker@qmul.ac.uk

David van Heel - Professor of Genetics

Research Field: East London Genes & Health is a long-term bioresource of Bangladeshi and Pakistani adults in East London, with DNA, e-health records and recall for further studies. The resource supports many different areas of research. My particular research interests are in naturally occurring human gene knockouts; and in a large scale East London non-invasive cardio-metabolic phenotyping program (body & visceral fat, liver fat, retinal imaging, blood biomarkers).

Email: d.vanheel@qmul.ac.uk

Tim Warner - Professor of Vascular Inflammation

Research Field: Investigations into influences of prostanoids and other vascular mediators on platelet and blood vessel wall reactivity.

Email: t.d.warner@qmul.ac.uk

James Whiteford - Senior Lecturer in Microvascular Research

Research Field: Investigations into the mechanisms of angiogenesis and the development of novel anti-angiogenic therapeutic reagents.

Email: j.whiteford@qmul.ac.uk

Qingzhong Xiao - Professor of Stem Cells and Cardiovascular Disease
Research Field: Investigations into the role of stem/progenitor cells, proteases and other genes-of-interest in the pathogenesis of cardiovascular diseases; Vascular cell differentiation from stem cells and molecular mechanisms involved; or direct conversion of other somatic cells into vascular cells and its application.

Email: q.xiao@qmul.ac.uk

Muhammad Magdi Yaqoob - Professor of Nephrology
Research Field: Pathogenesis of acute and chronic uraemia (with and without diabetes) and its complications (cardiovascular, musculoskeletal, haematological, immunological and genetic). Investigations include the examination of downstream effects of acute and chronic kidney injury in clinical subjects and in experimental models, both in vivo and in vitro.

Email: m.yaqoob@qmul.ac.uk

5. Details of current postgraduate students, proposed monitoring and other training schemes that will be in place

5.1 Total graduate research students

WHRI currently hosts over 100 postgraduate research students (MRes and PhD), while SMD has over 420 currently registered PhD students. For students enrolled in 2009-10 the SMD completion rate within 4 years was 97%, and for the 2010-11 intake was 87%; WHRI's data for the same intakes are 100% and 96%, and for QMUL as a whole 92% and 93%. High completion rates are also a hallmark of students trained by the programme supervisors (see section 4).

Overall, SMD provides an outstanding environment for PhD training. In PRES2015, PGR students within SMD reported higher levels of satisfaction than the Russell Group mean with regard to their support and training, their professional and researcher development, the research culture they experience, and the quality and involvement of their project supervisors. Notably for WHRI, our students scored their satisfaction at professional development as 92%, 14 percentage points higher than the Russell Group mean. Further analyses of PRES2015 data for PGR students within clinical medicine (REF2014 UoA1) showed SMD had an overall satisfaction score 3.2 percentage points above the Russell Group mean, 3.3 percentage points above the pre-92 group and 4.8 percentage points above the London mean. These PRES2015 outcomes follow comments from the REF2014 UoA1 panel, which noted that a particular strength of SMD was its 'effective and sustainable doctoral research training and evidence of a strong and integrated research student culture'.

5.2 Monitoring progression of the programme & students

5.2.1 Managing & monitoring the PhD Programme
The management and monitoring of the BHF 4 year PhD Programme will be under the Programme Committee, composed of the Head of Programme Prof Marelli-Berg, Prof Ahluwalia (Programme Co-ordinator), Prof Warner, Prof Brown, Prof Deloukas, and Prof Tinker.

All members of the Programme Committee are experienced PhD supervisors, and Tinker has also

overseen a 4-year PhD programme (funded by the MRC as a Doctoral Training Grant at UCL). Ahluwalia has substantial experience of mentoring schemes, having been involved since 2005 in the development and running of the National Mentoring Scheme for Women Pharmacologists and being awarded the 2015 Prize for Research by the WISE (Women in Science and Engineering) Campaign. The Programme Committee will meet at in each semester; at the beginning of the academic year for course commencement, in January to review taught course outcomes and research project placements, and in April/May for PhD project decisions. The Programme Committee will refer to the WHRI Board, and to the SMD Graduate Studies Committee and QMUL Postgraduate Research and Programmes Exam Board, as well as to the BHF.

5.2.2 Monitoring & mentorship of students

The WHRI Director of Graduate Studies and Education Committee oversee MRes/PhD student supervision within WHRI. At the SMD level a robust and effective monitoring system is in place, managed centrally by the Graduate Studies Committee (chaired by Warner) and Student Office with data and supervisor-student interactions controlled online via Queen Mary's MySIS system. Briefly, at 9

and 18 months students will produce interim reports of their progress and future plans, which will be considered by two independent assessors in conjunction with reports from the supervisors. At 30 months students will produce a short report of the progress of their research and an outline thesis plan and timetable for completion. Working together with the primary and secondary supervisors these assessors will provide a team providing pastoral care for the student and advice with respect to the many issues that arise in our profession outside of the actual experimental details of the research project. In particular this team will support the student in formulating his/her long-term career plans and identifying laboratories for post-doctoral positions. Students will also present at 'Research In Progress' meetings, at which PhD students and junior post-doctoral researchers share their on-going experimental work with researchers from across WHRI.

The integrated arrangement of research student progress reports, meetings and mentoring will provide an independent assessment of the progress of students and so ensure timely and successful completion of PhDs and progression to post-doctoral training.

5.3 Transferable skills and generic training

Within the SMD all students participate fully in a doctoral development training scheme, based on the Vitae Researcher Development Framework. This approach means that students are well prepared to become successful independent researchers and fully equipped with the necessary skills to enter the workplace. As we do presently, over the four years of their training the BHF MRes/PhD students will work with their supervisors and mentors to identify their individual training needs. In addition to opportunities within WHRI, students will then undertake training programs from a range of activities offered by the SMD and by QMUL's Doctoral College. In brief each activity has a point score with students being required to accumulate training experiences to a total of 210 points over the period of their research degree.

BHF MRes/PhD students will also be able to apply for the accreditation of points to outside activities, including external training courses and conference attendance. Students will also have additional training opportunities including:

5.3.1. William Harvey Research Institute Seminars

Research seminars are held weekly, presented by national and international experts (current listing at www.whri.qmul.ac.uk).

5.3.2.Biomedical Research Unit Wide Research Seminars

The BRU video conferencing network will interactively connect students to seminars across the network of NIHR funded BRUs and Biomedical Research Centres. We will also be connected to the Karolinska Institute and Institute of Translational Medicine and Therapeutics at the University of Pennsylvania.

5.3.3. William Harvey Research Institute Annual Research Review

Our Institutional annual review showcases externally invited researchers in CV and related areas. However, most of the programme time is dedicated to more junior researchers and PhD students to gain experience in presenting their research, with the best receiving prizes and travel awards.

5.3.4. William Harvey Day

The SMD organises an annual William Harvey Day at which researchers in the SMD present their work to colleagues and external guests. It is a great scientific occasion, attended also by members of the lay community, hence assuring dissemination of the research discoveries achieved with WHRI and the wider SMD.

5.3.5. Annual Careers Day

The Annual Careers Day is organised, in early summer, by the Barts and The London graduate school to provides students with key information to allow them to make informed career choices, which range from academic and industry-based research to scientific publishing, patenting, and technological and product support specialities.

5.3.6. Participation at External Meetings

As is our current practice, BHF MRes/PhD students will be required to attend and contribute to local meetings such as the London Vascular Biology Forum, the London Hypertension Society, and the London Inflammation Network (a scientific activity of CITI). PhD students will be encouraged to participate and contribute to at least two national (e.g. British Pharmacological Society, British Atherosclerosis Society, British Cardiovascular Society) and one international meeting.

5.4 Progression to post-doctoral research

The successful conclusion of the students' training through the BHF MRes/PhD programme will be transition to post-doctoral research. Success in this transition is greatly assisted by students building relationships with potential host supervisors and laboratories. To assist in this WHRI, SMD and QMUL will provide travel and subsistence support of up to £2200 for PhD students to visit potential post-doctoral host laboratories (subject to approval by the Programme Committee).