School of Medicine and Pharmacology
Queen Elizabeth II Medical Centre Unit

Research Profiles

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The SCGH Unit in the School of Medicine and Pharmacology, made up of clinicians, scientists and educators, offers unique opportunities for students, scientists and doctors interested in pursuing careers in biomedical research and training across a wide range of fields in the health sciences. This booklet outlines the research and education activities within the School and with adjunct staff at SCGH and the opportunities for students and collaborators to work and study within this vibrant group.

Unit Profile: Originally based around clinical academics, who work for part of their time as medical specialists at SCGH, and researchers and educators for the rest of their time, the SCGH Unit has now expanded to include a large number of research scientists. The mix of Clinical Academics, in current clinical practice, along with highly trained and motivated researchers from science backgrounds offers research opportunities from basic science through to clinical research, along with intervention, translational, epidemiological and educational research projects. In addition, proximity to the hospital has allowed collaboration with adjunct academics who are active researchers.

Areas of Research: As shown on with the research groupings, academics cover most of the disciplinary areas in clinical practice, and researchers bring skills from the sciences to humanities and clinical practice. Expertise in a wide range of areas (statistical, scientific, clinical) can be found within the School or with close collaborators. SMP researchers are closely linked to research organisations and Universities sited locally, nationally and internationally, including the Lung Institute of Western Australia (LIWA), the Centre for Cell Therapy and Regenerative Medicine (CCTRM), the National Centre for Asbestos Related Disorders (NCARD), the Cancer Council and Arthritis and Osteoporosis Western Australia.

Facilities: The SCGH Unit is based in new Harry Perkins North Building on the QE11 site, a purpose built research facility developed by UWA, the Health Dept and the Harry Perkins Research Institute. School researchers have access to world class laboratories in an environment designed to ensure mixing of researchers and ideas, and sharing of equipment, to enhance collaboration and success.

Opportunities: SMP members play a major role in the teaching for the professional practice Doctorates with a focus on the newly commenced Doctor of Medicine. As is laid out subsequently, there are many opportunities to participate in research in the School through Honours, higher degrees including Masters or a PhD, or research projects which are a required part of the MD program.

Funding: Scholarships to cover student living are available through UWA, the Unit, linked Institutes such as LIWA, NCARD and CCTRM and external bodies such as the Heart Foundation and the Asthma Foundation.

Interested people are encouraged to contact any individual academic, researcher or research group to discuss research and funding opportunities.
Winthrop Professor Joseph Hung has maintained research interests particularly in the area of epidemiology, risk factors, treatment, and prevention of cardiovascular diseases. More recently his research has focused on obesity and the mechanisms by which obesity influences metabolic and cardiovascular disorders, including the role of genes.

Recent Publications:


Research Group
- Associate Professor Tom Briffa (Pop. Health UWA)
- Dr Jo Crittenden

Research keywords
Cardiovascular, epidemiology, lipids, risk factors, obesity, metabolic disorders

Research projects available – Hons, MSc & PhD
Contact W/Prof Joe Hung for further information
joe.hung@uwa.edu.au
www.medpharm.uwa.edu.au/
Current research:

- Translational research in atrial fibrillation, heart failure and acute coronary syndromes.
- Principal investigator on a current WA State Health Research Translation grant: Implementation of evidence based guidelines for the management of atrial fibrillation via an electronic clinical governance management system.
- Ongoing research in genetic epidemiology, inflammatory pathways in atherosclerosis and the metabolic syndrome. Utilisation of data linkage and large prospective cohorts to evaluate novel cardiovascular risk factors and biomarkers.

Clinical Trial Supervision:
Primary Investigator at the Sir Charles Gairdner Hospital Site for:

- ECHO-CRT: Cardiac-resynchronization therapy in heart failure with a narrow QRS complex. REVIVE II:
- Short-Term Clinical Course of Patients With Acutely Decompensated Heart Failure.
- RAFT: Resynchronization–Defibrillation for Ambulatory Heart Failure Trial (RAFT) Investigators. Cardiac-Resynchronization Therapy for Mild-to-Moderate Heart Failure.
- CAPRIE: CAPRIE Steering Committee. A randomised, blinded, trial of clopidogrel versus aspirin in patients at risk of ischaemic events (CAPRIE).

Research Group:
- Dr Katayun Mohammadi,
- Dr Kalilur Anvardeen,
- Dr Jo Crittenden

Research keywords
Genetic epidemiology, atherosclerosis, echocardiography, metabolic syndrome

Associate Professor Brendan McQuillan
MBBS, PhD, FRACP, FCSANZ is the Head of the UWA School of Medicine and Pharmacology, and Director of Echocardiography and Consultant Cardiologist at Sir Charles Gairdner Hospital. He has a PhD in vascular biology and undertakes research examining genetic, metabolic and environmental risk factors for atherosclerosis. He has extensive experience in the use of non-invasive imaging for the assessment of vascular disease. He has completed subspecialist training in echocardiography at the Massachusetts General Hospital in Boston, and worked as a postdoctoral research fellow at Harvard University.

A/Prof McQuillan has received awards and fellowship support from the National Heart Foundation of Australia, the Royal Australasian College of Physicians and the National Health and Medical Research Council of Australia. He has presented at major national and international scientific meetings and published over forty papers in peer-reviewed journals.

A/Prof McQuillan has demonstrated a commitment to undergraduate teaching and postgraduate medical training and has previously served for six years as the Director of Clinical Training at Sir Charles Gairdner Hospital. He has been an examiner and supervisor of cardiology trainees for the Royal Australasian College of Physicians. He has participated in the Cardiac Society of Australia and New Zealand summit on training in Cardiology, which has influenced current training requirements and accreditation.

Research projects available – Hons, MSc & PhD
Contact A/Professor Brendan McQuillan for further information
www.medpharm.uwa.edu.au/
CCTRM Research

Over the last century we have seen transformational changes in medical practice based on scientific discovery. The next transformations in patient care will come from stem cell therapy and regenerative medicine. There are already some spectacular successes in treating leukaemia and eye diseases such as macular degeneration. The aim of our research is to extend these technologies to treat a wider spectrum of debilitating and chronic diseases.

The vision of the Centre “New Ideas Leading to New Medicines” is supported by a common research strategy across many areas of medicine. Disease areas include cancer, asthma, chronic lung diseases, diabetes, heart disease, rheumatoid arthritis, osteoarthritis, osteoporosis, fibrosis, macular degeneration, muscle degeneration and neurodegenerative diseases such as Alzheimer’s. In addition, we are investigating strategies to replace damaged tissue following acute trauma.

The science of tissue regeneration is still in its infancy with many challenges including rejection of cells and tissues when they are transplanted from one person to another. If we can solve the technical challenges, regenerative medicine and associated approaches will help us all live longer with an improved quality of life.

Winthrop Professor Geoffrey Laurent
PhD, FRCP (Hon), FRCPath, FMedSci.

Director, Centre for Cell Therapy and Regenerative Medicine, School of Medicine and Pharmacology, The University of Western Australia

Honorary Fellow, University College London.

Prior to his appointment at the University of Western Australia in June 2012 W/Prof Laurent was the Vice-Dean of Enterprise and Head of the Department of Internal Medicine at University College London. Geoff has published over 300 peer reviewed articles in international journals of biomedical research and was awarded the European Respiratory Societies Presidential Award for his contribution to lung science. He is the Editor-in-Chief of the International Journal of Biochemistry and Cell Biology and has edited several books including a four volume Encyclopaedia of Respiratory Medicine. He is a Fellow of the Academy of Medical Sciences and Past President of the British Association for Lung Research.

Professor Laurent has led the development of the cell and molecular biology programme investigating key mediators regulating inflammation and tissue remodelling. He has also made discoveries relating to the key cytokines and proteases regulating fibroblast function as well as lipid mediators as inhibitors of cell function in respiratory disorders. These studies have led to new approaches in the pharmaceutical sector.

Research projects available – Hons, MSc & PhD
Contact A/Prof Cecilia Prele or Ms Barbara Telfer for further information Ph: 61 8 6151 0957
giloffice-smp@uwa.edu.au Cecilia.prele@uwa.edu.au http://www.medpharm.uwa.edu.au/research/cctrm
Winthrop Professor George Yeoh, Deputy Director, Centre for Cell Therapy and Regenerative Medicine, School of Medicine and Pharmacology, Discipline of Biochemistry & Molecular Biology, School of Chemistry & Biochemistry; Associate Dean (Research) Faculty of Medicine, Dentistry and Health Sciences; Laboratory Head – Liver development & carcinogenesis laboratory, Centre for Medical Research, Perkins Institute of Medical Research

Research Interests: Regulation of liver genes during fetal development and its relevance to disease. Genetic changes that convert normal liver cells into cancer cells that can explain the development of hepatocellular carcinoma. Liver stem cells and their use in cell and gene therapy as an alternative to organ transplant in treating liver disease.

CCTRM has established collaborations with:-

Local
- School of Medicine and Pharmacology
- Western Australian Institute for Medical Research (WAIMR)
- Cell and Tissue Therapies WA (CTTWA)
- Centre for Microscopy and Characterisation Analysis (CMCA)
- Ear Science Institute, Australia
- Edith Cowan University
- Lions Eye Institute (LEI)
- Lung Institute of WA (LIWA)
- Princess Margaret Hospital for Children
- Royal Perth Hospital
- School of Anatomy, Physiology and Human Biology, UWA
- School of Animal Biology, UWA
- School of Biomedical Sciences, Curtin University (CHIRI)
- School of Chemistry and Biochemistry, UWA
- School of Pathology and Laboratory Medicine, UWA
- School of Surgery, UWA
- Telethon Institute for Child Health Research (TICHR)

National
- Australian Regenerative Medicine Institute, Monash University
- Stem Cells Australia

International
- Helmholtz Zentrum München (HMGU)
- University College of London (UCL)
- UCL FLARRE Consortium

Professor Steven Mutsaers is a Research Professor and Senior Research Scientist who holds a joint appointment at the Centre for Cell Therapy and Regenerative Medicine, University of Western Australia and Lung Institute of Western Australia.

Professor Mutsaers’ research interests include studies examining the mechanisms regulating serosal and lung repair and how a breakdown in repair leads to disease. In particular he is interested in the mediators and signalling pathways that regulate cell differentiation and function. His recent studies have examined the role of the IL-6 family of cytokines and STAT signalling in the pathogenesis of lung fibrosis and hedgehog signalling in the growth of malignant mesothelioma.

Professor Mutsaers sits on several national and international scientific committees and granting bodies and is on the editorial board of several international journals. He is the President of the International Mesothelioma Interest Group and is a current recipient of a Cancer Council Western Australia Research Fellowship.

Research projects available – Hons, MSc & PhD
Contact A/Prof Cecilia Prele or Ms Barbara Telfer for further information Ph: 61 8 6151 0957

giloffice-smp@uwa.edu.au Cecilia.prele@uwa.edu.au http://www.medpharm.uwa.edu.au/research/cctrm
Professor Irmgard Irminger-Finger studied biology and biochemistry in Zurich, where she graduated in molecular biology and biochemistry and obtained a PhD in molecular genetics. After a three year postdoctoral period at the Molecular Cell Biology Department at the Harvard University, she returned to Switzerland and first had a position as independent researcher at the Biochemistry Department of the University of Geneva. In 1997 she moved into oncology at the Medical Faculty of the University of Geneva, having obtained a Swiss federal career development award.

In 1998 Irmgard started her own research group focusing on the molecular pathways at the aging and cancer interface as part of the Biology of Aging Institute at the same institution. Since 2006 she has lead the Molecular Gynecology and Obstetrics Laboratory at the Department of Gynecology and Obstetrics at the Geneva University Hospitals. The main interest of this laboratory is the function of tumor suppressor genes in normal and cancer cells and their implication in carcinogenesis and cancer progression, in particular the breast cancer genes BRCA1 and BARD1. Over the years, Dr. Irmgard Irminger-Finger built up her reputation as expert in the Cancer and Aging field and as expert on the BRCA1 and BARD1 genes, as author of scientific articles, speaker at conferences, organizer of meetings, and member of specific study groups and Task Forces.

CCTRM researchers:

Postdoctoral Researchers
Dr Aurelien Pipperelli (Feb 2014)
Dr Magda Ratajska
Mr Chaun Bian Lim

Postgraduate Researchers
Anne Kramer

Adjunct Appointments
Senior Research Fellow – A/Prof Gerard Hoyne
Senior Research Fellow – Dr Michael Edel
Professor Darryl Knight

Visiting Academics
Prof Irmgard Irminger-Finger (2014)
Dr Michael Edel (2014)
Dr Adam Giangreco (2014)
Dr Heiko Lickert (2015)

Research keywords
Regeneration, cell therapy, translational, cancer, gene therapy, scaffolds for tissue engineering

A/Professor Cecilia Prele is a Senior Research Scientist with the Tissue Repair Group in the Centre for Asthma Allergy and Respiratory Research, UWA and is Administrative Director for the Centre for Cell Therapy and Regenerative Medicine, University of Western Australia.

She was awarded her PhD in Biochemistry from University College London, UK in 2001. After completing a short postdoctoral position at Guy’s, St Thomas’ and Kings College London she relocated to Perth. Her research focuses on investigating signal transduction pathways activated in disease and on how these modified pathways contribute to the initiation and progression of disease. Her research is part of a larger collaborative program of research, which aims to investigate the mechanisms driving lung tissue repair and regeneration.

cecilia.prele@uwa.edu.au

Research projects available – Hons, MSc & PhD
Contact A/Prof Cecilia Prele or Ms Barbara Telfer for further information Ph: 61 8 6151 0957
giloffice-smp@uwa.edu.au Cecilia.prele@uwa.edu.au http://www.medpharm.uwa.edu.au/research/cctrm
Winthrop Professor Fiona Lake holds the Eric Saint Chair in Medicine at UWA, based at Sir Charles Gairdner Hospital where she is a respiratory physician. Her academic interests include:

- learning in the clinical environment
- Community and Interprofessional learning
- Clinical practice related to interstitial lung disease.

In the area of medical education she has been involved in curriculum development and implementation, over many years in roles including the Associate Dean of Teaching and Learning and Head of the Education Centre, Faculty of Medicine and Dentistry at UWA (1998-2007), an AMC Medical School assessor (2000-present) and has been awarded a Carrick Award (2006), Clinical Tutor of the Year (2006), the Geoff Morel Medal from the CPMEC (2011) and the TSANZ Medal (2013) for contribution to training and educational development.

In Respiratory Medicine she completed her respiratory training in Perth before completing research in Allergy and Princess Margaret Hospital and an MD in cytokines and macrophages at the National Jewish Centre in Colorado. Her focus now is more on excellence in clinical service and finding ways to support basic scientists with ongoing studies in patients.

**Key Collaborations:**

Community and Interprofessional Learning (Helen Dugmore and Rosemary Saunders)

With Nursing collaborators, a number of large grants from the DHA and HWA were obtained to develop community and ambulatory care placement for interprofessional groups of students. These projects have been extensively evaluated.

Rosemary Saunders has established a Community Training Ward in Joondana Bethanie Aged Care Facility which provides insights into attitudes and experiences for both residents and learners.

At SCGH, with colleagues she is working to implement a Teaching and Learning agenda which crosses the professions.

**Learning in the Clinical Environment**

Her focus with colleagues has been on improving the clinical learning environment. With colleagues she has developed workshops in disciplines of medicine, nursing, dentistry, allied health and veterinarian science called “Teaching on the Run”, which in 2007 was awarded a Carrick Awards for Australian University Teaching: Programs that Enhance Learning – Flexible Teaching and Learning Category. The program has evolved to a blended format used around the world, using a sustainable model with local implementation by trained facilitators, linked in through the on-line component. A detailed database has allowed extensive assessment of outcomes and impact.

More recently workshops and papers for trainees called “Learning on the Run” have been developed and are being published. The group also work with collaborators on staff development for clinicians in third world countries.

**Interstitial Lung Disease**

Previously been involved in research related to rheumatoid arthritis and interstitial lung disease, Fiona Lake now runs the ILD Clinic at SCGH. New drugs are now available for some of these diseases however a focus has been to ensure patient receive appropriate and quality supportive care when the diseases is symptomatic and severe.

**Research Group**

Clin A/Prof Margaret Potter, Angela Lindley, Dr Gerard Ryan, Dan Baharudin, Jacquie Moran plus a range of national collaborators.

**Research projects available – Hons, MSc & PhD**

Contact Winthrop Professor Fiona Lake for further information


Fiona.lake@uwa.edu.au

**Research keywords**

- Clinical Learning, Staff development, evaluation, impact,
- interprofessional learning, community learning,
- Interstitial Lung disease, clinical care, supportive care

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**Research projects available – Hons, MSc & PhD**

Contact Winthrop Professor Fiona Lake for further information


Fiona.lake@uwa.edu.au

**Research keywords**

- Clinical Learning, Staff development, evaluation, impact,
- interprofessional learning, community learning,
- Interstitial Lung disease, clinical care, supportive care
Current research:
Thyroid function in health and disease:
- Population-based studies of thyroid function and dysfunction, exploring the complex relationship between TSH and free T4 and how this is affected by aging
- Maternal thyroid function during pregnancy as a predictor of adverse obstetric and foetal outcomes in a pregnancy cohort
- Subclinical thyroid disease as a risk factor for cardiovascular disease and fracture in Busselton
- Genetic determinants of pituitary-thyroid function in health and disease in TwinsUK cohort and Busselton Health Study using GWAS and whole genome sequencing
- Genetic basis of familial non-medullary thyroid cancer using next generation sequencing

Molecular genetics of Paget’s disease of bone
- Identification of genetic mutations in familial Paget’s disease and functional effects on osteoclast function

Osteoporosis, calcium and vitamin D
- Maternal, early life and endocrine predictors of bone density in the Raine cohort
- Genetic basis of bone density and osteoporosis in TwinsUK cohort using whole genome sequencing
- Vitamin D status of baby boomers in Busselton and associations with healthy aging
- Age-related changes in parathyroid hormone concentrations

Current Collaborations:
NATIONAL:
Adj A/Prof Scott Wilson, Clin Prof Bronwyn Stuckey, Clin Prof Alan James, Prof Craig Pennell, Prof Peter Leedman, Dr Kathy Zhu, Dr Ee Mun Lim, Prof Jack Goldblatt, Adj Prof John Beilby, Prof Tom Ratajczak, Dr Sarah Rea, W/Prof Jiake Xu, Busselton Population Medical Research Institute, Raine Health Study.

INTERNATIONAL:
Prof Tim Spector (TwinsUK, London), Dr Nicolas Rodondi (Thyroid Studies Collaboration, Bern), Dr Robin Peters (Thyroid Genetics Consortium, Rotterdam), Prof Stuart Ralston (Genetic Determinants of Paget’s Disease Consortium, Edinburgh), A/Prof Rory Clifton-Bligh (Thyroid Cancer, Sydney)

Clinical Professor John Walsh heads the Thyroid Research Group in the Department of Endocrinology & Diabetes (SCGH), is Principal Investigator of the Busselton Thyroid Study, Chairman of the Paget’s Disease Research Group of Western Australia and a coinvestigator in the Endocrinology Research Group of the Raine Study.

John Walsh is a Consultant Endocrinologist in the Department of Endocrinology & Diabetes, Sir Charles Gairdner Hospital and Clinical Professor in the School of Medicine and Pharmacology, UWA.

Research keywords
Thyroid disease, pituitary-thyroid axis, thyroid cancer, Paget’s disease of bone, osteoporosis, calcium metabolism, parathyroid disease

Research projects available – Hons, MSc & PhD
Contact C/Professor John Walsh for further information
www.medpharm.uwa.edu.au/
john.walsh@uwa.edu.au
The Bone and Vascular Research Group is divided into clinical and laboratory research and is a truly multidisciplinary translational medical research group.

The current clinical focus is identifying determinants of bone and cardiovascular disease. The research approach is to use epidemiological and clinical trial methodology to study various aspects of nutrition. The laboratory research focus is on the regulation of cellular differentiation using human mesenchymal stem cells as the material for these studies.

Finally, via the development of international collaborations in the area of genetic epidemiology, the group has collaborated clinical data to many studies of role of genetics in the development of the osteoporosis of aging itself a disorder of the elderly mesenchymal stem cell.

Research Focus
Epidemiology
In the CAREES study (formerly CAIFOS, CARES) we have followed up a cohort of 1,500 West Australian elderly women for twelve years in order to provide valuable insight into the prevalence, incidence, prognosis, and predisposing risk factors for diseases in not only age-related bone health but also cardiovascular disease and cognitive impairment.

Our focus continues to be on the epidemiology of bone and joint disease including genetic epidemiology using the CAREES study as our discovery cohort. This longitudinal study provides a unique opportunity for studying factors that influence morbidity and mortality associated with aging, which is of great importance for the development of healthy aging policy with the aging of the Australian population.

Clinical trials
A major focus of the group is the use of evidence high quality randomised controlled trials to confirm epidemiological findings. An example of this successful approach is the double blind randomised controlled trial of protein on musculoskeletal, cardiovascular and body composition of 243 elderly women entitled Protein Intake MEtabolic outcomes Study (PIMES).

Collaborations with:
A/Prof Wai Lim, Prof Jonathan Hodgson, A/Prof Kathy Zhu

Professor Richard Prince  MB ChB, BSc, FRACP, MRCP. MD, initially from the UK, has lived and worked in Australia since 1975 for the majority of that time as a member of the University of Western Australia where he has taught and carried out research in the area of endocrinology. He also has an appointment as a Consultant Physician in the Department of Endocrinology and Diabetes at Sir Charles Gairdner Hospital one of the major teaching hospitals in Perth and amongst the busiest tertiary hospitals in Australia. His clinical expertise covers all areas of endocrinology and diabetes in which he consults on a weekly basis.

Dr Joshua Lewis is the Research Officer for the Bone and Vascular Research Group. His research interests include clinical epidemiology and evidence-based medicine to identify individuals with clinically unrecognised age-related diseases such as osteoporosis and atherosclerosis to allow simple lifestyle modifications and clinical care to be implemented early. He has published over 35 papers on these topics in leading international clinical and basic medical journals including: Archives of Internal Medicine, American Journal of Clinical Nutrition, the Journal of Bone and Mineral Research and Nature Genetics. He is the recipient of numerous prestigious scholarships and awards for his research including the American Society for Bone and Mineral Research young investigator award, the World Congress on Osteoporosis, Osteoarthritis and Musculoskeletal Diseases ESCEO-MSD fellow, Strachan memorial prize for best clinical research paper and was named the inaugural Raine foundation Alan Robson Fellow.

Research projects available – Hons, MSc & PhD
Contact ProfessorRichard Prince for further information
richard.prince@uwa.edu.au

Research keywords
bone, cardiovascular disease, osteoporosis, atherosclerosis, fracture
The objective of the research program is to contribute information that will provide a better understanding of complex genetic diseases and to develop tools of potential use in the diagnosis and/or treatment of these diseases. To this end, we are following comprehensive approaches using techniques such as genome-wide sequencing of family based cohorts and gene association studies in human population samples. Molecular based experimental approaches, which also form part of the program, employ model cell systems and gene chip technology to study genome wide expression and the response of genes to pharmacological agents.

Current research:
- Osteoporosis
  - Genomic copy number variation
  - Genetic regulation of bone mineral density
  - Hip structural analysis
  - Bone cell biology
- Polycystic Ovary Syndrome
  - Genetic susceptibility to PCOS
  - Family-based studies of PCOS
- Thyroid Disease
  - Genetic control of thyroid hormone set points
  - Genetic susceptibility to autoimmune thyroid disease
  - Familial papillary thyroid carcinoma

Future research:
- Epigenetic influence on susceptibility to autoimmune thyroid disease.
- Effect of genomic copy number variation on gene expression.

Dr Scott Wilson is based at Sir Charles Gairdner Hospital, he is a scientist and principal investigator in endocrinology and molecular genetics (including clinical and basic scientific research). His academic interest is in complex disease genetics (including genome-wide association studies, exome sequencing and whole genome sequencing), osteoporosis and bone disease, polycystic ovary syndrome and thyroid disease (including thyroid cancer).

Current roles, responsibilities and expertise
- Chief Investigator (NHMRC)
- Chief Investigator (SCGH -RAC)
- Senior Scientific Officer, Sir Charles Gairdner Hospital, Nedlands
- Radiation Safety Officer (Endocrinology & Diabetes), Sir Charles Gairdner Hospital, Nedlands
- Fire Safety Section Warden (Endocrinology & Diabetes), Sir Charles Gairdner Hospital, Nedlands
- Research Supervisor - PhD and undergraduate students
  - Familial Thyroid Carcinoma (PhD)
  - Family-based studies of genetic basis of PCOS (BSc Hons).

Collaborations:

National
- Prof John Walsh (UWA), Prof Bronwyn Stuckey (UWA), Prof Roger Price (UWA), Dr Ee Mun Lim (UWA), Dr Vijay Panicker (SCGH)

International
- A/Prof Brent Richards (McGill University), Dr Nic Timpson & Dr Pete Taylor (University of Bristol), Dr Nicole Soranzo (Wellcome Trust Sanger Institute), Prof Frank Dudbridge (London School of Hygiene and tropical Medicine), Dr Jordana Bell (University of Oxford), Prof Tim Spector (Kings College London)

Research Group
Dr Benjamin Mullin, Ms Shelby Chew, Ms Purdey Campbell, Ms Alexia Camilleri, Ms Viviana Oo

Research keywords
genetics, bone mineral density, thyroid, polycystic ovary syndrome, PCOS, genetic epidemiology, epigenetics, molecular genetics

Research projects available – Hons, MSc & PhD
Contact A/Professor Scott Wilson for further information
www.medpharm.uwa.edu.au/
Professor Leon Adams is a Consultant Hepatologist in the Liver Transplant Unit at Sir Charles Gairdner Hospital and clinical academic with the School of Medicine and Pharmacology, UWA.

His research focuses on clinical aspects of non-alcoholic fatty liver disease (NAFLD) and non-invasive diagnostic technology for liver fibrosis. He runs an active investigator initiated clinical trials program for patients with NAFLD and is involved in several large scale population based cohorts (including the Raine Health Study). More recently, he is exploring the link between nutrition, the gut microbiome and liver injury in NAFLD.

Research Group:-

Research Co-ordinator:
- Helena Ching

PhD Students:
- Dr Michael Wallace
- Dr Briohny Smith
- Dr Ivy Huang
- Dr Koya Ayonrinde
- Mrs Catherine Properzi

Masters Students:
- Tom Grieg
- Paul Crabtree

Projects exploring nutritional, genetic and microbiome associations with liver injury in NAFLD are available.

Current collaborations:
Professor Adams has active collaborators nationally in ANU, University of Sydney, University of Queensland and internationally in the University of California, San Diego, University of Kentucky and Mayo Clinic.

Research keywords
Non alcoholic fatty liver disease, liver fibrosis, clinical trials, microbiome

Research projects available – Hons, MSc & PhD
Contact Professor Leon Adams for further information leon.adams@uwa.edu.au
www.medpharm.uwa.edu.au/
Winthrop Professor Gary Jeffrey is Professor of Medicine at the University of Western Australia, Medical Director of the West Australian Liver Transplantation Service at Sir Charles Gairdner Hospital and Chairman of the Liver Foundation of Western Australia. He and co-investigators were awarded the 2006 WA Inventor of the year award for creating the ‘Hepascore’ which is a serum model of liver fibrosis. This is now used worldwide including in the United States, France and Australia. In addition to his clinical and teaching roles, his research interests are diverse and include the role of iron in preservation injury in the isolated donor liver, mechanisms of HCV viral resistance, clinical studies in liver fibrosis, liver transplantation and HCC.

Current collaborations:
- Prof Leon Adams
- A/Prof Michaela Lucas
- Prof Luc Delriviere
- Dr Xianwa Niu

Current Research:-
- Liver fibrosis
- Transplant outcomes
- Oxidative stress and preservation injury in transplantation

W/Prof Jeffrey has an active research team working in the field of identification, prevention and treatment of liver diseases. His work has enabled him to experience clinical medicine and research in the United Kingdom, United States, Canada and New Zealand.

Recent Publications:


Research projects available – Hons, MSc & PhD
Contact W/Professor Gary Jeffrey for further information gary.jeffrey@uwa.edu.au
www.medpharm.uwa.edu.au/

Research keywords
Fibrosis, haemochromatosis, liver transplantation
Current research:

Molecular imaging clinical projects
- Mesothelioma (hypoxia, proliferation, apoptosis)
- High Grade Glioma (amino acid imaging)
- Prostate cancer (fluorocholine)
- Hepatocellular carcinoma (fluorocholine)

Cost analysis of PET imaging techniques
- Infection imaging

Pre-clinical imaging:
- Mesothelioma (hypoxia modulation)

Recently, A/Prof Francis has been involved in the ACRF Cancer Imaging Facility (CIF), a multimodality preclinical imaging collaborative in WA, which should provide unprecedented opportunities in translational research.

Current collaborations:

UWA Medicine and Pharmacology
Prof Anna Nowak, W/Prof Gary Lee, Prof Jenette Creaney, W/Prof Michael Millward, Prof Leon Adams, W/Prof Gary Jeffries.

Cancer Imaging Facility
http://www.cif.org.au/

Research keywords
Molecular Imaging, PET, hypoxia, cost analysis

Associate Professor Roslyn Francis
(MBBS, FRACP, PhD) is Associate Professor of Molecular Imaging and Head of Department (Nuclear Medicine) at SCGH.
She commenced her research experience over 15 years ago, initially through a PhD project in antibody therapies in the UK. More recently she has participated actively in molecular imaging research projects with novel PET tracers.

A/Prof Francis has collaborations in mesothelioma research and has publications on semi-quantitative volumetric FDG PET imaging for prognosis and response. Recent pilot clinical trials aim to characterise the molecular imaging profile of mesothelioma with FLT PET proliferation imaging, FMISO PET hypoxia imaging and apoptosis imaging with Tc-99m annexin.

In glioma research, A/Prof Francis has collaborated with Prof Nowak in a project of amino acid (C-MET) and proliferation (FLT) PET imaging in suspected recurrent glioma. They are currently undertaking a clinical trial of FET PET amino acid imaging in high-grade glioma, which aims to predict patient prognosis and identify treatment resistant tumours. This study incorporates matched tumour biospecimens, and has a nested substudy to assess the impact of FET PET on radiotherapy planning volumes.

Other current projects include assessment of Fluorocholine PET imaging in hepatocellular carcinoma, and projects focusing on the cost analysis of novel PET imaging techniques in patient management.

Research projects available – Hons, MSc & PhD
Contact A/Professor Roslyn Francis for further information  roslyn.francis@uwa.edu.au
www.medpharm.uwa.edu.au/
**Winthrop Professor Johannes (Hans) Nossent** is the UWA Chair of Rheumatology and Musculoskeletal Medicine has broad clinical experience in the field of Rheumatology, while his research interests focus on systemic inflammatory autoimmune diseases, such as Systemic Lupus Erythematosus, ANCA associated vasculitis as well as inflammatory joint diseases. His scientific efforts concentrate on clinico-epidemiological aspects of these disease as well as the diagnostic and athophysiological implications of autoantibody formation often seen in these diseases.

He has co-authored over 120 scientific, peer reviewed publications and contributed to several Rheumatology text books. He has served on the board of both research, professional and patient advocacy organizations in Europe, and serves as a referee for multiple international journals in the field of Rheumatology.

**Current research:**
- The Epidemiology of inflammatory systemic autoimmune diseases.
- Research interest in the development and application of diagnostic and prognostic biomarkers (genetic/serological) for systemic autoimmune disease
- Studies on predictors and the outcome of systemic rheumatic disease in Western Australia are being developed
- Efficacy and toxicity of long term anti-CD20 B-cell depletion treatment for patients with ANCA associated vasculitis

**Current collaborations:**

Ongoing collaborations with

1. the Bone & Joint Research Group at The University of Tromso in Northern Norway on AS and AAV
2. The Sjogren’s cohort study at the Queen Elizabeth Hospital, Adelaide

**Research keywords**
Autoimmune disease, SLE, prognostic biomarkers, rheumatology

Research projects available – Hons, MSc & PhD
Contact **W/Professor Hans Nossent** for further information  
[johannes.nossent@uwa.edu.au](mailto:johannes.nossent@uwa.edu.au)  
[www.medpharm.uwa.edu.au/](http://www.medpharm.uwa.edu.au/)
Winthrop Professor Graeme Hankey's main research interests include epidemiological studies and clinical trials of treatment strategies for acute stroke and stroke prevention.

Previous studies include the Perth Community Stroke Study [PCSS], Australian Co-operative Research on Subarachnoid Haemorrhage [ACROSS] study, and Health in Men Study [HIMS], for which he was a co-principal investigator; the international, multicentre CHARISMA, AMADEUS, BOREALIS and ROCKET-AF trials, for which he was an executive steering committee member; and the international VITAmins To Prevent Stroke [VITATOPS] trial for which he was the principal investigator.

He is presently co-principal investigator of the Assessment of Fluoxetine In Stroke Recovery (AFFINITY) trial in Australia and New Zealand, and national coordinator for Australia of the NAVIGATE-ESUS trial of rivaroxaban vs aspirin in patients with recent Embolic Stroke of Undetermined Source (ESUS).

Current research
Co-principal investigator of the Assessment of Fluoxetine In Stroke recovery (AFFINITY) trial: An Australasian, multi-centre, randomized, double-blind, placebo-controlled trial of the efficacy of fluoxetine in improving functional recovery after acute stroke. Supported by NHMRC Project Grant, Application: APP1059094 $2,212,237.40 for 2014-2018

Current collaborations include
W/Prof Leon Flicker, School of Medicine and Pharmacology, UWA
W/Prof Osvaldo Almeida, School of Psychiatry and Clinical Neurosciences, UWA
Professor Paul Norman, School of Surgery, UWA
Professor Bu Yeap, School of Medicine and Pharmacology, UWA

Stroke Clinical Research Group
Michelle Tang, Clinical Trials Coordinator
Julia O’Dea, Clinical Trials Coordinator
Anne Claxton, Clinical Trials Nurse Coordinator
Clare Williams, Clinical Trials Coordinator
Sarah Barrett, Clinical Trials Coordinator

Research keywords
Stroke, epidemiology, risk factors, incidence, outcome, clinical trials
Winthrop Professor Michael Millward is the foundation Cancer Council WA Chair of Clinical Cancer Research, University of Western Australia and Head of Medical Oncology at Sir Charles Gairdner Hospital, Perth, Australia. He has a strong track record in delivering clinical trial outcomes, particularly with novel therapeutics and phase I/II studies. He is an international expert on thoracic malignancies and melanoma.

Since November 2008 he has been the President of the Australasian Lung Cancer Trials Group. He has published >100 original papers and >200 abstracts at International meetings.

W/Prof Millward has an active and productive record of research in various clinical and pharmacology aspects of anti-cancer treatments. The theme has been to develop and introduce promising new agents into clinical research in Australia, and optimise and further develop the potential of existing treatment modalities.

Over the last 7 years he has acted as principal investigator on over 70 trials, and acted as an investigator on over 150 trials. He is currently on the management committees of several multi-centre, international trials.

Research keywords
melanoma

Research projects available – Hons, MSc & PhD
Contact Winthrop Professor Michael Millward for further information www.medpharm.uwa.edu.au/

Current research
- early clinical trials and pre-clinical research
- drug resistance
- clinical pharmacology

Participant in the following NHMRC Grant(s):
- Chemotherapy and regulatory T cells
- NITRO: a randomised phase 3 trial of adding nitroglycerin to first line chemotherapy for advanced non-small cell lung cancer
- Are all circulating melanoma cells metastatic?
- Melanoma Mutation Profiling For Personalised Treatment
- Novel surgery-chemotherapy-immunotherapy approaches for lung malignancies

Recent Publications:


**Professor Jenette Creaney** is the Head of the Biomarkers and Discovery unit of NCARD and manages the Mesothelioma Tissue Bank. The research program encompasses discrete projects with the specific objectives of
1. Improving mesothelioma diagnosis
2. Improving treatment outcomes for mesothelioma patients
3. Identifying novel targets for future cancer therapy

Jenette received her PhD in 1995 from La Trobe University (Melbourne, Australia), and has worked in the cancer and immunology fields as a molecular biologist and protein chemist since. Jenette returned to Australia from the US in 1999 to work in Perth principally on the marker discovery projects. The work from the group includes the seminal work on the biomarker mesothelin for use in patients with mesothelioma. This marker is now approved for use in the clinical management of mesothelioma patients. Jenette has received several prestigious awards for her work in Science including the Howard Hughes Research.

**Current research**

**Mesothelioma and Brain Tumours**

**Mesothelioma-**
- Radiological Imaging of Response- PET imaging; FDG and novel agents.
- Clinical trials of novel agents and immunotherapy (Phase I, II).
- Quality of Life research.
- Animal models of chemo-immunotherapy and small animal PET imaging

**High Grade Glioma-**
- AGOG collaboration principal investigator
- Exercise in glioma
- psycho-oncology studies.
- Pluripotency transcription factors in glioma

**Oncology research group**
Asst/ Prof Alistair Cook, Dr Alison McDonnell
Ms Tammy Corica, Dr Tarek Meniawy, Dr Dorit Lesterhuis-Vasbinder, Dr Melanie Jackson, Ms Tracy Seymour

**Current collaborators:-**
- Foteini Hassiotou – Chemistry and Biochemistry UWA (Pluripotency transcription factors)
- Pilar Blancafort – Harry Perkins Institute of Medical Research UWA (Pluripotency transcription factors)
- Georgia Halkett – Curtin University (psycho-oncology)
- Prue Cormie – Edith Cowan University (exercise physiology)
- Jenette Creaney, Roslyn Francis, Bruce Robinson, Richard Lake, Michael Millward - SMP UWA
- Cameron Platell, Christobel Saunders – Surgery, UWA
- Nik Zeps – SJOGH
- Wendy Erber – Pathology and Laboratory Medicine, UWA
- Kerrie McDonald – UNSW
- Samuel Armato III – University of Chicago
- NHMRC Clinical Trials Centre, COGNO, ALTG

**Research keywords**

Mesothelioma, Glioma, Clinical Trials, PET imaging, Patient preferences, Patient needs
Co-operative trials groups

**Research projects available – Hons, MSc & PhD**
Contact **Professor Anna Nowak** for further information

**Professor Anna Nowak** is a Medical Oncologist and member of the National Research Centre for Asbestos Related Diseases (NCARD) who has participated actively in mesothelioma research over the past 10 years, and has received international recognition in this area. She works closely with other researchers in this field at Sir Charles Gairdner Hospital and UWA.

Prof Nowak is active in neuro-oncology research, as a principal investigator of the Australian Genomics and Outcomes of Glioma biobanking initiative, clinical triallist within the CoOperative Group for NeuroOncology (COGNO) and with collaborations in psychosocial oncology, PET imaging, and exercise physiology. She has laboratory collaborations with Dr Kerrie McDonald (UNSW) and Dr Foteini Hassiotou (UWA) in the biology of high grade glioma.

Prof Nowak has been active in pre-clinical and translational research. Her laboratory work in mesothelioma includes a PhD thesis on combination chemo-immunotherapy which was awarded at local, national, and international level. She returned to UWA in 2005 to pursue laboratory work and clinical translational work in mesothelioma after a postdoctoral fellowship working in clinical trials research. She has given numerous oral presentations and published abstracts of her work at national and international meetings.

Her clinical research on measurement of response in mesothelioma culminated in the development of the Modified RECIST Criteria which have been widely accepted for use in clinical trials in this disease and extensively cited. She has been an invited speaker internationally on tumour measurement and clinical trials in mesothelioma. She also performed the first published validation of the use of a quality of life tool in clinical trials in mesothelioma. More recently, she has continued to investigate the role of PET scanning in prognostication and monitoring of treatment response in mesothelioma, as well as novel PET imaging in glioma, and has been the principal investigator in a number of investigator-initiated clinical trials in mesothelioma.
Associate Professor Aron Chakera, MBBS(Hon), MRCP, DPhil, PGDipLATHE, FRACP is a renal physician at Sir Charles Gairdner Hospital, with an interest in immune function as it relates to transplantation, autoimmune diseases, and peritoneal mesothelial cells. Prior to returning to Western Australia in 2012, he was the Clinical Lecturer in Renal Medicine at the University of Oxford, where he worked with Professor Richard Cornall studying lymphocyte subsets and responses to recall antigens in patients receiving immunosuppression.

Research Group:-
Dr Christine Carson
Dr Amanda McGuire

Collaborations:-
W/Prof YC Gary Lee, A/Prof Kevin Pfleger, A/Prof Alec Redwood, Prof Tim Inglis, Prof Moyez Jiwa

Research overview
Research in my group is focused on the immune system and how it is affected by immunosuppression. As infectious diseases are a common problem in immunosuppressed patients, by studying host responses to pathogens we can define levels of immune function that may predict the likelihood of disease and use this to better understand the factors that influence disease development.

The main areas of interest for the group are:
- Host responses to common viruses causing disease after renal transplantation
- Quantification of immune function through the assessment of recall antigen responses
- Interactions between bacteria and peritoneal mesothelial cells and the development of peritoneal-dialysis related peritonitis
- The interface between the immune system and potential pathogens

Research keywords
Renal, translation, immunosuppression, mesothelium, transplantation, infection and immunity

Research projects available – Hons, MSc & PhD
Contact A/Professor Aron Chakera for further information Ph 61 8 6151 0896 aron.chakera@uwa.edu.au

One in six Australians has impaired kidney function, with one in three at risk of developing kidney disease. The Translational Renal Research Group is focused on improving outcomes for patients with renal diseases, by translating advances in basic science from the bench to the bedside.
Current research focuses on the identification and validation of novel biomarkers for mesothelioma using proteomic, immunomic and genomic (including next generation sequencing) strategies. The group has a diverse range of skills which enables the smooth merging of clinical and laboratory aspects of the studies.

Ongoing projects include:
- Utility of the biomarker mesothelin in a clinical setting
- Validation of novel candidate biomarkers for mesothelioma diagnosis
- Characterisation of the genetic alterations in murine and human mesothelioma by next generation sequencing
- Characterisation and biological activity of pleural effusions
- Functional role of MUC1 in mesothelioma
- Genetic susceptibility to mesothelioma

Professor Jenette Creaney is the Head of the Biomarkers and Discovery unit of NCARD and manages the Mesothelioma Tissue Bank. The research program encompasses discrete projects with the specific objectives of:

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Jenette received her PhD in 1995 from La Trobe University (Melbourne, Australia), and has worked in the cancer and immunology fields as a molecular biologist and protein chemist since. Jenette returned to Australia from the US in 1999 to work in Perth principally on the marker discovery projects. The work from the group includes the seminal work on the biomarker mesothelin for use in patients with mesothelioma. This marker is now approved for use in the clinical management of mesothelioma patients.

Jenette has received several prestigious awards for her work in Science including the Howard Hughes Medical Institute Postdoctoral Fellowship and the International Mesothelioma Interest Group (iMig).

Biomarkers and Discovery Unit and the Mesothelioma Tissue Bank

Postdoctoral scientists:
- Dr Ian Dick, Dr Cynthia Gregory, Dr Michelle Tourigny

Research Assistants:
- Ms Justine Leon, Ms Hanne Dare

Students:
- Ms Sophie Sneddon, Mr Shaokang Ma

Research keywords
mesothelioma, diagnosis, pleural effusion, translation

Research projects available – Hons, MSc & PhD
Contact Professor Jenette Creaney for further information
Ph 61 8 6151 0896           jenette.creaney@uwa.edu.au
Winthrop Professor YC Gary Lee

is internationally recognised as a key opinion leader in pleural disease. His translational research program is patient focused and uniquely combines a clinical and laboratory research arm closely integrated with a tertiary pleural service. Prof Lee began his PhD, followed by a postdoc in 1999 and subsequently established his own research group in 2005.

W/Prof Lee’s research successes have been recognised in many countries:-
• Fulbright Scholarship, USA (PhD research 1999-01)
• Wellcome Postdoc Fellowship (UK 2002-04) & Advanced Fellowship (04-07)
• Senior Lecturer & Consultant (Oxford University & University College London 2005-08)
• UK Higher Education Foundation for Clinical Excellence Award 2008
• Winthrop Professorship, University of Western Australia (2009-)
• NHMRC Career Development Fellow (2013-17)

W/Prof Lee has been an invited speaker to 26 countries and delivered many lectures on pleural diseases. He has trained 12 clinical pleural fellows and was a facilitator of pleural training courses in 7 countries in the past five years.

W/Prof Lee has built a strong translational pleural research setup. The new animal models, state-of-the-art imaging facilities, clinical trial and biobank networks add to the platform established in the USA and UK, and will allow for significant expansion in the quality and quantity of research. The clinical pleural service is fast expanding and is one of the most active in Australasia.

Collaborations:-
LIWA – Lung Institute of Western Australia
Aron Chakera – Translational Renal Research Group
National Centre for Asbestos Related Diseases
Telethon Kids Institute

The Pleural Medicine Unit is renowned for its high productivity:-
• 180 original/invited papers: 80% as first/last author (H-index 32; total citations >3200)
• Research grant record: US $8 million
• Covers clinical (phase I to III) and bench (cell biology to animal models) research – all on pleural diseases (esp pleural malignancy and infection)
• Actively involved with biotech companies in developing new pleural drainage devices / therapies.

People:

Ms Cathy Read is an experienced research and clinical trials manager of the Pleural Medicine Unit. She coordinates the clinical studies of the group, including the AMPLE (Australasian Malignant Pleural Effusion) trial, multinational randomized trial on management of malignant effusions.

Dr Sally Lansley joined the Pleural Medicine Unit of LIWA under the supervision of Winthrop Professor YC Gary Lee in 2009. Her current research projects are aimed at investigating novel therapeutic strategies for the treatment of malignant mesothelioma and elucidating the pathobiology of pleural infection and pleural effusion formation using animal models of disease.

Dr Rajesh Thomas (FRACP) is a specialist in Respiratory and Sleep Medicine with a strong interest in clinical research in thoracic cancers, particularly pleural malignancy. He completed a post-FRACP clinical fellowship in lung cancer in 2012 at Sir Charles Gairdner Hospital. Dr Thomas is currently undertaking a PhD research fellowship (supervised by Prof YC Gary Lee, University of Western Australia) to pursue his goal of an academic career in thoracic cancer research. His thesis is aimed at identifying factors that will allow optimization of use of indwelling pleural catheters (IPC), a novel method of managing malignant pleural effusions. He is supported by a WA Cancer Palliative Care Network Fellowship and has won a NHMRC Phd Scholarship.

Dr Edward Fysh is a clinician completing his PhD research in malignant pleural effusion management. He has published 15 articles and won over $400,000 in research awards during his PhD research and was a finalist for the WA Young Scientist Award. He has contributed significantly to the setting up of an indwelling pleural catheter service for Western Australian cancer patients.

Ms Natalia Forrest is a clinical pharmacist with a strong interest in respiratory medicine who is undertaking PhD research in pharmacology of pleural diseases, including the use of novel therapy for pleural infection.

Ms Hui Min Cheah is a PhD student who is investigating the biological role of malignant pleural effusions.

The Unit has trained many clinical and research fellows (mostly home-funded) since 2009, including Drs Redzwan Rashid (Malaysia), Imran Bin Mohammed Noor & Sze Khee Tan (Singapore), Rogier Boshuizen (the Netherlands), Fraser Brims (UK), Claire Tobin (UK), Nicola Smith (New Zealand), Andrew Rosenstengel (Qld) and Alvin Tung (Hong Kong).

Research projects available – Hons, MSc & PhD
Contact W/Professor Gary Lee for further information
Current research

- Mesothelin – a tumour associated antigen for mesothelioma
- Biomarkers for determination of drug sensitivity in mesothelioma
- Identification of a microRNA signature for malignant mesothelioma diagnosis
- Developing biomarkers for the early detection of malignant mesothelioma

Tumour Immunology and Asbestos Diseases Group:

Senior Scientists
Professor Anna Nowak
Professor Richard Lake
Professor Jenette Creaney

Postdoctoral scientists:
Asst Prof Willem (Joost) Lesterhuis
Asst Prof Andrea Khong
Asst Prof Scott Fisher

Research Assistants:
Ms Justine Leon, Ms Hanne Dare, Ms Samantha Woo

Research keywords
mesothelioma, diagnosis, pleural effusion, translation

Contact W/Professor Bruce Robinson for further formation

Bruce robinson@uwa.edu.au
Professor Richard Lake is a molecular immunologist who has published more than 100 research papers. His research over the last fifteen years has been in the area of tumour immunology. He has engaged in a broad teaching portfolio to undergraduate medical and science students. He was a founding member of the National Centre for Asbestos Related Diseases (NCARD) and is a CI in the CCRE for respiratory diseases. His work in mesothelioma over the past ten years has received national and international recognition. His NEJ publication - Advances in malignant mesothelioma – is the most highly cited review of the disease published to date.

Key contributions to research

Richard cloned several novel tumour antigens in the search for a vaccine that might prevent asbestos-induced cancer; made a number of key discoveries in tumour immunology regarding host anti-tumour response and developed the concept of combination chemotherapy and immunotherapy with regard to the role of tumour antigen cross-presentation. He cloned and analyzed the mesothelin promoter and subsequently utilized its tissue specific properties to generate the MexTAG mouse model of mesothelioma. He was part of the team that demonstrated that soluble mesothelin-related protein could be used as a blood test to aid the diagnosis of mesothelioma. He has been involved in several translational studies including the first immuno-gene therapy trial in mesothelioma, the first use of vaccinia as a human cytokine gene therapy vector, and the first autologous tumour vaccine with GMCSF in mesothelioma.