BOSCH INSTITUTE of Medical Research
TRIENNIAL REPORT
2013-2015

THE UNIVERSITY OF SYDNEY

CHIEF EDITORS

Jonathan Stone, Charean Adams, Wannit Tongkao-on
Design: Charean Adams

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Cover Image: Micrograph image supplied by the Bosch Institute Advanced Microscopy Facility. For more detail on individual images visit the Bosch Institute website.

CONTENTS

BOSCH INSTITUTE FACILITY OFFICERS 2015

Left to Right:

Sheng Hua	Molecular Biology
Wannit Tongkao-on	Administrator
XiaoSuo Wang	Mass Spectrometry
Angeles Sanchez-Perez	Live Cell Analysis
Louise Cole	Advanced Microscopy
Thomas Burton	Animal Behavioural
Helen Ball	Bio2
Donna Lai	Molecular Biology

2013-15: GROWTH AND PROGRESS IN A COMPLEX ENVIRONMENT

JONATHAN STONE

EXECUTIVE DIRECTOR

A PERIOD OF GROWTH

The years 2013 -15 have been a triennium of continued success and growth in the Bosch Institute, in an increasingly complex environment. A review of available measures of research performance shows that over the review period:·

- HERDC listable publications from Bosch laboratories increased 19%, to 603 in 2015*.
- The use of Bosch multi-user facilities fell 3.5%, to 581 paid-up users*.
- The numbers of postgraduate research students in Bosch laboratories reached record levels (217*) in 2014.
- Competitive income received by Bosch laboratories from the NHMRC rose 12% to $6.797m p.a.**
- Competitive income received by Bosch laboratories from the ARC fell by 11%, to $1.15m p.a.
- The allocation of Research Infrastructure Block Grant funds to the Institute fell 4% to $1.497m p.a.

(*Record levels; **NHMRC funding peaked in 2014 at $6.914m)

Thus, we achieved record levels of discovery (publications) and student training, in the context of reduced income, the reduction resulting from increased University/Faculty taxation, and from shifts of grant policy, particularly by the NHMRC and ARC. The fall in Facility user numbers in 2015 was limited to one Facility. This was the most popular Facility, and the fall coincided with the provision by the University of free-to-user equipment in the Charles Perkins Centre. That Facility is rebuilding its user base and expanding its services, in response; it remains the most used of all our Facilities. This outcome – of expanding discovery in a time of changing priorities in the sources of our funding – is one of which any institute would be proud. This is in addition to achievements harder to measure – our Young Investigators program, the training done by our Facilities, our conferences and workshops and initiatives. These trends are a tribute, of course, to the work of Bosch scientists, from Honours students to laboratory heads. They are a tribute also to the colleagues who steer and guide the Institute - the Deputy Director (Prof Rebecca Mason), the Chief Operating Officer (Charean Adams), the Young Investigators mentor (Prof Frank Lovicu) and the Officers who lead our Facilities; and the Executive Leadership Group and Advisory Board, who have played critical roles.

Prof Chris Murphy's support as Head of SoMS continues to provide a firm foundation for the Institute. Our commitment remains to build on that foundation, to enhance all aspects of our research.

TIME AND TIDE

Farewell

Bill Stanley – Professor W. Stanley – joined us from the USA, late in 2012, his laboratory a distinguished addition to the Institute's Cardiovascular Theme. His death in late October 2013 robbed us of his person and his distinction. Though he was with us less than a year, he is much missed.

Departures and appointments

Dr Ying Ying Su served as a part time microscopy officer to the Advanced Microscopy Facility from 2012-2104

Dr Cathy Payne was appointed part time officer to the Advanced Microscopy Facility in 2014 and served until mid-2016

Dr Angeles Sanchez Perez has resigned as Officer of the Live Cell Analysis Facility, as of November 2016

The service of all is warmly acknowledged.

FACILITIES – OLD, NEW, RESTRUCTURED

The Institute's multi-user Facilities are central to what we do; they have grown in strength during 2013-15.

Older Facilities – mature success

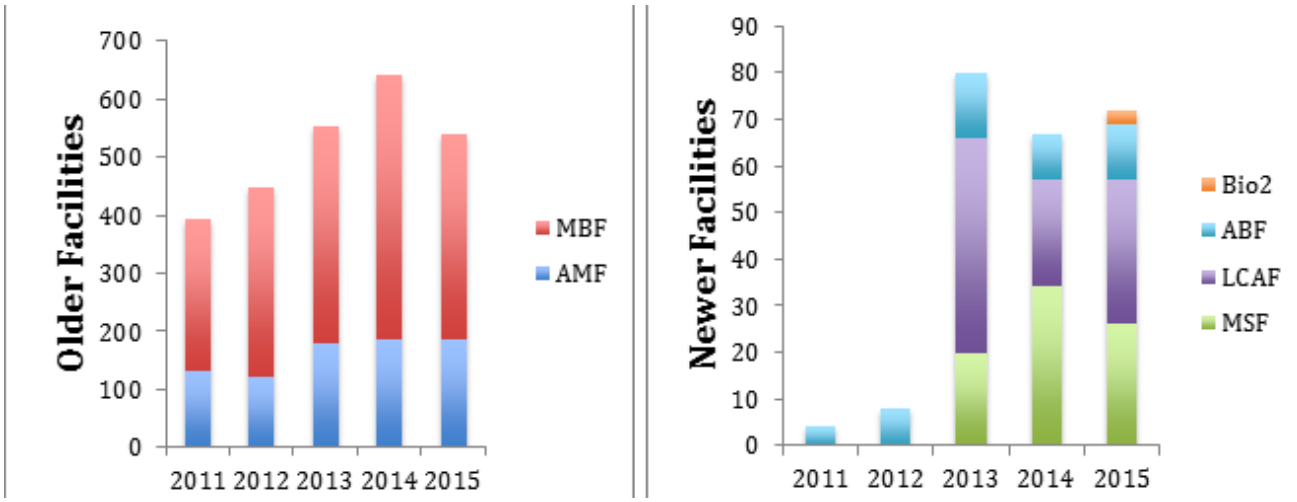
The **Advanced Microscope Facility** is the oldest, established in 1999 when the Head of Anatomy and Histology suggested that Department's confocal microscope become a multi-user facility managed by the Institute of Biomedical Research (Bosch's forerunner). It has expanded greatly, now with over 180 users and 12 major microscope systems. It has had great recent grant success, with a slide scanner system and a light-sheet microscope purchased and deployed, and a super-resolution confocal (Zeiss LSM 800) on order, for deployment early in 2017.

The **Molecular Biology Facility** was the second established, and its user numbers grew spectacularly, to 450 in 2014; in the last year of this triennium, numbers fell, for the first time, to 350. This fall coincides with the move of many Bosch laboratories to the CPC, where significant molecular biology equipment has been provided, without charge to users. In response, the MBF – which remains our most-subscribed Facility and has retained 2105 user levels through 2016 – has expanded its service-for-fee work, has attracted and been able to accommodate external users, paying significant fees. As a result it has built its income, equipment acquisitions continue apace and, in financial terms, it remains the most successful of our Facilities. It is still unique on campus.

Facilities new and restructured

The **Animal Behaviour Facility** was established when Professor Nick Hunt, having led a successful bid for an Intellicage system in 2010, agreed to it becoming the focus of a multi-user facility. With 3-year funding from the Sir Zelman Cowen Universities Fund, an Officer was hired and the Facility has grown since. The 0.5 FTE Officer position is currently appropriate, but the Facility is unique on campus and has acquired a second Intellicage system, and Rotarod and DigiGait systems for the assessment of motor behavior. These acquisitions will ensure that it grows over the next several years; at some level of growth a full-time appointment will have to be considered.

The **Mass Spectrometry Facility** was established in 2013, as an adaptation of an earlier Oxidative Stress Bioanalytical Facility, the vision of Professor Roland Stocker. In late 2012, when Professor Stocker left the University, the Facility was restructured, and is now operating successfully to provide mass spectrometry services and related platforms, including HPLC. User numbers peaked in 2014, falling in 2015 when the University launched a Core Mass Spectrometry Facility. Numbers have stabilized in 2016, however, and this technology has proved particularly suitable for service-for-fees. The Facility has been highly effective in building this aspect of its business plan and we have developed a strong working relationship with the Core Facility.



Facility user numbers 2011-5. Over the reporting period (2013-15) user numbers fell 3.5%, the fall occurring in 2014-5, when the University established a range of core facilities. User numbers have stabilised in 2016, and Bosch Facilities have maintained or built their income through service-for-fees and by attracting external users

The **Live Cell Analysis Facility** was established in 2014, as an adaptation of a previous Flow Cytometry Facility, which dated back to 2006. When the University established a Core Facility in flow cytometry (the Advanced Cytometry Facility at the Centenary Institute), in 2014, we were left with a single, old-model cytometer. So we broadened the technology base to include other live-cell techniques (tissue culture, live cell microscopy), rebuilt our user base and service-for-fees and in 2016 (so outside the review period) we have acquired a more modern, lower maintenance, 10-channel machine. The salary allocation is a cautious 0.5 FTE; if the user base (currently 31) grows towards 100 a full-time appointment will be sought.

Late in 2015, so very late in the triennium. a **Biostatistics and Bioinformatics** ('Bio2') **Facility** was established, again with a three-year salary grant from the Sir Zelman Cowen Universities Fund. At the time of writing it has been functioning for a year, has established a user base of 12, and has provided many low-cost workshops in both statistics and bioinformatics.

So, in an environment made complex by the University's commitment to core facilities, and by shifting priorities in the major granting bodies concerning team size and translational emphasis; and made more stringent as both Faculty and the University have taxed funds which long had been distributed to the Centre/Institute level, the Institute has adapted. I believe that we have adapted creatively, maintaining high-quality, open-access, low-cost platforms, which are diverse and many ways unique on campus. They continue to do what was recognized in the University's Strategic Review of Health and Medical Research – to build cost-effective research platforms step by step, and facilitate research throughout campus.

TRAINING OF SCIENTISTS, YOUNG AND OLD

A major function of the Institute is to train scientists in techniques. All the Facilities bring in new techniques, year after year – new microscope systems, new sequencers, new ways of observing live cells, new mass spectrometry techniques (like mass-spec based imaging), novel ways of assessing cognition or motor behaviour in rodents, custom-designed equipment interfaces and, most recently, in biostatistics and bioinformatics. And with each new technology, the Officers provide training sessions, essential to make the technology accessible. Our young investigators are still strongly influenced by their supervisor's skills and knowledge, but they are also offered access to what is beyond their host lab's strengths. This training, in 2015 at record levels and growing, is one of the most important things that we do.

Separately from the Facilities-based training, Bosch Young Investigators are offered training in scientific writing, in workshops organized through our Young Investigators program; and in oral presentation, through a series of YI symposia.

GOVERNANCE

The Institute is managed day-to-day by the Executive Director, Deputy Director and Chief Operating Officer. They are advised continuously by members and our Officers and more formally by four bodies/mechanisms:

Advisory Board

The current structure of the Bosch Advisory Board is given at:

http://sydney.edu.au/medicine/bosch/about-us/structure/board-directors/index.php

Mr Paul Fegan has chaired the Board throughout 2011-5, and has given most valuable leadership and guidance. The ex officio members of the Board include the Executive Director, Deputy Director, Chief Operating Officer and Head of the School of Medical Sciences. Mr Fegan and the external members have been essential to the Board's central role of oversight and advice. I am grateful particularly for Mr Fegan's advice and counsel.

Executive Leadership Group

The current composition of the Executive Leadership Group can be found at:

http://sydney.edu.au/medicine/bosch/about-us/structure/executive-leadership-group/index.php

This Group plays a central role in the governance of the Institute. All major decisions – about Facility management, conference planning, new activities and expenditures – are considered by the ELG.

Ex Officio members include the Executive Director, the Dean of Medicine, the Head of the School of Medical Sciences, the Deputy Director, Chief Operating Officer and the Leaders of the Institute's 5 Themes. In addition there are five elected members. Our meetings have been formal and bi-monthly.

Facility Officer Meetings

These are convened by the Chief Operations Officer, at monthly intervals. Informal notes are kept of their meetings. The Facilities are complex and adaptive operations, and these meeting serve as fora for many issues, simple and complex. They are increasingly used to develop the business strategies of the Facilities – the things they do in common, the services provided and how each adapts to its particular environment.

The Membership

'Town Hall' meetings of members are held each semester. These are informal (Minutes are not kept), but are important and often very influential.

THE INSTITUTE'S SCIENTIFIC MEETINGS – OUR INTELLECTUAL INFRASTRUCTURE

To develop the Institute's intellectual infrastructure, members meet regularly at 5 levels:

The Annual Scientific Meeting

These one-day meetings bring members, and national and international visitors together for theme-based meetings, reviewing research in a major area of biomedical science, and presenting new work. In the reporting period, the ASM's were:

2013: Visual Neuroscience: Modern Challenges and Australian Pioneers

2014: The Legacy of Victor Chang

2015: Canceromics: from Molecular and Cellular Biology to Breakthrough Therapeutics

Detail of these Meetings can be found at: http://sydney.edu.au/medicine/bosch/events/scientific-meeting/index.php

The Young Investigator's Meeting

These one-day meetings, also held annually are for Bosch YIs – a chance for them to present new work, to network among the Institute's laboratories (which are widely distributed through the University's campuses), and develop presentational skills.

Distinguished Seminars

These are held once each semester, usually with one speaker from campus and the other external. Recent Distinguished Speakers and details of their seminars give can be found at: http://sydney.edu.au/medicine/bosch/events/seminars/index.php

Facility Workshops

Organised by the Facility officers, these half-day meetings are an opportunity for young scientists to present work based on our Facilities. These meetings have a natural emphasis on techniques, exploring the capabilities of the available equipment.

Young Investigator Seminars

Organised by young investigators, these are the least formal of the meetings – opportunities to present thesis work in progress, in an accepting but not totally uncritical environment.

LOOKING AHEAD

No institute (or university or any human organisation) deserves to be here next year, just because it is here this year. Our Institute deserves to continue only if it continues to do the job that its member laboratories want done. That job is to facilitate biomedical discovery, and I believe we are doing it. Recent growth in so many measures of our research productivity (work published, students trained, infrastructure built), and the low administrative costs of our networked structure, are evidence that we are pioneering better (more cost-effective, more effective) ways of 'delivering' knowledge. I believe we have the organizational basis and the member support needed for the Institute to meet its role of research support and facilitation, for the foreseeable; and that the Institute will continue to prosper and grow, as long as we continue to put our energy and intellectual resources into its work.

3 November 2016

PAUL FEGAN

Paul was appointed as the Bosch Institute's Board Chairman in 2010.

Paul has over 30 years experience in the financial services industry. He was appointed to AMP Limited Board in August 2009, was Group Managing Director, Strategy and Corporate Services with Testra from February 2011 - January 2012 and Chief Executive Officer (CEO) of St George Bank from November 2007 and CEO and Managing Director from 2008 until its merger with Westpac Banking Corporation in December 2008. He was also a Director of St George's funds administration subsidiary, Asgard Wealth Solutions. Prior to joining St George, Paul was based in the UK as Chief Operating Officer of Yorkshire Bank. He held director positions in both Yorkshire Bank and Clydesdale Bank and a series of senior appointments with National Australia Bank in Australia, the US, Hong Kong, the UK and Ireland.

Paul completed his Master of Business Administration at the University of Melbourne in 1996. Mr Fegan is a Fellow of the Australian Institute of Banking and Finance and a Graduate of the Australian Institute of Company Directors.

JONTHAN STONE

Professor Stone completed a BSc (Med) and PhD (1966) in P.O. Bishop's group at the University of Sydney, beginning a life-long interest in the function, structure and diseases of the visual system. After postdoctoral work in Chicago and Münich, he rejoined Bishop's group, at the Australian National University, in 1970, as a Research Fellow. He moved to Anatomy at the University of New South Wales (1976-1986), and then to the Challis Chair of Anatomy (Sydney, 1987-2003). He is currently Professor of Retinal and Cerebral Neurobiology in Physiology, University of Sydney and Managing Trustee, Sir Zelman Cowen Universities Fund.

REBECCA MASON

Professor Rebecca Mason is an internationally recognized leader in the role of Vitamin D, particularly in photoprotection and is a media commentator on the importance of vitamin D.

Rebecca Mason graduated in Medicine at Sydney University in 1975. After hospital service, she completed a PhD on vitamin D at Sydney hospital, then moved to Royal North Shore Hospital in the Section of Endocrinology. In 1988, she accepted a position with the Department of Physiology, Sydney University, though still retains a position with Endocrinology and Cancer Genetics at Royal North Shore Hospital.

CHRIS MURPHY

Professor Murphy is Bosch Professor of Histology and Embryology and Professor of Female Reproductive Biology in the Faculty of Medicine. He has been Associate Dean and Head of the School of Medical Sciences since 2001 and was Chair of the Academic Staffing Committee from 2004 to 2008. Presently he is on the Divisional Boards of MNDP (Medicine, Nursing, Dentistry and Pharmacy) and also DNS (Science, Veterinary Science and Agricultural Science). Chris is also presently Vice-President of the University of Sydney Association of Professors (USAP).

ARTHUR CONIGRAVE

Prof Arthur Conigrave MD PhD FRACP. Deputy Dean and Associate Dean (Finance), Faculty of Medicine, University of Sydney is Professor in Molecular Nutrition and Cellular Endocrinology in the School of Molecular Bioscience.

Prof Arthur Conigrave is an internationally recognised research leader on the links between nutrient-sensing and the metabolic basis of health and disease. He is particularly concerned with the origins of metabolic bone disease including osteoporosis, disorders of calcium metabolism and the impact of dietary nutrients on the control of appetite and weight gain.

Arthur Conigrave graduated in Medical Science from the University of Sydney in 1978, in Medicine in 1982, as a Master of Science in 1983 and as a Doctor of Philosophy in 1992. He is a Fellow of the Royal Australasian College of Physicians (1987). He is an Endocrinologist at Royal Prince Alfred Hospital. In 1999-2000, Prof Conigrave was at Harvard Medical School investigating the nutrient sensing properties of a specific family of receptors that is represented in the human genome at an exceptionally high level. This work has led to a major rethink about the molecular mechanisms that underpin nutrient sensing in the body.

JANICE TAYLOR

Janice has been in Australia since 1991 having been a business migrant from New York City in that year. Since then she has worked within infrastructure development as well as within the not for profit sector since 2001. In June 2007 Janice joined the board of the Bosch Institute as a skill based board member specializing in Brand management, fundraising and business development. Janice works to ensure collaboration and consultation is an integral step in the journey of Bosch with its many stakeholders. Janice's personal ethos includes alignment to values based organisations that work to deliver equity, justice and social inclusion. Education and training are paramount in this pursuit of excellence and quality of life for those who are served. Janice has attained a Bachelor of Arts and Master of Arts from the City University of New York in Speech and Communications.

ROWENA TUCKER

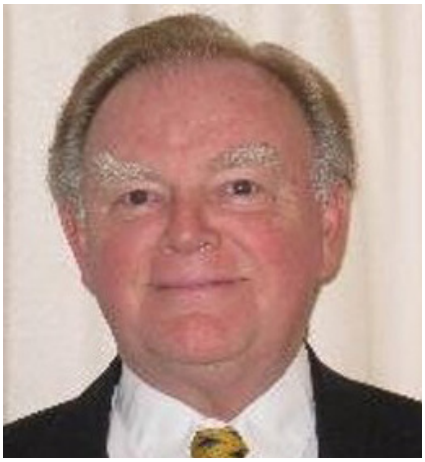
Rowena Tucker is the CEO of the Diabetes Vaccine Development Centre (DVDC) Limited. In this role she provides overall program management for the Centre which currently has clinical trials targeted at developing a vaccine to prevent or delay the onset of type 1 diabetes.

Prior to joining the DVDC in August 2008, Rowena was Director of Medical Research at the NSW Office for Science and Medical Research. In this role she led the development of policies and strategies aimed at supporting and building research capacity in NSW.

She has held a number of other senior government roles including Associate Director and Senior Principal Policy Officer in the Ministry for Science and Medical Research, and Manager of R&D Policy at NSW Health.

She has also worked at CSIRO, the University of New South Wales and as a consultant.

Rowena gained a Master of Science Degree from the University of New South Wales in 1990



GLENN WRAN

Glenn Wran is Director at Energy 2035 Limited, Owner & Director at Linden Enterprises Australia Pty Ltd.

Formerly Consultant at The Executive Connection (TEC), Director at Interplast Aust & NZ, Managing Director at Investment Capital Pty Ltd, District Governor at Rotary International, Divisional Manager at NSW Businesslink, General Manager at Department of Commerce, Director at CSAHS, Chairman at Childrens Cochlear Implant Centre, Director at Business Enterprise Centre, Director Marketing & PR at Bond University.

BOSCH INSTITUTE
EXECUTIVE LEADERSHIP GROUP

The Executive Leadership Group consists of ex- officio members (the Director, Deputy Director, Chief Operating Officer, Young Investigators' mentor), the leaders of each of the Institute's five Research Themes, and representatives elected by members. The Group provides advice to the Board and Executive Director concerning issues such as:

- implementation of agreed operational policies, planning and leadership processes
- cultivation of an innovative culture and climate
- implementation of agreed strategic plans
- budget management
- planning for growth

EXECUTIVE LEADERSHIP GROUP

Professor Jonathan Stone, Executive Director
Ms Charean Adams, Chief Operating Officer
Professor Des Richardson
Professor Tailoi Chan-Ling
Associate Professor Bill Phillips
Associate Professor Elena Bagley
Associate Professor Stuart Fraser
Professor Rebecca Mason, Deputy Director
Professor Nicholas King
Professor Roger Dampney
Professor Frank Lovicu
Associate Professor Susan McLennan
Associate Professor Catherine Leamey
Associate Professor Stephen Assinder
Associate Professor Margot Day

According to the Executive Director:

The Executive Leadership Group is what its name suggests - a group of members willing to step out of their laboratories, and provide leadership for the Institute.

It is a source of ideas, and a clearing house for ideas that may arise from members, from the Advisory Board or from the Director or the Deputy or from the COO, as we respond to opportunities and challenges.

It meets five times a year, and its Agenda includes reports on events past, and plans for scientific meetings and seminars, and for fund-raising.

The establishment of new facilities always requires the ELG's support, as do the reconstruction of old facilities; how to respond to University campus plans, how to take the opportunities and respond to the challenges which arise in any complex institution. The Group also advises on how best the Institute can support the University's research priorities.

The Institute's growth has been strong in recent years; we have met the challenge of the University's 2012 Strategic Review of Health and Medical Research, and the Institute's needs for the next 5 years (to 2020) have been formulated and submitted to the Faculty's planning process.

The ELG will be a key group in figuring out the way ahead - how to contribute to the future while maintaining the best of what we now do.

BOSCH INSTITUTE
YOUNG INVESTIGATORS

The Bosch Young Investigator Program is coordinated by a committee of Young Investigators (Postgraduate Research Students and Junior Postdoctoral Researchers), with each member representing different disciplines of the School of Medical Science, including members from other research laboratories affiliated with the Bosch Institute.

The Committee coordinates a number of events throughout the year with the primary purpose of each event to bring the large number of Young Investigators together. Given the sparse geographic spread of the Institutes laboratories and researchers across campus, this is the most fundamental aspect leading to the success of the BYI program. Most of the time the events are organised to encourage scientific exchange; however social activities are also organised to promote awareness and encourage involvement of all young investigators especially those newest to the Institute.

The combination of both the scientific and networking social events bring together young investigators, encourage participation and overall improve the student research experience.

COMMITTEE MEMBERS

2013

Sam Dowland
Marco Morsch
Vicki Velonas
Shawna Foo
Phuoc Huynh
Angelica Merlot
Goldie Lui
Charmaine Green
Rachel Shpaberg
Melissa Barron
David Clarke
Vicki Xie

2014

Sam Dowland
Angelica Merlot
Charmaine Green
Miranda Mathews
Vicki Velonas
Ben Harris
Rachel Shpaberg
Sadaf Kalam
Shawna Foo
Ben McIlwain
David Clarke
Kevin Danastas
Rosita Pang
Goldie Lui
Vicki Xie

2015

Ben Harris
Miranda Mathews
Sadaf Kalam
Kevin Danastas
Rosita Pang
David Clarke
Leyla Fouani
Sharleen Menezes
Hannah Glover
Victoria Tung
Chau Le

Kioloa Retreat 2014

EVENTS COORDINATED BY THE BOSCH YOUNG INVESTIGGATOR'S COMMITTEE

ANNUAL BOSCH RETREAT

Held annually at the idyllic Kioloa Coastal Campus, the annual retreat is a rare opportunity for postgraduate students and postdoctoral trainees alike to network with their peers, gain advice on career development and pick up valuable presentation, writing and other skills - all at a great location by the beach.

Kioloa Coastal Campus

WELCOME PARTY

The BYI committee prides itself on encouraging students to venture out of their labs and interact with their fellow researchers. Each year, the BYI's welcome new students and the Honours cohorts to the Institute with a **Welcome Party** - a themed cruise around Sydney Harbour.

Other annual social events organised by the BYI's that enable the bringing together of students from all points on campus include a **Trivia Night** and **Games Night**.

ACADEMIC/ SCIENTIFIC EVENTS

SEMINAR SERIES

Each semester the BYI's coordinate an afternoon seminar. Two special seminars featured in 2015 were the "Bosch Young Investigators Seminar Series", 22nd May and the second semester 2015, "Celebrating Women in Science" seminar, 25th September - links to all the Seminar Series programs can be found at http://sydney.edu.au/medicine/bosch/young-investigators/Seminar-series/index.php

MOLECULAR BIOLOGY FACILITY

DONNA LAI

OVERVIEW

The Bosch Molecular Biology Facility (MBF) is the largest facility of the six core facilities developed within the Bosch Institute (Bosch). The Bosch MBF is an open access, shared-use research facility. It consists of five laboratories in the Anderson Stuart Building (F13) and Blackburn Building (D06). Two of them are PC2 facilities, including Anderson Stuart PC2 facility (Room N132-N138, Anderson Stuart Building) and Bosch Blackburn MBF (Room 319-325, Blackburn Building). The other three laboratories are located within the Anderson Stuart Building (Room N232, W312 and N452, Anderson Stuart Building).

MBF PERSONNEL

Dr. Donna Lai and Dr. Sheng Hua are two full-time staff members within the facility. Several casual staff were hired to help the day-to-day running of the facility, including Dr. Chong Ho, Mr. Johnny Teng, Ms. Yaxin Lu and Ms. Catherine Chen. We received $236,153 salary support from CINSW and $135,000 co-contributions from USYD DVCR, Sydney Medical School (SMS) for 2012-2015 and $272,876 from CINSW and $165,000 co-contributions from DVCR, SMS and Bosch for 2015-2018.

Dr. Lai is a primary supervisor for the following students in 2014-2015. Ms. Leila Reyes (SMS Summer Scholarship Student), Mr. Jimmy Wu (International Exchange Medical student) and Mr. Jiuzhou (Mike) Zhao (Graduate Diploma Student).

LABORATORY PERSONNEL/ STUDENTS

Dr Donna Lai	
	Senior ResearchFellow,
	Facility Officer
	2004 - present
Dr Sheng Hua	Facility Officer
	2012 - present

USERS (2013-2015)

The MBF is an open access multi-disciplinary core facility used by a diverse group of researchers, including undergraduates, graduate students, post-docs, technicians and clinicians. The MBF users are from 118 laboratories, 40 disciplines/Schools/Institutes/ Centres and 10 Faculties from 32 institutions, including University of Sydney, Bosch Institute, Brian & Mind Research Institute, The Boden Institute of Obesity, Nutrition, Exercise & Eating Disorders, Save Sight Institute, Heart Research Institute, Queen Elisabeth II Research Institute for Mothers and Infants, Centenary Institute, ANZAC Institute, Woolcock Institute of Medical Research, Institute of Dental Research, Kolling Institute of Medical Research, Melanoma Institute Australia, Royal Prince Alfred Hospital, Royal North Shore Hospital, The Children's Hospital at Westmead, Sydney Dental Hospital, Garvan Institute of Medical Research, Victor Chang Cardiac Research Institute, Ingham Institute for Applied Medical Research, University of New South Wales, University of Technology, Sydney, Macquarie University, University of Western Sydney, University of New England, Liverpool Hospital, Australian Red Cross Blood Service, Australian Biologics Testing Services, Ceramisphere Pty Ltd, Teva Pharmaceuticals Australia Pty Ltd, Minomic International Ltd, and Novogen Ltd.

The numbers of MBF registered users in 2013-2015 are shown in Table 1 and Figure 1 below. There were 83 more users in 2014 compared to 2013, representing 22% increase. However, the number of MBF users dropped in 2015 by 22% (100 less users compared to 2014) because roughly half of the Blackburn building residents moved to the Charles Perkin Centre.

TRANING/WORKSHOPS

We ran 123 molecular biology workshops and group training sessions in 2013-2015 in total, including Western Blotting workshops, RT-qPCR workshops, PC2 training and equipment-related group training sessions. 1612 people in total attended these training programs. The numbers of MBF workshops and training sessions and participants in the past 3 years are listed in Table 2 and shown in Figure 2 and Figure 3. We provided over 800 one-on-one training and consultation sessions to our users in the past 3 years.

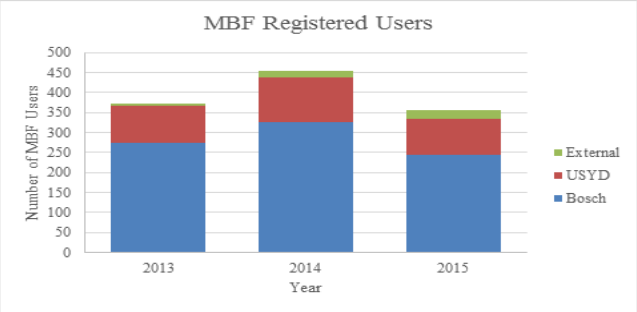


Figure 1. Number of MBF registered users in 2013-2015

Year	Bosch	USYD	External	Total
2013	274	93	5	372
2014	325	114	16	455
2015	245	90	20	355

Table 1. Number of MBF Registered Users in 2013-2015

Year	MBF Workshops /Training sessions	MBF Workshops /Training Participants
2013	46	520
2014	33	482
2015	44	610
Total	123	1612

Table 2. Number of MBF Workshops and Training Sessions and Participants in 2013-2015

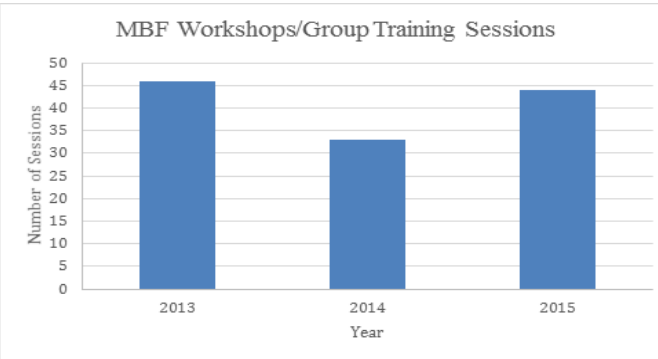


Figure 2. Number of MBF Workshops and Training Sessions in 2013-2015

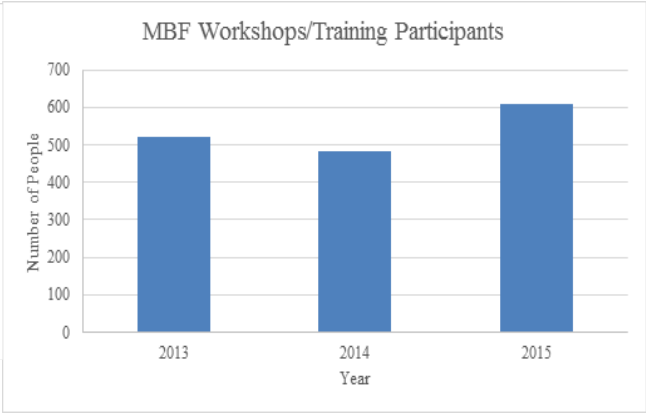


Figure 3. Number of MBF Workshops and Training Participants in 2013-2015

EQUIPMENT PURCHASED (2013-2015)

We purchased 26 pieces of new equipment and upgraded the IncuCyte FLR and QX100 ddPCR systems to the newer models, i.e. IncuCyte ZOOM and QX200 ddPCR, respectively, in 2011-2015.

- QX100 Droplet Digital PCR System (funded by NHMRC, purchased in 2013)
- Upgraded the QX100 Droplet Digital PCR System to QX200 Droplet Digital PCR System (upgraded in 2015)
- HydroFlex 3-in-1 plate washer (purchased in 2013)
- Upgraded the IncuCyte FLR Live Cell Imaging system to IncuCyte ZOOM Live Cell Imaging System (upgraded in 2013)
- Peggy Simple Western System (funded by Sydney Cancer Research Fund, purchased in 2013)
- QuantStudio 12K Flex OpenArray High-throughput Genetic Analysis System (funded by Ramaciotti, purchased in 2013)
- Thermo Fisher Multifuge X3R Centrifuge (purchased in 2013)

- C1 Single Cell Auto Prep System (funded by CINSW, purchased 2014)
- Cytation 3 Imaging System (purchased in 2014)
- CLARIOstar Multimode Microplate Reader (funded by NHMRC, purchased in 2014)
- Guava easyCyte 6-2L flow cytometer (purchased in 2014)
- Two Don Whitley Hypoxic Chambers for Seahorse Analyzers and IncuCyte Live Cell Imaging System (funded by NHMRC, purchased in 2015)
- 2nd and 3rd IncuCyte ZOOM Live Cell Imaging Systems (funded by Sydney Cancer Research Fund and USYD Collaborative Research Fund, respectively, purchased in 2014 and 2015, respectively)
- Fragment Analyzer (funded by Rebecca L Cooper Medical Research Foundation, purchased in 2015)
- Biacore T200 Molecular Interaction Analysis System (funded by CINSW, purchased in 2015)
- Tri-card Liquid Scintillation Counter (purchased in 2015)
- Geno Grinder (purchased in 2015)
- iBlot and Wet Western Transfer system (purchased in 2015)
- NanoSight NS300 Nanoparticle Analysis System (funded by USYD Collaborative Research Fund, purchased in 2015)
- Zetasizer Nano ZS System (funded by USYD Collaborative Research Fund, purchased in 2015).
- Nanolive 3D Cell Explorer (purchased in 2015).
- AKTA Start FPLC system (purchased in 2015).
- HERAcell 240i Tri-gas Incubator (purchased in 2015).
- Ice Flake machine (purchased in 2015).
- BMG FLUOstar Omega fluorescence microplate reader (purchased in 2015).
- Two Viaflo Assist Systems (purchased in 2014 and 2015).

EXTERNAL FUNDING TO FACILITY

(2013 - 2015)

MBF received 14 grants totalling $2,967,946 funding to support equipment purchase and staff salary in 2013-2015. The details are as below.

Source	Project Title	Collaborators	Awarded	Duration	Amount
Sydney Cancer Research Fund Infrastructure grant	Robotic High Throughput Western Analysis system for the Open Access, Multi-Disciplinary Sydney Cancer Research Core Facility	Des Richardson, Richard Scolyer, Michael Boyer, Gary Halliday, etc.	2013		$200,000
NHMRC Equipment Grant	QX100 Droplet Digital PCR System for Shared Use at the Multi-User Molecular Biology Core Facility	Des Richardson, Richard Scolyer, Judy Black, Gary Halliday, Jillian Kril, MacDonald Christie, etc.	2013		$74,750

CINSW Research Equipment Grant	BioMark HD System for shared use in the Anderson Stuart Bosch MBF	CIs: Des Richardson, Richard Scolyer, Cheok Soon Lee, Gary Halliday, Michael Murray, etc.	2013	$326,895
Clive & Vera Ramaciotti Foundation Equipment Grant	QuantStudio 12K Flex OpenArray High-throughput Genetic Analysis System for Shared Use in the Open Access Multi-user Bosch Molecular Biology Core Facility	Jonathan Stone, Judy Black, Anand Hardikar, Sue McLennan, MacDonald Christie, Richard Scolyer, etc.	2013	$74,000
NHMRC Equipment Grant	CLARIOstar Multimode Microplate Reader for Shared Used in the Open Access, Multi-User Molecular Biology Core Facility	Des Richardson, Richard Scolyer, Judy Black, Gary Halliday, Jillian Kril, Michael Murray, etc.	2013	$60,000
NHMRC Equipment Grant	Hypoxic Chambers for Seahorse XF Extracellular Flux Analyzers for Shared Use in the Open Access, Multi-User, Bosch Molecular Biology Facility	Des Richardson, Richard Scolyer, Martin Ng, Michael Murray, Jillian Kril	2014	$178,670
USYD Collaborative Research Equipment Grant	Automated High Throughput Hypoxic Live Cell Imaging System for Shared Use in the Open Access, Multi-User Bosch Blackburn Molecular Biology Facility	Gary Halliday, Des Richardson, Georgina Long, Rebecca Mason, Chris Murphy	2014	$170,573
Rebecca L Cooper Medical Research Foundation Equipment Grant	Fragment Analyzer for the open access, multidisciplinary Bosch Molecular Biology	Sue McLennan, Donna Lai	2014	$22,000

CINSW Research Equipment Grant	Biacore T200 Molecular Interaction Analysis System for the Open Access, Multi-Disciplinary Sydney Cancer Research Core Facility	Des Richardson, Richard Scolyer, Georgina Long, Gary Halliday, Michael Murray, Cheok Soon Lee, Naresh Kumar, Rebecca Mason, Richard Payne, Peter Lay	2015	$354,048
Bosch Small Equipment grant	"State-of-the-art Tri-Carb® Liquid Scintillation Counter for the Multi-User Bosch Molecular Biology Facility"	Des Richardson, Donna Lai, Rebecca Mason, Peter Lay, Gary Halliday, Hala Zreiqat, etc.	2015	$17,000
Bosch Smalll Equipment grant	2010 Geno Grinder for shared use in the Bosch Molecular Biology Facility	Brent McParland, Ann Mitrovic, Rachel Codd, Jonathan Arnold, Des Richardson, Sumit Sahni, etc.	2015	$20,000
CINSW Research Infrastructure Grant 2015	Advanced Technical Support for the Open Access, Multi-Disciplinary Sydney Cancer Research Core Facility	"CI: Prof. Des R. Richardson AIs: Richard Scolyer, Georgnia Long, Diona Damian, Michael Murray, etc."	2015	$272,876
NHMRC Equipment Grant	NanoString nCounter SPRINT Profiler System for Shared Use in the Open Access, Multi-user, Bosch Molecular Biology Facility	Des Richardson, Richard Scolyer, Michael Murray, Georgina Long, Barry Slobeman	2015	$199,000
USYD Collaborative Research Equipment Grant	"Advanced NanoSight NS300 System for Shared Use in the Open Access, Multi-User, Bosch Blackburn Molecular Biology Facility"	Gary Halliday, Des Richardson, Kim Chan, Georges Grau, Nick Shackel	2015	$190,000

ACCESS FEE INCOME

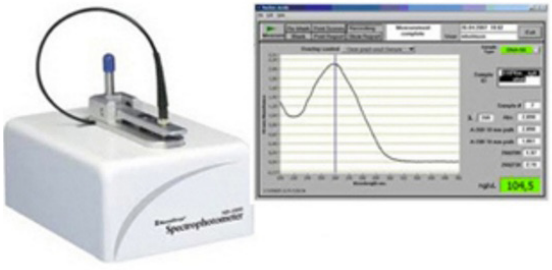
In the past three years, MBF received over $90,000/year access fee income plus $5,000/year access fee subsidy from the Central Clinical School (CCS) (please see the details in Table 4 and Figure 5).

HIGHLIGHTS (2013-2015)

- Following Prof. Brian Morris retirement in 2014, MBF took over the wet lab space in room N452, Anderson Stuart Building. It increased the MBF wet lab space by 20% (about 65m2). The room is mainly used to accommodate the equipment for protein analysis (e.g. protein qualification, Western blotting, BLItz systems etc), nucleic acid analysis (e.g. Nanodrop spectrophotometer, microarray system, DNA sequencing and fragment analysis system etc.), microplate readers, nanoparticle analysis (e.g. NanoSight NS300 and Zetasizer systems). It significantly increases the MBF wet lab capacity.
- We successfully obtained CIS funding to install several new benches with extra power points and data ports in room N232, Anderson Stuart building in 2015. So, we are able to install several high-end equipment on these new benches, e.g. NanoString SPRINT nCounter Profiler, Biacore T200, and Peggy Simple Western System etc.
- We started to provide contract services on various applications in 2014, e.g. live cell imaging (IncuCyte ZOOM), mitochondrial function analysis (Seahorse XF Analyzers), nucleic acid analysis including DNA & RNA purification, genotyping, Qubit assays, Bioanalyzer assays, qPCR, OpenArrays, QX200 Droplet digital PCR, Pyrosequencing, Peggy Size-based or Charge-based Simple Western assays, Luminex multiplex assays, microplate assays, biomolecular interactions using Biacore T200 etc. We achieved over 36-fold increase on income earned from contract services in 2015 compared to 2014 (Please see the details in Table 5 and Figure 6).

C1 Single Cell Auto Prep System

Bioanalyzer 2100



NanoDrop

Qubit 2.0

Equipment for Nucleic Acid Quantitation and Quality Control

For more information on the Bosch Molecular Biology Facility (visit http://sydney.edu.au/medicine/bosch/facilities/molecular-biology/index.php).

ADVANCED MICROSCOPY FACILITY

LOUISE COLE

OVERVIEW

The Bosch Institute Advanced Microscopy Facility (AMF) is a well-maintained facility that provides and supports over 180 research students and scientists annually with their microscopy requirements. The Facility is open access and is therefore available to students and researchers from the University of Sydney as well as external Institutes. The AMF has continued to grow both in terms of user numbers and equipment since 2013.

The highlights over the past three years include grant success that has enabled the purchase and implementation of two key technologies: **(i) high-throughput imaging** (ZEISS Axioscan slide-scanning microscope) and **(ii) light-sheet microscopy** (La Vision BioTec Ultramicroscope II.) These two instruments add to the suite of seven light and/or laser microscopes already available to researchers at the Bosch AMF (http://sydney.edu.au/medicine/bosch/facilities/advanced-microscopy/index.php). As a whole, the imaging equipment available at the Bosch AMF has allowed both scientists and students alike to increase their research output using tools that are both routine and innovative.

LOCATIONS

The AMF is located in the Anderson Stuart Building, F13 in the School of Medical Sciences and currently has two members of staff: One full-time Facility Manager and a part-time (0.5FT) Microscopy Officer.

USERS (2013-2015)

The number of registered users has increased by 46% since 2013 (127 users in 2013) and maintained relatively constant at approximately 180 users per year since 2014 (186 users in 2014 and 185 users in 2015).

TRANING/WORKSHOPS

The AMF runs group microscope training workshops for all instruments and related software twice a year (Winter/Spring and Summer/Autumn), as well as on demand. One-on-one training is offered immediately following the registration process, is conducted weekly for workhorse instruments (eg. wide-field fluorescence and confocal microscopes) and on demand.

Additional activities carried out in the AMF include **specialised workshops** on image analysis and processing (Bitplane Imaris and MetaMorph software) and new imaging technologies. The Bosch AMF hosted the first national light-sheet microscopy meeting in Australia in November 2015 and organised a light-sheet microscopy workshop as part of the International Focus On Microscopy Meeting in Sydney Australia in April 2014.

LABORATORY PERSONNEL/ STUDENTS

Dr Louise Cole	Senior Research Fellow Facility Officer 2002 - present
Cathy Payne	Facility Officer 2014 - 2016

EQUIPMENT PURCHASED

Significant grant and support funding since 2013 has allowed the purchase of the following instruments and accessories:

ZEISS Axioscan slide-scanning microscope (above left) provides routine high-throughput bright-field and wide-field fluorescence imaging of samples on slides and the La Vision BioTec Ultramicroscope II (right) provides light-sheet imaging capabilities for large cleared samples.

- **ZEISS Axioscan slide-scanning microscope**

Funds provided by a University of Sydney Equipment Grants Scheme 2012 (CIA: King), Bosch Institute, School of Medical Sciences, Pathology and RIBG funding 2013. This instrument was the first ZEISS Axioscan to be installed in Australia.

- **La Vision BioTec Ultramicroscope II.**

Funds provided by Clive and Vera Ramaciotti Equipment Grant 2013 (CIA: Keay), NHMRC Equipment Grant 2013 (CIA: Murphy), DVCR, Anatomy & Histology, Bosch Institute and School of Medical Sciences. This instrument was the first Ultramicroscope II to be purchased and installed in the Southern Hemisphere.

- **Upgrade of the Leica Stereology microscope to the Olympus MBF/ StereoInvestigator Microscope**

Funds were provided by RIBG 2013.

- **New Argon laser for the ZEISS LSM510 Meta confocal microscope**

Funds provided by RIBG 2013.

- **Stage incubator for live cell imaging on the PALM laser microdissection microscope**

Funds provided by a Bosch Small Equipment Grant in 2013.

- **Perkin Elmer Nuance FX Camera**

Funds provided by a Bosch Small Equipment Grant 2014 (CIA: Owens), Naylor and Johnstone Laboratories and the AMF.

- **New high-resolution monochrome camera for the ZEISS deconvolution microscope**

Funds provided in 2015 by the Bosch Institute.

- **Electro-optical Modulator upgrade for the La Vision BioTec two-photon microscope**

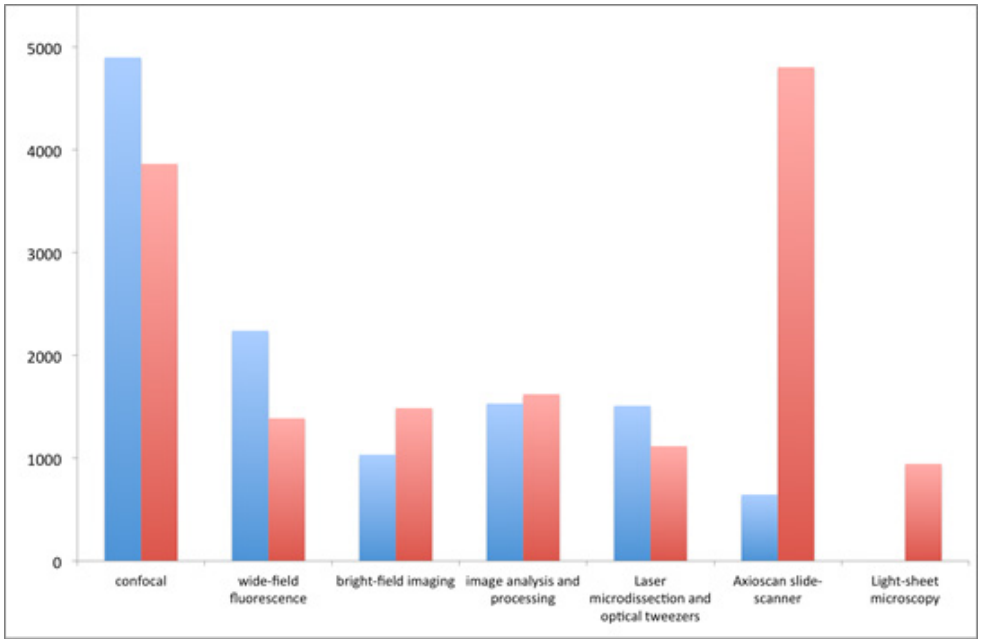
Funds provided in 2015 by the School of Medical Sciences.

- **Two high-end Precision tower computer workstations for image analyses**

Funds provided in 2015 by the School of Medical Sciences.

EQUIPMENT USAGE

The total usage (hours used annually) of equipment has increased since 2013 with a **22.1% increase in total usage** recorded in 2015 compared to 2014. The graph below shows the total usage of the major imaging technologies at the Bosch AMF in 2014 and 2015. The increased age of the confocal technology (ZEISS LSM 510 Meta confocal microscope was purchased in February 2007) has led to a decline in its usage since 2014, although it is still a popular workhorse instrument (see chart below). There has also been a significant trend towards the use of high-throughput imaging provided the ZEISS Axioscan slide-scanning microscope that allows both bright-field and fluorescence imaging (see both graph and table below). Up to 100 microscope slides can be loaded at one time and the slides scanned overnight, thereby freeing up time for researchers to carry out other activities.



Graph to show the total usage (hours) of the major imaging technologies an in the AMF in 2014 (blue) and 2015 (red).

Dr Louise Cole has been the full-time Facility Officer since 2006 and is currently the vice-president of Light Microscopy Australia. She has attended the following international conferences since 2013: Focus on Microscopy 2013 (Maastricht, Holland), 1st International Light-sheet microscopy Meeting 2014 (Barcelona, Spain), Focus on Microscopy 2014 (Sydney, Australia).

FACILITY HIGHLIGHTS

The **Bosch AMF Micrograph Competition** was organised in May-June 2015 and we received almost 70 entries. Nine prizes were kindly provided by the sponsors: Bosch Institute, Olympus Australia, Bitplane, Coherent Scientific and Nikon Australia, Leica Microsystems Australia, LasTek and Perkin Elmer. The Top 20 images were printed (Vision Graphics, St Leonards, Sydney) and are on permanent display in the Anderson Stuart Common Room, Anderson Stuart Building F13 at the University of Sydney.

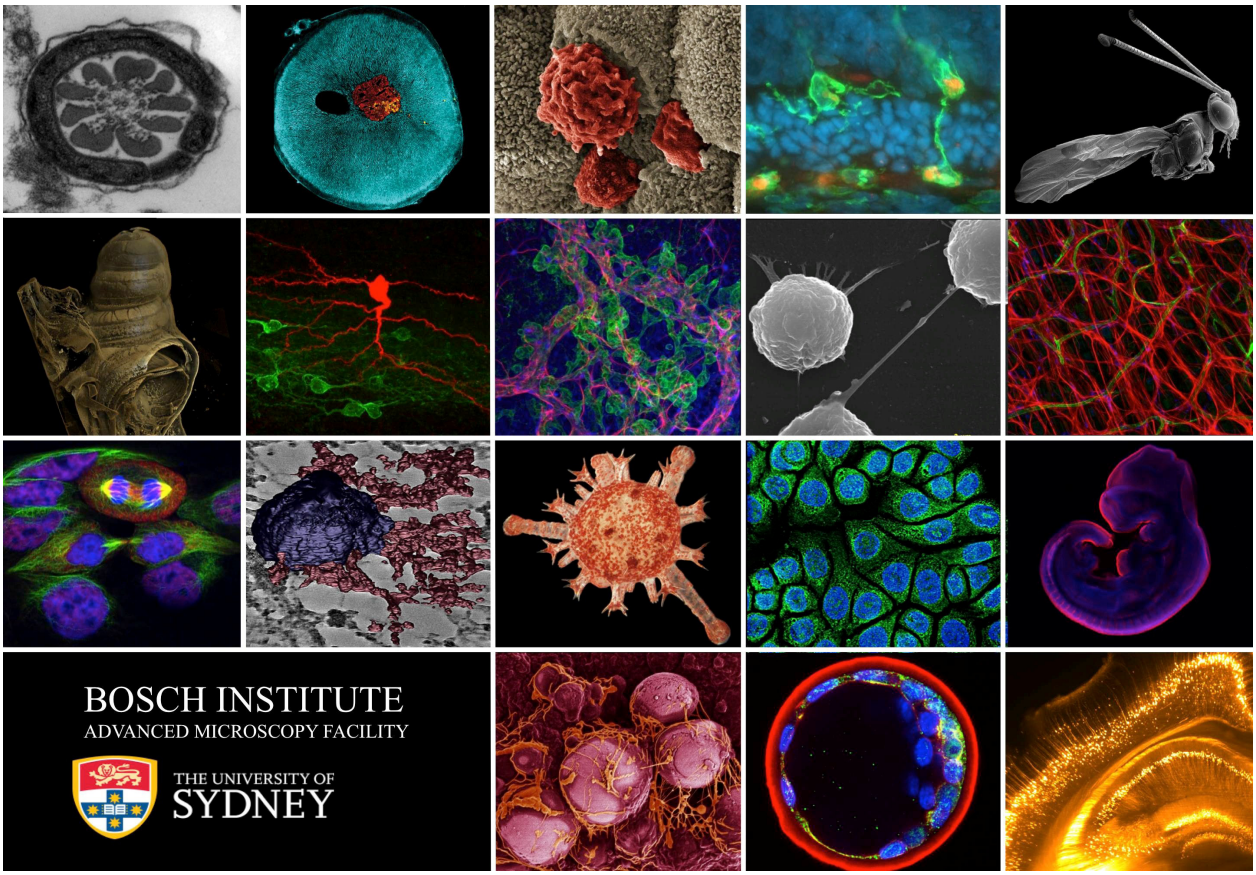


Image showing eighteen of the Top 20 micrographs of 2015

PUBLICATIONS
(2013 - 2015)

Key publications from the Bosch AMF since 2013 include the following 30 publications (15 in 2015, 16 in 2014, 9 in 2013) can be found at http://sydney.edu.au/medicine/bosch/facilities/advanced-microscopy/publications/index.php.

EXTERNAL FUNDING TO FACILITY

(2013 - 2015)

Funding from the Anatomy & Histology Department (USYD) in 2013 allowed the purchase of **PPMS Facility Management software (Stratocore)** that has been used since then to manage bookings on the microscopes and related workstations, plan interventions on the equipment, log incidents, record and manage user and project information, report publications where AMF equipment have been used and report statistics related to the usage of all equipment.

Full details of the **grants awarded** during the period 2013 to 2015 are listed here:

Source	Project Title	Collaborators	Awarded	Duration	Amount
Mason Foundation Grant	Understanding how vessel fragility contributes to Alzheimer's disease	D. Johnstone, J. Stone & L. Cole	2015		$44,690
Bosch Small Equipment Grant	Nuance FX Multispectral Imaging System	Owens, T.	2014		$23,500
Clive & Vera Ramaciotti Foundation Equipment Grant	A light-sheet microscope; revolutionary technology for improved imaging of thick fluorescent samples, tissues and whole small organisms	K. Keay, F. Braet, G. Lyons, A. Hardikar, J. Stone, C. Murphy, M. Byrne, C. Leamey, R. Overall, A. Weiss, G. Halliday, S. Fraser, D. Richardson, R. Mason, B. Hambly, B. Bao	2013		$75,000
NHMRC Equipment Grant	La Vision BioTec Ultramicroscope	C. Murphy, K. Keay, D. Johnstone, J. Stone, F. Braet, R. Mason, C. Goldsbury, M. Lovelace, D. Richardson, G. Halliday, G. Lyons, B. Hambly, S. Fraser, A. Weiss, R. Overall, T. Owens, M. Byrne, T. Chan-Ling	2013		$198,038

University of Sydney Combined Equipment Grant Scheme	A high-throughput, bright-field and fluorescence digital slide scanning platform and service that is both research- and teaching-focused and available University-wide	N. King, MB. Graeber, M. Naylor, J. Slapeta, R. Quinnell, K. Charles, T. Owens, R. Bourne, F. Braet, B. Hambly, J. Stone, R. Overall, S. Twigg, A. Hardikar, G.M. Halliday, D. Richardson, M. Byrne, K. Keay, D. Marsh, V.M. Howell, C. Pollock, X. Chen	2013	$191,268

An Overview of Room S443, Anderson Stuart Building

For more information on the Bosch Advanced Microscopy Facility (visit http://sydney.edu.au/medicine/bosch/facilities/advanced-microscopy/index.php).

LIVE CELL ANALYSIS FACILITY

ANGELES SANCHES-PEREZ

OVERVIEW

The Live Cell Analysis Facility (LCAF) is one of the newest Bosch laboratories, established in January 2014 after the re-structure of the Flow Cytometry Facility.

The LCAF is an open-access, multi-user facility that aims to provide all the necessary training and instrumentation for its members to assess biological cell function. The LCAF provides expert training and access to live cell analysis and flow cytometry instruments, cell culture facilities, cryostats, protein and nucleic acid analysis, centrifuges, and general laboratory equipment. The LCAF also has a comprehensive Cell Bank that is available to registered users.

The main facility laboratory is located in the Medical Foundation Building, but the LCAF also has a node in the Anderson Stuart Building, both at the University of Sydney.

The Facility is managed by Dr Ángeles Sánchez-Pérez, with Dr Stuart Fraser as the academic advisor.

HIGHLIGHTS 2014 - 2015

The Bosch Live Cell Analysis Facility started life in January 2014, without a laboratory and only offering flow cytometry training and analysis. The LCAF had just one instrument, a 17 year-old flow cytometer (the FACSCalibur) and a computer with FloJo (a software application with an integrated environment for viewing and analyzing flow cytometric data). Later in 2014, the LCAF established a node in the Anderson Stuart Building (Rm S204) equipped with a Leica cryostat, obtained from the Discipline of Physiology, to cater for the Physiology researchers located at Anderson Stuart.

In January 2015, the LCAF established a laboratory in the Medical Foundation Building (Rm G03) and received a considerable amount of instruments and materials from the then retiring Professor Nicholas Hunt. This legacy, together with grant success resulted in the Facility having more than 30 instruments and attaining 31 registered users in 2015.

LABORATORY PERSONNEL/ STUDENTS

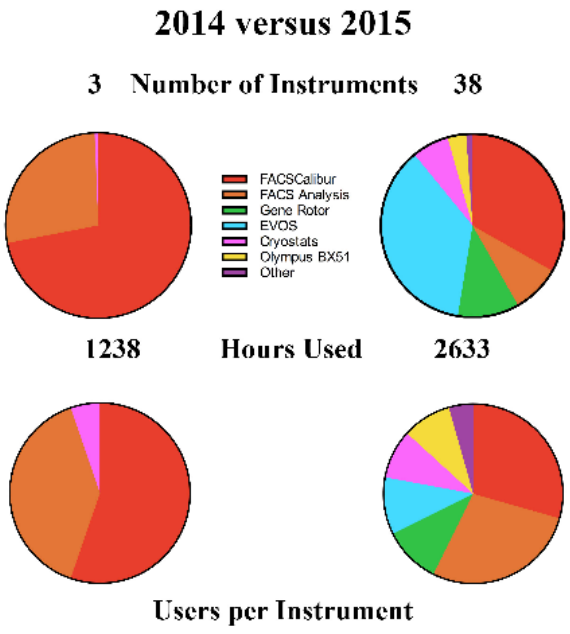
Dr Angeles Sanches-Perez

Facility Officer

2014 - 2015

LCAF Registered Users

	2014	2015
Bosch Institute:	19	27
Other USyd:	4	4
Total:	23	31



EQUIPMENT

The LCAF currently has 38 instruments, ranging from general laboratory equipment to state of the art equipment. Some of the key instruments are listed below in their relevant categories.

- Live Cell Analysis: EVOS FL Auto. Bought with a NHMRC equipment grant 2015.
- Flow Cytometry: FACSCalibur and FloJo Analysis
- Cell Culture: Class I Nuaire Safety Cabinet, Heracell 150i CO2 (and N2) incubator, 35 VHC Dewar, Clifton water bath, Willobert inverted microscope, and Boeko cell culture refrigerated centrifuge.
- Nucleic Acid and Protein: Rotor Gene Q, Rotor-disc heat sealer, CAS1200 automated PCR set up, Eppendorf Mastercycler, and SpectraMax 190 plate reader. As well as equipment to run and analyse protein and nucleic acids: GelDoc EZ Imaging System, electrophoresis equipment, Bio-Rad Power Pac 300, Trans-Blot Turbo, and Bio-Rad 2110 Fraction Collector.
- Cryostats: Leica CM3050 (located in Anderson Stuart Bldg.) and Leica 1510S.
- Microscopes: The LCAF has a variety of microscopes, including an Olympus BX51 fluorescent microscope with laserLED lights and a digital camera.
- Centrifuges: Beckman GS6R, refrigerated Eppendorf and DNA 110 SpeedVac.

TRANING/WORKSHOPS

- 2014 – FACSCalibur, Flow Cytometry and FACS Analysis using FloJo
- 2015 – FACSCalibur, Flow Cytometry and FACS Analysis using FloJo, EVOS, Fluorescence Microscope Olympus BX51, Cryostats, Protein and Nucleic Acid Analysis, and PCR, as well as helping in experimental design and interpretation of results.

PUBLICATIONS

(2014 - 2015)

Publications including abstracts arisen from using the LCAF facility or authorship involvement of LCAF officer (2014-2015) can be found at http://sydney.edu.au/medicine/bosch/facilities/live-cell-analysis/publications.php.

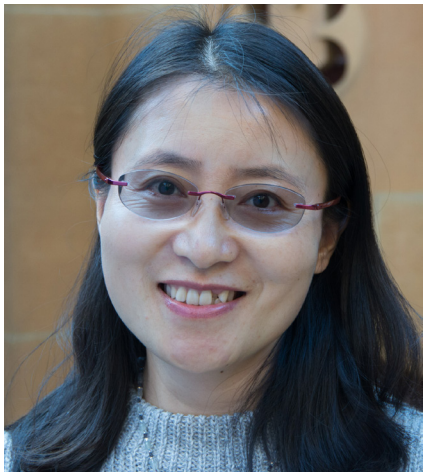
The LCAF was acknowledged on 5 posters and 1 oral presentation in 2014 and 10 posters and 11 oral presentations in 2015.

EXTERNAL FUNDING TO FACILITY

(2014 - 2015)

Source	Project Title	Collaborators	Awarded	Duration	Amount
NHMRC Equipment Grant	EVOS FL Auto Cell Imaging System	Sanchez-Perez, A.	2015		$69,958
Bosch Grants	Bio-Rad Gel Documentation System	Sanchez-Perez, A.	2015		$12,650
Bosch Grants	Laser LED Lights for Olympus BX51	Sanchez-Perez, A	2015		$6,975

For more information on the Bosch Live Cell Analysis Facility (visit http://sydney.edu.au/medicine/bosch/facilities/live-cell-analysis/index.php).



MASS SPECTOMETRY FACILITY

XIAO SUO WANG

OVERVIEW

The Bosch Mass Spectrometry Facility (BMSF) was reconfigured from the Oxidative Stress Bioanalytical Facility (OSBF) in late 2012. The facility offers open access and shared-use of mass spectrometers to researchers from different disciplines at the University of Sydney and beyond.

The BMSF is a unique world-class facility for detection, characterisation and quantification of biomarkers in cells, tissues and plasma. In addition to making state-of-the-art, user friendly instruments and services available, the facility also provides for education, methods development and validation, as well as development for new applications to meet the needs of new research projects. The facility is the proven choice for quantitative applications in pharmaceutical ADME/DMPK studies, biomarker validation, clinical research, food testing and environmental analyses.

The BMSF is currently in operation of three analytical instruments including a UPLC (Agilent 1290 series) tandem triple quadrupole mass spectrometer (Agilent 6460A), a HPLC (Agilent 1260 series) coupled with a single quadrupole mass spectrometer (Agilent 6120 B) and a HPLC connected with fluorescence and CoulArray electrochemical detectors.

In order to serve researchers for diversity research themes within Bosch Institute and beyond, the BMSF has set up a MALDI imaging workstation composing of advanced software set for post data analysis from MALDI imaging workflow and sample preparation equipment (ImagePrep, Bruker). This setup provides sample preparation for collaborative work with the UltrafleXtreme MALDI-TOF/TOF mass spectrometer recently relocated to the main Campus.

Due to the essential role of mass spectrometry in life science and its rapid growth of applications in medical sciences, the facility also offers services designed to meet various evolving needs in research such as sensitive LC-MS method development for specific applications, molecular mass determination and confirmation, quantitative analysis in complex matrices, various software for post data analyses, education on mass spectrometry technology and instrument operation and maintenance, etc.

USERS (2013-2015)

The multi user BMSF has provided both training and research project services for more than 80 registered users since 2013 with researchers registering from 30 laboratories across various schools and disciplines at the University and the external sites. They include 5 disciplines from School of Medical Sciences at Bosch Institute, Faculties of Agriculture, Chemistry and Pharmacy, Brain and Mind Research Institute, ANZAC Research Institute, Kolling Research Institute, Woolcock Institute of Medical Research, Victor Chang Research Institute, The Children's Hospital at Westmead, Western Sydney University and The University of New South Wales.

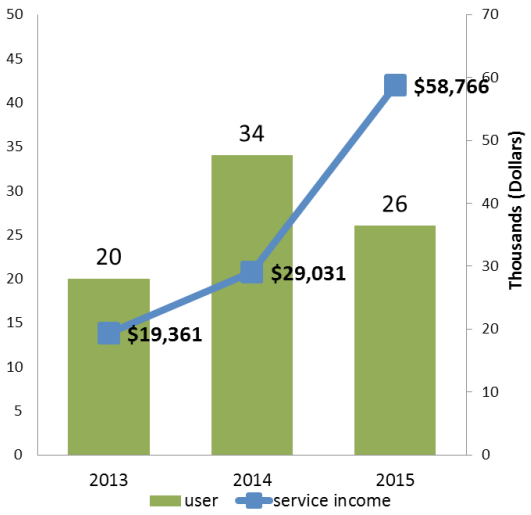
Annual registrations totalled 20, 34 and 26 registered users in 2013, 2014 and 2015 respectively. Each individual user performs /represents a different LC-MS related application in a different project. The booking and usage hours for one user each time are between 3 hours to 4 days including weekend. The average length of completing each project using the BMSF is between 6 months to 18 months.

The usage graphs illustrate (A) the user numbers on a yearly basis and service income generated from 19K steadily increased to 58K within 3 years. When converting to Bosch user numbers, they were equivalent to 64 user in 2013, 93 users in 2014 and 184 users in 2015, respectively; graph B shows the average usage of three instruments on a weekly (7 days) basis; it is also noted that the usage of general HPLC is decreasing with an increasingly use of LC-MS instead (graph C-E) over the last three years.

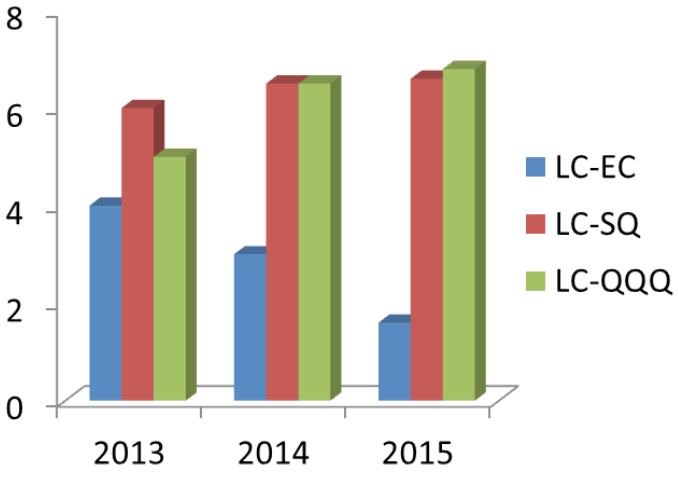
LABORATORY PERSONNEL/ STUDENTS

Dr Xiaosuo Wang	Facility Officer 2013 - present
Dr Paul Witting	Academic Support 2013 - present

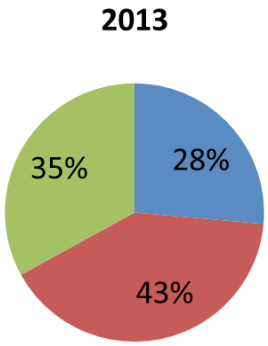
EQUIPMENT USAGE



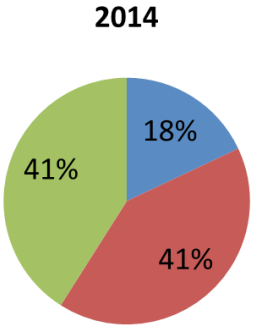
(A)



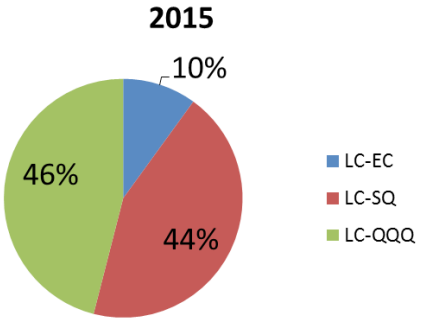
(B)



(C)



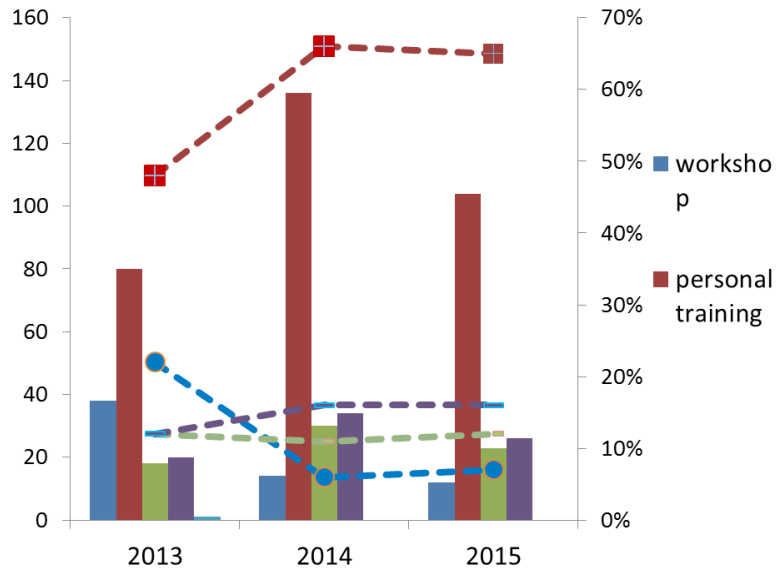
(D)



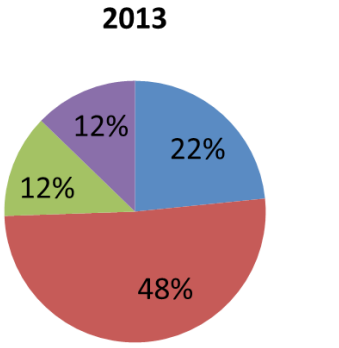
(E)

TRANING/WORKSHOPS

The BMSF runs two regular 2-day workshops every year on UPLC-QQQ-MS and HPLC-UV/FL/EC for beginner and intermediate users. For people who miss the regular workshops, customised personal on-site education and trainings are often arranged. The facility has provided workshops for 64 researchers and personal training for 320 in total from 2013 to 2015. PC2 training and training on general equipment are also provided to registered users. The types of training provided and numbers / times of training are detailed in graph F. Personal training takes up about 48%, 66% and 65% in 2013, 2014 and 2015, respectively, among workshops, PC2 and other training (graph F-L). Personal training includes training for liquid chromatography and mass spectrometry related technology, instrument operation, software use, method development, assay setup, and data analysis, etc. required by users.



(F)



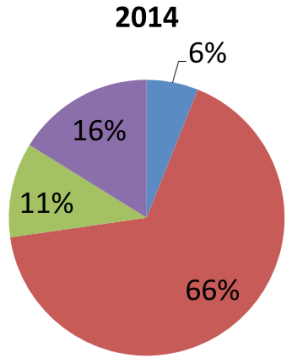
(G)

EQUIPMENT PURCHASED (2013-2015)

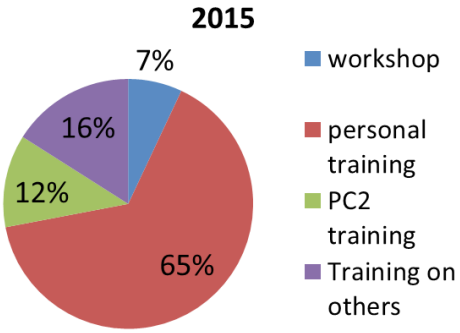
Since 2013, the equipment list has been expanded at BMSF with the funding resources mainly from categories of RIBG and Rebecca Cooper Medical Research Foundation (A/Prof Witting, Discipline of Pathology). The additions of equipment include the relocation of a HPLC-SQ-MS (Agilent 6120B single quadrupole mass spectrometer, the University NHMRC equipment Grant) from A/Prof Rachel Codd (Discipline of Pharmacology).

List:

- concentrator plus (Eppendorf; funded by University RIBG award 2013);
- centrifuge 5810R (Eppendorf; funded by University RIBG award 2013);
- ZXRD-A5055 oven (5-220°C, Labwit; funded by University RIBG award 2013);
- water ultrasonic bath (Unisonics; funded by University RIBG award 2013);
- uninterrupted power supply (UPS, funded by University RIBG award 2013);
- N2 generator (Peak; Bosch Small Equipment Grant 2013);
- ImagePrep station (Bruker; Rebecca Cooper Equipment Grant 2014);
- complete workstation for MALDI imaging workflow (FlexImaging, ClinPron tools, FlexiAnalysis, and SCiLs Lab; funded by University RIBG award 2014)
- upgrade for MassHunter operation system (version 7) for the QQQ-MS (Agilent; funded by University RIBG award 2015)
- offline MassHunter workstation (Dell; funded by University RIBG award 2015).



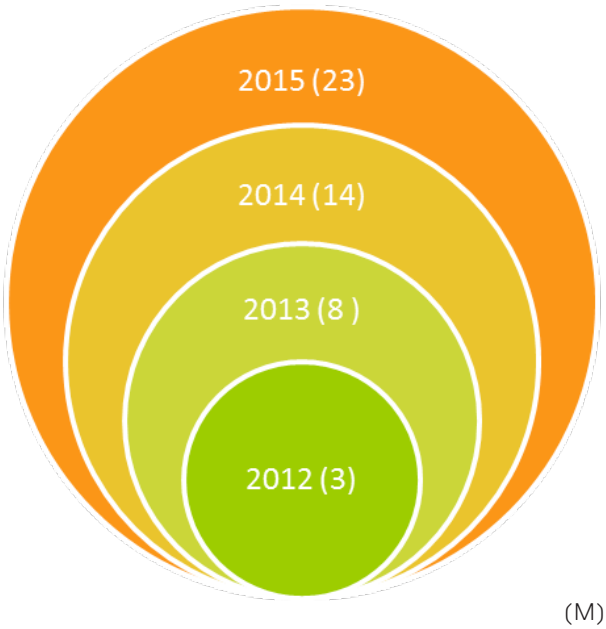
(H)



(L)

EQUIPMENT USAGE (2013-2015)

Because of critical information provided by mass spectrometry in the field of biomedical research, the need for the use of mass spectrometry increases markedly. The BMSF is the facility providing full and unlimited support through the whole application from method development and application design to assay trouble-shooting. On the only UPLC-QQQ-MS, the number of applications have been expanded from original 3 in 2012 to 8 in 2013, 14 in 2014 and 23 applications in 2015 seen in graph **M** covering detection ability for more than 60 compounds from drugs, amino acids to lipids. This numbers exclude routine applications run on LC-UV and LC-SQ-MS instruments. The service income generated from the use of UPLC-QQQ-MS is more than $75K in the period of 2013 to 2015 accounting for 82% of the total service income



(M)

EXTERNAL FUNDING TO FACILITY

(2013 - 2015)

In the period 2013 to 2015, the BMSF has attracted $125K that directly contributed to the purchases of new equipment listed above. The grants successful from various funding bodies include the University Research Infrastructure Block Grants ($95K), Bosch Small Equipment Grant ($10K) and Rebecca L Cooper Medical Research Foundation ($20K). Another $6k from Gibson Scientific Research Fund is for the collaborative research with Kolling Institute.

PUBLICATIONS

(2013 - 2015)

Publications including abstracts arisen from using the BMSF facility or authorship involvement of BMSF officer (2013-2015) can be found at http://sydney.edu.au/medicine/bosch/facilities/mass-spectrometry/publications/index.php.

For more information on the Bosch Mass Spectometry Facility (visit http://sydney.edu.au/medicine/bosch/facilities/mass-spectrometry/index.php).

ANIMAL BEHAVIOURAL FACILITY

THOMAS BURTON

OVERVIEW

The Animal Behavioural Facility (ABF) provides local researchers with the latest technologies for the study of laboratory animal behaviour. Along with offering expert training for all pieces of equipment and technology, the ABF Officer, Thomas Burton, provides a range of services, ongoing support and assistance with experimental design, execution, and analysis for research projects involving animals. Established in 2011, this facility continues to grow in terms of activity, equipment, space and collaboration.

LOCATIONS

All of the ABF equipment is located in Bosch Building 1B (D05). The IntelliCage system is located in the purpose built Behaviour Room 2, 116B, with the remainder being stored and implemented in Minor Procedures (Mice), 123.

TRANING/WORKSHOPS

The ABF Officer has developed two workshops which are unique within the University:

- *A Practical Introduction to Working with Laboratory Mice* was designed to train researchers and technicians at The University of Sydney in the practical and ethical handling of laboratory mice. It was developed by the ABF Officer to meet a need for staff and students to comply with the University's ethical standards and to achieve optimal outcomes in their scientific work.
- *The Advanced Excel Workshop* provides all University staff and students with the opportunity to learn and develop new and valuable skills centred around the use of one of the most commonly used pieces of software. Though geared towards participants working with large and complex datasets, it is also useful for those who wish to minimise the time required to complete tedious and repetitive tasks when using Excel.

EQUIPMENT PURCHASED

The ABF purchased the following equipment during this period:

- Topscan behavioural tracking software (CleverSys);
- TreadScan Gait Analysis system (CleverSys);
- 4 x Conditioned Place Preference chambers (CleverSys);
- Ultrasonic Vocalisation Analysis System (Avisoft);
- Light delivery system for in vivo Optogenetic experiments (Thorlabs).

This expansion greatly complements the existing suite of equipment which includes:

- 8 x IntelliCages (NewBehavior/TSE Systems);
- Rotarod (IITC);
- 2 x digital Grip Strength meters (Columbus);
- Balance beam.

LABORATORY PERSONNEL/ STUDENTS

Thomas Burton	Facility Officer 2011 - present

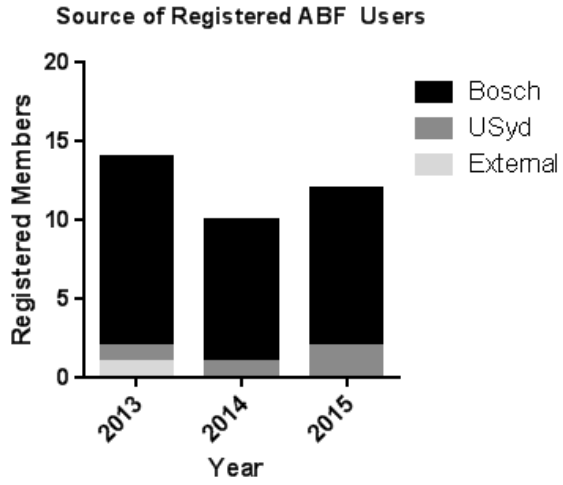
GRANT SUCCESS (2013-2015)

National Health and Medical Research Council (NHMRC)/Equipment Grants ($75,000): *Mouse behavioural phenotyping battery*; Hunt N, Christie M, McGregor I, Kassiou M, Collins M, Stone J, Arnold J, Sawatari A, Mitrofanis J, Camp A.

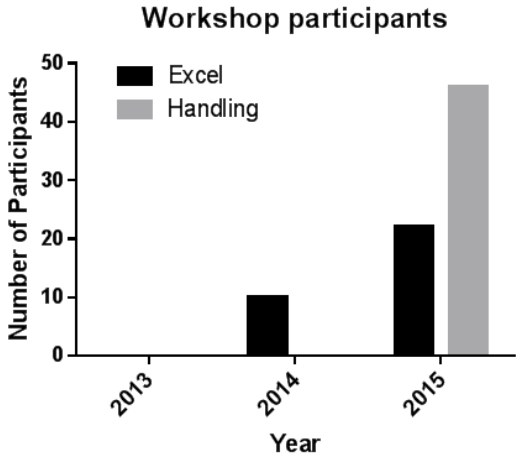
FACILITY HIGHLIGHTS (2013-2015)

The abovementioned grant success, along with significant procurement of internal funding, has allowed for the substantial expansion of sophisticated equipment and technologies made available to local researchers by the Animal Behavioural Facility. Furthermore, this grant highlights the broad range of Departments, Faculties and Institutes which form the critical mass of researchers invested in the ABF and the widespread collaborative nature of the facility.

The initiations of both the *Practical Introduction to Animal Handling Workshop* and the *Advanced Excel Workshop* have been received with robust interest. All advertised sessions have been fully (if not over) subscribed and feedback has been extremely positive. The Practical Introduction to Animal Handling Workshop in particular holds great promise for growth.



Number and Source of Registered ABF Users



Workshop Participants

For more information on the Bosch Animal Behavioural Facility (visit http://sydney.edu.au/medicine/bosch/facilities/animal-behavioural/index.php).

BIOSTATISTICS AND BIOINFORMATICS FACILITY

HELEN BALL

OVERVIEW

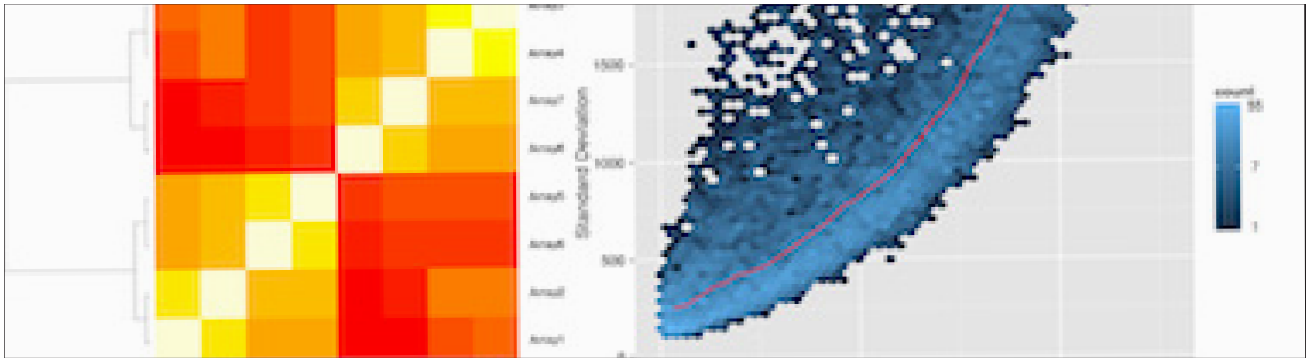
The Bosch Bio2 (Bioinformatics and Biostatistics) Facility provides training and advice in the areas of bioinformatics and statistical analysis. This facility is a recent initiative of the Bosch Institute, being established in the latter half of 2015. Dr Helen Ball was appointed as a parttime Facility Officer and her position is jointly funded by the Zelman Cowen Universities Fund.

The Bio2 Facility differs from the other Bosch Facilities in that it is not equipment-based. The University of Sydney supports staff and students with the provision of statistical software and many Bioinformatics tools are open source. The Bio2 Facility provides training in the theoretical and practical aspects of applying statistical methodology. Workshops have also covered genomics analysis such as profiling gene expression using RNAseq. Membership to the facility provides access to all workshops as well as individual consultations. It is expected that the majority of workshop attendees may register for individual workshops, rather than become members of the facility.

The Facility Officer was appointed in the latter half of 2015. Workshops were delivered in 2015 but facility registrations did not commence until 2016.

LABORATORY PERSONNEL/ STUDENTS

Dr Helen Ball	Facility Officer
	June 2015 - 2017



For more information on the Bosch Research Computing and Engineering Facility (visit http://sydney.edu.au/medicine/bosch/facilities/biostatistics-facility/index.php).

NERVOUS SYSTEM, SENSES & MOVEMENT

This is the largest and most diverse group of researchers within the Bosch Institute. It includes over 30 laboratories and more than 150 active scientists, including students. Their research interests fall into three broad groups.

Group 1 is exploring many aspects of mammalian brain function, including vision, hearing, the regulation of the cardiovascular system and pain perception. Other approaches include the study of glia, synapses and the properties of the transmitters and their receptors, which are the basis of most current neurally active drugs. Many groups are trying to identify the details of neurons, their connections and the transmitters, growth factors and circulating hormones that modulate their function.

Group 2 is focused on a wide range of diseases of the nervous system and use both model systems and, where possible, human samples to further our understanding of the disease process.

Group 3 studies movement at a variety of levels, nervous, skeletal and muscular.

Every laboratory in this Research Theme has collaborations with other groups, with other Research Themes within the Bosch Institute and with other scientists nationally and internationally. There also is a range of interactions with the health services and with industry.

Desired impact on knowledge and/or practice

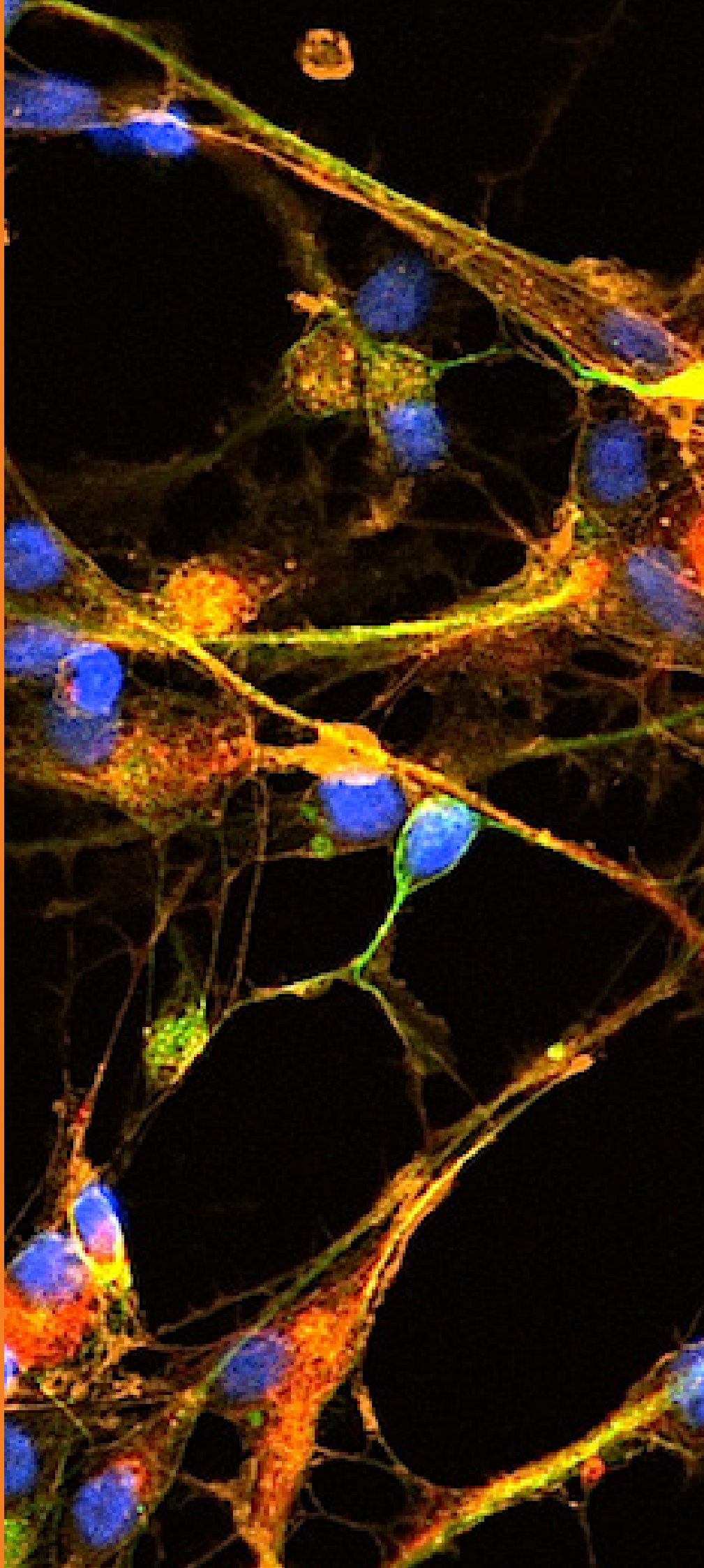
Basic Sciences: To develop, through molecular and integrative research approaches, a detailed understanding of the normal functioning of the central nervous system, how disturbances to the normal functioning of the central nervous system lead to disease and how movement is controlled and carried out under normal physiological circumstances.

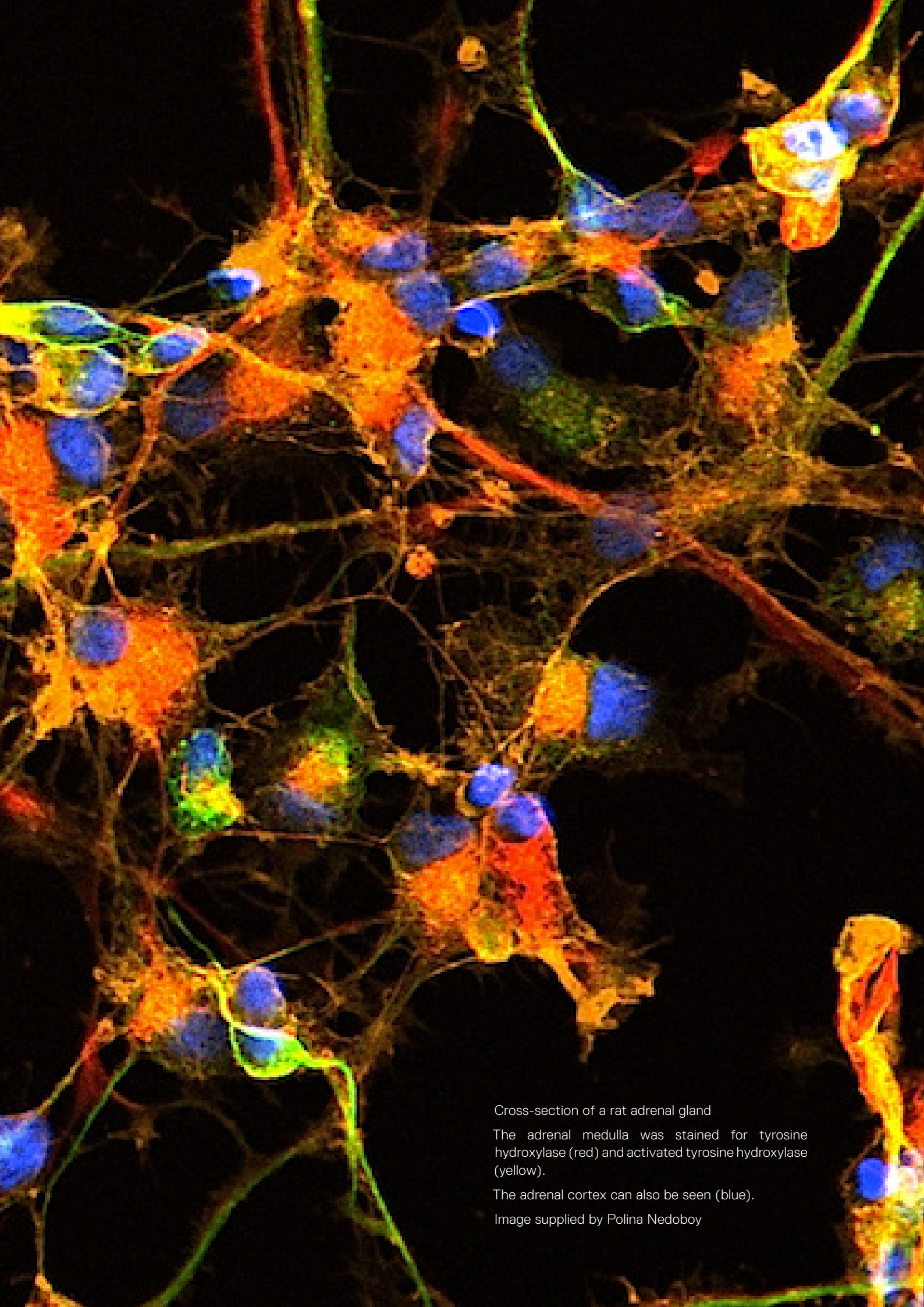
Innovation: To facilitate invention of innovative research techniques by scientifically "cross-cultural" collaboration, enabled by links generated within the Research Theme and links generated with members of other Research Themes.

Translation: To enable an informed approach to the clinical abrogation, treatment or palliation of diseases of the nervous system; application of new approaches to clinical problems of cognition and sensory impairment and to apply new approaches to management of clinical problems of the nervous system, skeleton and muscle.

For more information on this theme visit

http://sydney.edu.au/medicine/bosch/research/nervous-senses-movement/index.php



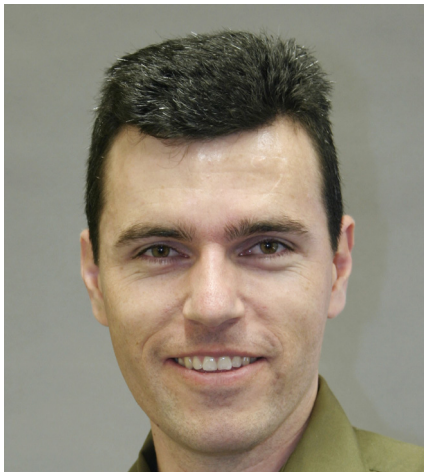


Cross-section of a rat adrenal gland

The adrenal medulla was stained for tyrosine hydroxylase (red) and activated tyrosine hydroxylase (yellow).

The adrenal cortex can also be seen (blue).

Image supplied by Polina Nedoboy



LABORATORY OF MOTOR AND SENSORY SYSTEMS

HAYDN ALLBUTT

LECTURER, PHYSIOLOGY

The primary focus of this lab is to determine the initiating trigger for sporadic Parkinson's disease.

LABORATORY OVERVIEW

Research in this Laboratory focuses on elucidating cellular mechanisms that initiate Parkinson's disease.

RESEARCH ACTIVITIES

During 2014 and 2015 we have continued investigating the role of environmental amyloid proteins as possible initiating triggers for the alpha synuclein pathology associated with Parkinson's disease (PD).

The environmental amyloid proteins we have been investigating include K-casein, which we initially extracted from low fat milk ourselves but then switched to the commercially available protein. We also continued to test raw fungal homogenate from various fungal species and have now tested 15 or so different species of fungi. We also tested the fungal amyloid protein hydrophobin extracted from two of the fungal species.

In addition to environmental sources of amyloid protein we examined other compounds reported to affect either amyloidogenesis of amyloid proteins or compounds reported to be associated with a reduced risk of developing PD to see if they have anti-amyloidogenic activity. Our aim is to screen compounds that may protect against the alpha-synuclein pathologies underlying Parkinson's disease.

The potentially anti-amyloidogenic compounds we have tested include nicotine and raw tobacco extract, since smoking has been associated with a decreased risk of Parkinson's disease, several types of tea (black, green, white and decaffeinated), kambucha tea (a type of fermented black tea) coffee, as well as caffeine, since coffee and tea drinking has been associated with a reduced risk of Parkinson's disease. We have also tested beer, vodka, hops and ethanol, since the flavonoids in beer and some spirits have been reported to have neuroprotective properties.

LABORATORY PERSONNEL/ STUDENTS

Haydn Allbutt	Lecturer 2007 - present
Abdurrahman Mubayyid	MPhil student 2012 - present
Courtney Wright	PhD student 2012 – present
Madeline Noonan	BSc(Hons) 2014

POSTGRADUATE & HONOURS COMPLETION (2013 - 2015)

BSc(Hons)

2014 - Madeline Noonan

Med(Hons)

2013 - Sarah Johnstone

EXTERNAL FUNDING TO LABORATORY (2013 - 2015)

Source	Project Title	Collaborators	Awarded	Duration	Amount
Brain Foundation	Investigation of alpha-synuclein transmission as the mechanism of propagation of degenerative pathologies throughout the brain in Parkinson's disease	Allbutt HN	2014	1 year	$29,700

MUSCLE CELL LABORATORY

DAVID ALLEN

PROFESSOR, PHYSIOLOGY

LABORATORY OVERVIEW

The Laboratory studies the function of cardiac and skeletal muscle in health and various diseases

Research conducted by this laboratory is concerned with the regulation of intracellular ions, particularly calcium, sodium and protons, and with their effects on muscle function. We are interested in situations where ionic regulation has major effects on cell function, for instance in cardiac pacemaker cells, in the heart during ischaemia and reperfusion and in skeletal muscle during fatigue. Much of the focus of the laboratory is on single cells in which ionic concentrations can be measured using fluorescent methods and on study of the distribution of ionic changes using confocal microscopy.

RESEARCH ACTIVITIES

In 2013 Dr Ju discovered that inositol triphosphate receptors are expressed in the sarcoplasmic reticulum of the pacemaker cells of the heart. This led her to investigate their contribution to Ca2+ release and to pacemaker firing. Dr Benson studied the effects of muscle length on ventricular myocytes. When cultured cells are stretched for long periods she discovered that their excitability and Ca2+ release are modified. Dr Trajanovska studied intact skeletal muscle and was involved in developing techniques to measure intracellular calcium in blood-perfused muscle. She, together with Kushy Athwal, studied muscle fatigue and stretch-induced muscle damage, with a particular aim to identify the proteins whose altered function affects Ca2+ release. Dr Li, a visiting PhD student from China, studyied traumatic brain damage. He grew neurons in culture and exposed them to sudden brief stretches which mimic some aspects of brain damage. Stretched neurons develop localized swellings and we hypothesized that these are caused by stretch-activated channels.

LABORATORY PERSONNEL/ STUDENTS

David G Allen	Professor 1989 - present
Yue-Kun Ju	Senior Research Officer 1996 – 2014
Jie Liu	Senior Research Officer 2010 – 2014
Victoria Benson	Senior Research Officer 2010 – 2014
Sophie Trananovska	Senior Research Officer 2010 – 2014
Yu Li	Visiting Scholar 2013 - 2014
Kushdeep Athwal	MPhil(Med) student 2013 - 2014

POSTGRADUATE & HONOURS COMPLETIONS

(2013 - 2015)

MPhil

2014 - Kushdeep Athwal

PUBLICATIONS
(2013 - 2015)

Allen DG. Dynamic changes in the contractile apparatus during exercise (Editorial). Acta Physiologica 2013; 208: 220-221.

Allen DG, Halligan R. The function of animal ethics committees (Letter to the Editor). Between the Species 2013; 16: 1-5.

Yu Z-Y, Tan JC, McMahon AC, Iismaa S, Xiao X-H, Kesteven SH, Reichelt ME, Mohl MC, Fatkin D, Allen DG, Head SI, Graham RM, Feneley MP. RhoA/Rock signalling and pleiotropic c α1A-adrenergic receptor regulation of cardiac contractility. PLoS One 2014; 9: e99024.

Lovelace MD, Gu B, Eamegdool SS, Weible II MW, Wiley JS, Allen DG, Chan-Ling T. P2X7 receptors mediate innate phagocytosis by human neural precursor cells and neuroblasts. Stem Cells 2015; 33: 526-541.

Liu J, Xin L, Benson VL, Allen DG, Ju YK. Store-operated calcium entry and the localisation of STIM1 and Orai1 proteins in isolated mouse sinoatrial node cells. Front Physiol 2015; 6: 69.

Ju YK, Lee BH, Trajanovska S, Hao G, Allen DG, Lei M, Cannell MB. The Involvement of TRPC3 channels in sinoatrial arrhythmias. Front Physiol 2015; 6: 86.

EXTERNAL FUNDING TO LABORATORY
(2013 - 2015)

Source	Project Title	Collaborators	Awarded	Duration	Amount
NHMRC Program Grant	Molecular mechanisms of cardiac function and disease *Funding to Allen Lab = $330,000	Graham R Fatkin D Feneley M Harvey R McDonald P	2010	5 years	$1,977,900

CANNABINOID RESEARCH GROUP

JONATHON ARNOLD

ASSOCIATE PROFESSOR, PHARMACOLOGY

LABORATORY OVERVIEW

A/Prof Arnold's research has principally focussed on the psychopharmacology of drugs of abuse, particularly cannabinoids (cannabis-like drugs) and their role in affecting psychiatric conditions. His team has isolated genes that modulate the neurobehavioural effects of cannabinoids which have important implications for understanding the genetic basis of cannabis-induced psychosis and cannabis dependence. His group showed for the first time that cannabinoids modulate the activity and expression of various ABC transporters. In 2012 his group reported that the ABC transporters P-glycoprotein (P-gp) and breast cancer resistance protein (Bcrp) regulate the brain uptake and effects of the propsychotic tetrahydrocannabinol (THC). This provided a mechanism for the observation that P-gp influences the risk of cannabis dependence in humans.

His group was the first to demonstrate that the schizophrenia susceptibility gene neuregulin 1 (Nrg1) altered the neurobehavioural actions of cannabinoids. This work was translated, with two human studies citing his animal work: the first showed NRG1 increased the risk of cannabis dependence (Biol Psychiatry,2012); the second reported that NRG1 enhanced the effects of cannabinoids on mismatch negativity (Pharmacopsychiatry,2010). His research on Nrg1-cannabinoid interactions also paved the way for new research examining interplay between endocannabinoid (eCB) and Nrg1-ErbB receptor systems (J Neurosci,2013)

.RESEARCH ACTIVITIES

In recent years he has broadened his Nrg1 research. In 2014 his group showed that partial genetic deletion of Nrg1 confers vulnerability to stress; this was published in the world's premier schizophrenia research journal, Schizophrenia Bulletin. His recent work has focussed on how genes confer vulnerability to the effects of stress, which has relevance to our understanding of anxiety, depression, post-traumatic stress disorder and schizophrenia. He has taken on a particular interest in how genes and stressors interact during neurodevelopment to disturb neuronal connectivity

Another major contribution of A/Prof Arnold's research is the discovery that dieting and exercise elevated blood concentrations of THC by dislodging fat-soluble THC from adipose tissue. This phenomenon has far-reaching practical implications, providing an explanation for false positive drug tests in the absence of recent cannabis use and a mechanism of cannabis flashback or re-intoxication. The initial research on this topic was performed in cell culture and animal experiments, but was recently translated in a human study. Both these studies attracted national and international media attention including coverage in the New Scientist, Time Magazine and the Sun-Herald. An extension of this work was NHMRC-funded in 2013.

LABORATORY PERSONNEL/ STUDENTS

Jonathon Arnold	Associate Professor Lab Head
Natalia Brzozoskwa	PhD student 2012 - present
Stephanie Todd	PhD student 2012 - present
David Clarke	PhD student 2012 - present
Dilara Bahceci	PhD student 2015 - present

PUBLICATIONS
(2013 - 2015)

Arnold, J. (2015). Inquiry into the Exposure Draft of the Drugs of Dependence (Cannabis Use for Medical Purposes) Amendment Bill 2014 and Related Discussion Paper | Appendix B Specialist Adviser Report: Report on the medical applications of cannabis and the cannabinoids, Report 6, August 2015, (pp. 1 - 24). Canberra, Australia: ACT Legislative Assembly.

Karl, T. and J.C. Arnold, The interactive nature of cannabis and schizophrenia risk genes, in Handbook of cannabis and related pathologies: biology, diagnosis, treatment and pharmacology, V. Preedy, Editor 2015, Elsevier.

Allsop, D., R. Kevin, and J.C. Arnold, Cannabis: Pharmacokinetics and Pharmacodynamics in relation to Patterns of Use in Handbook of Drug and Alcohol Studies K. Wolff, J. White, and S. Karch, Editors. 2015, SAGE: London, UK.

Thompson, G., Ireland, T., Larkin, X., Arnold, J., Holsinger, D. (2014). A Novel Segmentation-Based Algorithm for the Quantification of Magnified Cells. Journal Of Cellular Biochemistry, 115, 1849-1854.

Wong, A., Keats, K., Rooney, K., Hicks, C., Allsop, D., Arnold, J., McGregor, I. (2014). Fasting and exercise increase plasma cannabinoid levels in THC pre-treated rats: an examination of behavioural consequences. Psychopharmacology, 231(20), 3987-3996.

Chohan, T., Nguyen, A., Todd, S., Bennett, M., Callaghan, P., Arnold, J. (2014). Partial genetic deletion of neuregulin 1 and adolescent stress interact to alter NMDA receptor binding in the medial prefrontal cortex. Frontiers in Behavioral Neuroscience, 8, 1-10.

Chohan, T., Boucher, A., Spencer, J., Kassem, M., Hamdi, A., Karl, T., Fok, S., Bennett, M., Arnold, J. (2014). Partial Genetic Deletion of Neuregulin 1 Modulates the Effects of Stress on Sensorimotor Gating, Dendritic Morphology, and HPA Axis Activity in Adolescent Mice. Schizophrenia Bulletin, 40(6), 1272-1284.

Karl, T., Arnold, J. (2014). Schizophrenia: a consequence of gene-environment interactions? Frontiers in Behavioral Neuroscience, 8, 1-3.

Karl, T. and J.C. Arnold, Genetic Mouse Models for Cannabis Abuse & Dependence. , in Handbook of Behavioral Genetics of the Mouse. 2014, Cambridge University Press

Arnold, J. (2014). Why sigma-1 receptor dysfunction might confer vulnerability to cannabis-induced psychosis. International Journal of Neuropsychopharmacology, 17(12), 1911-1913.

Swift, W., Wong, A., Li, K., Arnold, J., McGregor, I. (2013). Analysis of cannabis seizures in NSW, Australia: Cannabis potency and cannabinoid profile. PloS One, 8(7), 1-9.

Wong, A., Montebello, M., Norberg, M., Rooney, K., Lintzeris, N., Bruno, R., Booth, J., Arnold, J., McGregor, I. (2013). Exercise increases plasma THC concentrations in regular cannabis users. Drug and Alcohol Dependence, 133(2), 763-767.

Spencer, J., Chohan, T., Karl, T., Arnold, J. (2013). Female neuregulin 1 heterozygous mice require repeated exposure to D9-tetrahydrocannabinol to alter sensorimotor gating function. Pharmacopsychiatry, 46(7), 286-291.

Spencer, J., Darbyshire, K., Boucher, A., Kashem, M., Long, L., McGregor, I., Karl, T., Arnold, J. (2013). Novel molecular changes induced by Nrg1 hypomorphism and Nrg1-cannabinoid interaction in adolescence: a hippocampal proteomic study in mice. Frontiers in Cellular Neuroscience, 7, 1-13.

Kassem, M., Lagopoulos, J., Stait-Gardner, T., Price, W., Chohan, T., Arnold, J., Hatton, S., Bennett, M. (2013). Stress-Induced Grey Matter Loss Determined by MRI Is Primarily Due to Loss of Dendrites and Their Synapses. Molecular Neurobiology, 47(2), 645-661.

Long, L., Chesworth, R., Huang, X., McGregor, I., Arnold, J., Karl, T. (2013). Transmembrane domain Nrg1 mutant mice show altered susceptibility to the neurobehavioural actions of repeated THC exposure in adolescence. International Journal of Neuropsychopharmacology, 16(1), 163-175.

Karl, T., Arnold, J. (2013). What does a mouse tell us about neuregulin 1-cannabis interactions? Frontiers in Cellular Neuroscience, 7, 1-4.

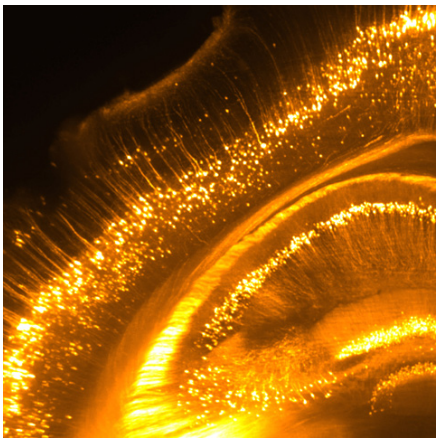


Image of a Clarity cleared chunk of mouse brain tissue (hippocampus focused) from a thy-1 YFP mouse, imaged on the ultramicrscope at Bosch Institute

POSTGRADUATE AND HONOURS COMPLETIONS

(2013 - 2015)

MPhil

2013 - Adena Spiro

BSc(Hons)

2013 - Callan Drew

2014 - Erik de Tonnerre

2014 - Lala Sarkissian

2015 - Peter Waters

2015 - Danielle Moore

PhD

2014 - Jarrah Spencer

2014 - Alex Wong

2015 - Tariq Chohan

EXTERNAL FUNDING TO LABORATORY

(2013 - 2015)

Source	Project Title	Collaborators	Awarded	Duration	Amount
Philanthropy	Lambert Initiative of Cannabinoid Therapeutics	Iain McGregor David Allsop Nicholas Lintzeris	2015	10 years	$33.78 million
NHMRC Project Grant, Reg Key Number 1070520	Randomised control trial of exercise for the management of cannabis withdrawal in adult humans	Lintzeris N, McGregor IS, Rooney K, Allsop D & Arnold JC.	2014	3 years	$524,506
Bosch Institute Translational Grant-in-Aid	A mechanism to inform antipsychotic drug selection for schizophrenia patients that use cannabis		2013	1 year	$20,000
University of Sydney Bridging Grant	Cannabis and schizophrenia: can ABC transporters explain the relationship		2013	1 year	$30,000

SYNAPTIC PHYSIOLOGY AND PLASTICITY LABORATORY

ELENA BAGLEY

ASSOCIATE PROFESSOR, PHARMACOLOGY

LABORATORY OVERVIEW

The laboratory primarily focuses on synapses, which are the point of communication between brain cells.

We are interested in normal synaptic function and synapse dysfuntion. Synaptic dysfunction is emerging as a key player in many brain disorders.

We use patch-clamp electrophysiology in brain slices, immunohistochemistry and biochemical assays to study synaptic properties and synaptic plasticity that may participate in physiological or pathophysiological processes.

Of particular interest are the synaptic changes or plasticity that may be responsible for chronic pain states, anxiety disorders and drug addiction. We also use behavioural assays to try to understand the role of these synaptic changes in the whole animal.

LABORATORY PERSONNEL/ STUDENTS

Elena Bagley	Associate Professor Lab head 2011 - present
Dr Bryony Winters	Post-doctoral research 2013 - 2016
Ms Sarah Kissiwaa	PhD student 2012 - present

PUBLICATIONS

(2013 - 2015)

Connor, M., Bagley, E., Chieng, B., Christie, M. (2015). beta-Arrestin-2 knockout prevents development of cellular μ-opioid receptor tolerance but does not affect opioid-withdrawal-related adaptations in single PAG neurons. British Journal of Pharmacology, 172(2), 492-500.

Sengupta A, Winters B, Bagley EE, McNally GP. (2015) Disrupted Prediction Error Links Excessive Amygdala Activation to Excessive Fear. J Neurosci. 2016 Jan 13;36(2):385-95. (IF 7.12)

Bagley, E. (2014). Opioid and GABAB receptors differentially couple to an adenylyl cyclase/protein kinase A downstream effector after chronic morphine treatment. Frontiers in Pharmacology, 5, 1-5.

SERVICE TO THE UNIVERSITY AND COMMUNITY

(2013 - 2015)

- Manuscripts reviewed on behalf of : Journal of Neuroscience British Journal of Pharmacology, Journal of Neurophysiology, Pain.
- Grants reviewed on behalf of NHRMC 2008-
- Editor for PeerJ 2014-

POSTGRADUATE AND HONOURS COMPLETIONS

(2013 - 2015)

BMedSc

2015 – Gabrielle Gregorious

2015 – Oliver Wells

SPECIAL AWARDS & PRIZES

(2013 - 2015)

Bishop Fellowship, Bosch Institute the University of Sydney
2015 - Elena Bagley

Accelerate Fellowship, Sydney Medical School
2016 - Elena Bagley

Thompson Fellowship, University of Sydney
2014 - Elena Bagley

EXTERNAL FUNDING TO LABORATORY

(2013 - 2015)

Source	Project Title	Collaborators	Awarded	Duration	Amount
NHMRC	"How the midbrain assembles fear".	Gavin McNally Pascal Carrive	2015	3 years	$484 936
NHMRC	"Endongeous opioids in the amygdala"	Gavin McNally	2013	4 years	$365 222

CHEMICAL NEUROANATOMY LABORATORY

VLADIMIR BALCAR

ASSOCIATE PROFESSOR, ANATOMY AND HISTOLOGY

LABORATORY OVERVIEW

Research conducted by this laboratory is concerned with investigating neurochemical, pharmacological and anatomical aspects of central synaptic transmission. Of particular interest is the transport and metabolism of glutamate, as impaired transport of this excitatory transmitter is implicated in a number of disease states, including: Alzheimer's disease, neurodegeneration following head injury and stroke as well as tissue damage caused by a variety of conditions from brain tumours to alcoholism. Our experiments on cultured astrocytes and stem cells critically depend on imaging (deconvolution and confocal microscopy) facilities and on Molecular Biology Laboratory, both shared with other members of Bosch Institute.

RESEARCH ACTIVITIES

Recently, our interests have expanded towards metabolomic studies of human brain and, in collaboration with an overseas laboratory (Masaryk University, Czechia), to genetic studies of mental disease.

LABORATORY PERSONNEL/ STUDENTS

Vladimir Balcar	Associate Professor
Mohammed Abul Kashem	PhD student 2013 - present Research Assistant 2011 - 2015
Nilufa Sultana	PhD student 2012 - present

PUBLICATIONS

(2013 - 2015)

Sery, O., Paclt, I., Drtilkova, I., Theiner, P., Kopeckova, M., Zvolsky, P., Balcar, V. (2015). A 40-bp VNTR polymorphism in the 3'-untranslated region of DAT1/SLC6A3 is associated with ADHD but not with alcoholism. Behavioural and Brain Functions, 11, 1-8.

Sery, O., Lochman, J., Povova, J., Janout, V., Plesnik, J., Balcar, V. (2015). Association between 5q232-located polymorphism of CTXN3 gene (Cortexin 3) and schizophrenia in European-Caucasian males; implications for the aetiology of schizophrenia. Behavioural and Brain Functions, 11(10), 1-7.

Sery, O., Sultana, N., Kashem, M., Pow, D., Balcar, V. (2015). GLAST But Not Least—Distribution, Function, Genetics and Epigenetics of l-Glutamate Transport in Brain—Focus on GLAST/EAAT1. Neurochemical Research, 40(12), 2461-2472.

Rae, C., Nasrallah, F., Balcar, V., Rowlands, B., Johnston, G., Hanrahan, J. (2015). Metabolomic Approaches to Defining the Role(s) of GABAI Receptors in the Brain. Journal of Neuroimmune Pharmacology, 10(3), 45-456.

Rae, C., Balcar, V. (2014). A Chip Off the Old Block: The Brain Slice as a Model for Metabolic Studies of Brain Compartmentation and Neuropharmacology. In Johannes Hirrlinger, Helle S. Waagepetersen (Eds.), Brain Energy Metabolism, (pp. 217-241). New York: Humana Press.

Rae, C., Balcar, V. (2014). A metabolomics multivariate statistical approach for obtaining data-driven information in neuropharmacological research. Receptors & Clinical Investigation, 1, 153-156.

Sery, O., Hlinecka, L., Balcar, V., Janout, V., Povova, J. (2014). Diabetes, hypertension and stroke - does Alzheimer protect you? Neuroendocrinology Letters, 35(8), 691-696.

Rae, C., Davidson, J., Maher, A., Rowlands, B., Kashem, M., Nasrallah, F., Rallapalli, S., Cook, J., Balcar, V. (2014). Ethanol, not detectably metabolized in brain, significantly reduces brain metabolism, probably via action at specific GABA(A) receptors and has measureable metabolic effects at very low concentrations. Journal of Neurochemistry, 129(2), 304-314.

Sery, O., Povova, J., Balcar, V. (2014). Perspectives in genetic prediction of Alzheimer's disease. Neuroendocrinology Letters, 35(5), 359-366.

Lochman, J., Balcar, V., Šastný, F., Sery, O. (2013). Preliminary evidence for association between schizophrenia and polymorphisms in the regulatory regions of the ADRA2A, DRD3 and SNAP-25 Genes. Psychiatry Research, 205(1-2), 7-12.

EXTERNAL FUNDING TO LABORATORY
(2013 - 2015)

Source	Project Title	Collaborators	Awarded	Duration	Amount
NHMRC	The transportome: a coordinate complex regulating brain excitation and inhibition	DV Pow, A Lee, P Poronnik	2013	3 years	$592,000

SERVICE TO THE UNIVERSITY AND COMMUNITY
(2013 - 2015)

- Memberships of Editorial Board: Neurochemical Research (since 2006), The Open Journal of Neuroscience (since 2008), Current Neuropharmacology (since 2009)

SPECIAL AWARDS & PRIZES
(2013 - 2015)

- 2014 - Scholarships and Fellowships: INNOLEC Lectureship, Masaryk University, Czechia - Vladimir Balcar

ANIMAL DEVELOPMENTLABORATORY

MARIA BYRNE

PROFESSOR OF DEVELOPMENTAL AND MARINE BIOLOGY, ANATOMY AND HISTOLOGY

LABORATORY OVERVIEW

1. Evo-Devo:

In multidisciplinary research we investigate development and evolution in closely related species with contrasting life histories. Current projects involve invertebrates from tropical and temperate Australia with a focus on echinoderms (starfish, sea urchin) and molluscs (snails, bivalves). We compare development from conception to adult body plan formation in species for which we have data on genetic relatedness to map developmental change on an evolutionary time-line. Documenting the cellular and molecular mechanisms underlying developmental change is key to understanding evolutionary phenomena such as formation of new species and the origin of our own phylum, the Chordata. Current research focuses on neurogenesis and origins of the CNS. With a fully annotatated developmental transcriptome we are now delving into gene regulatory networks, how they are used in development and how they may change in association with modifications in developmental programs. Our research on environmental toxicology and animal reproduction investigates the conservation status of aquatic animals and the health of aquatic ecosystems. We use sea urchin gametes and embryos to assess environmental toxicity

2. Global Change Biology:

The focus of the climate change research is the influence of anthropogenic stressors from climate change – ocean warming, acidification and hypercapnia on marine invertebrate life histories. This work addresses current urgent need to understand how marine biota and their progeny will respond to ocean change.

LABORATORY PERSONNEL/ STUDENTS

Maria Byrne	Professor 1988 - present
Dr Demian Koop	Postdoc 2011 - present
Dr Paula Cisternas	Postdoc 2000 - present
Dr Selma Klanten	Research Assistant 2015 - present
Sergio Gabarda	Research Assistant 2014 - present

PUBLICATIONS
(2013 - 2015)

Figueira W, Ferrari R, Weatherby E, Porter A, Hawes S, Byrne M. 2015 Accuracy and Precision of Habitat Structural Complexity Metrics Derived from Underwater Photogrammetry. Remote Sensing 7: 16883-16900

Przeslawski, R., Byrne, M., Mellin, C. (2015). A review and meta-analysis of the effects of multiple abiotic stressors on marine embryos and larvae. Global Change Biology, 21(6), 2122-2140.

Bewley, M., Friedman, A., Ferrari, R., Hill, N., Hovey, R., Barrett, N., Pizarro, O., Figueira, W., Meyer, L., Babcock, R., Byrne, M., Williams, S., et al (2015). Australian sea-floor survey data, with images and expert annotations. Scientific Data, 2, 1-12.

Mos, B., Byrne, M., Cowden, K., Dworjanyn, S. (2015). Biogenic acidification drives density-dependent growth of a calcifying invertebrate in culture. Marine Biology, 162(8), 1541-1558.

Zito, F., Koop, D., Byrne, M., Matangra, V. (2015). Carbonic anhydrase inhibition blocks skeletogenesis and echinochrome production in Paracentrotus lividus and Heliocidaris tuberculata embryos and larvae. Development, Growth and Differentiation, 57(7), 507-514.

Soars, N., Byrne, M. (2015). Contrasting arm elevation angles of multi- and two-armed sea urchin echinoplutei supports Grünbaum and Strathmann's hydromechanical model. Marine Biology, 162(3), 607-616.

Keith, S., Woolsey, E., Madin, J., Byrne, M., Baird, A. (2015). Differential establishment potential of species predicts a shift in coral assemblage structure across a biogeographic barrier. Ecography, 38(12), 1225-1234.

Falkner, I., Sewell, M., Byrne, M. (2015). Evolution of maternal provisioning in ophiuroid echinoderms: Characterisation of egg composition in planktotrophic and lecithotrophic developers. Marine Ecology Progress Series, 525, 1-13.

Wolfe, K., Graba-Landry, A., Dworjanyn, S., Byrne, M. (2015). Larval phenotypic plasticity in the boom-and-bust crown-of-thorns seastar, Acanthaster planci. Marine Ecology Progress Series, 539, 179-189.

Wolfe, K., Graba-Landry, A., Dworjanyn, S., Byrne, M. (2015). Larval starvation to satiation: Influence of nutrient regime on the success of Acanthaster planci. PloS One, 10(3), 1-17.

Woolsey, E., Keith, S., Byrne, M., Schmidt-Roach, S., Baird, A. (2015). Latitudinal variation in thermal tolerance thresholds of early life stages of corals. Coral Reefs, 34(2), 471-478.

D'Aniello, S., Delroisse, J., Valero-Gracia, A., Lowe, E., Byrne, M., Cannon, J., Halanych, K., Elphick, M., Mallefet, J., Kaul-Strehlow, S., et al (2015). Opsin evolution in the Ambulacraria. Marine Genomics, 24(Pt 2), 177-183.

Purcell, S., Uthicke, S., Byrne, M., Eriksson, H. (2015). Rotational harvesting is a risky strategy for vulnerable marine animals. Proceedings of the National Academy of Sciences of the United States of America (PNAS), 112(46), e6263-e6263.

Eriksson, H., Byrne, M. (2015). The sea cucumber fishery in Australia's Great Barrier Reef Marine Park follows global patterns of serial exploitation. Fish and Fisheries, 16(2), 329-341.

Byrne, M., Koop, D., Cisternas, P., Strbenac, D., Yang, J., Wray, G. (2015). Transcriptomic analysis of Nodal- and BMP-associated genes during juvenile development of the sea urchin Heliocidaris erythrogramma. Marine Genomics, 24(1), 41-45.

Byrne, M., Hofmann, G. (2014). Calcification in a Changing Ocean: Perspectives on a Virtual Symposium in The Biological Bulletin. Biological Bulletin, 226(3), 167-168.

Jones, H., Byrne, M. (2014). Changes in the distributions of freshwater mussels (Unionoida: Hyriidae) in coastal south-eastern Australia and implications for their conservation status. Aquatic Conservation: Marine and Freshwater Ecosystems, 24(2), 203-217.

Gall, M., Rymer, P., Edgar, G., Byrne, M., Holmes, S. (2014). Characterisation of thirteen polymorphic microsatellite markers for the red sea urchin Heliocidaris tuberculata (Lamarck, 1816) developed using a 454-sequencing approach. Conservation Genetics Resources, 6, 237-239.

Nguyen, H., Byrne, M. (2014). Early benthic juvenile Parvulastra exigua (Asteroidea) are tolerant to extreme acidification and warming in its intertidal habitat. Journal of Experimental Marine Biology and Ecology, 453, 36-42.

Hardy, N., Byrne, M. (2014). Early development of congeneric sea urchins (Heliocidaris) with contrasting life history modes in a warming and high CO2 ocean. Marine Environmental Research, 102, 78-87.

Doo, S., Fujita, K., Byrne, M., Uthicke, S. (2014). Fate of Calcifying Tropical Symbiont-Bearing Large Benthic Foraminifera: Living Sands in a Changing Ocean. Biological Bulletin, 226(32), 169-186.

Pecorino, D., Baker, M., Dworjanyn, S., Byrne, M., Lamare, M. (2014). Impacts of near future sea surface pH and temperature conditions on fertilisation and embryonic development in Centrostephanus rodgersii from northern New Zealand and northern New South Wales, Australia. Marine Biology, 161(1), 101-110.

Foo, S., Dworjanyn, S., Khatkar, M., Poore, A., Byrne, M. (2014). Increased temperature, but not acidification, enhances fertilization and development in a tropical urchin: Potential for adaptation to a tropicalized eastern Australia. Evolutionary Applications, 7(10), 1226-1237.

Uthicke, S., Liddy, M., Nguyen, H., Byrne, M. (2014). Interactive effects of near-future temperature increase and ocean acidification on physiology and gonad development in adult Pacific sea urchin, Echinometra sp. A. Coral Reefs, 33(3), 831-845.

Kamya, P., Dworjanyn, S., Hardy, N., Mos, B., Uthicke, S., Byrne, M. (2014). Larvae of the coral eating crown-of-thorns starfish, Acanthaster planci in a warmer-high CO2 ocean. Global Change Biology, 20(11), 3365-3376.

Coleman, D., Byrne, M., Davis, A. (2014). Molluscs on acid: Gastropod shell repair and strength in acidifying oceans. Marine Ecology Progress Series, 509, 203-211. [More Information]

Morris, V., Byrne, M. (2014). Oral-aboral identity displayed in the expression of HpHox3 and HpHox11/13 in the adult rudiment of the sea urchin Holopneustes purpurescens. Development Genes and Evolution, 224(1), 1-11.

Lamare, M., Pecorino, D., Hardy, N., Liddy, M., Byrne, M., Uthicke, S. (2014). The thermal tolerance of crown-of-thorns (Acanthaster planci) embryos and bipinnaria larvae: Implications for spatial and temporal variation in adult populations. Coral Reefs, 33(1), 207-219.

Hardy, N., Lamare, M., Uthicke, S., Wolfe, K., Doo, S., Dworjanyn, S., Byrne, M. (2014). Thermal tolerance of early development in tropical and temperate sea urchins: inferences for the tropicalization of eastern Australia. Marine Biology, 161(2), 395-409.

Wygoda, J., Yang, J., Byrne, M., Wray, G. (2014). Transcriptomic analysis of the highly derived radial body plan of a sea urchin. Genome Biology and Evolution, 6(4), 964-973.

Bridge, T., Ferrari, R., Bryson, M., Hovey, R., Figueira, W., Williams, S., Pizarro, O., Harborne, A., Byrne, M. (2014). Variable responses of benthic communities to anomalously warm sea temperatures on a high-latitude coral reef. PloS One, 9(11), 1-20.

Byrne, M., Smith, A., West, S., Collard, M., Dubois, P., Graba-Landry, A., Dworjanyn, S. (2014). Warming Influences Mg(2+) Content, While Warming and Acidification Influence Calcification and Test Strength of a Sea Urchin. Environmental Science & Technology, 48(21), 12620-12627.

Cisternas, P., O'Hara, T., Byrne, M. (2013). An ornate fertilisation envelope is characteristic of some Ophiocoma species (Ophiuroidea: Ophiocomidae). Echinoderms in a Changing World: 13th International Echinoderm Conference, Leiden, The Netherlands: CRC Press/Balkema.

Byrne, M., Andrew, N. (2013). Centrostephanus rodgersii. Developments in Aquaculture and Fisheries Science, 38, 243-256.

Davis, A., Coleman, D., Broad, A., Byrne, M., Dworjanyn, S., Przeslawski, R. (2013). Complex responses of intertidal molluscan embryos to a warming and acidifying ocean in the presence of uv radiation. PloS One, 8(2), 1-7.

Poore, A., Graba-Landry, A., Favret, M., Sheppard Brennand, H., Byrne, M., Dworjanyn, S. (2013). Direct and indirect effects of ocean acidification and warming on a marine plant-herbivore interaction. Oecologia, 173(3), 1113-1124.

Byrne, M. (2013). Echinoderm ecotoxicology: Application for assessing and monitoring vulnerabilities in a changing ocean. Echinoderms in a Changing World: 13th International Echinoderm Conference, Leiden, The Netherlands: CRC Press/Balkema.

Ferrari, R., Malcolm, H., Friedman, A., Williams, S., Jordan, A., Figueira, W., Byrne, M. (2013). Effect of structural complexity on fish abundance on deep reefs: a case study in the Solitary Islands Marine Park. 50th Australian Marine Sciences Association Conference, Gold Coast, Australia: Australian Marine Sciences Association Inc.

Uthicke, S., Soars, N., Foo, S., Byrne, M. (2013). Effects of elevated pCO2 and the effect of parent acclimation on development in the tropical Pacific sea urchin Echinometra mathaei. Marine Biology, 160(8), 1913-1926.

Byrne, M., Gonzalez-Bernat, M., Doo, S., Foo, S., Soars, N., Lamare, M. (2013). Effects of ocean warming and acidification on embryos and non-calcifying larvae of the invasive sea star Patiriella regularis. Marine Ecology Progress Series, 473, 235-246.

Ho, M., Price, C., King, C., Virtue, P., Byrne, M. (2013). Effects of ocean warming and acidification on fertilization in the Antarctic echinoid Sterechinus neumayeri across a range of sperm concentrations. Marine Environmental Research, 90, 136-141.

Wolfe, K., Dworjanyn, S., Byrne, M. (2013). Effects of ocean warming and acidification on survival, growth and skeletal development in the early benthic juvenile sea urchin (Heliocidaris erythrogramma). Global Change Biology, 19(9), 2698-2707.

Gonzalez-Bernat, M., Lamare, M., Uthicke, S., Byrne, M. (2013). Fertilisation, embryogenesis and larval development in the tropical intertidal sand dollar Arachnoides placenta in response to reduced seawater pH. Marine Biology, 160(8), 1927-1941.

Pecorino, D., Lamare, M., Barker, M., Byrne, M. (2013). How does embryonic and larval thermal tolerance contribute to the distribution of the sea urchin Centrostephanus rodgersii (Diadematidae) in New Zealand? Journal of Experimental Marine Biology and Ecology, 445, 120-128.

Dartnall, A., Stevens, H., Byrne, M. (2013). How to lose a population: The effect of Cyclone Larry on a population of Cryptasterina pentagona at Mission Beach, North Queensland. Echinoderms in a Changing World: 13th International Echinoderm Conference, Leiden, The Netherlands: CRC Press/Balkema.

Nguyen, H., Byrne, M., Thomson, M. (2013). Hsp70 expression in the south-eastern Australian sea urchins Heliocidaris erythrogramma and H. tuberculata. Echinoderms in a Changing World: 13th International Echinoderm Conference, Leiden, The Netherlands: CRC Press/Balkema.

Uthicke, S., Pecorino, D., Albright, R., Negri, A., Cantin, N., Liddy, M., Dworjanyn, S., Kamya, P., Byrne, M., Lamare, M. (2013). Impacts of ocean acidification on early life-history stages and settlement of the coral-eating sea star Acanthaster planci. PloS One, 8(12), 1-9.

Schneider, K., Silverman, J., Kravitz, B., Rivlin, T., Schneider-Mor, A., Barbosa, S., Byrne, M., Caldeira, K. (2013). Inorganic carbon turnover caused by digestion of carbonate sands and metabolic activity of holothurians. Estuarine, Coastal and Shelf Science, 133, 217-223.

Thorne, B., Eriksson, H., Byrne, M. (2013). Long term trends in population dynamics and reproduction in Holothuria atra (Aspidochirotida) in the southern Great Barrier Reef; the importance of asexual and sexual reproduction. Journal of the Marine Biological Association of the United Kingdom, 93(4), 1067-1072.

Wolfe, K., Smith, A., Trimby, P., Byrne, M. (2013). Microstructure of the paper nautilus (Argonauta nodosa) shell and the novel application of electron backscatter diffraction (EBSD) to address effects of ocean acidification. Marine Biology, 160(8), 2271-2278.

Byrne, M., Przeslawski, R. (2013). Multistressor Impacts of Warming and Acidification of the Ocean on Marine Invertebrates' Life Histories. Integrative and Comparative Biology, 53(4), 582-596.

Byrne, M., Foo, S., Soars, N., Wolfe, K., Nguyen, H., Hardy, N., Dworjanyn, S. (2013). Ocean warming will mitigate the effects of acidification on calcifying sea urchin larvae (Heliocidaris tuberculata) from the Australian global warming hot spot. Journal of Experimental Marine Biology and Ecology, 448, 250-257.

Woolsey, E., Byrne, M., Webster, J., Williams, S., Pizarro, O., Thornborough, K., Davies, P., Beaman, R., Bridge, T. (2013). Ophiopsila pantherina beds on subaqueous dunes off the Great Barrier Reef. Echinoderms in a Changing World: 13th International Echinoderm Conference, Leiden, The Netherlands: CRC Press/Balkema.

Eriksson, H., Thorne, B., Byrne, M. (2013). Population metrics in protected commercial sea cucumber populations (curryfish: Stichopus herrmanni) on One Tree Reef, Great Barrier Reef. Marine Ecology Progress Series, 473, 225-234.

Falkner, I., Barbosa, S., Byrne, M. (2013). Reproductive biology of four ophiocomid ophiuroids in tropical and temperate Australia-reproductive cycle and oogenic strategies in species with different modes of development. Invertebrate Reproduction and Development, 57(3), 189-199.

Durrant, H., Clark, G., Dworjanyn, S., Byrne, M., Johnston, E. (2013). Seasonal variation in the effects of ocean warming and acidification on a native bryozoan, Celleporaria nodulosa. Marine Biology, 160(8), 1903-1911.

Keever, C., Puritz, J., Addison, J., Byrne, M., Grosberg, R., Toonen, R., Hart, M. (2013). Shallow gene pools in the high intertidal: Extreme loss of genetic diversity in viviparous sea stars (Parvulastra). Biology Letters, 9(5), 1-5.

Morris, V., Cisternas, P., Whan, R., Byrne, M. (2013). Stone canal morphology in the brachiolaria larva of the asterinid sea star Parvulastra exigua. Echinoderms in a Changing World: 13th International Echinoderm Conference, Leiden, The Netherlands: CRC Press/Balkema.

Thorne, B., Byrne, M. (2013). Survivorship of post-split fission products of Holothuria atra (Holothuroidea: Aspidochirotida) on the southern Great Barrier Reef. Invertebrate Reproduction and Development, 57(4), 293-300.

Woolsey, E., Byrne, M., Baird, A. (2013). The effects of temperature on embryonic development and larval survival in two scleractinian corals. Marine Ecology Progress Series, 493, 179-184.

Byrne, M., Lamare, M., Winter, D., Dworjanyn, S., Uthicke, S. (2013). The stunting effect of a high CO2 ocean on calcification and development in sea urchin larvae, a synthesis from the tropics to the poles. Philosophical Transactions of the Royal Society B. Biological Sciences, 368(1627), 1-13.

Wolfe, K., Dworjanyn, S., Byrne, M. (2013). Thermal and pH/pCO2 fluctuations in the intertidal habitat of Heliocidaris erythrogramma: effects on post-metamorphic juveniles. Cahiers de Biologie Marine, 54(4), 657-666.

Martinez, A., Byrne, M., Coleman, R. (2013). Unique tagging of small echinoderms: a case study using the cushion star Parvulastra exigua. Methods in Ecology and Evolution, 4(10), 993-1000.

Barbosa, S., Klanten, S., Puritz, J., Toonen, R., Byrne, M. (2013). Very fine-scale population genetic structure of sympatric asterinid sea stars with benthic and pelagic larvae: Influence of mating system and dispersal potential. Biological Journal of the Linnean Society, 108(4), 821-833.

Byrne, M., Ho, M., Koleits, L., Price, C., King, C., Virtue, P., Tilbrook, B., Lamare, M. (2013). Vulnerability of the calcifying larval stage of the Antarctic sea urchin Sterechinus neumayeri to near-future ocean acidification and warming. Global Change Biology, 19(7), 2264-2275.

POSTGRADUATE & HONOURS COMPLETIONS

(2013 - 2015)

PhD

2013 - Hong Ngyuen
2014 - Hugh Jones
2014 - Erika Woolsey
2015 - Natalie Soars

BSc(Hons)

2014 - Sharna Katzeff
2015 - Roberta Johnson

SPECIAL AWARDS & PRIZES

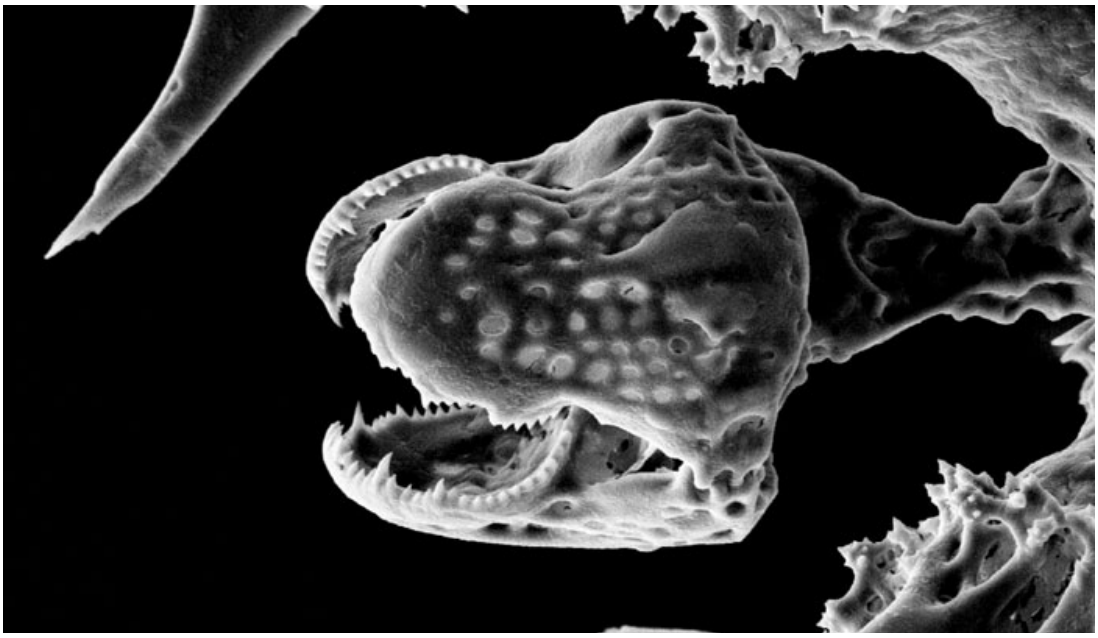
(2013 - 2015)

- Scholarships and Fellowships Awarded - Hong Ngyuen – Usyd APA
- Scholarships and Fellowships Awarded - Hugh Jones
- Scholarships and Fellowships Awarded - Erika Woolsey JCU APA
- Scholarships and Fellowships Awarded - Natalie Soars– Usyd APA
- Scholarships and Fellowships Awarded - Shawna Foo– Usyd APA

EXTERNAL FUNDING TO LABORATORY

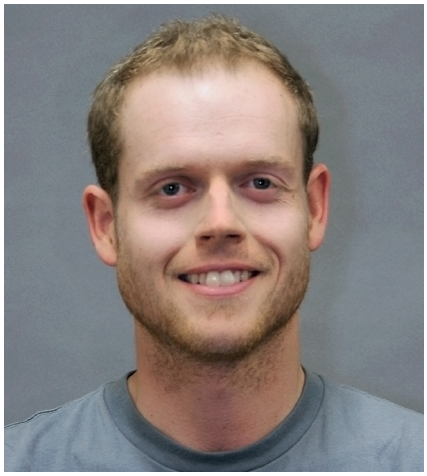
(2013 - 2015)

Source	Project Title	Collaborators	Awarded	Duration	Amount
ARC Discovery	Adaptive capacity of marine invertebrates in a climate change ocean.	Byrne, Dworjanyn, Poore	2015	2015-19	$725,000
NSW Environmental Trust	Physiological effects of climate change on adults and offspring	Byrne	2013	2013-16	$200,000
Great Barrier Reef Foundation	Quantification of coral reef habitat structural complexity and community composition in a changing ocean using 3D models	Byrne: Figueira, Williams, Ferrari, and others	2013	2013-15	$550,000
ARC Discovery	Heads or tails: which did echinoderms loose in evolution of pentamery	Byrne	2012	2012-14	$362,000
Great Barrier Reef Foundation	Reef-scale Impacts of Changing Climates on Calcification by Large Benthic Foraminifera on the Great Barrier Reef	Byrne: Hamilyton. Vila-Concejo, Eggins	2013	2013-14	$90,000



Prehistoric Pedicellaria - Kenedy Wolfe, Byrne Lab, Discipline of Anatomy & Histology

Pedicellaria are small claw-shaped structures commonly found on sea urchins. This structure looks like a dangerous set of teeth and jaws, but is only 40 µm of brittle calcium carbonate.



SENSORY SYSTEMS AND INTEGRATION LABORATORY

AARON CAMP

SENIOR LECTURER, BIOMEDICAL SCIENCES

LABORATORY OVERVIEW

Airplanes, submarines and even our humble phones use sophisticated guidance systems to allow them to navigate through the environment. Amazingly, vertebrates have used an analogous system for billions of years! This system is called the vestibular or balance system.

RESERCH ACTIVITIES

I am interested in how our vestibular system allows us to maintain balance under normal conditions, how disease or aging impairs this ability, and how balance signals are ultimately combined with those of other senses to enable navigation through our complex world.

LABORATORY PERSONNEL/ STUDENTSS

Dr Aaron Camp	Lab Head - present
Victoria Tung	PhD student 2012 - present
Miranda Matthews	PhD student 2013 - present
Dr Rajiv Wijesinghe	MPhil student 2015 - present

CURRENT PROFESSIONAL ROLES

- University of Sydney Senior Executive Group Divisional Disability Liaison (2016- present)
- Reviewer- NHMRC Project grants (2016)
- Sydney Medical School Disability Action Plan Coordinator (2015- present)
- Category C member University of sydney Animal Ethics Committee (2014- present)
- President Society for Neuroscience (SfN) Sydney Chapter (2014-present)
- Review Editor- Frontiers in Neurology (2016-present)
- Neuroscience Editorial Board member- Journal of Visualized Experiments (JoVE; 2013- present)
- Guest Editor- Neural Plasticity (2013-present)
- Reviewer- Journal of Physiology (2010- present)
- Reviewer- International Journal of Biochemistry and Cell Biology (2009- present)
- Member- Australasian Neuroscience society
- Member- Society for Neuroscience

SPECIAL AWARDS & PRIZES

(2013 - 2015)

- 2015 - Usyd Grant In Aid- Victoria Tung Advanced Neuroscience Fellowship (ACAN) - Victoria Tung

NATIONAL AND INTERNATIONAL COLLABORATIONS

National

- Dr Daniel Johnstone, University of Sydney: Developing models of neurodegenerative disease PSP
- Dr Erika Gyengesi, University of Western Sydney: Cholinergic signalling in PSP

International

- Professor Brian Corneil, University of Western Ontario, Canada: Clinical vestibular testing
- Dr Andrew Murray, University College London, UK: Efferent vestibular circuitry
- Dr Anne Leubke, University of Rochester, USA: Efferent vestibular circuitry

PUBLICATIONS
(2013 - 2015)

Mathews MA, Murray A, Wijesinghe R, Cullen K, Tung VWK, Camp AJ (2015) Efferent Vestibular Neurons Show Homogenous Discharge Output But Heterogeneous Synaptic Input Profile In Vitro. PLoS ONE 10(9): e0139548. doi:10.1371/journal.pone.0139548

Wijesinghe R, Protti DA, Camp AJ. (2015) Vestibular Interactions in the Thalamus. Front Neural Circuits. doi: 10.3389/fncir.2015.00079. eCollection 2015.

Wijesinghe R, Tung VW, Camp AJ, Protti DA, Mathews MA. (2015), Exciting potential: The importance of the right environment. Journal of Physiology. 593, Vol.10, 2253–2255

Zhang L, Tung V, Mathews M, Camp A.J (2015) Near infrared (Nlr) light increases expression of a marker of mitochondrial function in the mouse vestibular sensory epithelium. J. Vis. Exp. 14;(97). doi: 10.3791/52265.

Lim, R. Camp, A.J, Tadros, M, Drury, H, Callsiter, R, Brichta, A (2014) Preliminary characterization of voltage-activated whole-cell currents in developing human vestibular hair cells and calyx afferent terminals. JARO 15(5): 755-66

Tung, V.W.K, Burton, T, Debabneh, E, Quail, S, Camp, A.J (2014) Behavioural assessment of the ageing mouse vestibular system. J. Vis. Exp. (89), e51605, doi:10.3791/51605

Wijesinghe, R., Solomon, S.G., and Camp, A.J. (2013) Noise normalizes firing output of mouse lateral geniculate nucleus neurons. PLoS One. 8(2):e57961. doi: 10.1371/journal.pone.0057961

Tung, V.W.K., DiMarco, D., Lim, R., Brichta, A.M., and Camp, A.J. (2013) An isolated semi-intact preparation of the mouse vestibular sensory epithelium for electrophysiology and high-resolution two-photon microscopy. J. Vis. Exp. (76):e50471. doi: 10.3791/50471.

POSTGRADUATE AND HONOURS COMPLETIONS
(2013 - 2015)

BMedSc(Hons)

2014 - Lucy Zhang

EXTERNAL FUNDING TO LABORATORY
(2013 - 2015)

Source	Project Title	Collaborators	Awarded	Duration	Amount
Discipline of Biomedical Science	Building Research Infrastructure Grant		2015		$20,000
University of sydney	International Program Development Fund		2014		$17,000
NHMRC	Equipment grant		2014		$60,000
Garnett Passe & Rodney Williams Foundation	PhD Scholarship (V. Tung)		2013-15		$81, 000
Discipline of Biomedical Science	Building Research Infrastructure Grant		2013		$20,000
University of Sydney	Early Career Researcher Award		2013		$25,000
NHMRC	Equipment grant		2013		$74,500
NHMRC	Equipment grant		2013		$75,000

AUDITORY NEUROSCIENCE LABORATORY

SIMON CARLILE

ASSOCIATE PROFESSOR, PHYSIOLOGY

Development and applications of virtual auditory space technologies in hearing research, spatial hearing devices for the hearing impaired and for communications and consumer applications.

LABORATORY OVERVIEW AND RESEARCH ACTIVITIES

Research in the Laboratory during 2014 and 2015 focused on three main areas: (i) The role of spatial attention and localization in speech intelligibility in noisy environments in normally hearing and hearing impaired individuals; (ii) The capacity to accelerate the adaptation by the auditory system to chronic changes in spectral input as occurs with normal ageing and with the fitting of a new hearing aid or hearing prosthesis; (iii) The perception of moving auditory stimuli and specifically testing current models of auditory motion perception.

1. Speech intelligibility and the "cocktail party problem"

We have extended our work examining the spatial unmasking of speech in the hearing impaired We have completed a second study of the effects of different hearing aid form factors on localisation performance: completely in canal (CIC) aids which preserve some spectral cues to sound location and more traditional behind the ear hearing (BTE) aids which only preserve interaural differences. Following on from our previous work, this study has found that an additional period of accommodation does not improve outcomes over and above what was originally seen with a 30 day accommodation period. This study has also been complemented by an extensive acoustical study of the perturbations of the normal acoustic cues to sound location produced by the five main hearing aid form factors.

For the first time, this work accurately documents the range of spectral changes that the auditory system is required to accommodate to with the different hearing aid form factors.

This has led to a major data base that will be of significant interest to researchers in both commercial and not-for profit institutions that are involved in the design and testing of hearing aids. Two manuscripts describing this work have been submitted for publication.

We also completed a further study of the effects of spatial attention on speech intelligibility demonstrating that knowing where to listen plays an important role not just in helping enhance the perception of talkers at the attended location, but also in the suppression of unwanted maskers. This work is now published. We have also completed a study examining the role of differences in the perceived distance of different sources in speech segregation. This work points to the important role of interaural differences in sound level in unmasking.

2. Studies of auditory accommodation

The auditory system calibrates itself to subtle acoustic changes produced by changes in the outer ears during maturation and ageing but almost nothing is known about this process. New work in the Laboratory is examining how experience and training can affect the accommodation process and has a particular focus on the roles of sensory-motor interaction, auditory-visual coherence and top-down processes such as selective spatial attention. In developing a better understanding of what drives this process we aim to develop training programs to expedite accommodation to hearing aids and hearing prosthesis.

Small moulds are inserted into the outer ears to produce subtle changes in the acoustic spectral cues to sound location and sound localisation performance is measured over the period of accommodation. We have now confirmed our preliminary work that indicates human subjects are able to accommodate (more or less) to these changes following 10 to 60 days of wearing the moulds. This work is being prepared for publication. One important question that has arisen is why do some subjects accommodate faster and some more completely than others? One driver could be the extent of the modification of the filter properties of the outer ear produced by the moulds. Bioacoustic work in 2011 has focussed on the development of methods to systematically change the spectral filtering of the outer ear as a means of exploring this driver to accommodation.

3. The perception of moving auditory stimuli

Tracking moving stimuli is an essential ability and involves complex integration of sensory-motor information. Our understanding of visual tracking has enabled a huge range of applications from vigilance detection to schizophrenia diagnosis. Nothing is known about tracking moving sounds.

SIMON CARLILE

Left to Right: Rick Ballan, Yosef Nacach, Heather Kelly, James Shannon, Narayan Sankaran, Martin Burgess, Imran Dhamani, Kapilesh Balachander, Johahn Leung, Alexander Fox, Shannon Locke, Simon Carlile, Emily Orchard-Mills, Gaven Lin

We have been developing a state of the art dynamic multisensory system capable of tracking performance for a wide range of both head and target motion. This system allows different kinds of motion to be used to help characterise the underlying control systems. Not only will this work result in a deep understanding of this basic human behaviour, it will provide the basis for high fidelity motion capture and analysis as well as diagnosis and study of many sensory motor and neurological deficits. In addition to completing system development phase, in 2011 we have also completed one experiment looking at head tracking to audio, visual and audio visual targets moving in a smooth arc across the frontal hemisphere. In addition to providing a proof of concept of our system this has provided new information on this basic human ability and is currently being prepared for publication.

LABORATORY PERSONNEL/ STUDENTS

Simon Carlile	A/Prof 1993 - present
Heather Kelly	Research Officer 2009
Rick Ballan	Research Associate 2012 - present
Johann Leung	PhD student 2011 - present
Imran Dhamani	PhD student 2011 - present
Gavin Lin	PhD student 2013 - present
Narayan Sankaran	PhD student 2012 - present
Anthony Wakulicz	PhD student 2014 - present
Martin Burgess	PhD student 2014 - 2015
Chris Watson	BMedSc(Hons) 2014
Francesca Meliton	BSc(Hons) 2013 - Jun 2014
Jennifer Lee	BSc(Hons) 2014
Madeleine Bautista	BSc(Hons) 2014
Tamara Dzudovic Simpson	BMedSc(Hons) 2015
Robert Mills	BMedSc(Hons) 2015

SERVICE TO THE UNIVERSITY AND COMMUNITY (2013 - 2015)

- 2015 - present Editorial Board of Journal - Scientific Reports (a Nature journal)

PUBLICATIONS
(2013 - 2015)

Carlile, S. (2015). Auditory Perception: Attentive Solution to the Cocktail Party Problem. Current Biology, 25(17), R757-R759.

Lin, G., Carlile, S. (2015). Costs of switching auditory spatial attention in following conversational turn-taking. Frontiers in Neuroscience, 9, 1-11.

Carlile, S., Corkhill, C. (2015). Selective spatial attention modulates bottom-up informational masking of speech. Scientific Reports, 5(8662), 1-7.

Leung JW, V, Burgess M, Carlile S. Head tracking of Auditory, Visual and Audio-Visual Targets. Frontiers in Neuroscience. 2015; 9.

Carlile, S., Balachandar, K., Kelly, H. (2014). Accommodating to new ears: The effects of sensory and sensory-motor feedback. Journal of the Acoustical Society of America, 135(4), 2002-2011.

Durin, V., Carlile, S., Guillon, P., Best, V., Kalluri, S. (2014). Acoustic analysis of the directional information captured by five different hearing aid styles. Journal of the Acoustical Society of America, 136(2), 818-828.

Carlile, S. (2014). Active listening: Speech intelligibility in noisy environments. Acoustics Australia, 42(2), 90-96.

Reijniers, J., Vanderelst, D., Jin, C., Carlile, S., Peremans, H. (2014). An ideal-observer model of human sound localization. Biological Cybernetics, 108(2), 169-181.

Sharma, M., Dhamani, I., Leung, J., Carlile, S. (2014). Attention, memory, and auditory processing in 10- to 15-year-old children with listening difficulties. Journal of Speech, Language, and Hearing Research, 57(6), 2308-2321.

Freeman, T., Leung, J., Wufong, E., Orchard-Mills, E., Carlile, S., Alais, D. (2014). Discrimination Contours for Moving Sounds Reveal Duration and Distance Cues Dominate Auditory Speed Perception. PloS One, 9(7), 1-10.

Sankaran, N., Leung, J., Carlile, S. (2014). Effects of Virtual Speaker Density and Room Reverberation on Spatiotemporal Thresholds of Audio-Visual Motion Coherence. PloS One, 9(9), 1-7.

Kalluri, S., Carlile, S. (2014). Mapping HRTFs: Acoustic Cues for Three-dimensional Spatial Hearing Across Hearing Aid Styles. Hearing Review, 21(9), 34-37.

Carlile, S., Blackman, T. (2014). Relearning Auditory Spectral Cues for Locations Inside and Outside the Visual Field. JARO (Journal of the Association for Research in Otolaryngology), 15(2), 249-263.

Carlile, S. (2014). The Christmas Party Problem. Audiology Now, 55, 15-17.

Feinkohl, A., Locke, S., Leung, J., Carlile, S. (2014). The effect of velocity on auditory representational momentum. Journal of the Acoustical Society of America, 136(1), EL20-EL25.

Carlile, S. (2014). The plastic ear and perceptual relearning in auditory spatial perception. Frontiers in Neuroscience, 8, 1-13.

Orchard-Mills, E., Leung, J., Burr, D., Morrone, M., Wufong, E., Carlile, S., Alais, D. (2013). A Mechanism for detecting coincidence of auditory and visual spatial signals. Multisensory Research,

Dhamani, I., Leung, J., Carlile, S., Sharma, M. (2013). Switch Attention to Listen. Scientific Reports, 3, 1-8.

POSTGRADUATE & HONOURS COMPLETIONS

(2013 - 2015)

BSc(Hons)

2014 - Jennifer Lee

2014 - Madeleine Bautista

2015 - Francesca Meliton

BMedSc(Hons)

2014 - Chris Watson

2015 - Tamara Dzudovic Simpson

2015 - Robert Mills

EXTERNAL FUNDING TO LABORATORY

(2013 - 2015)

Source	Project Title	Collaborators	Awarded	Duration	Amount
ARC	The effect of multi-sensory and sensory-motor training on auditory accommodation	Carlile S	2011	3 years	$270,000

RETINAL AND DEVELOPMENTAL NEUROBIOLOGY LABORATORY

TAILOI CHAN-LING

PROFESSOR, ANATOMY AND HISTOLOGY

LABORATORY OVERVIEW

Dr Chan-Ling has made a sustained contribution to the understanding of glial-vascular biology during normal CNS development as well as key understanding to the disease processes in Retinopathy of Prematurity (the leading cause of infant blindness in the world) animal models of multiple sclerosis, cerebral malaria and inflammation.

An overall unifying theme to our research has been the study of the retina as a model of the brain in order to further our understanding of the developmental biology of the glial cells and vasculature of the central nervous system. A major focus of our research is to gain insights regarding the cellular and molecular mechanisms by which new vessels are formed in the retina and choroid during normal development, and how these processes change during disease. Since retinal and choroidal neovascularisation are part of a number of sight threatening diseases, our studies are relevant to retinopathy of prematurity (ROP), diabetic retinopathy and age-related macular degeneration.

A second theme of research in the lab is stem cell biology. We aim to determine the best conditions required to generate pure populations of human fetal-derived astrocytes, while further studies are underway to maximise cell differentiation along the oligodendrocytic and neuronal pathways.

RESEARCH ACTIVITIES

Currently, our laboratory undertakes research in the following areas:

- Purification of oligodendrocyte progenitor cells, neural stem cells and astrocytes: Applications in regenerative medicine
- Studies to determine the effects of superparamagnetic iron oxide nanoparticles on stem cell proliferation, migration & bioenergetics
- Lymphatics in the human choroid: Normal developmental processes and changes in diabetes and cancer
- Cellular and molecular mechanisms of human retinal vascularisation
- Pharmacological manipulation of SIRT2 to promote lifespan and delay cognitive decline in aging
- CNS inflammation and bone marrow neuropathy in type 1 and type 2 diabetes
- Insulin-like growth factor binding protein-3 as a potential therapy in maximising repair functions of hematopoietic stem cells in stemming vision loss
- A non-invasive treatment for Retinopathy of Prematurity – dark rearing as a potential therapy for ROP
- A non-invasive treatment for Retinopathy of Prematurity – dark rearing as a potential therapy for ROP.

LABORATORY PERSONNEL/ STUDENTS

Tailoi Chan-Ling	Professor NHMRC Principal Research Fellow 1994 - present
Samuel Adamson	PhD student 2013 - 2016
Dr Steven Eamegdool	PhD student 2012 - 2015
Rosita Pang	PhD student 2013 - present
Saeed Shahoseini	PhD student 2013 - present
Mohammed Nasir Uddin	PhD student 2015 - present
Dr Ping Hu	PhD student 2010 - 2014
Dr Michael Lovelace	Honorary Research Associate 2009 - present
Dr Michael Wible	Honorary Research Associate 2006 - present
Dr Frank Arfuso	Honorary Research Associate 2009 - present
Dr George Fatseas	Honorary Research Associate 2014 - present
Louise Baxter	Honorary Research Associate 2013 - 2015

PUBLICATIONS
(2013 - 2015)

Chan-Ling, T., Koina, M., Arfuso, F., Adamson, S., Baxter, L., Hu, P., Madigan, M. (2015). Author response: Sufficient evidence for lymphatics in the developing and adult human choroid? Investigative Ophthalmology & Visual Science, 56(11), 6711-6713.

Braidy, N., Poljak, A., Grant, R., Jayasena, T., Mansour, H., Chan-Ling, T., Smythe, G., Sachdev, P., Guillemin, G. (2015). Differential expression of sirtuins in the aging rat brain. Frontiers in Cellular Neuroscience, 9(MAY), 1-16.

Koina, M., Baxter, L., Adamson, S., Arfuso, F., Hu, P., Madigan, M., Chan-Ling, T. (2015). Evidence for lymphatics in the developing and adult human choroid. Investigative Ophthalmology & Visual Science, 56(2), 1310-1327.

Hu, P., Thinschmidt, J., Caballero, S., Adamson, S., Cole, L., Chan-Ling, T., Grant, M. (2015). Loss of survival factors and activation of inflammatory cascades in brain sympathetic centers in type 1 diabetic mice. American Journal of Physiology: Endocrinology and Metabolism (online), 308(8), E688-E698.

Gu, B., Lovelace, M., Weible, M., Allen, D., Eamegdool, S., Chan-Ling, T., Wiley, J. (2015). P2X7 is an archaic scavenger receptor recognizing apoptotic neuroblasts in early human neurogenesis. Receptors & Clinical Investigation, 2, 1-8.

Lovelace, M., Gu, B., Eamegdool, S., Weible, M., Wiley, J., Allen, D., Chan-Ling, T. (2015). P2X7 Receptors mediate Innate phagocytosis by Human Neural Precursor Cells and Neuroblasts. Stem Cells, 33(2), 526-541.

Braidy, N., Poljak, A., Grant, R., Jayasena, T., Mansour, H., Chan-Ling, T., Guillemin, G., Smythe, G., Sachdev, P. (2014). Mapping NAD(+) metabolism in the brain of ageing Wistar rats: potential targets for influencing brain senescence. Biogerontology, 15, 177-198.

Eamegdool, S., Weible, M., Pham, T., Hawkett, B., Grieve, S., Chan-Ling, T. (2014). Ultrasmall superparamagnetic iron oxide nanoparticle prelabelling of human neural precursor cells. Biomaterials, 35(21), 5549-5564.

Hu, P., Thinschmidt, J., Yan, Y., Hazra, S., Bhatwadekar, A., Caballero, S., Salazar, T., Miyan, J., Li, W., Derbenev, A., Chan-Ling, T., et al (2013). CNS Inflammation and Bone Marrow Neuropathy in Type 1 Diabetes. The American Journal of Pathology, 183(5), 1608-1620.

Mansour, H., McColm, J., Cole, L., Weible, M., Korlimbinis, A., Chan-Ling, T. (2013). Connexin 30 expression and frequency of connexin heterogeneity in astrocyte gap junction plaques increase with age in the rat retina. PloS One, 8(3), 1-14.

SPECIAL AWARDS & PRIZES

(2013 - 2015)

- Wiederhelm Award – From the journal Microcirculation, for the most highly cited original article over the previous 5 years. 2012, for the paper: Chan-Ling T, Hughes S, Baxter L, Rosinova E, McGregor I, Morcos Y, van Nieuwenhuyzen, PS and Hu P, "Inflammation and breakdown of the blood-retinal barrier during 'physiological aging' in the rat retina: a model for CNS aging" (2007) 14(1) Microcirculation 63.
- Highly commended in the 2013 New Scientist Eureka Prize for Science Photography. The dawn of neurodevelopment – the migratory journey of neural precursors, Dr Michael Lovelace and Professor Tailoi Chan-Ling, University of Sydney.
- Mr Ping Hu - The Brian M. Kirby Gift of Sight Initiative Scholarship - 2011-2013
- Mr Steven Eamegdool - The Brian M. Kirby Gift of Sight Initiative - 2011-2013
- Dr. Michael Lovelace - Charles D Kelman M.D. Postdoctoral Scholar Award (International Retinal Research Foundation, USA) 2011

Scholarships and Fellowships Awarded

- Mohammad Nasir Uddin (APA & IPRS holder) 2015-Present
- Samuel Adamson (UPA 2014-2016, Recipient; Brian M. Kirby Foundation Gift of Sight Scholarship)
- Samuel Adamson: 2nd Prize Winner, Bosch Institute Annual Scientific Meeting Young Investigator Poster Competition, July 2016. Travel Award Winner, International Society For Eye Research Biennial Meeting, Tokyo, Japan September 2016; 2014 Recipient; NWG Macintosh Memorial Project Funding (CI) "Comparison of Two Novel, Non-invasive Treatments with current Anti-VEGF Therapies for Retinopathy of Prematurity" ($15,000 in direct research costs); 2014 Highly Commended; Bosch Institute Advanced Microscopy Facility Image Prize
- Rosita Pang: 2nd Prize Winner, Bosch Institute Annual Scientific Meeting 3 Minute Thesis Competition, July 2016

SERVICE TO THE UNIVERSITY AND COMMUNITY

(2013 - 2015)

- 2014-present Rebecca L Cooper Medical Research Foundation Scientific Advisory Committee
- 2014-present Board Member, Alliance for Design and Application in Tissue Engineering (ADATE), University of Sydney.
- 2012-present Councilor, University of Sydney Association of Professors (USAP)
- 2007-present Academic Board Nominee, University of Sydney
- 2006-present Executive Leadership Group, Bosch Institute
- 2001-present University of Sydney, Harassment and Discrimination Support Officer
- 1998-present Honorary Research Associate: Institute of Clinical Neurosciences, Royal Prince Alfred Hospital

International Committee Membership

- 2012-present Secretary, International Society for Eye Research
- 2014-present Member, Association for Research in Vision and Ophthalmology (ARVO) Publications Committee.
- 2009 Member, International Organising Committee for the World Retinopathy of Prematurity Meeting, "NO-ROP: Partnership, Prevention and Planning " New Delhi, India November 2009
- 2007-present Member. International Liaison Committee of the World Congress For Microcirculation.
- 2007-present Member, International Committee of the World Union of Microcirculation: Australian and New Zealand Representative
- 2003-present Executive member, Asian Union of Microcirculation, 2003-present

Editorial Board Membership

- 2006-present Editorial Board of Public Library of Science (PLoS) ONE, open Access online peer-reviewed journal on all areas of science and medicine
- 2002-present Editorial Board, Glia

EXTERNAL FUNDING TO LABORATORY
(2013 - 2015)

Source	Project Title	Collaborators	Awarded	Duration	Amount
NHMRC	La Vision BioTec Ultramicroscope;	Murphy C, Braet F, Byrne M, Chan-Ling T, Fraser S, Goldsbury C, Halliday G, Hambly B, Johnstone D, Keay K, Lovelace M, Lyons G, Mason R, Overall R, Owens T, Richardson D, Stone J, Weiss A;	2014	1 Year	
Dr David Tai	Personal donation of $50,000 to support research activities of the Chan-Ling Laboratory	T Chan-Ling	2015	1 Year	$50,000
Sydney Medical Foundation	Bequest from the estate of Victor Richard Whittington 2015. For project entitled "Comparison of Novel, Non-invasive Treatments with current Anti-VEGF Therapies for Retinopathy of Prematurity: Optimisation of combinational therapy"	T Chan-Ling	2015	1 Year	$50,000
AusIndustry	Research connections grant (Sirtex Technology) "Optimisation and Application	T Chan-Ling	2015	1 Year	$100,000
University of Sydney Faculty of Medicine	Research Bridging Support	T Chan-Ling	2015	1 Year	$75,000
University of Sydney	'Near-Miss' Grant. Evidence for existence of lymphatics in the human choroid: Normal development and pathology,	T Chan-Ling	2014	1 Year	$30,000
Baxter Charitable Foundation	Stemming Vision Loss with Stem Cells,	T Chan-Ling	2013	1 Year	$25,000

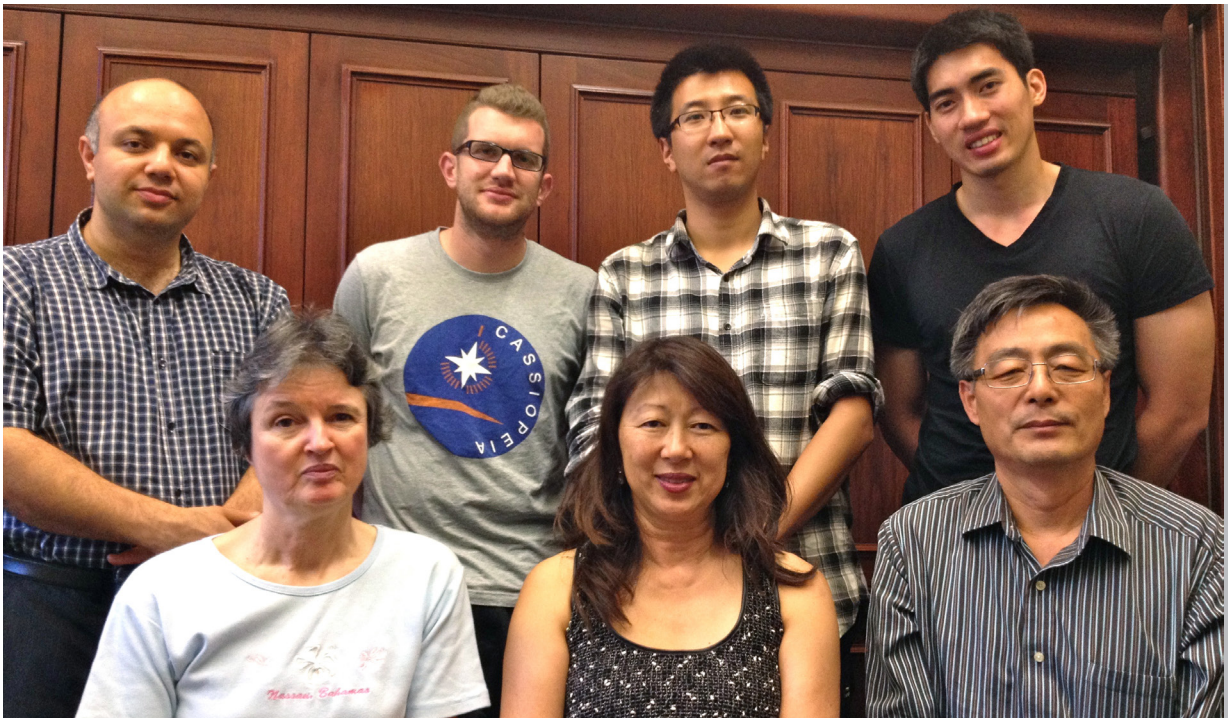
POSTGRADUATE & HONOURS COMPLETIONS

(2013 - 2015)

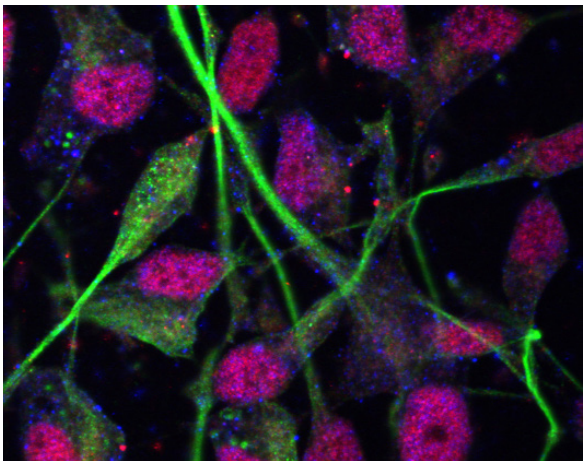
PhD

2014 - Ping Su

2015 - Steven Eamegdool

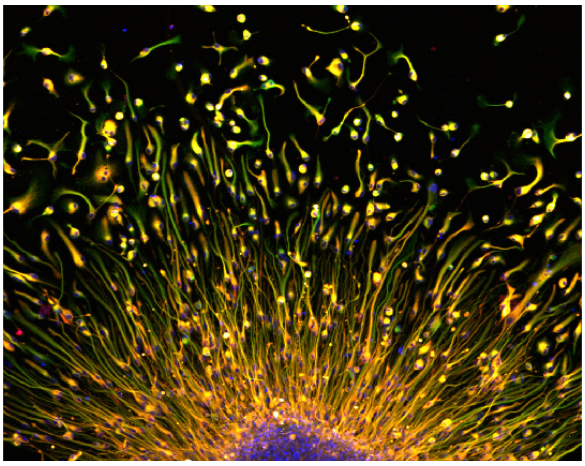


Chan-Ling Lab (Left to Right) Standing: Saeed Shahoseini, Sam Adamson, Wenchen Ji, Steve Eamegdool
Seated: Louise Baxter, Tailoi Chan-Ling, Ping Hu



"Cultured neuron stem cell in day 7: Cultured NeuN+ (blue) and B III Tubulin+ (green) cells express IGFBP-3 (red)".

Image supplied by Ping Hu



"The dawn of neurodevelopment – the migratory journey of neural precursors".

Michael Lovelace

DEVELOPMENTAL PHYSIOLOGY LABORATORY

MARGOT DAY

ASSOCIATE PROFESSOR, PHYSIOLOGY

LABORATORY OVERVIEW

Research conducted by this laboratory is related to the cellular processes occurring during development of the embryo before implantation, including fertilisation, cell division and cell differentiation. Roughly 3% of babies born in Australia result from assisted reproduction involving fertilization and then culture of the embryo in vitro. It is known that the embryo culture environment causes significant alterations in gene expression, epigenetics, metabolism and cell proliferation during preimplantation development and that these alterations may have effects on later life. Our studies aim to help us to understand the impact of the culture environment on pre-implantation embryonic development in order to improve reproductive outcomes.

This laboratory uses a range of techniques including in vitro fertilization, isolation and culture of preimplantation mouse embryos, gene expression, cell signalling, electrophysiology and live cell imaging.

RESEARCH ACTIVITIES

Current research in this Laboratory is aimed at understanding the regulation and role of ion and solute transport during preimplantation embryonic development. Some of our recent studies have shown that oocytes fertilised in the presence of a specific amino acid, namely L-proline, show improved development to the blastocyst stage. Furthermore, embryos cultured in medium containing L-proline from the 1-cell stage to the blastocyst stage, developed significantly better than embryos cultured with other amino acids. We are using of competitive inhibitors of L-proline to identify the transporter responsible for the uptake of L-proline into the embryo. These studies provide evidence for the beneficial effect of specific amino acids, such as L-proline, on development and their inclusion in culture medium may be useful for improving human assisted reproduction.amino acids, such as L-proline, on development and their inclusion in culture medium may be useful for improving human assisted reproduction.

LABORATORY PERSONNEL/ STUDENTS

Margot Day	Associate Professor Co-ordinator (Foundation Studies), Sydney Medical Program 2014 - present
Sarah Dalati	PhD 2010 - 2015
Charmaine Green	PhD 2011 - present
Radu Zamfirescu	PhD 2014 - present
Nicola Pitt	PhD (P/T) 2013 - present
Salini Sreedharan	MPhil 2013 - 2015
Miriam Span	Graduate Diploma 2015
Marisa Perera	Honours student 2014

PUBLICATIONS

(2013 - 2015)

Poon, C., Madawala, R., Day, M., Murphy, C. (2015). EpCAM is decreased but is still present in uterine epithelial cells during early pregnancy in the rat: potential mechanism for maintenance of mucosal integrity during implantation. Cell and Tissue Research, 359(2), 655-664.

Green, C., Fraser, S., Day, M. (2015). Insulin-like growth factor 1 increases apical fibronectin in blastocysts to increase blastocyst attachment to endometrial epithelial cells in vitro. Human Reproduction, 30(2), 284-298.

Kaneko, Y., Murphy, C., Day, M. (2014). Calpain 2 activity increases at the time of implantation in rat uterine luminal epithelial cells and administration of calpain inhibitor significantly reduces implantation sites. Histochemistry and Cell Biology, 141(4), 423-430.

Huang, C., Day, M., Poronnik, P., Pollock, C., Chen, X. (2014). Inhibition of KCa3.1 suppresses TGF-Beta1 induced MCP-1 expression in human proximal tubular cells through Smad3, p38 and ERK1/2 signaling pathways. The International Journal of Biochemistry and Cell Biology, 47(1), 1-10.

Poon, C., Lecce (Venuto), L., Day, M., Murphy, C. (2014). Mucin 15 is lost but mucin 13 remains in uterine luminal epithelial cells and the blastocyst at the time of implantation in the rat. Reproduction, Fertility and Development, 26(3), 421-431.

Hinton, T., Yeoman, P., Carvalho, L., Parisio, M., Day, M., Byrne, S., Bell, A., Donohoe, K., Radford, J., Tregloan, P., Poronnik, P., Goodyear, P. (2014). Participating in the communication of science: Identifying relationships between laboratory space designs and students' activities. International Journal of Innovation in Science and Mathematics Education, 22(5), 30-42.

Arnaiz, I., Johnson, M., Cook, D., Day, M. (2013). Changing expression of chloride channels during preimplantation mouse development. Reproduction, 145(1), 73-84. [More Information]

Poon, C., Madawala, R., Day, M., Murphy, C. (2013). Claudin 7 is reduced in uterine epithelial cells during early pregnancy in the rat. Histochemistry and Cell Biology, 139(4), 583-593.

Kaneko, Y., Murphy, C., Day, M. (2013). Extracellular Matrix Proteins Secreted From both the Endometrium and the Embryo are Required for Attachment: A Study using A Co-Culture Model of Rat Blastocysts and Ishikawa Cells. Journal of Morphology, 274(1), 63-72.

Green, C., Day, M. (2013). Insulin-like growth factor 1 acts as an autocrine factor to improve early embryogenesis in vitro. The International Journal of Developmental Biology, 57(11-12), 837-844.

Kaneko, Y., Day, M., Murphy, C. (2013). Uterine epithelial cells: Serving two masters. The International Journal of Biochemistry and Cell Biology, 45(2), 359-363.

POSTGRADUATE AND HONOURS COMPLETIONS

(2013 - 2015)

MPhil

2014 - Naomi Perera

2015 - Salini Sreedharan

Grad Dip

2015 - Miriam Span

BSc(Hons)

2014 - Marisa Perera

PHYSICAL ANTHROPOLOGY AND COMPARATIVE ANATOMY GROUP

DENISE DONLON

SENIOR LECTURER, ANATOMY AND HISTOLOGY

LABORATORY OVERVIEW

Research is the field of biological and forensic anthropology with a focus on the variation in the human postcranial skeleton, human tooth morphometrics, non-human bone identification and taphonomy.

RESEARCH ACTIVITIES

Specific projects involve

- Forensic osteology of the Sydney region
- Identification of fragmented bone as human or non-human,
- Estimation of post-mortem interval of skeletonised surface remains in an Australian context
- Estimation of age and post-mortem interval of teeth using amino-acid racemization

LABORATORY PERSONNEL/ STUDENTS

Dr Denise Donlon	Senior lecturer and curator Jan 1992 - present
Dr Sarah Croker	PhD student then Half-time lecturer Jan 2013 - present
Dr Rebecca Griffin	Hon Research Associate Jan 2014 - present
Jennifer Menzies	MMed then PhD student Jan 2015 - present
Callan Birkmann-Little	Honours sudent Jan 2015 - Dec 2015

PUBLICATIONS

(2013 - 2015)

Donlon,D. 2015 Review of Craig Cormick (ed.): Ned Kelly Under the Microscope: Solving the Forensic Mystery of Ned Kelly's Remains.Historical Records of Australian Science Vol 26 (2): 216-217.

Donlon, D, Lowe, A and Manns. B . 2014. Forensic archaeology and the Australian war dead. In WJ Groen, N. Marquez-Grant and R Janaway (eds) Forensic Archaeology: A Global Perspective. Wiley-Blackwell, London.

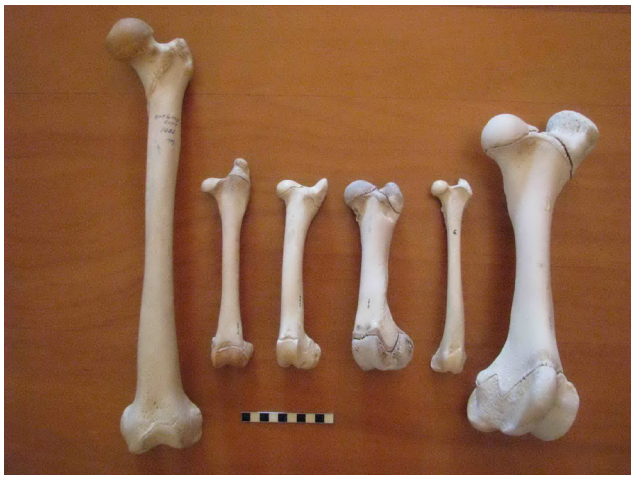
Briggs, C. and Donlon, D 2014 Forensic Osteology, Chapter 35. In Freckelton, I and Selby, H. Expert Evidence. Thomson Reuters.

Croker, S., Reed, W., Donlon, D. (2013). The endosteal region of long bone shafts: a potential area of difference between human and non-human bones. HOMO: Journal of comparative human biology, 64(2), 146-146.

SERVICE TO THE UNIVERSITY AND COMMUNITY

(2013 - 2015)

- Consultant in anthropology – Department of Forensic Medicine (ongoing)
- RAAF Specialist Reserve – identification of skeletons from Pozieres (2013)
- Forensic Specialists Management Committee (MAFC) of the RAAF
- Editorial Board – Australian Journal of Forensic Science
- Anthropology Scientific Working Group of NIFS/ANZPAA
- Reviewer for journals - Australian Journal of Forensic Science, Forensic Science International, Journal of Forensic Science,
- Australian Archaeology, Antiquity, American Journal of Physical Anthropology, Archaeology in Oceania, Homo, Journal of Odontostomatology, Archives of Oral Biology.



Femora (thigh bones) of human, kangaroo, sheep, pig, dog, cow (from left)

Excavation of old European burial ground on Christmas Island in order to locate the unknown sailor from HMAS Sydney II.

FUNCTIONAL ORGANISATION MAMMALIAN VISUAL SYSTEM

BOGDAN DREHER

EMERITUS PROFESSOR, ANATOMY AND HISTOLOGY

LABORATORY PERSONNEL/ STUDENTS

Bogdan Dreher	Professor Personal Chair - Dec 2013 Emeritus from Jan 2014
Philip A. Romo	PhD student/ part time

LABORATORY OVERVIEW

Research conducted by this laboratory is concerned with the structural and functional aspects of the developing and mature mammalian visual system, including:

- The organisation of the striate and extra-striate cortices (where the processing of retinal input by the brain begins), with particular emphasis on the interaction between different information channels within this region.
- The role of 'feedback' projections from the 'higher-order' extra-striate visual areas to 'lower-order' visual areas (including the primary visual cortices and subcortical visual nuclei).
- The extent, time-course and mechanisms of cortical reorganisation following retinal injury in adolescent and adult mammals.
- Functional properties of neurons in the koniocellular layers of primate lateral geniculate nucleus

SPECIAL AWARDS & PRIZES

(2013 - 2015)

- 2013 - Award from Nencki Institute for Experimental Biology

In 2013, Professor Dreher received the Nencki Award, from the Nencki Institute for Experimental Biology, Poland's premier research institute for biology. The citation read:

Professor Dreher prepared and defended his PhD thesis in Neurophysiology Department in Nencki Institute under supervision of Prof. Boguslaw Zernicki and followed up his postdoctoral training with Peter Bishop in the Department of Physiology in at Australian National University in Canberra. From 1968 he works on the University of Sydney and in 1995 he was nominated a Professor of Visual Neuroscience in the Department of Anatomy and Histology in Bosch Institute, where he leads the Laboratory of Functional Organization of Mammalian Visual System. His research is focused on the structural and functional aspects of the developing and mature mammalian visual system, mechanisms of cortical plasticity following retinal injury, and interaction of thalamic and cortical activity in the primate visual system. Professor Bogdan Dreher is a coauthor of more than 100 of journal articles and book chapters. Despite of long distance between Poland and Australia, Professor Dreher maintains close connections with the Nencki Institute hosting postdocs from the Institute and working in the board of Acta Neurobiologiae Experimentalis.

PUBLICATIONS
(2013 - 2015)

Zeater, N., Cheong, S., Solomon, S., Dreher, B., Martin, P. (2015). Binocular Visual Responses in the Primate Lateral Geniculate Nucleus. Current Biology, 25, 3190-3195.

Romo, PA., Zeater, N., Wang, C., Dreher, B. (2014). Binocular Neurons in Parastriate Cortex: Interocular 'Matching' of Receptive Field Properties, Eye Dominance and Strength of Silent Suppression. PloS One, 9(6), 1-17.

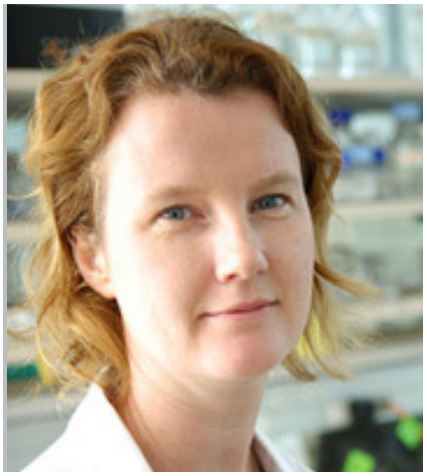
Jayakumar, J., Roy, S., Dreher, B., Martin, P., Vidyasagar, T. (2013). Multiple pathways carry signals from short-wavelength-sensitive ('blue') cones to the middle temporal area of the macaque. The Journal of Physiology, 591(1), 339-352.

Hietanen, M., Cloherty, S., van Kleef, J., Wang, C., Dreher, B., Ibbotson, M. (2013). Phase sensitivity of complex cells in primary visual cortex. Neuroscience, 237, 19-28.

Jayakumar, J., Dreher, B., Vidyasagar, T. (2013). Tracking blue cone signals in the primate brain. Clinical & Experimental Optometry, 96(3), 259-266.

EXTERNAL FUNDING TO LABORATORY
(2013 - 2015)

Source	Project Title	Collaborators	Awarded	Duration	Amount
National Health and Medical Research Council (NHMRC)/ Project Grants.	Brain pathways serving conscious and sub-conscious vision	Martin P, Solomon S, Dreher B, Grunert U, Rosa M;			



ALZHEIMER'S DISEASE CELL BIOLOGY LABORATORY

CLAIRE GOLDSBURY

SENIOR RESEARCH FELLOW,

BRAIN AND MIND CENTRE

LABORATORY OVERVIEW

The Alzheimer's Disease Cell Biology Lab is located in the University's Brain and Mind Centre. During the period of this report, the Centre was known as the Brain and Mind Research Institute. Our approach to tackling the challenge posed by Alzheimer's disease involves investigations at all levels – from basic science to disease progression and treatments. As part of that effort, this laboratory is looking at the disease's effects on the cytoskeleton – the dynamic protein scaffold or skeleton by which the body's cells maintain their structure and shape and carry out a diverse range of essential functions. The research is focused on the cause, mechanism and consequences of cytoskeletal rearrangement in neurons and glial cells in the brain.

RESERCH ACTIVITIES

The research group is using confocal microscopy to examine the distribution of cofilin rods in the human post-mortem brain. In this way, they are looking at samples from brains that have experienced normal ageing as well as those affected by Alzheimer's disease and other neurodegenerative disease.

PUBLICATIONS

(2013 - 2015)

Rahman, T., Davies, D., Tannenberg, R., Fok, S., Shepherd, C., Dodd, P., Cullen, K., Goldsbury, C. (2014). Cofilin rods and aggregates concur with tau pathology and the development of Alzheimer's disease. Journal of Alzheimer's Disease, 42(4), 1443-1460.

Acosta, J., Goldsbury, C., Winnick, C., Badrock, A., Fraser, S., Laird, A., Hall, T., Don, E., Fifita, J., Blair, I., Nicholson, G., Cole, N. (2014). Mutant Human FUS Is Ubiquitously Mislocalized and Generates Persistent Stress Granules in Primary Cultured Transgenic Zebrafish Cells. PloS One, 9(6), 1-9.

Saberi, S., Du, Y., Christie, M., Goldsbury, C. (2013). Human Chorionic Gonadotropin Increases b-Cleavage of Amyloid Precursor Protein in SH-SY5Y Cells. Cellular and Molecular Neurobiology, 33(6), 747-751.

POSTGRADUATE AND HONOURS COMPLETIONS

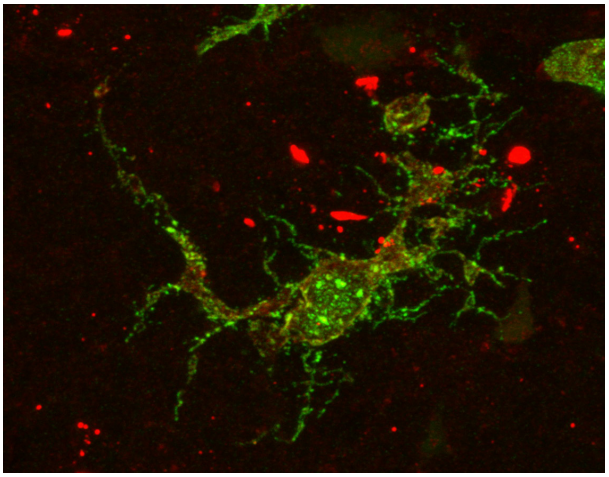
(2013 - 2015)

MPhil

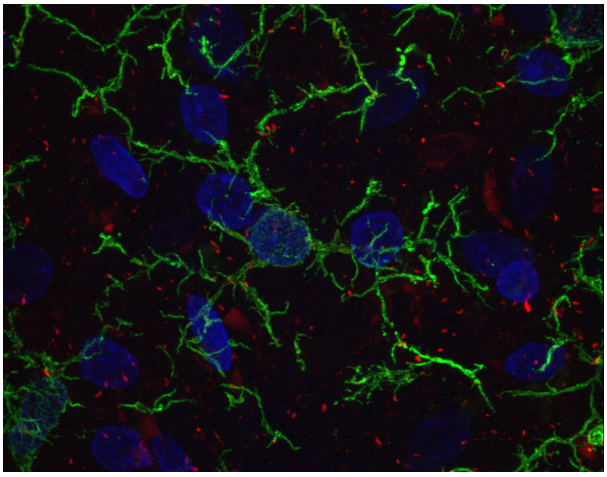
2013 - Ms Sohelia Saberi

BSc(Hons)

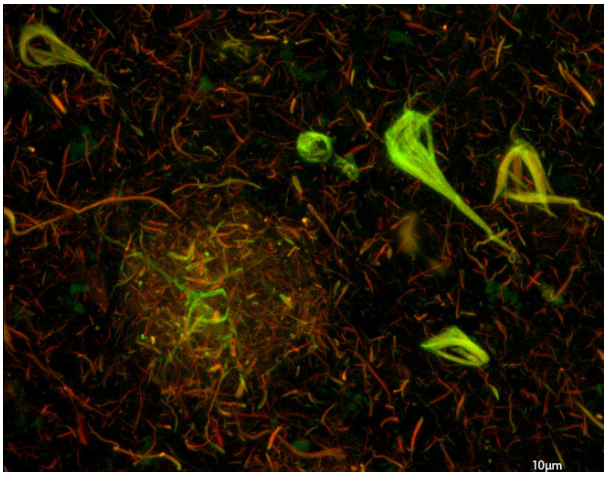
2013 - Mr Hayden Aitken
2014 - Ms Archana Majumdar
2015 - Ms Jolande Ma



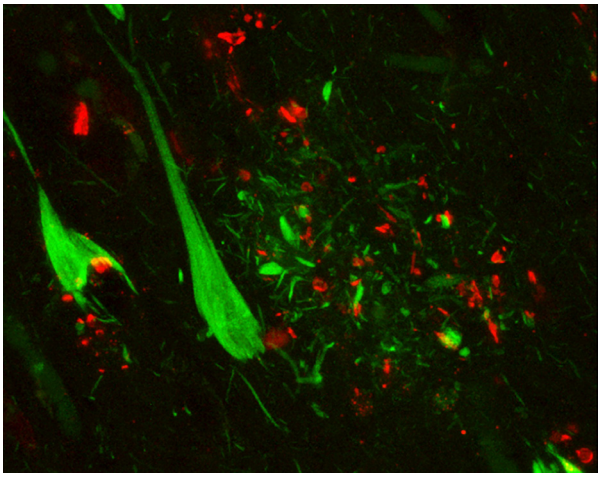
Microglia surrounded by Cofilin aggregates in an Alzheimer's brain



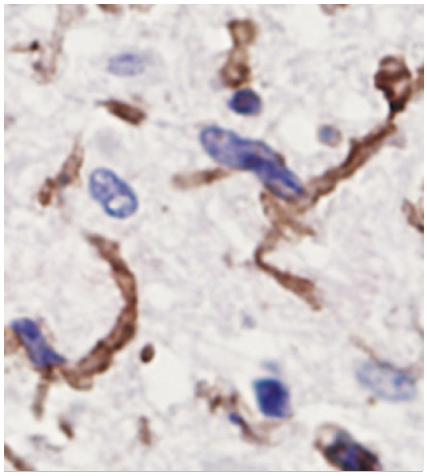
Microglia with distinctive ramified processes in a control brain



Classic Alzheimer's tau patholgy showing tangles and neuritic plaques



Cofilin aggregates with tau stained tangles and neurtic plaques



BRAIN TUMOUR RESEARCH LABORATORIES

MANUEL GRAEBER, PROFESSOR

BARNET-CROPPER CHAIR OF BRAIN TUMOR RESEARCH,

BRAIN AND MIND CENTRE

DIRECTOR, BRAIN TUMOR RESEARCH

LABORATORY OVERVIEW

The Brain Tumour Research Laboratories are located on the Brain Tumour Research floor (Level 7, Building F) of the University's Brain and Mind Centre. Their work focuses on the role of microglia in brain diseases and in brain tumours in particular.

RESERCH ACTIVITIES

1. PET imaging of glioma in a TSPO knockout model

Glioblastoma is the most frequent primary brain tumour and the most malignant glial neoplasm (glioma) with predominantly astrocytic differentiation. Due to their invasive nature, glioblastomas cannot be completely resected, and despite progress in radio- and chemotherapy, less than half of patients survive more than a year. Microglia cells populate gliomas in large numbers and are especially numerous in malignant astrocytic tumours. Microglia are so common in these neoplasms as to contribute to tumour mass.

It is our long-term goal to develop the techniques that enable the reprogramming of microglia for therapeutic purposes. Malignant gliomas and especially glioblastomas attract microglia/macrophages in large numbers and subsequently control their activity eliciting mainly tumour-supportive functions that facilitate tumour growth. We find intriguing the question of whether this "fatal attraction" can be utilized against the tumour, i.e. by employing bone-marrow transplantation of genetically modified, tumour-targeting microglia precursors that may carry a (radio) cytotoxic payload.

We have established the first model of background free tumour imaging and we would like to use it to test the following hypothesis: Glioma-expressed TSPO is a highly sensitive marker of tumor progression that allows early preclinical detection of glioma, evaluation of its likely growth characteristics and assessment of the functional (metabolic) state of the cancer cells.

The model will enable us to dissect host from tumour responses. It is the first model of its kind. The model allows to undertake critical refinement of the kinetic modeling of imaging tracers that will inform experimental and future clinical studies. Our knock-out model enables the removal of signal contributions from the host tissue leaving only tumour cells as the biological source of the signal.

2. The Role of Microglia in Synaptic Plasticity

Microglia are the immune cells of the brain and are known to respond to infectious and non-infectious insults to the nervous system. Recently, a new function has been demonstrated for microglia: active involvement in the maintenance of synapses, i.e. the connections between nerve cells. This function of the microglia has been likened to that of electricians. Using the transparent and genetically amenable brain of the zebrafish, our research explores this new function of microglia at the single cell level in the intact, behaving animal, through visualization of cellular components of the brain (neurons, glia, microglia, blood vessels, synapses), and through the genetic manipulation of synaptic density, and real time observation of microglia in the process.

Maintenance of synaptic integrity is of key importance for normal nervous system functioning. If synaptic connections are compromised, disease develops ranging from motor disturbances to dementia. The maintenance of synaptic integrity is only poorly understood while pruning of synapses during development and post-traumatic synaptic stripping are well-established processes in which microglial cells have a key role.

What distinguishes synapses that are to be removed by microglia from those that are to stay? Microglia engaged in synaptic stripping following facial nerve axotomy in rodents strongly express complement receptors, and it has been shown subsequently that the

classical complement cascade mediates CNS synapse elimination. In the past, synaptic connections had to be studied in complex mammalian systems where the analysis of effects caused by genetic manipulation is technically demanding and time-consuming. This has changed with the arrival of zebrafish as an experimental model.

We use the zebrafish model to elucidate the spatial relationship between microglia and synapses and their dynamics in real time to clarify the role of molecules such as complement in microglia-synapse interactions. We will further test the hypothesis that behavioural changes ensue if synaptic density is altered following silencing or genetic ablation of the microglia, i.e. that microglia have an essential role in the maintenance of synaptic integrity.

3. The Role of Microglia in Alzheimer's disease

The memory of past experiences forms an essential part of who we are and losing one's memory therefore means losing one's self. Dementia due to Alzheimer's disease is becoming a most important medical problem. Many aspects of memory dysfunction result from disturbances of the connections between nerve cells, the synapses.

Microglial cells are generally referred to as the brain's defense and immune system. However, their functions in normal CNS have begun to attract considerable attention following the discovery that a compulsive behavioral trait is caused by loss of Hoxb8 activity in microglia. Thus, the interactions that take place between microglia and neurons are considerably more sophisticated than previously thought. We have proposed a new role for microglial cells in the maintenance of synaptic integrity analogous to electricians, and this proposition has gained significant support through findings by other groups. An electrician maintains and installs electrical equipment but is not involved in the actual circuitry.

Evidence for an involvement of microglial cells in synaptic plasticity was originally obtained in the rat facial nerve axotomy model where microglial cell processes were observed to interpose between afferent axonal endings and the surface membrane of motor neurons after their peripheral axons had been cut. It was also in this model where the first evidence was obtained that microglial complement receptor 3 (CR3) and MHC class I antigens are involved in synaptic changes. Recently, it has been demonstrated that during normal brain development or preceding degeneration of adult retinal neurons, synapses are marked by the complement component C1q before they are removed.

Using the facial nerve axotomy paradigm we are exploring the synaptic role of microglia in transgenic mice that develop amyloid deposits that are typical of Alzheimer's disease. Activated glial cells are seen surrounding amyloid plaques in the Alzheimer's brain. In this project, we study whether synaptic plasticity is affected by amyloid deposition. We will also examine how the removal of synaptic material by microglia, the brain's resident 'garbage collectors', differs between normal and pathological aging.

PUBLICATIONS
(2013 - 2015)

Graeber MB, Banati RB (2015) Glial cells: Microglia. In Reference Module in Biomedical

Sciences, edited by George B. Richerson, Chapter BMED:04614, Elsevier. 06-Feb-2015 doi: B978-0-12-801238-3.04614-6.

Alafuzoff, I., Pikkarainen, M., Neumann, M., Arzberger, T., Al-Sarraj, S., Bodi, I., Bogdanovic, N., Bugiani, O., Ferrer, I., Graeber, M., et al (2015). Erratum to: Neuropathological assessments of the pathology in frontotemporal lobar degeneration with TDP43-positive inclusions: an inter-laboratory study by the BrainNet Europe consortium. Journal of Neural Transmission, 122(7), 973-974.

Alafuzoff, I., Pikkarainen, M., Neumann, M., Arzberger, T., Al-Saraj, S., Bodi, I., Bogdanovic, N., Bugiani, O., Ferrer, I., Gelpi, E., Graeber, M., et al (2015). Neuropathological assessments of the pathology in frontotemporal lobar degeneration with TDP43-positive inclusions: an inter-laboratory study by the BrainNet Europe consortium. Journal of Neural Transmission, 122(7), 957-972.

Beck, A., Birney, E., Graeber, M., Tumwine, J., Hay, P., Ahn, H., Patel, A., du Cros, P., von Seidlein, L., Wareham, N., et al (2015). Progress in Medicine: Experts Take Stock. PLoS Medicine, 12(12), 1-7.

Filiou, M., Arefin, A., Moscato, P., Graeber, M. (2014). 'Neuroinflammation' differs categorically from inflammation: transcriptomes of Alzheimer's disease, Parkinson's disease, schizophrenia and inflammatory diseases compared. Neurogenetics, 15(3), 201-212

Graeber, M. (2014). Banking on the brain. Australasian Science, 35(3), 36.

Svahn, A., Becker, T., Graeber, M. (2014). Emergent properties of microglia. Brain Pathology, 24(6), 665-670.

Duffy, S., Lagopoulos, J., Hickie, I., Diamond, K., Graeber, M., Lewis, S., Naismith, S. (2014). Glutathione relates to neuropsychological functioning in mild cognitive impairment. Alzheimer's and Dementia, 10(1), 67-75.

Dennis, C., Sheahan, P., Graeber, M., Sheedy, D., Kril, J., Sutherland, G. (2014). Microglial proliferation in the brain of chronic alcoholics with hepatic encephalopathy. Metabolic Brain Disease, 29(4), 1027-1039.

Graeber, M. (2014). Neuroinflammation: no rose by any other name. Brain Pathology, 24(6), 620-622.

Banati, R., Middleton, R., Chan, R., Hatty, C., Kam, W., Quin, C., Graeber, M., Parmar, A., Zahra, D., Callaghan, P., Fok, S., Liu, G., et al (2014). Positron emission tomography and functional characterization of a complete PBR/TSPO knockout. Nature Communications, 5, 1-12.

Sajjan, S., Holsinger, D., Fok, S., Ebrahimkhani, S., Rollo, J., Banati, R., Graeber, M. (2014). Up-regulation of matrix metallopeptidase 12 in motor neurons undergoing synaptic stripping. Neuroscience, 274, 331-340.

Muller, U., Winter, P., Graeber, M. (2013). A presenilin 1 mutation in the first case of Alzheimer's disease. The Lancet Neurology, 12(2), 129-130.

Svahn, A., Graeber, M., Ellett, F., Lieschke, G., Rinkwitz, S., Bennett, M., Becker, T. (2013). Development of Ramified Microglia from Early Macrophages in the Zebrafish Optic Tectum. Developmental Neurobiology, 73(1), 60-71.

Li, W., Holsinger, D., Kruse, C., Flugel, A., Graeber, M. (2013). The Potential for Genetically Altered Microglia to Influence Glioma Treatment. CNS & Neurological Disorders - Drug Targets, 12(6), 750-762.

POSTGRADUATE AND HONOURS COMPLETIONS

(2013 - 2015)

MPhil

2015 - Grace Yin

2015 - Emily Si

EXTERNAL FUNDING TO LABORATORY
(2013 - 2015)

Source	Project Title	Collaborators	Awarded	Duration	Amount
Cure for Life Foundation/ Cure Brain Cancer Australia Research Grants	Support for glioma model	M.B. Graeber, R.B. Banati	2014	1 year	$30,000
Australian Institute of Nuclear Science and Engineering (AINSE)/ Research Projects	Development of multi-ligand imaging in a unique live null background mode	M.B. Graeber, R.B. Banati	2014	1 year	$13,000
Part of the Sydney Neuro sciences Network, USyd	Establishment of an Experimental Neuropathology Affinity Group	M.B. Graeber	2014	2 years	$2,000
Cancer Council NSW G176688	Ibudilast as a therapy for chemotherapy-induced neuropathic pain and cognitive impairments	I. Johnston, M. Graeber, M. Hutchinson, J. Vardy, H. Dhillon	2015	3 years	$356,021
Cancer Institute New South Wales, Equipment Grant	Portable Infrared Spectroscopy Equipment for Cancer Diagnosis, Research into Prevention of Cancer by Understanding the Role of Diet, and for Drug Development and Studies on Efficacy	P. Lay, D. Richardson, R. Banati, M. Biro, M. Bebawy, M. Graeber, G. Grau, T. Hambley, E. New, E. Carter	2015	1 year	$102,000
ARC DP150104472	Beyond Neuroinflammation: The Role of Microglia in Synaptic Plasticity	M.B. Graeber, Becker T.S.	2015	3 years	$178,812

NEURAL IMAGING LABORATORY

LUKE HENDERSON

ASSOCIATE PROFESSOR, ANATOMY AND HISTOLOGY

LABORATORY OVERVIEW

The major aim of the laboratory is to define the brain circuitry responsible for acute and chronic pain in humans. In addition, we are exploring the neural circuitry responsible for analgesia and its relationship to the development and maintenance of chronic pain. We use electroencephalography as well as multiple brain imaging techniques including voxel based morphometry, magnetic resonance spectroscopy, functional magnetic resonance imaging and arterial spin labelling to explore thalamocortical rhythms in individuals with chronic pain following nerve injury. The laboratory also uses functional brain imaging to explore the circuitry responsible for conditioned pain modulation, that is, pain inhibiting pain. Our ultimate aim is to provide pain relief by manipulating the circuitry responsible for pain perception.

LABORATORY PERSONNEL/ STUDENTS

Associate Professor Luke Henderson

Dr Flavia Di Pietro	Post-doctoral Researcher 2015 - present
Dr Andrew Youssef	PhD student 2014 - present
Zeynab Alshelh	PhD student 2015 - present
Kasia Marciszewski	PhD student 2015 - present
Noemi Maylakh	PhD student 2015 - present

PUBLICATIONS

(2013 - 2015)

Wilcox, S., Gustin, S., Macey, P., Peck, C., Murray, G., Henderson, L. (2015). Anatomical changes at the level of the primary synapse in neuropathic pain: Evidence from the spinal trigeminal nucleus. The Journal of Neuroscience, 35(6), 2508-2515.

Wilcox, S., Gustin, S., Macey, P., Peck, C., Murray, G., Henderson, L. (2015). Anatomical changes within the medullary dorsal horn in chronic temporomandibular disorder pain. NeuroImage, 117, 258-266.

Macefield, V., Henderson, L. (2015). Autonomic responses to exercise: Cortical and subcortical responses during post-exercise ischaemia and muscle pain. Autonomic Neuroscience: Basic and Clinical, 188, 10-18.

Lundblad, L., Fatouleh, R., McKenzie, D., Macefield, V., Henderson, L. (2015). Brain stem activity changes associated with restored sympathetic drive following CPAP treatment in OSA subjects; A longitudinal investigation. Journal of Neurophysiology, 114(2), 893-901.

Fatouleh, R., Lundblad, L., Macey, P., McKenzie, D., Henderson, L., Macefield, V. (2015). Reversal of functional changes in the brain associated with obstructive sleep apnoea following 6?ÿmonths of CPAP. NeuroImage: Clinical, 7, 799-806.

Lundblad, L., Fatouleh, R., Hammam, E., McKenzie, D., Macefield, V., Henderson, L. (2014). Brainstem changes associated with increased muscle sympathetic drive in obstructive sleep apnoea. NeuroImage, 103, 258-266.

Youssef, A., Gustin, S., Nash, P., Reeves, J., Petersen, E., Peck, C., Murray, G., Henderson, L. (2014). Differential brain activity in subjects with painful trigeminal neuropathy and painful temporomandibular disorder. Pain, 155(3), 467-475.

Fatouleh, R., Hammam, E., Lundblad, L., Macey, P., McKenzie, D., Henderson, L., Macefield, V. (2014). Functional and structural changes in the brain associated with the increase in muscle sympathetic nerve activity in obstructive sleep apnoea. NeuroImage: Clinical, 6, 275-283.

Gustin, S., McKay, J., Petersen, E., Peck, C., Murray, G., Henderson, L. (2014). Subtle Alterations in Brain Anatomy May Change an Individual's Personality in Chronic Pain. PloS One, 9(10), 1-9.

Gustin, S., Wrigley, P., Youssef, A., McIndoe, L., Wilcox, S., Rae, C., Edden, R., Siddall, P., Henderson, L. (2014). Thalamic activity and biochemical changes in individuals with neuropathic pain after spinal cord injury. Pain, 155(5), 1027-1036.

Henderson, L., Peck, C., Petersen, E., Rae, C., Youssef, A., Reeves, J., Wilcox, S., Akhter, R., Murray, G., Gustin, S. (2013). Chronic Pain: Lost Inhibition? The Journal of Neuroscience, 33(17), 7574-7582.

Henderson, L., Macefield, V. (2013). Functional imaging of the human brainstem during somatosensory input and autonomic output. Frontiers in Human Neuroscience, 7, 1-8.

Macefield, V., James, C., Henderson, L. (2013). Identification of sites of sympathetic outflow at rest and during emotional arousal: Concurrent recordings of sympathetic nerve activity and fMRI of the brain. International Journal of Psychophysiology, 89(3), 451-459.

Wrigley, P., Gustin, S., McIndoe, L., Chakiath, R., Henderson, L., Siddall, P. (2013). Longstanding neuropathic pain after spinal cord injury is refractory to transcranial direct current stimulation: A randomized controlled trial. Pain, 154(10), 2178-2184.

James, C., Henderson, L., Macefield, V. (2013). Real-time imaging of brain areas involved in the generation of spontaneous skin sympathetic nerve activity at rest. NeuroImage, 74, 188-194.

James, C., Macefield, V., Henderson, L. (2013). Real-time imaging of cortical and subcortical control of muscle sympathetic nerve activity in awake human subjects. NeuroImage, 70, 59-65.

Wilcox, S., Gustin, S., Eykman, E., Fowler, G., Peck, C., Murray, G., Henderson, L. (2013). Trigeminal Nerve Anatomy in Neuropathic and Non-neuropathic Orofacial Pain Patients. The Journal of Pain, 14(8), 865-872.

Gustin, S., Peck, C., Macey, P., Murray, G., Henderson, L. (2013). Unraveling the Effects of Plasticity and Pain on Personality. The Journal of Pain, 14(12), 1642-1652.

POSTGRADUATE AND HONOURS COMPLETIONS

(2013 - 2015)

BMedSc(Hons)

2015 - Emily Mills
2014 - Zeynab Alshelh
2014 - Kasia Marciszewski
2013 - Noemi Maylakh

EXTERNAL FUNDING TO LABORATORY

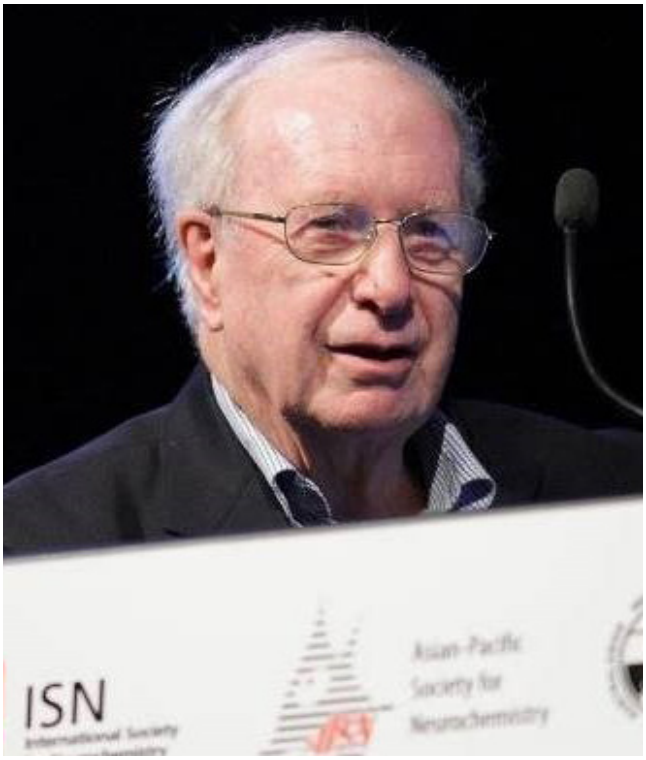
(2013 - 2015)

Source	Project Title	Collaborators	Awarded	Duration	Amount
NHMRC	Does a pain-specific pathway exist in humans		2014	3 years	$425,680
NHMRC	Underlying mechanisms of thalamocortical dysrhythmia in chronic pain		2014	3 years	$382,111
NHMRC	Endogenous pain relief in healthy and osteoarthritic patients		2012	3 years	$493,510
NHMRC	The role of the thalamus in chronic pain		2011	3 years	$289,182
NHMRC	Functional imaging of the brainstem and cortical sites of blood pressure control in human subjects in health and disease		2011	3 years	$419,000

NEUROPHARMACOLOGY LABORATORY

GRAHAM JOHNSTON & TINA HINTON

PROFESSOR, PHARMACOLOGY | SENIOR LECTURER



Professor Graham Johnston & Dr Tina HInton

LABORATORY OVERVIEW

Professor Johnston retired in July 2011 and now works part-time as an Emeritus Professor collaborating with Drs Hinton, McParland and Matthews in Pharmacology and in Pharmacy with Prof Mary Collins and Prof Jane Hanrahan with whom he shared an NHMRC Project Grant in 2013-2015.

Dr Tina Hinton continues collaborations with Prof Johnston, as well as Dr Slade Matthews and Dr Rita Machaalani in areas of neuropharmacology, including the role of GABA in stress and effects of naturally occurring substances, and the role of nicotinic receptors and cigarette smoking in sudden infant death syndrome.

RESEARCH ACTIVITIES

Research areas include:

- The design, synthesis and evaluation of new chemical entities as agents to treat anxiety, epilepsy, insomnia, myopia and memory deficits in disorders such as Alzheimer's disease and schizophrenia
- The investigation of naturally occurring substances, especially flavonoids, that influence brain function
- The effects of stress on brain function
- The role of smoking and changes in nicotinic receptors in SIDS.

LABORATORY PERSONNEL/ STUDENTS

Graham Johnston	Emeritus Professor 1980 - Present
Dr Tina HInton	Senior Lecturer 2003 - Present

PUBLICATIONS
(2013 - 2015)

Locock, K., Bakas, T., Sanai, F., Allan, R. and Hinton, T. (2015). What is the 'Areca' in 'Areca Nuts'? Extraction and Neuroactive Bioassay of Arecoline. J. Chemical Education doi 10.1021/acs.jchemed.5b00312

Machaalani, R., Ghazavi, E., David, R.V., Hinton, T., Makris, A. and Hennessy, A. (2015). Nicotinic acetylcholine receptors (nAChR) are increased in the pre-eclamptic placenta. Hypertens. Pregnancy, doi 10.310910641955.2015.1009545.

Abdelhalim, A., Karim, N., Chebib, M., Aburjai, T., Khan, I., Johnston, G., Hanrahan, J. (2015). Antidepressant, Anxiolytic and Antinociceptive Activities of Constituents from Rosmarinus Officinalis. Journal of Pharmacy and Pharmaceutical Sciences, 18(4), 448-459.

Johnston, G. (2015). Flavonoid nutraceuticals and ionotropic receptors for the inhibitory neurotransmitter GABA. Neurochemistry International, 89, 120-125.

Hanrahan, J., Chebib, M., Johnston, G. (2015). Interactions of flavonoids with ionotropic GABA receptors. Advances in Pharmacology, 72, 189-200.

Rae, C., Nasrallah, F., Balcar, V., Rowlands, B., Johnston, G., Hanrahan, J. (2015). Metabolomic Approaches to Defining the Role(s) of GABAI Receptors in the Brain. Journal of Neuroimmune Pharmacology, 10(3), 45-456.

Abdelhalim, A., Chebib, M., Aburjai, T., Johnston, G., Hanrahan, J. (2014). GABAA Receptor Modulation by Compounds Isolated from Salvia triloba L. Advances in Biological Chemistry, 4(2), 148-159.

Blednov, Y., Benavidez, J., Black, M., Leiter, C., Osterndoff-Kahanek, E., Johnson, D., Borghese, C., Hanrahan, J., Johnston, G., Chebib, M., et al (2014). GABAa Receptors Containing p1 Subunits Contribute to In Vivo Effects of Ethanol in Mice. PloS One, 9(1), 1-16.

Hall, B., Karim, N., Chebib, M., Johnston, G., Hanrahan, J. (2014). Modulation of Ionotropic GABA Receptors by 6-Methoxyflavanone and 6-Methoxyflavone. Neurochemical Research, 39, 1068-1078.

Johnston, G. (2014). Muscimol as an Ionotropic GABA Receptor Agonist. Neurochemical Research, 39(10), 1942-1947.

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Machaalani, R.*, Ghazavi, E.*, Hinton, T., Waters, K. A., & Hennessy, A. Cigarette smoking during pregnancy regulates the expression of specific nicotinic acetylcholine receptor (nAChR) subunits in the human placenta. Toxicology and Applied Pharmacology, 276, 204–212.

Johnston, G. (2013). Advantages of an antagonist: bicuculline and other GABA antagonists. British Journal of Pharmacology, 169(2), 328-336.

Gavande, N., Kim, H., Doddareddy, M., Johnston, G., Chebib, M., Hanrahan, J. (2013). Design, synthesis, and pharmacological evaluation of fluorescent and biotinylated antagonists of rho1 GABA(c) receptors. ACS Medicinal Chemistry Letters, 4(4), 402-407.

Karim, N., Wellendorph, P., Absalom, N., Johnston, G., Hanrahan, J., Chebib, M. (2013). Potency of GABA at human recombinant GABA alpha receptors expressed in Xenopus oocytes: a mini review. Amino Acids, 44(4), 1139-1149.

Locock, K., Yamamoto, I., Tran, P., Hanrahan, J., Chebib, M., Johnston, G., Allan, R. (2013). Aminobutyric Acid(C) (GABAC) Selective Antagonists Derived from the Bioisosteric Modification of 4-Aminocyclopent-1-enecarboxylic Acid: Amides and Hydroxamates. Journal of Medicinal Chemistry, 56(13), 5626-5630.

Lloyd, H.*, Hinton, T.*, Bullock, S., Babey, A-M., Davis, E., Hart, J., Fernandez, L., Musgrave, I. & Ziogas, J. (2013). An Evaluation of Pharmacology Curricula in Australian Science and Health-related Degree Programs. BMC Medical Education, 13, 153 DOI: 10.1186/10.1186/1472-6920-13-153. *denotes dual first authors.

SERVICE TO THE UNIVERSITY AND COMMUNITY

(2013 - 2015)

Professor Johnston served as the official historian and council member of the International Society for Neurochemistry 2014-2015. He has been very active as an expert witness for the Commonwealth Department of Public Prosecutions and was an invited speaker at their annual conference in 2015. He retired from his part time position as a Specialist Member of the Commonwealth Administrative Appeals Tribunal in 2014. He is a board member of the Karl McManus Foundation, a not for profit organisation to study tick-borne diseases. He was elected as a Fellow of the Royal Society of New South Wales in 2015.

Dr Tina Hinton is a Board member of the Australasian Society of Clinical and Experimental Pharmacologists and Toxicologists (ASCEPT) and served as the ASCEPT Education Forum Secretary for 4 years prior to this. Dr Hinton is also an active member of the Collaborative Universities Biomedical Education Network (CUBEnet), organising the CUBEnet Discipline Day workshops for the Australian Conference on Mathematics and Science Education (ACSME). Dr Hinton peer reviews submissions for PloS One, Future Medicine, Journal of Psychiatric Research, Schizophrenia Research, Human Psychopharmacology, and International Journal of Innovation in Science and Mathematics.

POSTGRADUATE AND HONOURS COMPLETIONS
(2013 - 2015)

MPhil

2013 - Emma Ghazavi

BSc(Hons)

2013 - Sandra Kindaro, Melanie Alkhas

EXTERNAL FUNDING TO LABORATORY
(2013 - 2015)

Source	Project Title	Collaborators	Awarded	Duration	Amount
NHMRC	Allosteric targets on GABA-A receptors	Hanrahan, Johnston, Chebib	2013	3 years	$628,237
Office of Learning and Teaching	Strategic Priority Project: The Global Canopy - Linking international inbound students with domestic outbound students	Patricia McLaughlin (RMIT - lead), Philip Poronnik (Sydney), Tina Hinton (Sydney), Anthony Mills (Deakin), Roger Hadgraft (CQU), Andrea Chester (RMIT), James Baglin (RMIT), Swapan Saha (Western Sydney), Peter Davis (Newcastle).	2015	1 year	$278,000

NEUROPATHOLOGY UNIT

JILLIAN KRIL

PROFESSOR OF NEUROPATHOLOGY, DISCIPLINES OF MEDICINE AND PATHOLOGY

ASSOCIATE DEAN (RESEARCH), SYDNEY MEDICAL SCHOOL

DIRECTOR, NSW BRAIN TISSUE RESOURCE CENTRE

LABORATORY OVERVIEW

Professor Kril has a long-standing interest in the neuropathological effects of alcohol abuse. She demonstrated the extent and topography of cortical neuronal loss in alcoholics and the contribution of associated thiamin and other nutritional deficiencies. She developed techniques to undertake volumetric analysis of postmortem brains and pioneered the use of stereological methodology in alcohol-related brain damage. Her paper on the evidence of regionally-specific neuronal loss in the cerebral cortex of alcoholics (Kril et al Neuroscience 1997), remains one of the most highly-cited studies on this topic. Ongoing research in this field includes collaborative studies delineating the correlation between neuronal pathology and the clinical symptoms and signs of neuronal dysfunction in alcoholics.

Professor Kril is a chief investigator on an NHMRC program grant looking at the pathogenesis of frontotemporal dementia (FTD) and motor neurodegenerative syndromes, investigating the associated proteinopathies and clinicopathological correlations. The ultimate goal of this research program is to develop a platform for therapeutic intervention with disease-modifying therapies. This requires an understanding of the pathogenesis of the protein abnormalities to be treated, as well as the ability to clinically identify the patients with the various proteinopathies. Professor Kril's research concentrates on these themes while continuing to build a substantive knowledge base of these syndromes. Questions addressing the concept of pathogenesis include: (a) How do FTD and motor neurodegeneration spread to involve multiple brain systems and regions? (b) Do the main proteins involved in FTD/motor neuron disease (MND) differ in their relative toxicity and what are their mechanisms of action? (c) Why do particular regions and cell types become vulnerable to multiple types of pathologies in FTD/MND? Professor Kril is working with colleagues at NeuRA, UNSW, the University of Queensland and the University of Sydney's Brain and Mind Centre, on this broad program of research.

RESEARCH ACTIVITIES

Current projects include;

- Clinicopathological correlates of frontotemporal dementia
- Pathological substrate of language dysfunction in frontotemporal dementia
- Refining diagnostic criteria for frontotemporal dementia and related disorders

Dr Greg Sutherland works closely with Professor Kril and the two co-supervise a number of students. Dr Sutherland's interests include the neuropathology, transcriptomics and genetic epidemiology of neurodegenerative diseases including Alzheimer's disease (AD) and alcohol-related brain damage. He also leads the "Brain and Body" node at the Charles Perkin's Centre that aims to understand the bidirectional relationships between the brain and systemic chronic disorders such as cardiovascular disease, type 2 diabetes and obesity.

Current projects include;

- Role of neurogloblin in Alzheimer's disease
- Neurogenesis in alcoholics with and without hepatic encephalopathy
- Transcriptomic studies of human brain

LABORATORY PERSONNEL/ STUDENTS

Professor Jillian Kril
Professor of Neuropathology
-present

Dr Greg Sutherland
Senior Lecturer/Research Fellow
-present

Dr Shelley Forrest
Research Officer
2013 - present

Donna Sheedy
Laboratory Manager
1994 - persent

Toni McCrossin
Clinical Liaison Officer
2011 - present

Dr Joanne Sy
Neuropathologist
2009 - 2014

Caine Smith
Research Assistant
2014 - present

Julia Stevens
Research Assistant
2009-present

Marloes Van Roijen
Research Assistant
2014 - present

Anastasia Sizemova
Research Assistant
2015 - present

Ciara McGinley
Research Assistant
2013 - present

Dr Marika Heblinski
Research Assistant
2015 - 2016

Nicolas Legrande
Research Assistant
2014 - 2015

Karen Say
Research Assistant
2009 - 2015

Alana Anderson
Research Assistant
2013 - 2014

Beatrix Aronsten-Palmer
Research Assistant
2011 - 2014

Dr Terry Middleton
Research Assistant
2013 - 2014

Dr Cheryl Cordery
IT Support
2005 - 2014

Erna Lilje
Laboratory Assistant
2010 - 2015

Anna Britton
MPhil student
2012 - 2014

Manaal Fatima
PhD student
2013 - 2016

Claude Dennis
PhD student
2013 - 2016

Lisa Suh
PhD student
2014 - 2016

Julia Lim
PhD student
2014 - 2016

Andrew McCorkindale
Honours student
2014 - 2015

Johannes Michael
Honours student
2015

Ainsley Papp
Honours student
2015

Remika Mito
Honours student
2014

Lisa Suh
Honours student
2013

Guntitat Rujites
Honours student
2014

PUBLICATIONS
(2013 - 2015)

Geevasinga, N., Menon, P., Nicholson, G., Ng, K., Howells, J., Kril, J., Yannikas, C., Kiernan, M., Vucic, S. (2015). Cortical Function in Asymptomatic Carriers and Patients With C9orf72 Amyotrophic Lateral Sclerosis. JAMA Neurology, 72(11), 1268-1274.

van Eersel, J., Stevens, C., Przybyla, M., Gladbach, A., Stefanoska, K., Chan, C., Ong, W., Hodges, J., Sutherland, G., Kril, J., Ittner, L., et al (2015). Early-onset axonal pathology in a novel P301S-Tau transgenic mouse model of frontotemporal lobar degeneration. Neuropathology and Applied Neurobiology, 41(7), 906-925.

Ittner, L., Halliday, G., Kril, J., Gotz, J., Kiernan, M. (2015). FTD and ALS-translating mouse studies into clinical trials. Nature Reviews. Neurology, 11(6), 360-366.

Leyton, C., Hodges, J., McLean, C., Kril, J., Piguet, O., Ballard, K. (2015). Is the logopenic-variant of primary progressive aphasia a unitary disorder? Cortex, 67, 122-133.

Kril, J., Chimelli, L., Morris, C., Harris, J. (2015). Nutritional and toxic diseases. In S Love, H Budka, J W Ironside, and A Perry (Eds.), Greenfield's Neuropathology, Ninth Edition, (pp. 589-636). Boca Raton: CRC Press.

Fatima, M., Tan, R., Halliday, G., Kril, J. (2015). Spread of pathology in amyotrophic lateral sclerosis: assessment of phosphorylated TDP-43 along axonal pathways. Acta Neuropathologica Communications, 3(1), 1-9.

Tan, R., Kril, J., Fatima, M., McGeachie, A., McCann, H., Shepherd, C., Forrest, S., Affleck, A., Kwok, J., Hodges, J., Kiernan, M., et al (2015). TDP-43 proteinopathies: pathological identification of brain regions differentiating clinical phenotypes. Brain, 138(10), 3110-3122.

Forrest SL, Kril JJ, Halliday GM. Frontotemporal lobar degeneration with tau inclusions (FTLD-tau): Recent developments in pathology and pathogenesis. Australian Biochemist 2015;46:8-11.

Sutherland G, Sheedy D, Kril JJ. Neuropathology of alcoholism. In Alcohol and the Central Nervous System. Pfefferbaum A, Sullivan EV Eds. Handbook of Clinical Neurology. Vol 125 Series editors Aminoff MJ, Boller F, Swaab DF. Elsevier Science Ltd London 2014 ISBN 9780444626196

Tan, R., Wong, S., Kril, J., Piguet, O., Hornberger, M., Hodges, J., Halliday, G. (2014). Beyond the temporal pole: Limbic memory circuit in the semantic variant of primary progressive aphasia. Brain, 137(7), 2065-2076.

Sutherland, G., Sheedy, D., Sheahan, P., Kaplan, W., Kril, J. (2014). Comorbidities, Confounders, and the White Matter Transcriptome in Chronic Alcoholism. Alcoholism: Clinical and Experimental Research, 38(4), 994-1001.

Blennerhassett, R., Lillo, P., Halliday, G., Hodges, J., Kril, J. (2014). Distribution of Pathology in Frontal Variant Alzheimer's Disease. Journal of Alzheimer's Disease, 39(1), 63-70.

de la Monte, S., Kril, J. (2014). Human alcohol-related neuropathology. Acta Neuropathologica, 127(1), 71-90.

Couttas, T., Kain, N., Daniels, B., Lim, X., Shepherd, C., Kril, J., Pickford, R., Li, H., Garner, B., Don, A. (2014). Loss of the neuroprotective factor Sphingosine 1-phosphate early in Alzheimer's disease pathogenesis. Acta Neuropathologica Communications, 2(1), 1-13.

Dennis, C., Sheahan, P., Graeber, M., Sheedy, D., Kril, J., Sutherland, G. (2014). Microglial proliferation in the brain of chronic alcoholics with hepatic encephalopathy. Metabolic Brain Disease, 29(4), 1027-1039.

Sutherland, G., Sheedy, D., Kril, J. (2014). Neuropathology of Alcoholism. In Edith V. Sullivan and Adolf Pfefferbaum (Eds.), Handbook of Clinical Neurology, Vol 125, (pp. 603-615). Elsevier Inc.

Chare, L., Hodges, J., Leyton, C., McGinley, C., Tan, R., Kril, J., Halliday, G. (2014). New criteria for frontotemporal dementia syndromes: clinical and pathological diagnostic implications. Journal of Neurology, Neurosurgery and Psychiatry, 85(8), 866-871.

Mills, J., Sheahan, P., Lai, D., Kril, J., Janitz, M., Sutherland, G. (2014). The alternative splicing of the apolipoprotein E gene is unperturbed in the brains of Alzheimer's disease patients. Molecular Biology Reports, 41(10), 6365-6376.

Gallagher, M., Suh, E., Grossman, M., Elman, L., McCluskey, L., van Swieten, J., Al-Sarraj, S., Neumann, M., Gelpi, E., Ghetti, B., Kril, J., et al (2014). TMEM106B is a genetic modifier of frontotemporal lobar degeneration with C9orf72 hexanucleotide repeat expansions. Acta Neuropathologica, 127(3), 407-418.

Sutherland, G., Sheedy, D., Kril, J. (2014). Using Autopsy Brain Tissue to Study Alcohol-Related Brain Damage in the Genomic Age. Alcoholism: Clinical and Experimental Research, 38(1), 1-8.

Newman JR, Todorovic M, Silburn PA, Sutherland GT, Mellick GD. Lack of reproducibility in re-evaluating associations between GCH1 polymorphisms and Parkinson's disease and isolated dystonia in an Australian case--control group. Parkinsonism Relat Disord. 2014 Jun;20(6):668-70.

Tan, R., Shepherd, C., Kril, J., McCann, H., McGeachie, A., McGinley, C., Affleck, A., Halliday, G. (2013). Classification of FTLD-TDP cases into pathological subtypes using antibodies against phosphorylated and non-phosphorylated TDP43. Acta Neuropathologica Communications, 1(1), 1-9.

Bhatia, S., Jenner, A., Li, H., Ruberuc, K., Spiro, A., Shepherd, C., Kril, J., Kain, N., Don, A., Garner, B. (2013). Increased Apolipoprotein D Dimer Formation in Alzheimer's Disease Hippocampus is Associated with Lipid Conjugated Diene Levels. Journal of Alzheimer's Disease, 35(3), 475-486.

Ravenscroft, T., Baker, M., Rutherford, N., Neumann, M., Mackenzie, I., Josephs, K., Boeve, B., Petersen, R., Halliday, G., Kril, J., et al (2013). Mutations in protein N-arginine methyltransferases are not the cause of FTLD-FUS. Neurobiology of Aging, 34(9), 2235.e11-2235.e13.

Sutherland, G., Sheahan, P., Matthews, J., Dennis, C., Sheedy, D., McCrossin, T., Curtis, M., Kril, J. (2013). The effects of chronic alcoholism on cell proliferation in the human brain. Experimental Neurology, 247, 9-18.

Tan, R., Pok, K., Wong, S., Brooks, D., Halliday, G., Kril, J. (2013). The pathogenesis of cingulate atrophy in behavioral variant frontotemporal dementia and Alzheimer's disease. Acta Neuropathologica Communications, 1(30), 1-6.

Sutherland GT, Chami B,Youssef P, Witting PK.Oxidative stress in Alzheimer's disease: Primary villain or physiological by-product? Redox report 2013;18:134-41.

Ooi L, Sidhu K, Poljak A, Sutherland G, O'Connor MD, Sachdev P, Münch G. Induced pluripotent stem cells as tools for disease modelling and drug discovery in Alzheimer's disease. J Neural Transm. 2013;120:103-11.

SERVICE TO THE UNIVERSITY AND COMMUNITY
(2013 - 2015)

Kril

Associate Editor, Journal of Alzheimer's Disease, 2014

Sutherland

Editorial Board of the journal, Alcohol, 2015-

POSTGRADUATE AND HONOURS COMPLETIONS
(2013 - 2015)

MPhil

2014 - Anna Britton

BMedSc(Hons)

2013 - Lisa Suh

2014 - Ariah Steel, Gun Rujitat, Remika Mito (University Medal)

2015 - Andrew McCorkindale (University Medal), Johannes Michael, Ainsley Papp

Kril Lab 2015
Standing: Professor Jillian Kril, Patrick Jarmo Paasila, Julia Lim, Daniel Crockford,
Dr Greg Sutherland, Toni McCrossin, Andrew McCorkindale, Claude Dennis, Dr Shelley Forrest
Seated: Marloes Van Roijen, Donna Sheedy, Anastasia Sizemova

EXTERNAL FUNDING TO LABORATORY

(2013 - 2015)

Source	Project Title	Collaborators	Awarded	Duration	Amount
NHMRC Program grant	Frontotemporal dementia and motor neurodegenerative syndromes	Glenda Halliday Juergen Gotz Lars Ittner John Hodges Matthew Keirnan	2013	5 years	$11,011,390
NHMRC Dementia Team grant	Non-Alzheimer's disease degenerative dementias: Identifying prodromal genetic/familial phenotypes, modifying factors, and protein variations involved in progression	Glenda Halliday John Hodges, Simon Lewis Olivier Piguet John Kwok Victor Villemagne Matthew Kiernan Dominic Rowe Ian McKeith	2015	5 years	$6,449,246
NHMRC Enabling grant	National Network of Brain Banks	Catriona McLean	2010	5 years	$2,500,000
NIH (NIAAA)	Brain Tissue Resource Centre for Alcohol Research		2013	5 years	US $2,349, 169
Sydney Medical School Foundation Fellowship	The microglial transcriptome in health and disease	Nick King Jillian Kril Jean Yang R Dayne Mayfield	2014	1 year	$60,000
Brain Foundation	Modelling Alzheimer's disease (AD) in patient-derived stem cells	Lezanne Ooi	2014	1 year	$40,000
NHMRC Project grant	Novel mechanisms underlying the spreading of tau pathology in Alzheimer's disease and other tauopathies	Lars Ittner	2012	3 years	$523,000

DEVELOPMENTAL NEUROBIOLOGY LABORATORY

CATHERINE LEAMEY

ASSOCIATE PROFESSOR

SENIOR LECTURER, PHYSIOLOGY

SYSTEMS NEUROSCIENCE LABORATORY

ATOMU SAWATARI

LECTURER, PHYSIOLOGY

LABORATORY OVERVIEW

The primary aim of the Laboratories of Developmental Neurobiology and Systems Neuroscience is to further our knowledge of the mechanisms which underlie the formation and function of neural circuits. We also investigate how changes in neural circuitry compromise function and how this can be influenced by environmental factors.

RESEARCH ACTIVITIES

The mammalian binocular visual pathway provides a highly advantageous to elucidate mechanisms of neural development. We have discovered that the loss of different members of the Teneurin family of proteins each cause unique and detrimental changes to the wiring of these circuits. Further, we have found that the most profound of these changes, caused by deletion of the Ten-m3 gene, can be at least partially rescued via environmental enrichment. These studies are ongoing.

The neural circuits which underlie striatal function are also of central interest. Following on from studies which demonstrated that aggregations of extracellular matrix proteins known as peri-neuronal nets (PNNs) surround specific subclasses of interneurons in the striatum, we have found that these may be altered in a model of neurodegenerative disease. We have also discovered that the Ten-m3 gene is critical for the formation of thalamostriatal circuits; its deletion leads to correlated anatomical and functional deficits in this circuit.

LABORATORY PERSONNEL/ STUDENTS

Catherine Leamey	Associate Professor Senior Lecturer 2003 - present
Atomu Sawatari	Lecturer 2005 - present
Dr Timothy Young	Visiting Scholar 2013
Michael Bourke	PhD Student 2010 - 2014
Heidi Tran	PhD Student 2011 - 2014
Angela O'Connor	PhD Student 2011 - 2015
Thomas Burton	PhD Student 2012 - present
Sam Liu	PhD Student 2013 - present
Darius Rowntree-Harrison	MPhil Student 2011 - 2014
Nigel Tse	MPhil Student 2013 - 2014
Dylan Kilpatrick	MPhil Student 2014 - present
Tasnim Rahmeen	Honours Student 2013
Peta Eggins	Honours Student 2013
Anthony Wakulicz	Honours Student 2013
Isabella Breukalaar	Honours Student 2014
Niluni Madapatha	Honours Student 2014
Jessica Westling	Honours Student 2014
Andria Yaourtis	Honours Student 2015

PUBLICATIONS

(2013 - 2015)

Tran, H., Sawatari, A., Leamey, C. (2015). The glycoprotein Ten-m3 mediates topography and patterning of thalamostriatal projections from the parafascicular nucleus in mice. European Journal of Neuroscience, 41(1), 55-68.

Carr, O., Glendining, K., Leamey, C., Marotte, L. (2014). Retinal overexpression of Ten-m3 alters ipsilateral retinogeniculate projections in the wallaby (Macropus eugenii). Neuroscience Letters, 566, 167-171.

Tse, N., Morsch, M., Ghazanfari, N., Cole, L., Visvanathan, A., Leamey, C., Phillips, W. (2014). The Neuromuscular Junction: Measuring Synapse Size, Fragmentation and Changes in Synaptic Protein Density Using Confocal Fluorescence Microscopy. Journal of Visualized Experiments, 94, 1-16.

Leamey, C., Sawatari, A. (2014). The teneurins: New players in the generation of visual topography. Seminars in Cell & Developmental Biology, 35, 173-179.

O'Connor, A., Burton, T., Leamey, C., Sawatari, A. (2014). The Use of the Puzzle Box as a Means of Assessing the Efficacy of Environmental Enrichment. Journal of Visualized Experiments, 94, 1-8.

Merlin, S., Horng, S., Marotte, L., Sur, M., Sawatari, A., Leamey, C. (2013). Deletion of Ten-m3 Induces the Formation of Eye Dominance Domains in Mouse Visual Cortex. Cerebral Cortex, 23(4), 763-774.

Carr, O., Glendining, K., Leamey, C., Marotte, L. (2013). Overexpression of Ten-m3 in the retina alters ipsilateral retinocollicular projections in the wallaby (Macropus eugenii). International Journal of Developmental Neuroscience, 31(7), 469-504.

Young, T., Bourke, M., Zhou, X., Oohashi, T., Sawatari, A., Fassler, R., Leamey, C. (2013). Ten-m2 Is Required for the Generation of Binocular Visual Circuits. The Journal of Neuroscience, 33(30), 12490-12509.

POSTGRADUATE AND HONOURS COMPLETIONS

(2013 - 2015)

PhD

2013 - Michael Bourke

2014 - Heidi Tran

2015 - Angela O'Connor

MPhil

2013 - Darius Rowntree Harrison

2014 - Nigel Tse

BSc(Hons)

2013 - Tasnim Rahmeen

2013 - Peta Eggins

2013 - Anthony Wakulicz

2014 - Jessica Westling

2014 - Isabella Breukalaar

2014 - Niluni Madapatha

2015 - Andria Yaourtis

SERVICE TO THE UNIVERSITY AND COMMUNITY

(2013 - 2015)

- External Reviewer of NHMRC grants
- External Examiner for UTS Honours
- Examiner for PhD thesis from University of Queensland
- Examiner for PhD thesis from University of Sydney
- Reviewer for Journal of Comparative Neurology
- Reviewer for Journal pf Neural Regeneration Research
- Reviewer for PLoS Biology
- Instructor for CSIRO Scientists and Mathematicians in Schools Program.

EXTERNAL FUNDING TO LABORATORY

(2013 - 2015)

Source	Project Title	Collaborators	Awarded	Duration	Amount
MJ Fox	Novel enzymatic method for improving therapeutic targeting of dopaminergic afferents in a mouse model of Parkinson's disease	A. Sawatari C. A. Leamey	2013	3 years	$US 75,000

PHARMACOINFORMATICS LABORATORY

SLADE MATTHEWS

SENIOR LECTURER PHARMACOLOGY,

SUB-DEAN SYDNEY MEDICAL SCHOOL

LABORATORY OVERVIEW

Slade's research is focussed on stress and heart disease, computational modelling of relationships between physicochemical descriptors and toxicological outcomes and novel areas for computational approaches to medical research. Machine learning algorithms, statistical analysis and analysis of heart rate variability are key research techniques.

Mathematical analysis of the ECG traces can reveal changes in the sympathetic and parasympathetic drivers of homeostasis under various conditions. This laboratory has been using mathematical analysis of human ECG recordings to reveal relationships hidden in the changes in heart rate over time.

There are many potential machine learning architectures that can be employed to model the relationship between physicochemical properties and toxicological outcomes. In the lab nascent relationships between mutagenic and non-mutagenic carcinogenicity are being investigated using the newest deep learning and integrated machine learning models using newly developed and curated databases.

RESEARCH ACTIVITIES

The use of computational techniques in the assessment of histological images is another area of research being undertaken in the lab. So far we have identified aspects of oligodendroglioma histopathology that can assist classification by trained machine learning alogrithms and automated image analysis tools. This work is continuing in the area of breast cancer screen images and blob detection and region-of-interest isolation using machine learning algorithms.

LABORATORY PERSONNEL/ STUDENTS

Slade Matthews	Senior Lecturer Aug 2013-present
Davy Guan	PhD Student 2016-2018
Luke Harb	Honours Student 2013
Daisy Howe	Honours Student 2014
Aaron Shockman	Masters Student 2014-present
Bosco Chan	Honours Student 2015
Davy Guan	Honours Student 2015
Agam Misra	PhD Student (UNSW) 2015-present

PUBLICATIONS
(2013 - 2015)

Gnjidic, D., Bennett, A., Le Couteur, D., Blyth, F., Cumming, R., Waite, L., Handelsman, D., Naganathan, V., Matthews, S., Hilmer, S. (2015). Ischemic heart disease, prescription of optimal medical therapy and geriatric syndromes in community-dwelling older men: A population-based study. International Journal of Cardiology, 192, 49-55.

Qi, K., Reeve, E., Hilmer, S., Pearson, S., Matthews, S., Gnjidic, D. (2015). Older peoples' attitudes regarding polypharmacy, statin use and willingness to have statins deprescribed in Australia. International Journal of Clinical Pharmacy, 37(5), 949-957.

Bennett, A., Gnjidic, D., Gillett, M., Carroll, P., Matthews, S., Johnell, K., Fastbom, J., Hilmer, S. (2014). Prevalence and impact of fall-risk-increasing drugs, polypharmacy, and drug-drug interactions in robust versus frail hospitalised falls patients: a prospective cohort study. Drugs and Aging, 31(3), 225-232.

Marzbanrad, F., Hambly, B., Ng, E., Tamayo, M., Matthews, S., Karmakar, C., Khandoker, A., Palaniswami, M., Jelinek, H. (2014). Relationship Between Heart Rate Variability and Angiotensinogen Gene Polymorphism in Diabetic and control individuals. 2014 36th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC 2014), Piscataway: (IEEE) Institute of Electrical and Electronics Engineers.

Johnston, C., Hilmer, S., McLachlan, A., Matthews, S., Carroll, P., Kirkpatrick, C. (2014). The impact of frailty on pharmacokinetics in older people: using gentamicin population pharmacokinetic modeling to investigate changes in renal drug clearance by glomerular filtration. European Journal of Clinical Pharmacology, 70(5), 549-555.

Ng, E., Lu, Y., Hambly, B., Jelinek, H., Yu, B., Matthews, S., McLachlan, C. (2013). Angiotensin-converting enzyme gene DD genotype is associated with increased systolic blood pressure in an Australian Rural Type 2 Diabetic Cohort. Hypertension Research, 36(4), 381-382.

Matthews, S. (2013). Letter to the Editor: One-tailed significance tests and the accounting for alpha. Clinical and Experimental Pharmacology and Physiology, 40(8), 594-594.

Marzbanrad, F., Jelinek, H., Ng, E., Tamayo, M., Hambly, B., McLachlan, C., Matthews, S., Palaniswami, M., Khandoker, A. (2013). The Effect of Automated Preprocessing of RR Interval Tachogram on Discrimination Capability of Heart Rate Variability Parameters. 2013 40th Computing in Cardiology Conference (CinC 2013), Spain: IEEE.

SPECIAL AWARDS & PRIZES
(2013 - 2015)

- 2015 - ASCEPT Toxicology Special interest Group Poster Prize - Davy guan

POSTGRADUATE & HONOURS COMPLETIONS

(2013 - 2015)

BMedSc(Hons)

2014 - Daisy Howe

2015 - Bosco Chan

BSc(Hons)

2015 - Davy Guan

BSc(Advanced)(Hons)

2013 - Luke Harb

SERVICE TO THE UNIVERSITY AND COMMUNITY

(2013 - 2015)

- NSW Poisons Advisory Committee (Pharmacologist member, NSW Government)
- Scientific Advisory Panel, Therapeutic Goods Administration, Australian Federal Government
- Member Editorial Board, Journal of Clinical and Translational Medicine
- Review Editor, Integrative Physiology, Frontiers in Physiology

EXTERNAL FUNDING TO LABORATORY

(2013 - 2015)

Source	Project Title	Collaborators	Awarded	Duration	Amount
National Health and Medical Research Council (NHMRC)/ Equipment Grants.	Clinical observation and comprehensive psychophysiological recording and behavioural coding equipment;	Guastella A, de Rosnay M, Einfeld S, Glozier N, Hawes D, Hickie I, Lagapolos J, Menzies R, Morley K, Naismith S;	2014	-	$50, 000

ENVIRONMENTAL PHYSIOLOGY LABORATORY

BRONWYN MCALLAN

SENIOR LECTURER, PHYSIOLOGY

Animal models are frequently used to understand physiological mechanisms.

LABORATORY OVERVIEW

This Lab works in the area of comparative physiology. Research is aimed at understanding the mechanisms by which mammals respond physiologically to environmental change. Work has involved photoperiodic control of reproduction and torpor in mammals, with a focus on Australian mammals. Current work involves the evolution of the placenta in diverse mammals and the use of diet selection in optimizing reproduction in endangered Australian mammals, including the Tasmanian Devil.

RESEARCH ACTIVITIES

Animal models are frequently used to understand physiological mechanisms. Comparative Physiologists use the diverse information that can be discovered in a wide variety of non-laboratory animals to help formulate ideas about physiological processes. Of particular interest in this laboratory is the photoperiodic regulation of physiological activities and the mechanism by which photic information is transduced from the eye, to the nervous system and into an endocrine signal. The expression of photoperiodism in humans is best seen in those individuals who experience seasonal affective disorder (SAD).

Research in 2013 - 2015 focused on the environmental control of structure and function in mammals, especially marsupials. Research areas included the photoperiodic control of reproduction, and the seasonal implications for metabolism. Other research related to the seasonal physiological and endocrine changes in mammals and the morphological implications of these. During 2014 and 2015 we continued work on the environmental control of reproduction and thermoregulation in marsupials, especially the dunnarts (Sminthopsis spp). We also worked on the evolution of the structure and function of the placenta, our focus being primarily the placentae of marsupials. We also continued collaborative work with colleagues from around the world on the physiology, biochemistry and molecular biology of mammals. We are continuing work on the anatomy and physiology of marsupials using dunnarts in collaboration with Prof David Raubenheimer, Prof Stephen Simpson (CPC), Prof Chris Murphy (Anatomy & Histology), Prof Michael Thompson (School of Life and Environmental Sciences), Dr Jan Slapeta (Veterinary Sciences) and Prof Fritz Geiser (University of New England).

LABORATORY PERSONNEL/ STUDENTS

Bronwyn M McAllan	Senior Lecturer 2011 - present
Hayley Stannard	ARC Postdoctoral fellow 2014 - present
Lihong Yuan	China Scholarship Council Visiting Fellow 2014
Petra Hanke	Research assistant (p/t) 2013 - 2014
Melanie Laird	PhD student 2013 - present
Jessica Dudley	PhD student 2014 - present
Jessica Dudley	BSc(Hons) student 2013

PUBLICATIONS
(2013 - 2015)

Laird, M., M. Turancova, B. McAllan, C. Murphy, M. Thompson 2015. Unlocking amniote live birth: The 'other' mammalian model. Journal and Proceedings of the Royal Society of New South Wales, 148 (455-456): 52-59.

Van Herck, S. L., J. Delbaere, N. M. Bourgeois, B. M. McAllan, S. J. Richardson, V. M. Darras 2015. Expression of thyroid hormone transporters and deiodinases at the brain barriers in the embryonic chicken: insights into the regulation of thyroid hormone availability during neurodevelopment. General and Comparative Endocrinology 214: 30- 39.

Dudley, J. S., M. B. Thompson, C. R. Murphy and B. M. McAllan (2015) Desmoglein-2 during pregnancy and its role in the evolution of viviparity in a marsupial (Sminthopsis crassicaudata; Dasyuridae). Journal of Morphology: 276: 261-272.

McAllan, B. M. 2014. Feature: Adventures in comparative endocrinology. Stress and life: lessons from comparative models. The Endocrinologist, Autumn 2014: 14 Invited review.

McAllan B. M. and F. Geiser 2014. Torpor during Reproduction in Mammals and Birds: Dealing with an Energetic Conundrum. Integrative and Comparative Biology 54 (3): 516-532

Laird, M. K., M. B. Thompson, C. R. Murphy and B. M. McAllan 2014. Uterine epithelial cell changes during pregnancy in a marsupial (Sminthopsis crassicaudata; Dasyuridae). Journal of Morphology: 275 (10): 1081-1092

Stannard, H. J., B. M. McAllan, and J. M. Old 2014. Dietary composition and nutritional outcomes in two marsupials, Sminthopsis macroura and S. crassicaudata. Journal of Mammalogy 95: 503-515

He, G-M., C-G. Dong, Z-H. Luan, B. M. McAllan, T. Xu, L.H Zhao, and J. Qiao 2013. Oxygen free radical involvement in acute lung injury induced by H5N1 virus in mice. Influenza and Other Respiratory Viruses 7: 945-953

Geiser, F., M. Klingenspor, and B. M. McAllan 2013. A Functional Nexus between Photoperiod Acclimation, Torpor Expression and Somatic Fatty Acid Composition in a Heterothermic Mammal. PLOS ONE Volume: 8 Issue: 5 Pages: e63803 DOI: 10.1371/journal.pone.0063803 Published: 2013 May 22 2013

Pan, Y.-H.; Zhang, Y.; Cui, J.; Liu, Y. ; McAllan, B. M.; Liao, C.-C.; and Zhang, S. 2013. Adaptation of Phenylalanine and Tyrosine Catabolic Pathway to Hibernation in Bats. PLOS ONE Volume: 8 Issue: 4 Article Number: e62039 DOI: 10.1371/journal.pone.0062039 Published: APR 19 2013

SERVICE TO THE UNIVERSITY AND COMMUNITY

(2013 - 2015)

Member of Editorial Board of Journal

·Associate Editor, Australian Mammalogy, 2007–

Service to Professional Society

·Member, governing committee, Asia and Oceania Society for Comparative Endocrinology 2009– (sole Australian representative)

Manuscripts Refereed for Journals

·Oecologia, Reproduction, Am J Physiol, J Applied Physiol, J Comp Physiol B, Gen Comp Endocrinol, J Endocrinol, Comp Biochem Physiol, J Mammal, J Zool, Aust J Zool Wildlife Res.

Grant Applications Assessed

·ARC

EXTERNAL FUNDING TO LABORATORY

(2013 - 2015)

Source	Project Title	Collaborators	Awarded	Duration	Amount
ARC Discovery Project DP130101589	Lively reproduction: do common molecules underlie all vertebrate live birth?	Prof CR Murphy, Prof MB Thompson, Dr BM McAllan	2013	3 years	$310,000
ARC Linkage Program LP140100235	Dining with Dasyurids: Using nutritional geometry to improve diets for captive breeding programs	Raubenheimer D Wilder S McAllan BM Simpson S Spindler R Van Sluys M Shaw M	2014	4 years	$284,500

$ per year for 2014 and 2015 only

Sminthopsis crassicaudata, the fat-tailed dunnart, our experimental animal model

CNS DEGENERATION LABORATORY

JOHN MITROFANIS

PROFESSOR OF ANATOMY, ANATOMY AND HISTOLOGY

LABORATORY OVERVIEW

The inability to control one's movement and/or posture is a terrifying and striking affliction. Perhaps the best known movement disorder is Parkinson's disease where individuals suffer a variety of signs including tremor, slowness of movement and stiffness. These signs are generated by a death of dopaminergic cells - by factors that are unknown currently - from a brain region called substantia nigra.

RESEARCH ACTIVITIES

The experiments undertaken in this laboratory explore treatments that help save these cells from death in Parkinson's disease; this is a feature that the current gold standard of treatment, namely dopamine replacement drug therapy, does not do. In particular, we are examining the impact of a wonder near-infrared light has on the survival and function of cells in animal models of this disease. In collaboration with Prof Jonathan Stone (Sydney) and Prof AL Benabid (Grenoble). We are in process of exploring a novel method of applying the light from inside the brain itself. Our results will hopefully lay the groundwork for a new therapeutic treatment for Parkinson's disease, one that will help make sick cells better and save cells from death. We use modern anatomical methods including immunohistochemistry and tract tracing techniques, together with various behavioural tests.

PUBLICATIONS

(2013 - 2015)

Reinhart, F., El Massri, N., Darlot, F., Torres, N., Johnstone, D., Chabrol, C., Costecalde, T., Stone, J., Mitrofanis, J., Benabid, A., et al (2015). 810nm near-infrared light offers neuroprotection and improves locomotor activity in MPTP-treated mice. Neuroscience Research, 92, 86-90.

Purushothuman, S., Johnstone, D., Nandasenaa,, C., van Eersel, J., Ittner, L., Mitrofanis, J., Stone, J. (2015). Near infrared light mitigates cerebellar pathology in transgenic mouse models of dementia. Neuroscience Letters, 591, 155-159.

Johnstone, D., Mitrofanis, J., Stone, J. (2015). Targeting the body to protect the brain: Inducing neuroprotection with remotely-applied near infrared light. Neural Regeneration Research, 10(3), 349-351.

Stone, J., Johnstone, D., Mitrofanis, J., O'Rourke, M. (2015). The Mechanical Cause of Age-Related Dementia (Alzheimer's Disease): The Brain is Destroyed by the Pulse. Journal of Alzheimer's Disease, 44(2), 355-373.

Johnstone, D., El Massri, N., Moro, C., Spana, S., Wang, X., Torres, N., Chabrol, C., de Jaeger, X., Reinhart, F., Purushothuman, S., Stone, J., Mitrofanis, J., et al (2014). Indirect application of near infrared light induces neuroprotection in a mouse model of parkinsonism - an abscopal neuroprotective effect. Neuroscience, 274, 93-101.

Moro, C., El Massri, N., Torres, N., Ratel, D., de Jaeger, X., Chabrol, C., Perraut, F., Bourgerette, A., Berger, M., Purushothuman, S., Johnstone, D., Stone, J., Mitrofanis, J., et al (2014).

Photobiomodulation inside the brain: a novel method of applying near-infrared light intracranially and its impact on dopaminergic cell survival in MPTP-treated mice. Journal of Neurosurgery, 120(3), 670-683.

Purushothuman, S., Johnstone, D., Nandasena, S., Mitrofanis, J., Stone, J. (2014). Photobiomodulation with near infrared light mitigates Alzheimer's disease-related pathology in cerebral cortex - evidence from two transgenic mouse models. Alzheimers Research & Therapy, 6(1), 1-13.

Johnstone, D., Coleman, K., Moro, C., Torres, N., Eells, J., Baker, G., Ashkan, K., Stone, J., Benabid, A., Mitrofanis, J. (2014). The potential of light therapy in Parkinson's disease. ChronoPhysiology and Therapy, 4, 1-14.

Moro, C., Torres, N., El Massri, N., Ratel, D., Johnstone, D., Stone, J., Mitrofanis, J., Benabid, A. (2013). Photobiomodulation preserves behaviour and midbrain dopaminergic cells from MPTP toxicity: evidence from two mouse strains. BMC Neuroscience, 14(1), 1-9.

Purushothuman, S., Nandasena, C., Peoples, C., El Massri, N., Johnstone, D., Mitrofanis, J., Stone, J. (2013). Saffron Pre-Treatment Offers Neuroprotection to Nigral and Retinal Dopaminergic Cells of MPTP-Treated mice. Journal of Parkinson's Disease, 3(1), 77-83.

Stone, J., Johnstone, D., Mitrofanis, J. (2013). The helmet experiment in Parkinson's disease: an observation of the mechanism of neuroprotection by near infra-red light. The 9th World Association for Laser Therapy Congress, Bologna, Italy: Medimond International Proceedings.

Purushothuman, S., Nandasena, S., Johnstone, D., Stone, J., Mitrofanis, J. (2013). The impact of near-infrared light on dopaminergic cell survival in a transgenic mouse model of parkinsonism. Brain Research, 1535, 61-70.

MOTOR NEURONE DISEASE LABORATORY

ROGER PAMPHLETT

ASSOCIATE PROFESSOR, PATHOLOGY

LABORATORY PERSONNEL/ STUDENTS

Roger Pamphlett	Associate Professor
Jane Parkin Kullmann	PhD student 2014 - present

LABORATORY OVERVIEW

Our work is directed to an understanding of the genetic and toxic causes for motor neuron disease that will enable therapy to halt this devastating condition.

PUBLICATIONS

(2013 - 2015)

Parkin Kullmann, J., Hayes, S., Wang, M., Pamphlett, R. (2015). Designing an Internationally Accessible Web-Based Questionnaire to Discover Risk Factors for Amyotrophic Lateral Sclerosis: A Case-Control Study. JMIR Research Protocols, 4(3), 1-12.

Pamphlett, R., Kum Jew, S. (2015). Different Populations of Human Locus Ceruleus Neurons Contain Heavy Metals or Hyperphosphorylated Tau: Implications for Amyloid-α and Tau Pathology in Alzheimer's Disease. Journal of Alzheimer's Disease, 45, 437-447.

Steinberg, K., Yu, B., Koboldt, D., Mardis, E., Pamphlett, R. (2015). Exome sequencing of case-unaffected-parents trios reveals recessive and de novo genetic variants in sporadic ALS. Scientific Reports, 5, 1-8.

Steinberg, K., Nicholas, T., Koboldt, D., Yu, B., Mardis, E., Pamphlett, R. (2015). Whole genome analyses reveal no pathogenetic single nucleotide or structural differences between monozygotic twins discordant for amyotrophic lateral sclerosis. Amyotrophic Lateral Sclerosis and Frontotemporal Degeneration, 16(5-6), 385-392.

Stoyanov, A., Pamphlett, R. (2014). Is the Risk of Motor Neuron Disease Increased or Decreased after Cancer? An Australian Case-Control Study. PloS One, 9(7), e103572.

Pamphlett, R. (2014). Uptake of environmental toxicants by the locus ceruleus: A potential trigger for neurodegenerative, demyelinating and psychiatric disorders. Medical Hypotheses, 82(1), 97-104.

Pamphlett, R., Cheong, P., Trent, R., Yu, B. (2013). Can ALS-Associated C9orf72 Repeat Expansions be Diagnosed on a Blood DNA Test Alone? PloS One, 8(7), 1-6.

Pamphlett, R., Rikard-Bell, A. (2013). Different Occupations Associated with Amyotrophic Lateral Sclerosis: Is Diesel Exhaust the Link? PloS One, 8(11), 1-10.

Pamphlett, R., Kum Jew, S. (2013). Heavy metals in locus ceruleus and motor neurons in motor neuron disease. Acta Neuropathologica Communications, 1(1), 1-15.

Yang, S., Fifita, J., Williams, K., Warraich, S., Pamphlett, R., Nicholson, G., Blair, I. (2013). Mutation analysis and immunopathological studies of PFN1 in familial and sporadic amyotrophic lateral sclerosis. Neurobiology of Aging, 34(9), 2235.e7-2235.e10.

Simpson, M., Johanssen, V., Boyd, A., Klug, G., Masters, C., Li, Q., Pamphlett, R., McLean, C., Lewis, V., Collins, S. (2013). Unusual clinical and molecular-pathological profile of gerstmann-sträussler-scheinker disease associated with a novel PRNP mutation (V176G). JAMA Neurology, 70(9), 1180-1185.

Pamphlett, R., Kum Jew, S. (2013). Uptake of inorganic mercury by human locus ceruleus and corticomotor neurons: implications for amyotrophic lateral sclerosis. Acta Neuropathologica Communications, 1(1), 1-11.

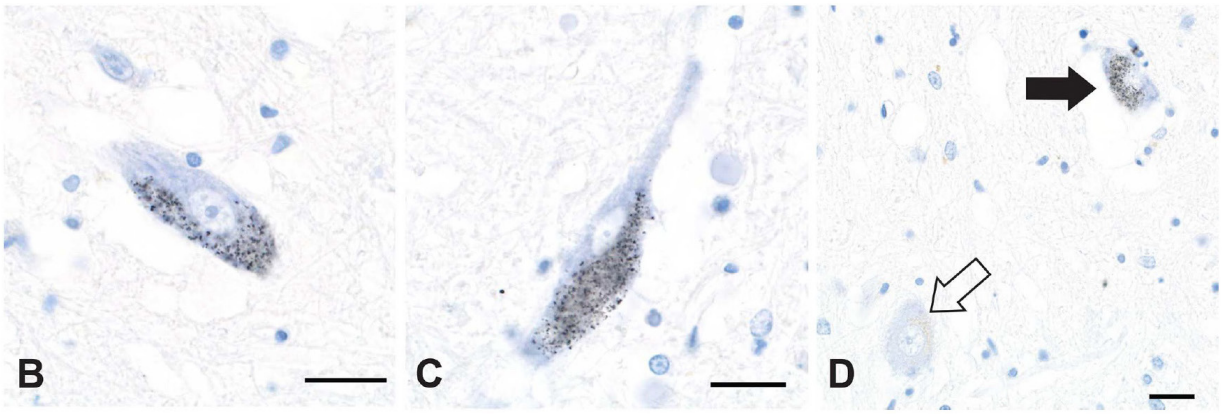


Image of Interneuron heavy metal staining

MOLECULAR NEUROSCIENCE LABORATORY

WILLIAM (BILL) PHILLIPS

ASSOCIATE PROFESSOR, PHYSIOLOGY

LABORATORY OVERVIEW

The neuromuscular junction is the connection between nerve and muscle: the synapse through which all our living thoughts are put into action. This Laboratory investigates the physiological signalling mechanisms through which the nerve-muscle relationship adapts to the challenges of life. We also study how we might use these natural adaptive mechanisms to prevent or delay the failure of muscle control in neuromuscular diseases and in old age.

The Lab has played a leading role in investigating a new form of the autoimmune muscle weakness disease, myasthenia gravis. Some myasthenia patients have antibodies in their blood that bind to a muscle protein called muscle specific kinase (MuSK). We had previously shown that these antibodies cause myasthenia gravis when injected into mice. In 2014 and 2015 we went on to show that these antibodies suppress a form of chemical signalling at the neuromuscular junction referred to as tyrosine phosphorylation. We showed that supplementing the lost MuSK protein in our experimental mice, using a gene therapy vector, was sufficient to protect muscles from the harmful effects of the pathogenic anti-MuSK antibodies from patients.

RESEARCH ACTIVITIES

We have tested drugs that are used to treat other forms of myasthenia gravis in our mouse model of the anti-MuSK form of myasthenia gravis. Interestingly, a drug commonly used to treat asthma showed some potential to reduce weakness. Disturbingly, a cholinesterase inhibitor drug called pyridostigmine that is used as first-line treatment for myasthenia gravis reacted badly with the anti-MuSK disease mechanism. Mice with subclinical anti-MuSK myasthenia became weak when treated with therapeutically-relevant doses of pyridostigmine. In contrast, diaminopyridine, a drug that acts on the neuromuscular junction by a different mechanism, was beneficial for treating anti-MuSK myasthenia in mice. These findings will need to be confirmed in patients. However they show that anti-MuSK myasthenia must be considered differently when considering treatment options, compared to other forms of myasthenia gravis. Our studies provide a clearer understanding of the mechanism of the disease and how it might best be countered.

LABORATORY PERSONNEL/ STUDENTS

William (Bill) Phillips	Associate Professor 1993 -present
Marco Morsch	Postdoctoral researcher 2009 - 2013
Nazanin Ghazanfari	PhD student 2010 - 2014
Joanne Ban	PhD student 2014 - present
Archunan Visvanathan	MPhil student 2013 - 2015
Nigel Tse	MPhil student (co-supervised) 2013 - 2014
Anson Cheng	MPhil student 2011 - 2013
Eva Kichkin	BSc(Hons) student 2014
Erna Linsao	BMedSc(Hons) student 2014
Joshua Way	BSc(Hons) student 2014

PUBLICATIONS
(2013 - 2015)

Plomp, J., Morsch, M., Phillips, W., Verschuuren, J. (2015). Electrophysiological analysis of neuromuscular synaptic function in myasthenia gravis patients and animal models. Experimental Neurology, 270, 41-54.

Ghazanfari, N., Linsao, E., Trajanovska, S., Morsch, M., Gregorevic, P., Liang, S., Reddel, S., Phillips, W. (2015). Forced expression of muscle specific kinase slows postsynaptic acetylcholine receptor loss in a mouse model of MuSK myasthenia gravis. Physiological Reports, 3(12), 1-15.

Phillips, W., Christadoss, P., Losen, M., Punga, A., Shigemoto, K., Verschuuren, J., Vincent, A. (2015). Guidelines for pre-clinical animal and cellular models of MuSK-myasthenia gravis. Experimental Neurology, 270, 29-40.

Ban, J., Phillips, W. (2015). Mouse models of myasthenia gravis. Current Pharmaceutical Design, 21(18), 2468-2486.

Reddel, S., Morsch, M., Phillips, W. (2014). Clinical and scientific aspects of muscle-specific tyrosine kinase-related myasthenia gravis. Current Opinion In Neurology, 27(5), 558-565.

Ghazanfari, N., Morsch, M., Tse, N., Reddel, S., Phillips, W. (2014). Effects of the Beta2-Adrenoceptor Agonist, Albuterol, in a Mouse Model of Anti-MuSK myasthenia Gravis. PloS One, 9(2), 1-11.

Ghazanfari, N., Morsch, M., Reddel, S., Liang, S., Phillips, W. (2014). Muscle Specific Kinase (MuSK) autoantibodies suppress the MuSK pathway and ACh receptor retention at the mouse neuromuscular junction. The Journal of Physiology, 592(13), 2881-2897.

Tse, N., Morsch, M., Ghazanfari, N., Cole, L., Visvanathan, A., Leamey, C., Phillips, W. (2014). The Neuromuscular Junction: Measuring Synapse Size, Fragmentation and Changes in Synaptic Protein Density Using Confocal Fluorescence Microscopy. Journal of Visualized Experiments, 94, 1-16.

Liang, S., Phillips, W. (2013). Migration of Resident Cardiac Stem Cells in Myocardial Infarction. Anatomical Record - Advances in Integrative Anatomy and Evolutionary Biology, 296(2), 184-191.

Morsch, M., Reddel, S., Ghazanfari, N., Toyka, K., Phillips, W. (2013). Pyridostigmine but not 3,4-diaminopyridine exacerbates ACh receptor loss and myasthenia induced in mice by muscle specific kinase autoantibody. The Journal of Physiology, 591(10), 2747-2762.

Cheng, A., Morsch, M., Murata, Y., Ghazanfari, N., Reddel, S., Phillips, W. (2013). Sequence of Age-Associated Changes to the Mouse Neuromuscular Junction and the Protective Effects of Voluntary Exercise. PloS One, 8(7), 1-8.

SPECIAL AWARDS & PRIZES
(2013 - 2015)

- 2014 - Award of International Postgraduate Research Scholarship and Australian Postgraduate Award - Joanne Ban

SERVICE TO THE UNIVERSITY AND COMMUNITY
(2013 - 2015)

- Academic Editor for the journal PLOS ONE (2012-present) 82 manuscripts through to final disposition.

- Invited Session Chair, MGFA/NIH funded conference: Preclinical Guidelines for MG Therapeutic Development -- Standards for Preclinical Efficacy Evaluation for Myasthenia Gravis, Bethesda, MD, USA 23-25 Sept 2014.

- Neuroscience Theme Leader, Bosch Institute (2012-present)

POSTGRADUATE AND HONOURS COMPLETIONS
(2013 - 2015)

PhD

2015 – Nazanin Ghazanfari

MPhil

2014 – Anson Cheng

2015 – Nigel Tse

BMedSc(Hons)

2015 – Erna Linsao

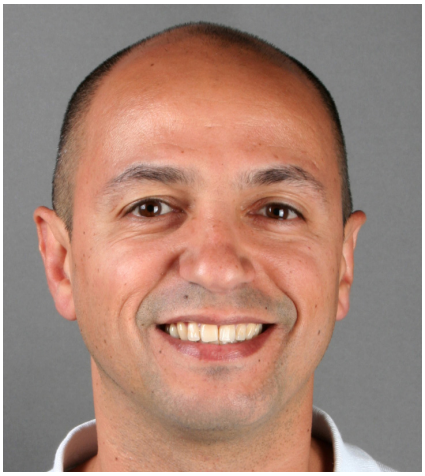
BSc(Hons)

2015 – Eva Kichkin

2015 – Joshua Way

Left to Right: Eva Kichkin, Erna Linsao, William Phillips, and Joshua Way

Left to Right: Nigel Tse, Anson Cheng, William Phillips, Nazanin Ghazanfari, and Marco Morsch



VISION LABORATORY

DARIO PROTTI

SENIOR LECTURER, PHYSIOLOGY

LABORATORY OVERVIEW

Our research focuses on signal processing in the retina, in particular on the synaptic mechanisms involved in the extraction of visual information. We are also interested in understanding the role of different neurotransmitters and receptors in the modulation of signal transmission in the retina and in plasticity phenomena in the early stages of visual processing.

RESEARCH ACTIVITIES

During this period, our Lab focused on the study of the modulatory effects of cannabinoids and endocannabinoids (eCBs) on signal transmission in the retina and on cellular excitability. We also continued our studies on the mechanisms involved in lateral inhibition in retinal circuits.

Effects of endocannabinoid on retinal signaling: The endocannabinoids are bioactive lipids that act as neuromodulators in the central nervous system. We have previously shown that endocannabinoids are released in the retina and modulate the strength of light-responses as well as the receptive field properties of retinal ganglion cells. During 2014 and 2015 we delved into the effects of endocannabinoids on retinal signalling. We found that eCBs reduce the strength of synaptic transmission in the retina, as expected from their known effects in other brain areas. Paradoxically we also found eCBs enhanced retinal ganglion cell excitability by modulating the sensitivity of voltage-gated sodium channels.

Lateral inhibition in the primate retina: We characterized the synaptic mechanisms that shape the receptive field of retinal ganglion cells in the mouse and primate retina. We found that both pre- and post-synaptic inhibitory mechanisms originating in the inner plexiform layer mediate lateral inhibition in ganglion cells.

LABORATORY PERSONNEL/ STUDENTS

Dr Dario Protti	Senior Lecturer 2003-present
Jin Huang	Lecturer 2008-present
Terence Middleton	PhD student 2009-2014
Charles Yates	BSc(Hons) student/ Research Assistant 2014-2015
Josef Daroczy	BSc(Hons) student 2014
Ibrahim Darwish	BMedSc(Hons) student 2014

Protti Lab: Xiaohui Lin, Kevin Leung, Dario Protti, Jin Huang, and Andrea Yong

PUBLICATIONS

(2013 - 2015)

Wijesinghe, R., Tung, V., Camp, A., Protti, D., Mathews, M. (2015). Exciting potential: the importance of the right environment. The Journal of Physiology, 593(10), 2253-2255. [More Information]

Wijesinghe, R., Protti, D., Camp, A. (2015). Vestibular Interactions in the Thalamus. Frontiers in Neural Circuits, 9, 1-8.

Weltzien, F., Dimarco, S., Protti, D., Daraio, T., Martin, P., Grunert, U. (2014). Characterization of secretagogin immunoreactive amacrine cells in marmoset retina. The Journal of Comparative Neurology, 522(2), 435-455.

Protti, D., Di Marco, S., Huang, J., Vonhoff, C., Nguyen, V., Solomon, S. (2014). Inner retinal inhibition shapes the receptive field of retinal ganglion cells in primate. The Journal of Physiology, 592(1), 49-65.

Di Marco, S., Protti, D., Solomon, S. (2013). Excitatory and inhibitory contributions to receptive fields of alpha-like retinal ganglion cells in mouse. Journal of Neurophysiology, 110(6), 1426-1440.

Huang, J., Stiefel, K., Protti, D. (2013). Implementing dynamic clamp with synaptic and artificial conductances in mouse retinal ganglion cells. Journal of Visualized Experiments, 75, 1-7.

POSTGRADUATE AND HONOURS COMPLETIONS
(2013 - 2015)

PhD
2014 - Middleton TP

BSc(Hons)
2014 - Yates CF, 1st Class

2014 - Daroczy J, 2nd Class

BMedSc(Hons)
2014 - Darwish I, 1st Class

EXTERNAL FUNDING TO LABORATORY
(2013 - 2015)

Source	Project Title	Collaborators	Awarded	Duration	Amount
Rebecca Cooper Foundation	Understanding retinal ganglion cell function in glaucoma	Protti DA Huang JY	2014		$22,000
Institute of Teaching and Learning, University of Sydney	Deeper learning engagement through hands-on experience with equipment assembly and collection of electrophysiological data	Protti DA Mason R Phillips WD Hinton T	2015		$9,975

TRANSPORTER BIOLOGY GROUP

ROBERT VANDENBERG & RENAE RYAN

PROFESSOR, PHARMACOLOGY
SCHOOL OF MEDICAL SCIENCES,
BOSCH INSTITUTE

ASSOCIATE PROFESSOR, PHARMACOLOGY

Professor Robert Vandenberg & Associate Professor Renae Ryan

LABORATORY OVERVIEW

Dr Vandenberg and Dr Ryan's research focuses on understanding the way in which proteins move molecules across the cell membrane. In particular, they study transporters for the neurotransmitters glutamate and glycine that play an important role in regulating normal neurotransmission in the brain. The dysfunction of these transporters has been implicated in disease states such as Alzheimer's disease, schizophrenia and ischemia following a stroke. Dr. Ryan uses a variety of biochemical and molecular techniques to try and understand the mechanism of transport and also how drugs interact with these proteins.

LABORATORY PERSONNEL/ STUDENTS

Robert Vandenberg	Professor
Renae Ryan	Associate Professor Lab head 2010 - present
Josep Font	Postdoc 2014 - present
Ben McIlwain	Hons, PhD student 2011 - 2016
Rosemary Cater	Hons, PhD student 2011 - present
Hugh Nursey	Hons student 2014
Ben Gallagher	Hons student 2015
Reem Bashour	MPhil student 2011 - 2012

PUBLICATIONS

(2013 - 2015)

Vinh, N., Devine, S., Munoz, L., Ryan, R., Wang, B., Krum, H., Chalmers, D., Simpson, J., Scammells, P. (2015). Design, Synthesis, and Biological Evaluation of Tetra-Substituted Thiophenes as Inhibitors of p38Î± MAPK. ChemistryOpen, 4(1), 56-64.

McIlwain, B., Vandenberg, R., Ryan, R. (2015). Transport rates of a glutamate transporter homologue are influenced by the lipid bilayer. The Journal of Biological Chemistry, 290(15), 9780-9788.

Vandenberg, R., Ryan, R., Carland, J., Imlach, W., Christie, M. (2014). Glycine transport inhibitors for the treatment of pain. Trends In Pharmacological Sciences, 35(8), 423-430.

Carland, J., Handford, C., Ryan, R., Vandenberg, R. (2014). Lipid Inhibitors of High Affinity Glycine Transporters: Identification of a novel class of analgesics. Neurochemistry International, 73, 211-216.

Wang, K., Grkovic, T., Font Sadurni, J., Bonham, S., Pouwer, R., Bailey, C., Moran, A., Ryan, R., Rasko, J., Jormakka, M., Holst, J., et al (2014). Monoterpene Glycoside ESK246 from Pittosporum Targets LAT3 Amino Acid Transport and Prostate Cancer Cell Growth.ACS Chemical Biology, 9(6), 1369-1376.

Scopelliti, A., Heinzelmann, G., Kuyucak, S., Ryan, R., Vandenberg, R. (2014). Na+ interactions with the neutral amino acid transporter. The Journal of Biological Chemistry, 289(25), 17468-17479.

Wang, K., Beaumont, K., Otte, N., Font Sadurni, J., Bailey, C., van Geldermalsen, M., Sharp, D., Tiffen, J., Ryan, R., Jormakka, M., Haass, N., Rasko, J., Holst, J. (2014). Targeting glutamine transport to suppress melanoma cell growth. International Journal of Cancer, 135(5), 1060-1071.

Cater, R., Vandenberg, R., Ryan, R. (2014). The Domain Interface of the Human Glutamate Transporter EAAT1 Mediates Chloride Permeation. Biophysical Journal, 107(3), 621-629.

Carland, J., Edington, A., Scopelliti, A., Ryan, R., Vandenberg, R. (2013). Directed Mutagenesis in Structure Activity Studies of Neurotransmitter Transporters. In David Figurski (Eds.), Genetic Manipulation of DNA and Protein - Examples from Current Research, (pp. 167-184). Rijeka: InTech Publishers.

Ryan, R., Boudker, O. (2013). Glutamate Transporter Family. In Gordon C. K. Roberts (Eds.), Encyclopedia of Biophysics, (pp. 893-900). Heidelberg: Springer.

Vandenberg, R., Ryan, R. (2013). Mechanisms of glutamate transport. Physiological Reviews, 93(4), 1621-1657.

Scopelliti, A., Ryan, R., Vandenberg, R. (2013). Molecular Determinants for Functional Differences between Alanine-Serine-Cysteine Transporter 1 and Other Glutamate Transporter Family Members. The Journal of Biological Chemistry, 288(12), 8250-8257.

Carland, J., Mansfield, R., Ryan, R., Vandenberg, R. (2013). Oleoyl-L-carnitine inhibits glycine transport by GlyT2. British Journal of Pharmacology, 168(4), 891-902. [More Information]

SERVICE TO THE UNIVERSITY AND COMMUNITY

(2013 - 2015)

- Renae Ryan: Chair, Sydney Medical School Gender Equity Comittee

PATENTS

(2013 - 2015)

- Robert Vandenberg, Renae Ryan, Tristan Rawling, Wendy Imlach, Macdonald Christie, Megan O'Mara, Jane Carland.

  Novel glycine transport inhibitors for the treatment of pain.

  Australian application number: 2015905424.

POSTGRADUATE AND HONOURS COMPLETIONS

(2013 - 2015)

MPhil

2013 - Reem Bashour

BSc(Hons)

2014 - Hugh Nursey

2015 - Ben Gallagher

EXTERNAL FUNDING TO LABORATORY

(2013 - 2015)

Source	Project Title	Collaborators	Awarded	Duration	Amount
NHMRC	Mechanism of anoxic iron acquisition in pathogenic bacteria	Jormakka M, Maher M	2015	3 years	$519,492
NHMRC	Novel Drugs for the Treatment of Chronic Pain	Vandenberg R, O'Mara M, Imlach W, Rawling T, Carland J	2015	3 years	$745,266
NHMRC	The structural basis for glutamate transporter function	Vandenberg R	2013	3 years	$360,429

RETINAL AND CEREBRAL NEUROBIOLOGY LABORATORY

JONATHAN STONE

PROFESSOR, PHYSIOLOGY

DIRECTOR, BOSCH INSTITUTE

LABORATORY OVERVIEW

Our work concerns the stability of the central nervous system, focusing on ways of mitigating degenerations characteristic of ageing – age-related dementia (Alzheimer's disease), Parkinson's disease and age-related macular degeneration.

RESEARCH ACTIVITIES

Neuroprotection in the Retina

Following a series of studies which established the neuroprotective potential of two low-toxicity, low-stress neuroprotectants (dietary saffron and photobiomodulation), our recent work has determined the time course of their protective effects. We have also tested the effect of combined therapy, as a test of whether they activate the same or separate mechanisms.

In earlier studies, we had shown the ability of several interventions (control of oxygen levels, preconditioning with light, dietary saffron, photobiomodulation) to slow the degeneration of the retina, in rodent models. In current work, we are exploring interactions between distant parts of the body – remote ischemic preconditioning – with the potential to protect the retina against degenerative stress. Remote conditioning both protects the retina, and enhances the response of the unstressed retina to light. The mechanisms involved are being explored using microarray technology, and cellular analysis of microglial activity in the stressed and preconditioned retina.

Neuroprotection in the brain

Our work on neuroprotection has been extended to the brain, using several mouse models of cerebral degeneration, including an acute toxin-induced model of Parkinson's disease and transgenic models of Parkinsonism, and of dementia. The work has shown evidence that photobiomodulation and saffron can reduce cerebral degeneration in these models, assessed by both neuropathology and behavioral techniques.

The challenge of these studies is now to identify mechanisms – how three very different interventions (one dietary, one radiation, one ischemic) act, and to identify the molecular and cellular mechanisms involved.

Vascular basis of dementia

This work investigates the involvement of vascular degeneration in the causation of the age-related dementia (Alzheimer's disease). Our recent work has tested the idea that haemorrhage from cerebral vessels can lead to the formation of plaques and neurofibrillary tangles, two of the features of the demented brain described by Alzheimer, a century ago. The response of brain tissue to small, haemorrhagic lesions is being studied in a rodent model, showing a complex 'halo' response, which may be important to understanding the full response of tissue to the small lesions which are prominent in dementia.

We are also analyzing epidemiological evidence that long-established changes in the properties of the great arteries (principally the stiffening of the arterial wall) play a key role is the causation of age-related dementia.

LABORATORY PERSONNEL/ STUDENTS

Jonathan Stone	Professor 2007 - present
Dr Daniel Johnstone	Postdoctoral Fellow 2012 - present
Sharon Spana	Research Assistant 2008 - present
Alice Brandli	PhD student 2011 - 2015
Charith Nandasena	PhD student 2010 - present
Ji Yeon Kim	PhD student 2015 - present
Tianchen Feng	MPhil student 2013 - present
Nicholas Skladnev	BMedSc(Hons) student 2015
Varshika Ganeshan	BMedSc(Hons) student 2015
Marcus Andersson	BMedSc(Hons) student 2015 - present
Sivaraman Purushothuman	PhD student 2010 - 2014

JONATHAN STONE

Our work in 2015 has involved the following strands:

- The cause of age-related dementia
- The potential of photobiomodulation in the stabilization of the brain in rodent and primate models of parkinsonism
- The use of photobiomodulation, saffron and remote ischaemic conditioning in rodent models of dementia
- The demonstration of supernormal retinal function following remote ischemic conditioning.

In 2015, we published a novel understanding of the cause of age-related dementia in vascular ageing ('The Pulse Destroys the Brain'). The idea has achieved wide publicity. This review, a synthesis of many strands of data, is backed up by a wide range of experimental studies on neuroprotection.

Valuable collaborations with Clinatec (Grenoble), Rowan University (USA) and the Victor Chang Cardiac Research Institute have strengthened and broadened our work, to include human and non-human primate studies, the analysis of the role of circulating bone marrow-derived stem cells in neuroprotection, and to the role of vascular ageing in age-related degenerations.

Left to Right: Lucia Corso, Alice Brandli, Charith Nandasena, Dr Daniel Johnstone, Dr Sivaraman Purushothuman, and Prof Jonathan Stone

POSTGRADUATE AND HONOURS COMPLETIONS

(2013 - 2015)

BSc(Hons)

2015 - Skladnev N

2015 - Ganeshan V

PhD

2014 - Purushothuman S

2015 - Brandli A

SPECIAL AWARDS & PRIZES

(2013 - 2015)

Awards, Prizes and Other Recognition

2015 - Johnstone D. NSW Young Tall Poppy Award, Australian Institute of Policy & Science, 2015

Fellowship Awarded

2015 - Johnstone DM, Ron Rickards Fellowship, Australian Academy of Science

PUBLICATIONS

(2013 - 2015)

Brandli A. Remote limb ischemic preconditioning: a neuroprotective technique in rodents. J Vis Exp 2015; e52213.

Brandli A, Stone J. Using the electroretinogram to assess function in the rodent retina and the protective effects of remote limb ischemic preconditioning. J Vis Exp 2015: e52658.

Bravo-Nuevo A, Brandli AA, Gerhart J, Nichols J, Pitts M, Sutera CK, Assali S, Scheinfeld V, Prendergast GC, Stone J, George-Weinstein M. Neuroprotective effect of Myo/Nog cells in the stressed retina. Exp Eye Res 2015; 146: 22-25.

Johnstone DM, Mitrofanis J, Stone J. Targeting the body to protect the brain: inducing neuroprotection with remotely-applied near infrared light. Neural Regen Res 2015; 10: 349-351.

Purushothuman S, Johnstone DM, Nandasena C, Ittner L, Mitrofanis J, Stone J. Near infrared light mitigates cerebellar pathology in transgenic mouse models of dementia. Neurosci Lett 2015; 591: 155-159.

Purushothuman S, Stone J. The reaction of cerebral cortex to a nearby lesion: damage, survival, self-protection. Brain Res 2015; 1601: 52-63.

Reinhart F, El Massri N, Darlot F, Torres N, Johnstone DM, Chabrol C, Costecalde T, Stone J, Mitrofanis J, Benabid AL, Moro C. 810 nm near-infrared light offers neuroprotection and improves locomotor activity in MPTP-treated mice. Neurosci Res 2015; 92: 86-90.

Shahandeh A, Purushothuman S, Martin K, Graham M, Johnstone DM, Milward EA. Anti-oxidant phytochemicals as potential treatments for age-related macular degeneration. J Antioxidant Activity 2015; 1: 26-38.

Stone J, Johnstone DM, Mitrofanis J, O'Rourke M. The mechanical cause of age-related dementia (Alzheimer's disease): the brain is destroyed by the pulse. J Alzheimers Dis 2015; 44: 355-373.

Aryal R, Woods JJ, Johnstone DM, Horvat JC, Milward EA. Is the A-beta peptide of Alzheimer's disease an antimicrobial peptide? J Gerontol Geriatr Res 2014; 3: 165.

Brandli A, Stone J. Remote ischemia influences the responsiveness of the retina: observations in the rat. Invest Ophthalmol Vis Sci 2014; 55: 2088-2096.

Di Marco F, Di Paolo M, Romeo S, Colecchi L, Fiorani L, Spana S, Stone J, Bisti S. Combining neuroprotectants in a model of retinal degeneration: no additive benefit. PLoS One 2014; 9: e100389.

Johnstone DM, Coleman K, Moro C, Torres N, Eells JT, Baker GE, Ashkan K, Stone J, Benabid AL, Mitrofanis J. The potential of light therapy in Parkinson's disease. ChronoPhysiol Ther 2014; 4: 1-14.

Johnstone DM, El Massri N, Moro C, Spana S, Wang XS, Torres N, Chabrol C, De Jaeger X, Reinhart F, Purushothuman S, Benabid AL, Stone J, Mitrofanis J. Indirect application of near infrared light induces neuroprotection in a mouse model of parkinsonism – an abscopal neuroprotective effect. Neuroscience 2014; 274: 93-101.

Mate K, Riveros C, Weidenhofer J, Goldie B, Scott J, Moscato P, Johnstone D, Milward E. Strategies for enhancing communication between students, academics and researchers participating in large-scale undergraduate research projects. Int J Innov Sci Math Educ 2014; 22: 14-29.

Milward EA, Moscato P, Riveros C, Johnstone DM. Beyond statistics – a new combinatorial approach to identifying biomarker panels for the early detection and diagnosis of Alzheimer's disease. J Alzheimers Dis 2014; 39: 211-217.

Moro C, El Massri N, Torres N, Ratel D, Chabrol C, Perraut F, Bourgerette A, Purushothuman S, Johnstone D, Stone J, Mitrofanis J, Benabid AL. Photobiomodulation inside the brain: a novel method of intracranial application of near-infrared light and its impact on dopaminergic cell survival in MPTP-treated mice. J Neurosurg 2014; 120: 670-683.

Purushothuman S, Johnstone DM, Nandasena C, Mitrofanis J, Stone J. Photobiomodulation with near infrared light mitigates Alzheimer's disease-related pathology in cerebral cortex – evidence from two transgenic mouse models. Alzheimers Res Ther 2014; 6: 2.

Stone, J., De La Torre, J. (2013). Alzheimer's disease is associated with increased risk of haemorrhagic stroke. Evidence-Based Mental Health, 16(3), 88.

Moro, C., Torres, N., El Massri, N., Ratel, D., Johnstone, D., Stone, J., Mitrofanis, J., Benabid, A. (2013). Photobiomodulation preserves behaviour and midbrain dopaminergic cells from MPTP toxicity: evidence from two mouse strains. BMC Neuroscience, 14(1), 1-9.

Kirk, D., Gopalakrishnan, S., Schmitt, H., Abroe, B., Stoehr, M., Dubis, A., Carroll, J., Stone, J., Valter, K., Eells, J. (2013). Photobiomodulation Reduces Photoreceptor Death and Regulates Cytoprotection in Early States of P23H Retinal Dystrophy. Mechanisms for Low-Light Therapy VIII, Bellingham: SPIE Society of Photo-Optical Instrumentation Engineers.

Purushothuman, S., Nandasena, C., Peoples, C., El Massri, N., Johnstone, D., Mitrofanis, J., Stone, J. (2013). Saffron Pre-Treatment Offers Neuroprotection to Nigral and Retinal Dopaminergic Cells of MPTP-Treated mice. Journal of Parkinson's Disease, 3(1), 77-83.

Stone, J., Johnstone, D., Mitrofanis, J. (2013). The helmet experiment in Parkinson's disease: an observation of the mechanism of neuroprotection by near infra-red light. The 9th World Association for Laser Therapy Congress, Bologna, Italy: Medimond International Proceedings.

Purushothuman, S., Nandasena, S., Johnstone, D., Stone, J., Mitrofanis, J. (2013). The impact of near-infrared light on dopaminergic cell survival in a transgenic mouse model of parkinsonism. Brain Research, 1535, 61-70.

Purushothuman, S., Marotte, L., Stowe, S., Johnstone, D., Stone, J. (2013). The response of cerebral cortex to haemorrhagic damage: experimental evidence from a penetrating injury model. PloS One, 8(3), 1-18.

Di Marco, F., Romeo, S., Nandasena, S., Purushothuman, S., Adams, C., Bisti, S., Stone, J. (2013). The time course of action of two neuroprotectants, dietary saffron and photobiomodulation, assessed in the rat retina. American Journal of Neurodegenerative Disease, 2(3), 208-220.

SERVICE TO THE UNIVERSITY AND COMMUNITY
(2013 - 2015)

J Stone

- Managing Trustee, Sir Zelman Cowen Universities Fund, The Fund, a private charitable trust, donates funds for research at, and for student and academic exchanges between, the University of Sydney and the Hebrew University of Jerusalem.
- Convenor, Heritage Committee of the Anderson Stuart Building. This Committee advises the Head of the School of Medical Sciences on heritage aspects of the Anderson Stuart Building. It has been active in proposing, funding and guiding small and large heritage/refurbishment projects in the Building.
- Executive Director, Bosch Institute. The Institute represents, supports and facilitates research in the School of Medical Sciences and throughout the University.

D Johnstone

- Director, Australian Society for Medical Research, Nov 2012 – present
- President-Elect, Australian Society for Medical Research, Nov 2015– present
- ECR Coordinator, School of Medical Sciences, 2015 – present

EXTERNAL FUNDING TO LABORATORY
(2013 - 2015)

Source	Project Title	Collaborators	Awarded	Duration	Amount
Brain Foundation, Australia	Protection against Parkinson's disease using remote photobiomodulation: understanding mechanisms	Johnstone D Stone J Mitrofanis J	2013	1 year	$35,000
Sydney Medical School, USyd	Mechanisms of PBM-induced neuroprotection: the role of the immune system	Johnstone D	2013	1 year	$22,500
NHMRC	Early Career Fellowship	Johnstone D	2013	3 years	$225,000
Parkinson's NSW	Common pathways in neuroprotection: understanding mechanisms of three neuroprotectants in a model of Parkinson's disease	Johnstone D Stone J Mitrofanis J	2015	1 year	$19,990
BRIG Scheme, USyd	Identifying mechanisms underlying neuroprotection by photobiomodulation with near infrared light	Camp A Johnstone D	2015	1 year	$20,000

SIDS AND SLEEP APNEA GROUP

KAREN WATERS & RITA MACHAALANI

PROFESSOR, DISCIPLINE OF CHILD AND ADOLESCENT HEALTH, THE CHILDREN'S HOSPITAL AT WESTMEAD

CLINICAL SENIOR LECTURER, MEDICINE, CENTRAL CLINICAL SCHOOL

Professor Karen Waters and Clinical Senior Lecturer, Rita Machaalani

LABORATORY OVERVIEW

Neuropathological changes in the Sudden Infant death Syndrome (SIDS) and effects of hypoxia and nicotine in the developing brain and placenta.

Our laboratory is the only one in NSW actively conducting brain research into SIDS. Over the past 15 years, we have studied a big dataset of SIDS infants and obtained pioneering findings into the neuropathology of SIDS.

RESEARCH ACTIVITIES

Concurrently, we study the brain from piglet models of two risk factors of SIDS; hypoxia and nicotine exposure. These have helped to define the mechanism of abnormal brain pathology seen in SIDS. We recently embarked on studying the placenta from pregnancies where cigarette smoke exposure is present to identify how that pathology affects the fetus. These studies were conducted by various Honours, Masters and PhD students and are currently continuing.

LABORATORY PERSONNEL/STUDENTS

Karen Waters	Professor
Dr Rita Machaalani	Senior Clinical Lecturer 2003 - present
Nicholas J Hunt	PhD student 2013 - 2016
Emma Ghazavi	Masters student 2013 - 2013
Maggie Du	Honours student 2013 - 2014
Arunnjah Vivekanandarajah	PhD student 2014 - 2016
Jessica Huang	Masters student 2015 - 2016
Natalie Ambrose	Honours student

PUBLICATIONS

(2013 - 2015)

Hunt, N., Rodriguez, M., Waters, K., Machaalani, R. (2015). Changes in orexin (hypocretin) neuronal expression with normal aging in the human hypothalamus. Neurobiology of Aging, 36(1), 292-300.

Hunt, N., Waters, K., Rodriguez, M., Machaalani, R. (2015). Decreased orexin (hypocretin) immunoreactivity in the hypothalamus and pontine nuclei in sudden infant death syndrome. Acta Neuropathologica, 130(2), 185-198.

Machaalani, R., Ghazavi, E., David, R., Hinton, T., Makris, A., Hennessy, A. (2015). Nicotinic acetylcholine receptors (nAChR) are increased in the pre-eclamptic placenta. Hypertension in Pregnancy, 34(2), 227-240.

Vivekanandarajah, A., Waters, K., Machaalani, R. (2015). Postnatal nicotine effects on the expression of nicotinic acetylcholine receptors in the developing piglet hippocampus and brainstem. International Journal of Developmental Neuroscience, 47, 183-191.

Machaalani, R., Ghazavi, E., Hinton, T., Waters, K., Hennessy, A. (2014). Cigarette smoking during pregnancy regulates the expression of specific nicotinic acetylcholine receptor (nAChR) subunits in the human placenta. Toxicology and Applied Pharmacology, 276(3), 204-212.

Machaalani, R., Waters, K. (2014). Neurochemical abnormalities in the brainstem of the Sudden Infant Death Syndrome (SIDS). Paediatric Respiratory Reviews, 15(4), 293-300.

Machaalani, R., Hunt, N., Waters, K. (2013). Effects of changes in energy homeostasis and exposure of noxious insults on the expression of orexin (hypocretin) and its receptors in the brain. Brain Research, 1526, 102-122.

Hunt, N., Waters, K., Machaalani, R. (2013). Orexin receptors in the developing piglet hypothalamus, and effects of nicotine and intermittent hypercapnic hypoxia exposures. Brain Research, 1508, 73-82.

Bejjani, C., Machaalani, R., Waters, K. (2013). The dorsal motor nucleus of the vagus (DMNV) in sudden infant death syndrome (SIDS): Pathways leading to apoptosis. Respiratory Physiology and Neurobiology, 185(2), 203-210.

SERVICE TO THE UNIVERSITY AND COMMUNITY

(2013 - 2015)

Reviewer for professional journals: Brain Research, Developmental Brain Research, Neuroscience, Journal of Neuropathology & Experimental Neurology, Acta Neuropathologica, Journal of Neuroscience Research, New England Journal of Medicine.

SPECIAL AWARDS & PRIZES

(2013 - 2015)

Scholarships and Fellowships Awarded

2014 - Nicholas J Hunt (APA)

POSTGRADUATE AND HONOURS COMPLETIONS

(2013 - 2015)

MMed

2014 - Emma Ghazavi

BMedSc(Hons)

2015- Natalie Ambrose

BSc(Hons)

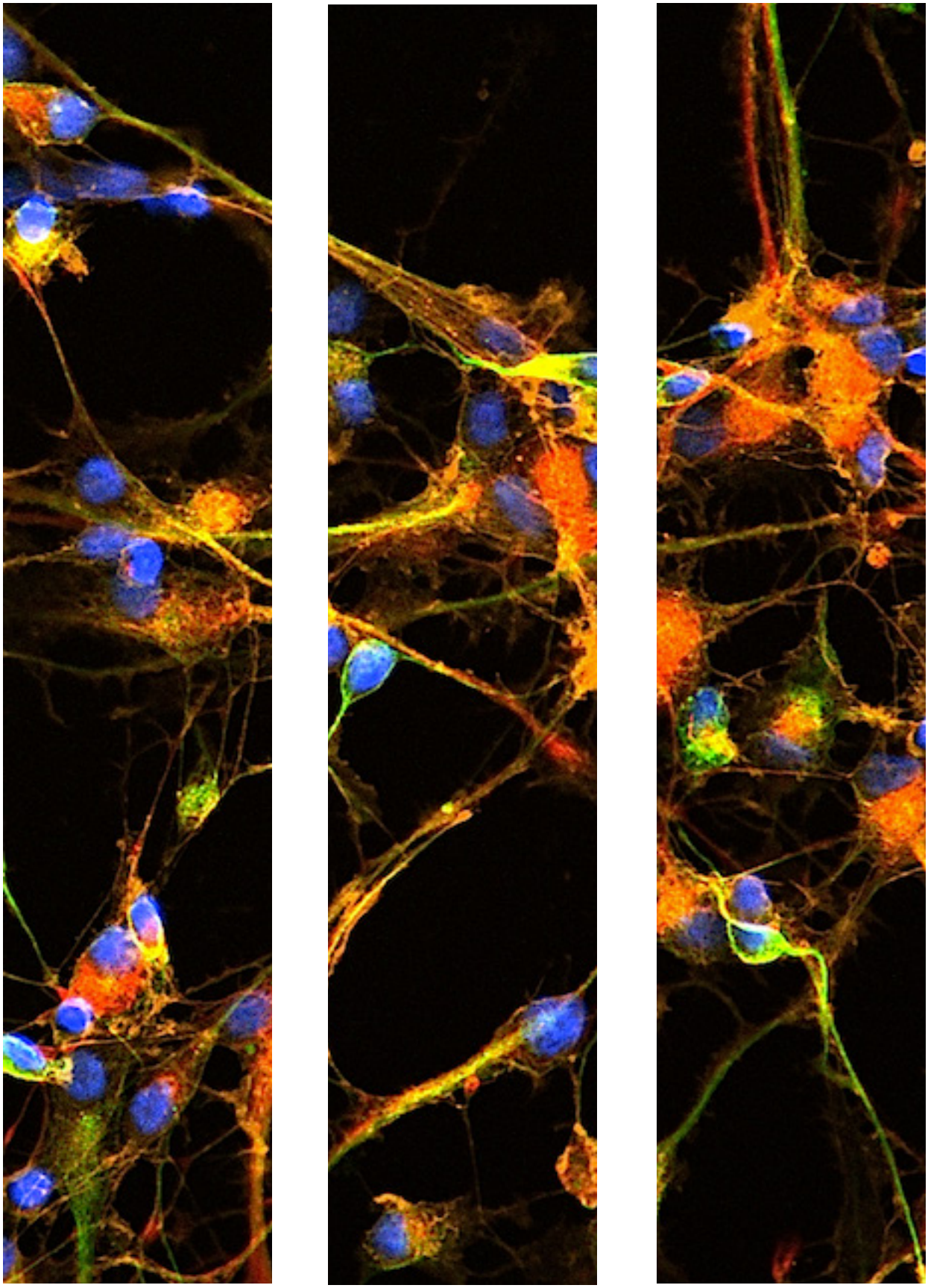
2014 - Maggie Du

EXTERNAL FUNDING TO LABORATORY

(2013- 2015)

Source	Project Title	Collaborators	Awarded	Duration	Amount
SIDS Stampede	Neuropathology of SIDS.	Karen Waters		2013-2015	$100,000
Miranda Belshaw foundation	SIDS brain research	Karen Waters		2013-2015	$33,000

SIDS and Sleep Apnea Group,
Left to Right: Arunnjah Vivekanandarajah, Jessica Huang, Atqiya Aishah, Natalie Ambrose, Dr Rita Machaalani, Nicholas Hunt and Prof Karen Waters



CARDIOVASCULAR RESEARCH

Cardiovascular disease related research is strongly represented, with major programs examining new and innovative approaches to improve the management of heart attacks, the immunopathology of atherosclerosis and inherited risk factors for heart disease.

Cross-disciplinary inputs are made from groups studying the neuroendocrine regulation of blood pressure, and from groups studying the physiological properties of cardiac muscle cells, both normally and following pathological insult. There are a number of areas of particular research strength within the Research Theme. These include:

1. Clinical and experimental studies of cardiovascular disease;

2. The roles of gene expression and polymorphisms in the development of cardiovascular disease;

3. Mechanisms controlling heart function and vascular tone.

Desired impact on knowledge and/or practice

While some of our work constitutes basic research, the benefits of which will only be reaped in future years, much of the research has more direct and immediate clinical application to the health of the people of NSW. Of particular note are:

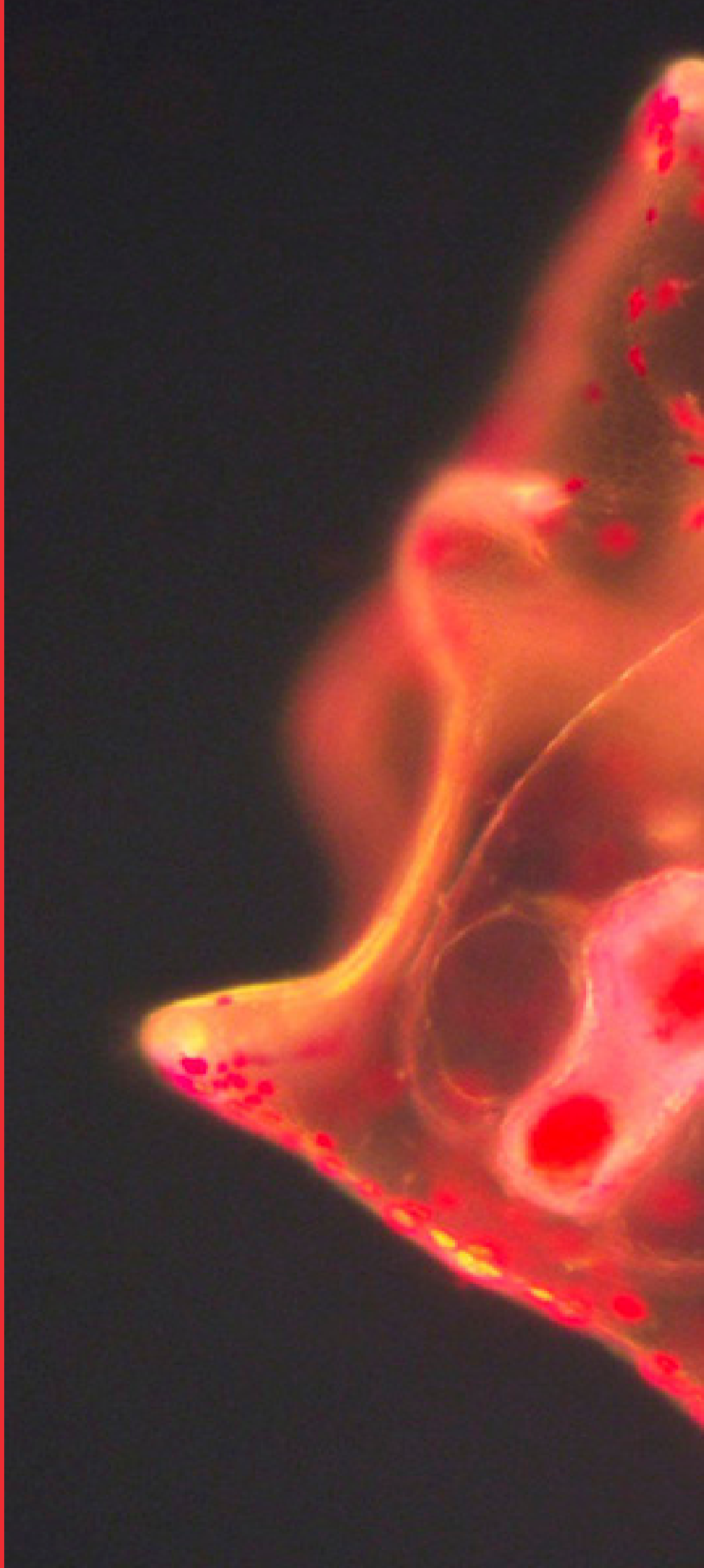
Projects that focus on diagnosis and screening of disease, for example, finding new biomarkers for early ischaemia of the heart, and determining genetic lesions that lead to cardiac and vascular disease.

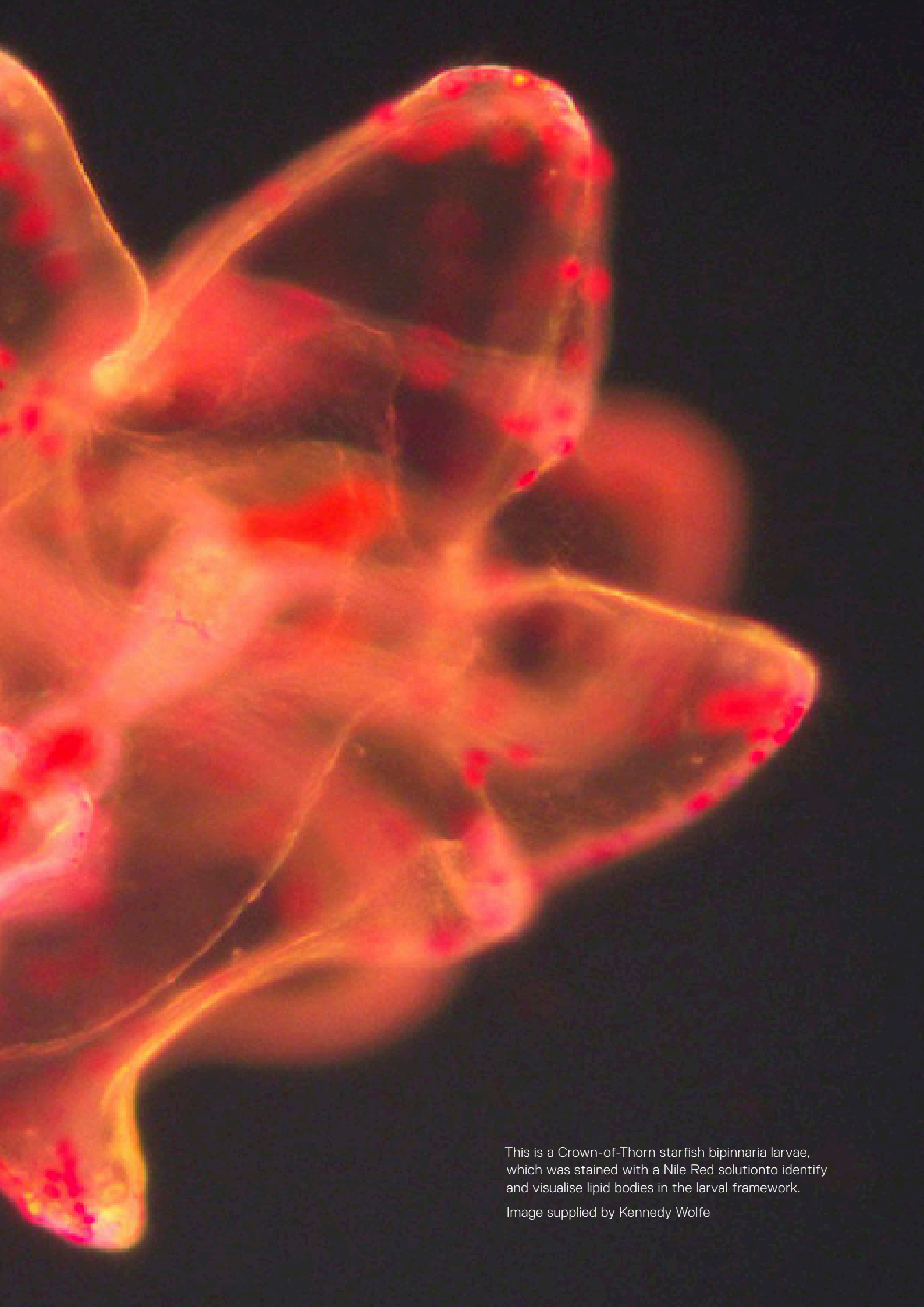
Projects that will lead to new, more cost-effective treatments for diseases, for example, discovery of new treatments for myocardial ischaemia (early phase of heart attacks) that will substantially reduce the impact of a heart attack on the long term survival of the individual, or drugs that will minimise the impact of atherosclerosis.

Projects that will lead to prevention of disease, for example, understanding the causes, and better management, of diabetes, atherosclerosis, cardiomyopathy, heart failure, stroke and myocardial infarction.

For more information on this theme visit

http://sydney.edu.au/medicine/bosch/research/





This is a Crown-of-Thorn starfish bipinnaria larvae, which was stained with a Nile Red solutionto identify and visualise lipid bodies in the larval framework.

Image supplied by Kennedy Wolfe

MUCOSAL IMMUNOLOGY LABORATORY

BOB BAO

ASSOCIATE PROFESSOR, PATHOLOGY

LAB OVERVIEW

Research conducted by this unit focuses on mucosal immunity, at both a molecular and cellular level. More specifically, this unit investigates the involvement of a number of genes (traditionally associated with the control of the immune response) in experimental models of idiopathic inflammatory bowel disease and atherosclerosis, with a view to gaining new insights into the mechanisms which underlie these disorders.

RESEARCH ACTIVITIES

Cytokine regulation of intestinal mucosal immunity. The development of two lineages of murine B cells (B1 and B2 cells) in the intestinal mucosa are being investigated, using cytokine gene knock out mice. Although we found that conventional B2 cells are dependent on IL-6, whereas B1 cells rely on IL-5, the precise mechanism(s) underlying these interactions still remains to be explored. More recently, we have been using STAT3 signal transduction gene knock-in mice, and IL-5Rbgene knockout mice, to explore whether these two signal transduction pathways are critical for B2 or B1 cell maturation, respectively.

The pathogenesis of atherosclerosis. Using a microvascular surgical technique, we have successful developed a unique mouse model of endothelial damage/neointimal proliferation that has allowed us to access gene knockout mice to selectively examine the effects of specific proteins in neointimal proliferation.

PUBLICATIONS

(2013 - 2015)

Wang, H., Wu, H., Bao, B., Xiang, X., Zhao, G., Liu, K., Li, F., Xu, Y., An, B., Zhou, H., et al (2015). Association of IPS1 polymorphisms with peginterferon efficacy in chronic hepatitis B with HBeAg-positive in the Chinese population. Infection, Genetics and Evolution, 31, 161-168.

Cao, Z., Li, F., Xiang, X., Liu, K., Liu, Y., Tang, W., Lin, L., Guo, Q., Bao, B., Xie, Q., et al (2015). Circulating cell death biomarker: Good candidates of prognostic indicator for patients with hepatitis B virus related acute-on-chronic liver failure. Scientific Reports, 5, 1-11.

Williams, B., Tebbutt, N., Buchert, M., Putoczki, T., Doggett, K., Bao, B., Johnstone, C., Masson, F., hollande, F., Burgess, A., et al (2015). Glycoprotein A33 deficiency: a new model of impaired intestinal epithelial barrier function and inflammatory disease. Disease Models & Mechanisms, 8(8), 805-815.

Liu, Z., Wang, W., Li, Q., Tang, M., Li, J., Wu, W., Wan, Y., Wang, Z., Bao, B., Fei, J. (2015). Growth hormone secretagogue receptor is important in the development of experimental colitis. Cell & Bioscience, 5, 1-10.

Wang, H., Liu, K., Fang, B., Wu, H., Li, F., Xiang, X., Tang, W., Zhao, G., Lin, L., Bao, B., et al (2015). Identification of acetyltransferase genes (HAT1 and KAT8) regulating HBV replication by RNAi screening. Cell & Bioscience, 5, 1-9.

Kwan, T., Chadban, S., Ma, J., Bao, B., Alexander, S., Wu, H. (2015). IL-17 Deficiency Attenuates Allograft Injury and Prolongs Survival in a Murine Model of Fully MHC-Mismatched Renal Allograft Transplantation. American Journal Of Transplantation, 15(6), 1555-1567.

Miller, C., Zakrzewski, A., Robinson, D., Fuller, S., Walker, R., Ikin, R., Bao, B., Grigg, M., Wiley, J., Smith, N. (2015). Lack of a Functioning P2X7 Receptor Leads to Increased Susceptibility to Toxoplasmic Ileitis. PloS One, 10(6), 1-17.

Xu, B., Lin, L., Xu, G., Zhuang, Y., Guo, Q., Liu, Y., Wang, H., Zhou, X., Wu, S., Bao, B., et al (2015). Long-term lamivudine treatment achieves regression of advanced liver fibrosis/cirrhosis in patients with chronic hepatitis B. Journal of Gastroenterology and Hepatology, 30(2), 372-378.

Fulcher, J., Patel, S., Nicholls, S., Bao, B., Celermajer, D. (2015). Optical coherence tomography for serial in vivo imaging of aortic plaque in the rabbit: a preliminary experience. Open Heart, 2(1), 1-8.

Lai, R., Xiang, X., Mo, R., Bao, R., Wang, P., Guo, S., Zhao, G., Gui, H., Wang, H., Bao, B., et al (2015). Protective effect of Th22 cells and intrahepatic IL-22 in drug induced hepatocellular injury. Journal of Hepatology, 63(1), 148-155.

Yao, M., Xie, C., Kiang, M., Teng, Y., Harman, D., Tiffen, J., Wang, K., Sved, P., Bao, B., Witting, P., Holst, J., Dong, Q. (2015). Targeting of cytosolic phospholipase A2a impedes cell cycle re-entry of quiescent prostate cancer cells. Oncotarget, 6(33), 34458-34474.

Dunn, L., Simpson, P., Prosser, H., Lecce (Venuto), L., Yuen, S., Buckle, A., Sieveking, D., Vanags, L., Lim, P., Chow, R., Bao, B., Davies, M., Celermajer, D., Bursill, C., Ng, M., et al (2014). A Critical Role for Thioredoxin Interacting Protein in Diabetes-Related Impairment of Angiogenesis. Diabetes, 63(2), 675-687.

Liu, H., Wise, S., Rnjak-Kovacina, J., Kaplan, D., Bilek, M., Weiss, A., Fei, J., Bao, B. (2014). Biocompatibility of silk-tropoelastin protein polymers. Biomaterials, 35(19), 5138-5147.

Xia, Q., Kahramanian, A., Arnott, C., Bao, B., Patel, S. (2014). Characterisation of novel cytokines in human atherosclerotic plaque. International Journal of Cardiology, 176(3), 1167-1169.

Zhang, X., Zeng, H., Bao, B., Wang, N., Gillies, M. (2014). Diabetic macular edema: New concepts in patho-physiology and treatment. Cell & Bioscience, 4, 1-14.

Lui, W., Zhang, X., Song, C., Bao, B., Lai, D., Mou, J., Jiang, T., Wang, N. (2014). Expression and characterization of a soluble VEGF receptor 2 protein. Cell & Bioscience, 4(1), 1-10.

Zhang, X., Wang, N., Schachat, A., Bao, B., Gillies, M. (2014). Glucocorticoids: Structure, Signaling and Molecular Mechanisms in the Treatment of Diabetic Retinopathy and Diabetic Macular Edema. Current Molecular Medicine, 14(3), 376-384.

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POSTGRADUATE AND HONOURS COMPLETIONS

(2013 - 2015)

PhD

2013 - T Lin

BMedSc(Hons)

2013 - F Sinclair

2013 - A Barrientos

SPECIAL AWARDS & PRIZES

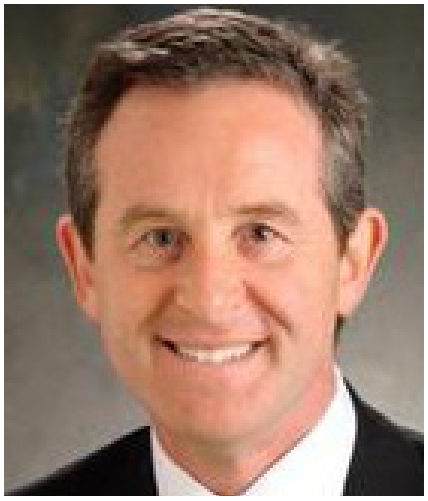
(2013 - 2015)

Scholarships and Fellowships Awarded - 5 PhD scholarships

EXTERNAL FUNDING TO LABORATORY

(2013 - 2015)

Source	Project Title	Collaborators	Awarded	Duration	Amount
2012-2104	Biomaterials with multifaceted tunabilty and bio-specificity	M Belik, A Wiess	ARC	3 years	$650,000



CARDIOVASCULAR DISEASE DETECTION AND PREVENTION

DAVID CELERMAJER

SCANDRETT PROFESSOR OF CARDIOLOGY

LAB OVERVIEW

We have 3 main types of research endeavour;

1. **Basic Science** - The cell and molecular biology of atherosclerosis, especially endothelial adhesiveness and foam cell macrophage biology
2. **Clinical research** - Mainly on non-invasive methods to assess arterial structure and function to detect early signs of vascular disease (especially endothelial dysfunction)
3. **Public Health research in developing nations** - We collaborate on projects dealing with atherosclerosis in China and India; Rheumatic Heart Disease in Africa and Asia; and malaria-related vascular dysfunction in Indonesia.

LABORATORY PERSONNEL/ STUDENTS

David Celermajer	Professor 1993 - present
	5 PhD students 4 Research Assistants 2013 - present

PUBLICATIONS

(2013 - 2015)

Strange, G., Rose, M., Kermeen, F., O'Donnell, C., Keogh, A., Kotlyar, E., Grigg, L., Bullock, A., Disney, P., Dwyer, N., Celermajer, D., et al (2015). A Binational Registry of Adults with Pulmonary Arterial Hypertension complicating Congenital Heart Disease. Internal Medicine Journal, 45(9), 944-950.

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Choudhary, P., Hsu, C., Grieve, S., Smillie, C., Singarayar, S., Semsarian, C., Richmond, D., Muthurangu, V., Celermajer, D., Puranik, R. (2015). Improving the diagnosis of LV non-compaction with cardiac magnetic resonance imaging. International Journal of Cardiology, 181, 430-436.

Choudhary, P., Canniffe, C., Jackson, D., Tanous, D., Walsh, K., Celermajer, D. (2015). Late outcomes in adults with coarctation of the aorta. Heart, 101(15), 1190-1195.

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O'Meagher, S., Seneviratne, M., Skilton, M., Munoz, P., Robinson, P., Malitz, N., Tanous, D., Celermajer, D., Puranik, R. (2015). Right Ventricular Mass is Associated with Exercise Capacity in Adults with Repaired Tetralogy of Fallot. Pediatric Cardiology, 36(6), 1225-1131.

Arnott, C., Skilton, M., Ruohonen, S., Juonala, M., Viikari, J., Kähönen, M., Lehtimäki, T., Laitinen, T., Celermajer, D., Raitakari, O. (2015). Subtle increases in heart size persist into adulthood in growth restricted babies: the Cardiovascular Risk in Young Finns Study. Open Heart, 2(1), 1-9.

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Kapellas, K., Skilton, M., Maple-Brown, L., Do, L., Bartold, P., O'Dea, K., Brown, A., Celermajer, D., Jamieson, L. (2014). Periodontal disease and dental caries among Indigenous Australians living in the Northern Territory, Australia. Australian Dental Journal, 59(1), 93-99.

O'Meagher, S., Ganigara, M., Tanous, D., Celermajer, D., Puranik, R. (2014). Progress of right ventricular dilatation in adults with repaired tetralogy of Fallot and free pulmonary regurgitation. IJC Heart & Vessels, 3, 28-31.

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Marijon, E., Bougouin, W., Perier, M., Celermajer, D., Jouven, X. (2013). Incidence of sports-related sudden death in France by specific sports and sex. JAMA, 310(6), 642-643.

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Ou, P., Khraiche, D., Celermajer, D., Agnoletti, G., Le Quan Sang, K., Thalabard, J., Quintin, M., Raisky, O., Vouhe, P., Sidi, D., et al (2013). Mechanisms of coronary complications after the arterial switch for transposition of the great arteries. The Journal of Thoracic and Cardiovascular Surgery, 145(5), 1263-1269.

Marijon, E., Tafflet, M., Antero-Jacquemin, J., El Helou, N., Berthelot, G., Celermajer, D., Bougouin, W., Combes, N., Hermine, O., Empana, J., et al (2013). Mortality of French participants in the Tour de France (1947-2012). European Heart Journal, 34(40), 3145-3150.

O'Meagher, S., Celermajer, D., Puranik, R. (2013). Preserved stroke volume late after tetralogy repair, despite severe right ventricular dilatation. Heart, 99(24), 1875-1876.

Lau, E., Jaijee, S., Melehan, K., Wong, K., Yee, B., Grunstein, R., Celermajer, D. (2013). Prevalence of patent foramen ovale and its impact on oxygen desaturation in obstructive sleep apnea. International Journal of Cardiology, 165(1), 35-40.

Cordina, R., O'Meagher, S., Karmali, A., Rae, C., Liess, C., Kemp, G., Puranik, R., Singh, N., Celermajer, D. (2013). Resistance training improves cardiac output, exercise capacity and tolerance to positive airway pressure in Fontan physiology. International Journal of Cardiology, 168(2), 780-788.

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Cordina, R., O'Meagher, S., Gould, H., Rae, C., Kemp, G., Pasco, J., Celermajer, D. (2013). Skeletal muscle abnormalities and exercise capacity in adults with a Fontan circulation. Heart, 99(20), 1530-1534.

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Offen, S., Celermajer, D., Semsarian, C., Puranik, R. (2013). The role of diastolic filling in preserving left ventricular stroke volume - An MRI study. International Journal of Cardiology, 168(2), 1596-1598.

Schuuring, M., Bouma, B., Cordina, R., Gatzoulis, M., Budts, W., Mullen, M., Vis, J., Celermajer, D., Mulder, B. (2013). Treatment of segmental pulmonary artery hypertension in adults with congenital heart disease. International Journal of Cardiology, 164(1), 106-110.

Blyton, D., Skilton, M., Edwards, N., Hennessy, A., Celermajer, D., Sullivan, C. (2013). Treatment of sleep disordered breathing reverses low fetal activity levels in preeclampsia. Sleep, 36(1), 15-21.

Simonneau, G., Gatzoulis, M., Adatia, I., Celermajer, D., Denton, C., Ghofrani, A., Angel Gomez Sanchez, M., Kumar, R., Landzberg, M., Machado, R., et al (2013). Updated Clinical Classification of Pulmonary Hypertension. Journal of the American College of Cardiology, 62(25 Suppl D), D34-D41.

Skilton, M., Marks, G., Ayer, J., Garden, F., Garnett, S., Harmer, J., Leeder, S., Toelle, B., Webb, K., Baur, L., Celermajer, D. (2013). Weight gain in infancy and vascular risk factors in later childhood. Pediatrics, 131(6), e1821-e1828.

SERVICE TO THE UNIVERSITY AND COMMUNITY
(2013 - 2015)

- Editorial Board member of Circulation; Journal of the American College of Cardiology and heart; International Associate Editor of the European heart Journal
- Board member of the Menzies School of Health Research, Darwin
- Trustee of the Sir Zelman Cowen Universities Fund
- Board member of the Pulmonary Hypertension Society of ANZ
- Board Member of the Australian friends of the Tel Aviv University

SPECIAL AWARDS & PRIZES
(2013 - 2015)

- Officer of the Order of Australia for services to clinical and research work into Heart Disease
- Approx 25 PhDs awarded since 1997 – most recent ones were to Dr Edmund Lau; Dr Jason Harmer; Dr Rachael Cordina

EXTERNAL FUNDING TO LABORATORY
(2013 - 2015)

Source	Project Title	Collaborators	Awarded	Duration	Amount
NHMRC	Continuous Program Grant funding since 2002 - Atherosclerosis	Barter, Rye, Kritharides, Jessup		15 years	Over $25M
NHMRC	Early detection of pulmonary vascular disease	Lau	2013	4 years	$350K

CARDIAC PROTEOMICS LABORATORY

STUART CORDWELL

ASSOCIATE PROFESSOR, MOLECULAR BIOSCIENCE

LAB OVERVIEW

Our group is primarily interested in utilizing the tools of proteomics to understand disease processes and to discover new targets for protein-based diagnosis of disease and potential vaccine and therapeutic targets. Our Cardiac Proteomics Laboratory is managed through our affiliation with the Discipline of Pathology in the School of Medical Sciences and the Bosch Institute, while our Microbial Pathogens Laboratory is affiliated with the School of Life and Environmental Sciences.

RESEARCH ACTIVITIES

Our major projects in the period 2013-2015 in the Cardiac Proteomics Laboratory concerned the molecular mechanisms by which myocardial ischemia / reperfusion injury is mediated. Our NHMRC funded work examined how complex cascades of post-translational modifications transmit the signals of ischemia and reperfusion. Our group employs proteomics strategies, particularly high resolution mass spectrometry, to identify many thousands of signal events within a temporal profile of ischemia, reperfusion and during cardioprotection by ischemic pre- and post-conditioning and during pharmacological intervention.

LABORATORY PERSONNEL/ STUDENTS

Stuart Cordwell	Associate Professor 2004 - present
Dr Melanie White	ARC DECRA Fellow 2008 - present
Dr Nathan Hare	Postdoctoral Fellow 2010 - 2014
Angela Connolly	Lab Manager 2008 - 2014
Shivanjali Lingam	PhD Student 2015 - present
Desmond Li	PhD Student 2015 - present
Lauren Smith	PhD Student 2012 - present
Joel Cain	PhD Student 2012 - present
Jana Paulech	PhD Student 2010 - present
Kiersten Liddy	PhD Student 2011 - present
Lauren Smith	PhD Student 2012 - present
Joel Cain	PhD Student 2012 - present
Kiersten Liddy	PhD Student 2011 - 2016
Nestor Solis	PhD Student 2009 - 2014
Jana Paulech	PhD Student 2010 - 2014
Benjamin Parker	PhD Student 2009 - 2013
Stine Thyssen	MSc Student 2013 - 2014
Lok Man	Honours Student 2015
Nina Hartcher	Honours Student 2015
Pamela Soh	Honours Student 2015
Prajwal Thapa	Honours Student 2015
Shawn Alaron Abeynaike	Honours Student 2014
Thomas Grinyer	Honours Student 2014
Dina Vassilevska	Honours Student 2013
Jessie He	Honours Student 2013
Harriet Wadsworth	Honours Student 2013

Post-translational modifications (PTM)

PTM are chemical or physical alterations to proteins that change the structure / function paradigm. PTM can influence enzymatic function, protein-protein interactions and complex formation, and cellular localization. Some PTM occur rapidly and linger only transiently due to their reversible nature (e.g. phosphorylation), while others occur over time and are generally irreversible (e.g. some redox modifications, glycosylation). Our group is interested in understanding how these PTM contribute to ischemia / reperfusion (I/R) injury. We developed a profile of cell signalling via phosphorylation over an ischemia time-course in animal models to enable identification of the primary signal events that occur upon ischemia in the heart. This work has identified important kinases that are activated immediately upon ischemic insult. We have also examined additional PTM, such as lysine acetylation. This work enabled us to identify how PTM crosstalk with each other during ischemia and cardioprotection, often either competing for the same sites within proteins, or occurring in a regulated fashion that either encourages or inhibits a modification at a proximal site. Our work on crosstalk published in the Journal of Biological Chemistry was awarded by the Editors as one of 21 'Papers of the Year' (#1 in Genomics and Proteomics), a remarkable achievement considering the >100 year history of the journal and that it publishes >30,000 pages annually. Our work showed that lysine acetylation changed the confirmation of the peptide backbone allowing increased phosphatase accessibility and thus rapid dephosphorylation at neighbouring phosphosites. The group has also developed for the first time an enrichment method for identifying very low abundance redox modifications of cysteine residues that are considered biologically and chemically irreversible; and examined the prevalence of these modifications during I/R injury. Our work has shown that mitochondrial metabolic processes, rather than contractile proteins, are the major targets of oxidants during injury.

Biomarker discovery

Our group has also used animal models to investigate new biomarkers of I/R injury. In this work, we utilized serum-free medium to enable the identification by mass spectrometry of low abundance cardiac-specific proteins released from injured tissue into the 'circulation'. Two potential new markers of ischemia were identified, one of which (Csrp3) was subsequently identified in the serum samples of 8 patients who had undergone significant cardiac ischemic events. Further work will determine whether Csrp3 is a suitable early marker of injury, or whether it is best utilized in

PUBLICATIONS

(2013 - 2015)

Scott, N., Cordwell, S. (2015). Enrichment and Identification of Bacterial Glycopeptides by Mass Spectrometry. In Anton Posch (Eds.), Proteomic Profiling: Methods and Protocols, (pp. 355-368). New York: Springer Science+Business Media.

Paulech, J., Liddy, K., Engholm-Keller, K., White, M., Cordwell, S. (2015). Global analysis of myocardial peptides containing cysteines with irreversible sulfinic and sulfonic acid post-translational modifications. Molecular and Cellular Proteomics, 14(3), 609-620.

Harmer, C., Wynn, M., Pinto, R., Cordwell, S., Rose, B., Harbour, C., Triccas, J., Manos, J. (2015). Homogentisate 1-2-Dioxygenase Downregulation in the Chronic Persistence of Pseudomonas aeruginosa Australian Epidemic Strain-1 in the CF Lung. PloS One, 10(8), 1-13.

Dewi, V., Kwok, A., Lee, S., Lee, M., Tan, Y., Nicholas, H., Isono, K., Wienert, B., Mak, K., Knights, A., Cordwell, S., Crossley, P., et al (2015). Phosphorylation of Krüppel-like factor 3 (KLF3/BKLF) and C-terminal binding protein 2 (CtBP2) by homeodomain-interacting protein kinase 2 (HIPK2) modulates KLF3 DNA binding and activity. The Journal of Biological Chemistry, 290(13), 8591-8605.

Cain, J., Solis, N., Cordwell, S. (2014). Beyond gene expression: The impact of protein post-translational modifications in bacteria. Journal of Proteomics, 97, 265-286.

Scott, N., Marzook, N., Cain, J., Solis, N., Thaysen-Andersen, M., Djordjevic, S., Packer, N., Larsen, M., Cordwell, S. (2014). Comparative Proteomics and Glycoproteomics Reveal Increased N-Linked Glycosylation and Relaxed Sequon Specificity in Campylobacter jejuni NCTC11168 O. Journal of Proteome Research, 13(11), 5136-5150.

Solis, N., Parker, B., Kwong, S., Robinson, G., Firth, N., Cordwell, S. (2014). Staphylococcus aureus Surface Proteins Involved in Adaptation to Oxacillin Identified Using a Novel Cell Shaving Approach. Journal of Proteome Research, 13(6), 2954-2972.

Parker, B., Shepherd, N., Trefely, S., Hoffman, N., White, M., Engholm-Keller, K., Hambly, B., Larsen, M., James, D., Cordwell, S. (2014). Structural Basis for Phosphorylation and Lysine Acetylation Cross-talk in a Kinase Motif Associated with Myocardial Ischemia and Cardioprotection. The Journal of Biological Chemistry, 289(37), 25890-25906.

Getts, D., Terry, R., Getts, M., Deffrasnes, C., Müller, M., Van Vreden, C., Ashhurst, T., Chami, B., McCarthy, D., Wu, H., Ma, J., Witting, P., Campbell, I., Reilly, D., White, M., Cordwell, S., Chadban, S., Bao, B., King, N., et al (2014). Therapeutic inflammatory monocyte modulation using immune-modifying microparticles. Science Translational Medicine, 6(219), 1-14.

Paulech, J., Solis, N., Cordwell, S. (2013). Characterization of reaction conditions providing rapid and specific cysteine alkylation for peptide-based mass spectrometry. Biochimica et Biophysica Acta. Proteins and Proteomics, 1834 (1), 372-379.

Liddy, K., White, M., Cordwell, S. (2013). Functional decorations: post-translational modifications and heart disease delineated by targeted proteomics. Genome Medicine, 5(2), 1-12.

Paulech, J., Solis, N., Edwards, A., Puckeridge, M., White, M., Cordwell, S. (2013). Large-scale capture of peptides containing reversibly oxidized cysteines by thiol-disulfide exchange applied to the myocardial redox proteome. Analytical Chemistry, 85(7), 3774-3780.

Harmer, C., Alnassafi, K., Hu, H., Elkins, M., Bye, P., Rose, B., Cordwell, S., Triccas, J., Harbour, C., Manos, J. (2013). Modulation of gene expression by Pseudomonas aeruginosa during chronic infection in the adult cystic fibrosis lung. Microbiology, 159(11), 2354-2363.

Scott, N., Hare, N., White, M., Manos, J., Cordwell, S. (2013). Secretome of Transmissible Pseudomonas aeruginosa AES-1R Grown in a Cystic Fibrosis Lung-Like Environment. Journal of Proteome Research, 12(12), 5357-5369.

Parker, B., Thaysen-Andersen, M., Solis, N., Scott, N., Larsen, M., Graham, M., Packer, N., Cordwell, S. (2013). Site-Specific Glycan-Peptide Analysis for Determination of N-Glycoproteome Heterogeneity. Journal of Proteome Research, 12(12), 5791-8000.

SERVICE TO THE UNIVERSITY AND COMMUNITY
(2013 - 2015)

- President, Australasian Proteomics Society (2015 - present)
- NHMRC Assigners Academy (2014 - present)
- Director, Mass Spectrometry Core Facility (2014 - present)

POSTGRADUATE AND HONOURS COMPLETIONS
(2013 - 2015)

PhD
2014 - Nestor Solis
2014 - Jana Paulech
2013 - Benjamin Parker

MSc
2014 - Stine Thyssen

BMedSc(Hons)
3 students

BSc(Hons)
6 students

EXTERNAL FUNDING TO LABORATORY
(2013 - 2015)

Source	Project Title	Collaborators	Awarded	Duration	Amount
NHMRC	The role of N-linked protein glycosylation in *Campylobacter jejuni* pathogenesis		2014	4 years	$757,600
ARC LIEF	A systems biology capability for the Ramaciotti Centre for Genomics	James, Simpson, Payne et al. plus UNSW, UTS, Macquarie and U Newcastle	2015	1 year	$550,000
ARC DP	The role of N-linked protein glycosylation in *Campylobacter jejuni*		2011	3 years	$300,000
NHMRC	Identification of proteins specific to transmissible *Pseudomonas aeruginosa* in cystic fibrosis infections	Manos, Triccas	2010	3 years	$440,000

CARDIOVASCULAR NEUROSCIENCE LABORATORY

ROGER DAMPNEY

EMERITUS PROFESSOR, PHYSIOLOGY

LAB OVERVIEW

The coordinated regulation of cardiorespiratory function is my main research interest and from 2013 to 2015 was carried out in collaboration with Assoc Prof Ann Goodchild and Dr Simon McMullan at Macquarie University. The research has shown that there are neurons within the midbrain tectum that are capable of producing highly synchronized cardiovascular and respiratory changes, together with appropriate somatomotor effects, in response to auditory, visual and somatosensory stimuli. In future research we will use optogenetic and advanced anatomical methods to define the inputs and outputs of the neurons that produce these coordinated physiological responses. Other activities included writing three invited reviews on the brain control of cardiorespiratory function, particularly in relation to behaviours such as arousal, exercise and sleep.

PUBLICATIONS

(2013 - 2015)

Silvani, A., Calandra-Buonaura, G., Bennaroch, E., Dampney, R., Cortelli, P. (2015). Bidirectional interactions between the baroreceptor reflex and arousal: an update. Sleep Medicine, 16(2), 210-216.

Beig, M., Horiuchi, J., Dampney, R., Carrive, P. (2015). Both Ox1R and Ox2R orexin receptors contribute to the cardiorespiratory response evoked from the perifornical hypothalamus. Clinical and Experimental Pharmacology and Physiology, 42(10), 1059-1067.

Morris, B., Dampney, R. (2015). Brain-stem microRNAs implicated in hypertension. Physiological Genomics, 49(7), 386-387.

Dampney, R. (2015). 2013 Carl Ludwig Distinguished Lectureship of the APS Neural Control and Autonomic Regulation Section: Central mechanisms regulating coordinated cardiovascular and respiratory function during stress and arousal. American Journal of Physiology: Regulatory, Integrative and Comparative Physiology, 309(5), R429-R443.

Müller-Ribeiro, F., Dampney, R., McMullan, S., Fontes, M., Goodchild, A. (2014). Disinhibition of the midbrain colliculi unmasks coordinated autonomic, Respiratory, And somatomotor responses to auditory and visual stimuli. American Journal of Physiology. Regulatory, Integrative and Comparative Physiology, 307(8), R1025-R1035.

Furlong, T., McDowall, L., Horiuchi, J., Polson, J., Dampney, R. (2014). The effect of air puff stress on c-Fos expression in rat hypothalamus and brainstem: central circuitry mediating sympathoexcitation and baroreflex resetting. European Journal of Neuroscience, 39(9), 1429-1438.

Alessandro, S., Dampney, R. (2013). Central control of cardiovascular function during sleep. American Journal of Physiology:Heart and Circulatory Physiology, 305(12), H1683-H1692.

Chalmers, J., Angus, J., Graham, R., Carmody, J., Dampney, R., Jennings, G., Korner, N. (2013). Paul Ivan Korner 1925-2012. Historical Records of Australian Science, 24(2), 251-282.

Dampney, R., Furlong, T., Horiuchi, J., Iigaya, K. (2013). Role of dorsolateral periaqueductal grey in the coordinated regulation of cardiovascular and respiratory function. Autonomic Neuroscience: Basic and Clinical, 175(1-2), 17-25.

SERVICE TO THE UNIVERSITY AND COMMUNITY

(2013 - 2015)

During the period May to September 2014 Roger was a Visiting Professor at the University of Iowa. During that time Roger visited and presented 3 seminars at the University of Iowa, and also visited and presented seminars at the University of Nebraska, University of St Louis, University of Virginia, Wayne State University, and Oregon Health Sciences University. Roger has been a Member of the Editorial Boards of American Journal of Physiology (Regulatory, Integrative and Comparative Physiology), and American Journal of Physiology (Heart and Circulatory Physiology), since 2010, and a Member of the NSW Cardiovascular Research Network since 2012.

SPECIAL AWARDS & PRIZES

(2013 - 2015)

- 2013 - Carl Ludwig Distinguished Lectureship of the American Physiological Society - Roger Dampney
- 2013 - Fellow of the Cardiovascular Section, American Physiological Society - Roger Dampney
- 2014 - Levitt Visiting Professorship, University of Iowa - Roger Dampney

EXTERNAL FUNDING TO LABORATORY

(2013 - 2015)

Source	Project Title	Collaborators	Awarded	Duration	Amount
NHMRC	Reduction of the cardiovascular response of psychological stress through blockade of orexin's action on one of its receptors.	Carrive P Dampney RAL Horiuchi J McNally G Klugmann M	2012	3 years	$124,975

MUSCLE RESEARCH UNIT

CRISTOBAL DOS REMEDIOS

EMERITUS PROFESSOR, ANATOMY AND HISTOLOGY

LABORATORY PERSONNEL/ STUDENTS

Cristosbal dos Remedios	Professor
Dr Neil Nosworthy	Senior Post Doc Fellow 2000 - 2014
Sean Lal	Cardiologist and Curator of the Sydney Heart Bank 2012 - present
Amy Li	Deputy Director 2012 - present
Joshua Ho	PhD student 2012 - 2015
James McNamara	PhD student 2013 - present
Vicki Velonas	PhD student 2012 - 2015
Michael Kahramania	MPhil student 2013 - present
Rebecca Bao	PhD student 2014 - present

LAB OVERVIEW

Heart failure is the most prevalent cause of morbidity in Australia and indeed in the world. There are multiple causes of heart disease. Hypertrophic cardiomyopathy results from mutations in genes that encode the contractile proteins that comprise the structural unit of muscle, namely the sarcomere. Idiopathic (i.e. unknown cause) dilated (enlarged) cardiomyopathy (heart disease) is increasingly better understood.

Several genes have now been identified, only some of which encode sarcomeric proteins. Ischaemic heart disease is arguably the most prevalent cause of heart failure and is essentially an inflammatory disease.

The establishment of the Sydney Heart Bank shares tissue (at not cost to the recipients) from failing and healthy donor heart tissue. We have collaborated with over 60 research laboratories around the world.

POSTGRADUATE AND HONOURS COMPLETIONS

(2013 - 2015)

PhD

2015 - Mahendran Maliapen

2015 - Maurizio Stefani

BSc(Hons)

2014 – Madeleine R Fitpatrick

2014 – Liana Brien

PUBLICATIONS
(2013 - 2015)

Wijnker, P., Li, Y., Zhang, P., Foster, B., dos Remedios, C., van Eyk, J., Stienen, G., Murphy, A., van der Velden, J. (2015). A novel phosphorylation site, Serine 199, in the C-terminus of cardiac troponin I regulates calcium sensitivity and susceptibility to calpain-induced proteolysis. Journal of Molecular and Cellular Cardiology, 82, 93-103.

Pluess, M., Daeubler, G., dos Remedios, C., Ehler, E. (2015). Adaptations of cytoarchitecture in human dilated cardiomyopathy. Biophysical Reviews, 7, 25-32.

Sequeira, V., Najafi, A., Wijnker, P., dos Remedios, C., Michels, M., Kuster, D., van der Velden, J. (2015). ADP-stimulated contraction: A predictor of thin-filament activation in cardiac disease. Proceedings of the National Academy of Sciences of the United States of America (PNAS), 112(50), e7003-e7012.

Lal, S., Li, A., Allen, D., Allen, P., Bannon, P., Cartmill, T., Cooke, R., Farnswoirth, A., Keogh, A., dos Remedios, C. (2015). Best practice BioBanking of human heart tissue. Biophysical Reviews, 7(4), 399-406.

Foster, S., Porrello, E., Stefani, M., Smith, N., Molenaar, P., dos Remedios, C., Thomas, W., Ramialison, M. (2015). Cardiac gene expression data and in silico analysis provide novel insights into human and mouse taste receptor gene regulation. Naunyn-Schmiedeberg's Archives of Pharmacology, 388, 1009-1027.

Ge, Z., Lal, S., Le, T., dos Remedios, C., Chong, J. (2015). Cardiac stem cells: translation to human studies. Biophysical Reviews, 7(1), 127-139.

Bergmann, O., Zdunek, S., Felker, A., Salehpour, M., Alkass, K., Bernard, S., Sjostrom, S., Szewczykowska, M., Jackowska, T., dos Remedios, C., et al (2015). Dynamics of Cell Generation and Turnover in the Human Heart. Cell, 161(7), 1566-1575.

Mamidi, R., Gresham, K., Li, A., Dos Remedios, C., Stelzer, J. (2015). Molecular effects of the myosin activator omecamtiv mecarbil on contractile properties of skinned myocardium lacking cardiac myosin binding protein-C. Journal of Molecular and Cellular Cardiology, 85, 262-272.

Polizzotti, B., Ganapathy, B., Walsh, S., Choudhury, S., Ammanamanchi, N., Bennett, D., dos Remedios, C., Haubner, B., Penninger, J., Kuhn, B. (2015). Neuregulin stimulation of cardiomyocyte regeneration in mice and human myocardium reveals a therapeutic window. Science Translational Medicine, 7(281), 1-13.

Chahine, M., Mioulane, M., Sikkel, M., O'Gara, P., dos Remedios, C., Pierce, G., Lyon, A., Foldes, G., Harding, S. (2015). Nuclear pore rearrangements and nuclear trafficking in cardiomyocytes from rat and human failing hearts. Cardiovascular Research, 105(1), 31-43.

Marston, S., Montgiraud, C., Munster, A., Copeland, O., Choi, O., dos Remedios, C., Messer, A., Ehler, E., Knöll, R. (2015). OBSCN Mutations Associated with Dilated Cardiomyopathy and Haploinsufficiency. PloS One, 10(9), 1-10.

Lynch, T., Sivaguru, M., Velayutham, M., Cardounel, A., Michels, M., Barefield, D., Govindan, S., dos Remedios, C., van der Velden, J., Sadayappan, S. (2015). Oxidative Stress in Dilated Cardiomyopathy Caused by MYBPC3 Mutation. Oxidative Medicine and Cellular Longevity, 2015, 1-14.

Li, A., dos Remedios, C. (2015). Special Issue on human heart failure. Biophysical Reviews, 7(1), 1-3.

Kagemoto, T., Li, A., dos Remedios, C., Ishiwata, S. (2015). Spontaneous oscillatory contraction (SPOC) in cardiomyocytes. Biophysical Reviews, 7(1), 15-24.

Sequeira, V., Najafi, A., Mcconnell, M., Fowler, E., Bollen, I., Wust, R., dos Remedios, C., Helmes, M., White, E., Stienen, G., et al (2015). Synergistic role of ADP and Ca2+ in diastolic myocardial stiffness. The Journal of Physiology, 593(17), 3899-3916.

McNamara, J., Li, A., dos Remedios, C., Cooke, R. (2015). The role of super-relaxed myosin in skeletal and cardiac muscle. Biophysical Reviews, 7(1), 5-14.

Kosobrodova, E., Mohamed, A., Su, Y., Kondyurin, A., dos Remedios, C., McKenzie, D., Bilek, M. (2014). Cluster of differentiation antibody microarrays on plasma immersion ion implanted polycarbonate. Materials Science and Engineering C: Materials for Biological Applications, 35(1), 434-440.

Manders, E., Bogaard, H., Handoko, L., Van De Veerdonk, M., Keogh, A., Westerhof, N., Stienen, G., dos Remedios, C., Humbert, M., Dorfmuller, P., et al (2014). Contractile dysfunction of left ventricular cardiomyocytes in patients with pulmonary arterial hypertension. Journal of the American College of Cardiology, 64(1), 28-37.

Marsman, R., Bezzina, C., Freiberg, F., Verkerk, A., Adriaens, M., Podliesna, S., Chen, C., Purfürst, B., Spallek, B., Koopmann, T., dos Remedios, C., et al (2014). Coxsackie and Adenovirus Receptor is a Modifier of Cardiac Conduction and Arrhythmia Vulnerability in the Setting of Myocardial Ischemia. Journal of the American College of Cardiology, 63(6), 549-559.

Walweel, K., Li, J., Molenaar, P., Imtiaz, M., Quail, A., dos Remedios, C., Beard, N., Dulhunty, A., van Helden, D., Laver, D. (2014). Differences in the regulation of RyR2 from human, sheep, and rat by Ca2+ and Mg2+ in the cytoplasm and in the lumen of the sarcoplasmic reticulum. Journal of General Physiology, 144(3), 263-271.

Witjas-Paalberends, E., Gulcu, A., Germans, T., Knaapen, P., Harms, H., Vermeer, A., Christiaans, I., Wilde, A., Dos Remedios, C., Lammertsma, A., et al (2014). Gene-specific increase in the energetic cost of contraction in hypertrophic cardiomyopathy caused by thick filament mutations. Cardiovascular Research, 103(2), 248-257.

Koopmann, T., Adriaens, M., Moerland, P., Marsman, R., Westerveld, M., Lal, S., Zhang, T., Simmons, C., Baczko, I., dos Remedios, C., et al (2014). Genome-Wide Identification of Expression Quantitative Trait Loci (eQTLs) in Human Heart. PloS One, 9(5), 1-11.

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Hirsh, S., Bilek, M., Bax, D., Kondyurin, A., Kosobrodova, E., Tsoutas, K., Tran, C., Waterhouse, A., Yin, Y., Nosworthy, N., McKenzie, D., dos Remedios, C., Weiss, A., et al (2013). Ion Implanted, Radical-Rich Surfaces For The Rapid Covalent Immobilization Of Active Biomolecules. AIP Conference Proceedings, 1525, 364-369.

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Bayliss, C., Jacques, A., Leung, M., Ward, D., Redwood, C., Gallon, C., Copeland, O., McKenna, W., dos Remedios, C., Marston, S., et al (2013). Myofibrillar Ca(2+) sensitivity is uncoupled from troponin I phosphorylation in hypertrophic obstructive cardiomyopathy due to abnormal troponin T. Cardiovascular Research, 97(3), 500-508.

Sequeira, V., Wijnker, P., Nijenkamp, L., Kuster, D., Najafi, A., Witjas-Paalberends, E., Regan, J., Boontje, N., Ten Cate, F., Germans, T., dos Remedios, C., et al (2013). Perturbed length-dependent activation in human hypertrophic cardiomyopathy with missense sarcomeric gene mutations. Circulation Research, 112(11), 1491-1505.

Kooij, V., Zhang, P., Piersma, S., Sequeira, V., Boontje, N., Wijnker, P., Jimenez, C., Jaquet, K., dos Remedios, C., Murphy, A., et al (2013). PKC′ -Specific Phosphorylation of the Troponin Complex in Human Myocardium: A Functional and Proteomics Analysis. PloS One, 8(10), 1-10.

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SERVICE TO THE UNIVERSITY AND COMMUNITY
(2013 - 2015)

Membership of Editorial Boards

- Proteomics (2010 - 2013)
- Proteomics Clinical Applications (2010 - 2013)
- Journal of Biophysics (2010 - 2013)
- Biophysical Reviews (Associate editor) (2010 - 2013)

MACROMOLECULAR STRUCTURE LABORATORY

BRETT HAMBLY

ASSOCIATE PROFESSOR, PATHOLOGY

LAB OVERVIEW

My research focuses on cardiovascular disease, in particular familial hypertrophic cardiomyopathy, atherosclerosis and genetic thoracic aortic aneurysm

LABORATORY PERSONNEL/ STUDENTS

Brett Hambly	Associate Professor
Dr Yaxin Lu	Postdoctoral Fellow Sept 2014 - present
Joo-Mee Huang	PhD 2007 - 2014
Komal Prabhu	PhD 2007 - 2014
Ryan Ocsan	PhD 2009 - 2014
Yaxin Lu	PhD 2010 - 2014
Candice Dilworth	MPhil 2014 - present
Alex Sahagian	MPhil 2015 - present
Yuling Zhou	PhD (UNSW) 2012 - present
Elizabeth Robertson	PhD 2013 - present
Yi Neng Lai	BMedSc Honours 2013
Candice Dilworth	BMedSc Honours 2013
Alex Sahagian	BMedSc Honours 2014
Morvarid Emami	BMedSc Honours 2014
Stefanie Portelli	BMedSc Honours 2015
Jasha Trompf	BMedSc Honours (Madal) 2015

PUBLICATIONS

(2013 - 2015)

Robertson, E., Dilworth, C., Lu, Y., Hambly, B., Jeremy, R. (2015). Molecular mechanisms of inherited thoracic aortic disease- from gene variant to surgical aneurysm. Biophysical Reviews, 7(1), 105-115.

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McLachlan, C., Hambly, B., McGuire, M. (2014). Late open artery hypothesis and cardiac electrical stability. In A.S. Kibos, B.P. Knight, V. Essebag, S.B. Fishberger, M. Slevin, I.C. Tintoiu (Eds.), Cardiac Arrhythmias: From Basic Mechanism to State-of-the-Art Management, (pp. 131-144). London: Springer.

McLachlan CS; Hambly BD; Almsherqi ZA; McGuire MA. (2014) “Connexin-43 Expression: A Therapeutic Target for the Treatment of Ventricular Tachycardia.” In: “Cardiac Arrhythmias: From Basic Mechanism to State-of-the-Art Management.” (Kibos AS; Knight BP; Essebag V; Fishberger SB; Slevin M; Tintoiu I Eds.), Springer, London, pp. 351 - 360, http://dx.doi.org/10.1007/978-1-4471-5316-0_27

Marzbanrad, F., Hambly, B., Ng, E., Tamayo, M., Matthews, S., Karmakar, C., Khandoker, A., Palaniswami, M., Jelinek, H. (2014). Relationship Between Heart Rate Variability and Angiotensinogen Gene Polymorphism in Diabetic and control individuals. 2014 36th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC 2014), Piscataway: (IEEE) Institute of Electrical and Electronics Engineers.

Parker, B., Shepherd, N., Trefely, S., Hoffman, N., White, M., Engholm-Keller, K., Hambly, B., Larsen, M., James, D., Cordwell, S. (2014). Structural Basis for Phosphorylation and Lysine Acetylation Cross-talk in a Kinase Motif Associated with Myocardial Ischemia and Cardioprotection. The Journal of Biological Chemistry, 289(37), 25890-25906.

Issa, C., Hambly, B., Wang, Y., Maleki, S., Wang, W., Fei, J., Bao, B. (2014). TRPV2 in the development of experimental colitis. Scandinavian Journal of Immunology, 80(5), 307-312.

Ng, E., Lu, Y., Hambly, B., Jelinek, H., Yu, B., Matthews, S., McLachlan, C. (2013). Angiotensin-converting enzyme gene DD genotype is associated with increased systolic blood pressure in an Australian Rural Type 2 Diabetic Cohort. Hypertension Research, 36(4), 381-382.

Ocsan, R., Lai, Y., Prabhu, K., Hambly, B., McLachlan, C. (2013). Chronic NG-nitro-l-arginine methyl ester (L-NAME) administration in C57BL/6J mice induces a sustained decrease in c-kit positive cells during development of cardiac hypertrophy. Journal of Physiology and Pharmacology, 64(6), 727-736.

Buljan, V., Holsinger, D., Hambly, B., Banati, R., Ivanova, E. (2013). Intrinsic microtubule GTP-cap dynamics in semi-confined systems: kinetochore-microtubule interface. Journal of Biological Physics, 39(1), 81-98.

Jeremy, R., Robertson, E., Lu, Y., Hambly, B. (2013). Perturbations of mechanotransduction and aneurysm formation in heritable aortopathies. International Journal of Cardiology, 169(1), 7-16.

Ko, H., Yin, J., Wyburn, K., Wu, H., Eris, J., Hambly, B., Chadban, S. (2013). Sirolimus reduces vasculopathy but exacerbates proteinuria in association with inhibition of VEGF and VEGFR in a rat kidney model of chronic allograft dysfunction. Nephrology, Dialysis, Transplantation, 28(2), 327-336.

Buljan, V., Holsinger, D., Brown, D., Bohorquez-Florez, J., Hambly, B., Delikatny, E., Ivanova, E., Banati, R. (2013). Spinodal decomposition and the emergence of dissipative transient periodic spatio-temporal patterns in acentrosomal microtubule multitudes of different morphology. Chaos, 23(2), 1-16.

Marzbanrad, F., Jelinek, H., Ng, E., Tamayo, M., Hambly, B., McLachlan, C., Matthews, S., Palaniswami, M., Khandoker, A. (2013). The Effect of Automated Preprocessing of RR Interval Tachogram on Discrimination Capability of Heart Rate Variability Parameters. 2013 40th Computing in Cardiology Conference (CinC 2013), Spain: IEEE.

Zhang, X., Lai, D., Bao, B., Hambly, B., Gillies, M. (2013). Triamcinolone Acetonide Inhibits p38MAPK Activation and Neuronal Apoptosis in Early Diabetic Retinopathy. Current Molecular Medicine, 13(6), 946-958.

POSTGRADUATE AND HONOURS COMPLETIONS
(2013 - 2015)

PhD

2014 - Joo-Mee Huang

2014 - Komal Prabhu

2014 - Ryan Ocsan

2014 - Yaxin Lu

BMedSc(Hons)

2013 - Yi Neng Lai

2013 - Candice Dilworth

2014 - Alex Sahagian

2014 - Morvarid Emami

2015 - Stefanie Portelli

2015 - Jasha Trompf (Medal)

SPECIAL AWARDS & PRIZES
(2013 - 2015)

Scholarships and Fellowships Awarded

- Joo-Mee Huang (APA)
- Komal Prabhu (APA)
- Yaxin Lu (IPRS)
- Candice Dilworth (APA)
- Alex Sahagian (APA)
- Elizabeth Robertson (NHMRC PostGrad Schol)

EXTERNAL FUNDING TO LABORATORY
(2013 - 2015)

Source	Project Title	Collaborators	Awarded	Duration	Amount
NHMRC Development 1093330	BioQ cardiac assist device - application for chronic hypertensive heart failure	C McLachlan CIA B Hambly Assoc Investig	2015	3 years	$900,000

BASIC & CLINICAL GENOMICS LABORATORY

BRIAN J MORRIS

PROFESSOR EMERITUS, PHYSIOLOGY

LAB OVERVIEW

Research involves (i) molecular genetics of hypertension, (ii) molecular genetics of longevity (iii) the function of splicing factors, (iv) the placental (pro)renin-angiotensin system in premature labour, and (v) the benefits of male circumcision.

RESEARCH ACTIVITIES

Longevity: Research continued on the molecular genetic basis of attainment of extreme old age (living to 95 years or older). This involved collaboration with Brad Willcox and colleagues at Kuakini Medical Center and University of Hawaii in Honolulu where Professor Morris undertook a special studies programme during the 2012–2013 summer. The subjects used were Japanese American men living on the island of Oahu who were recruited in the mid-1960s as part of the Honolulu Heart Program (HHP) that over time and extensive follow-up became the Hawaii Lifespan Study. During the study period he and his colleagues evaluated multiple single nucleotide polymorphisms (SNPs) in genes belonging to the insulin/insulin-like growth factor signalling pathway (ATF4, CBL, CDKN2, EXO1 and JUN) and in genes and flanking DNA in the mechanistic target of rapamycin (mTOR) pathway (MTOR, RPTOR, RICTOR and RPS6KA1), all of which are involved in growth. None of the SNPs were associated with longevity.

In another study an association of short stature with exceptional lifespan was found. The Kuakini group was the first to implicate genetic variation in the gene for the transcription factor FoxO3 with longevity. Interestingly the major longevity-associated allele of FOXO3 was associated with short stature, suggesting a mechanism that could be responsible.

We then set out to discover the cause of death that the longevity-associated allele of FOXO3 protected against. It turned out to be coronary heart disease. Subjects with the protective allele were, moreover, found to exhibit lower serum tumor necrosis factor-alpha concentrations, so implicating reduced inflammation, which contributes to atheroma, in the protective effect. The protective allele of FOXO3 was also associated with reduced prevalence of infection.

Separate from his work with the Honolulu group, Prof Morris published an invited review on sirtuins, a group of 7 proteins implicated in longevity and most common diseases of ageing. His article in Free Radical Biology and Medicine contained 627 references, making it the largest published on the topic.

Hypertension: Studies involving the offspring of the HHP subjects led us to find an association of genetic variation in the gene encoding raptor (which is a component of the TOR complex) with being overweight but not hypertension. Another study found that SNPs in FOXO3 were associated with hypertension and blood pressure in women.

LABORATORY PERSONNEL/ STUDENTS

Brian J Morris	Professor Emeritus 1978–present
Lilian J Morris	Honorary Research Assistant 2001–present
M Andrea Markus	Honorary Associate 2010–2015
Francine Z Marques	Honorary Associate 2012–present
Yu (Eric) Wang	Honorary Associate 2013–2015

With former PhD student Francine Marques, now at the Baker IDI Institute in Melbourne, Fadi Charchar at Federation University of Australia and Maciej Tomaszewski, University of Leicester, we found the microRNA miR-181a in kidney tissue from 200 human subjects correlated inversely with renin expression in the renal collecting duct and directly with miR-181a in the circulation, as well as with blood pressure. By next generation RNA sequencing the signatures of miR-181a in the renal transcriptome were determined. These included mitochondrial pathways and signalling cascades of adaptive immunity and inflammation. The findings added to prior studies in my Lab that have

revealed pathway abnormalities and mechanisms responsible for the etiology of essential hypertension.

Splicing factor RBM4: Analyses were completed on transcriptome-wide exon array experiments that identified all of the primary messenger RNA transcript targets for the splicing factor RBM4 cloned by the Lab years earlier. These data and the results of functional experiments implicating RBM4 in various cancers were written up and accepted for publication.

Placental (pro)renin-angiotensin system: In a collaboration with Professor Emeritus Eugenie Lumbers at John Hunter Hospital in Newcastle, exposure of cultured human trophoblast cells to low oxygen was found to increase the expression of angiotensin II type 1 receptor and vascular endothelial growth factor, as well as angiotensin converting enzyme protein, but not other renin-angiotensin system components. The results suggested a potential role for the placental renin-angiotensin system in mediating the proangiogenic effects of low oxygen in placental development.

Male circumcision: During 2013–2015 Professor Emeritus Morris continued to make a significant contribution to this field by publishing systematic reviews, a meta-analysis and other articles on lifetime urinary tract infections, sexual function, sensitivity and sensation, HIV and other sexually transmitted infections, genital cancers, ethical and legal aspects.

The prevalence of male circumcision in each of the 249 countries and territories in the world was determined in an extensive study involving published survey data and, for countries in which no survey data were available, estimates based on the proportion of the population whose culture or religion mandates male circumcision. From this it was found that 38% of males in the world are circumcised.

In a separate study, trends in male circumcision prevalence over time were determined for the USA. In addition, a detailed risk-benefit analysis was performed. This invited article, published in Mayo Clinic Proceedings, led to hundreds of news media reports globally, including in major US newspapers and on US television. It was the lead story for the American Medical Association's Morning Rounds on the day it appeared

In collaboration with Guy Cox, a morphologist in the School of Medical Sciences, a systematic review of histological correlates of penile sensitivity was undertaken. This led us to conclude that sensory neuroreceptors involved in sexual sensation reside in the glans, not the foreskin, thus confirming the conclusions of Brian Morris' systematic review with John Krieger, a urologist at VA Puget Sound Medical Center and University of Washington in Seattle, that circumcision has no adverse effect on sexual function, sensitivity or sensation

Finally, several critiques of claims by circumcision opponents were prepared and published.

PUBLICATIONS
(2013 - 2015)

Morris BJ. Renin, genes, microRNAs, and renal mechanisms involved in hypertension. (Irvine Page–Alva Bradley Lifetime Award) Hypertension 2015; 65: 956-962.

Morris BJ, Donlon TA, He Q, Grove JS, Masaki KH, Elliott A, Willcox DC, Willcox BJ. Genetic analysis of TOR complex gene variation with human longevity: A nested case-control study of American men of Japanese ancestry. Journal of Gerontology A Biological Science and Medical Science 2015; 70: 133-142. (+ online supplement containing 4 Figures and 2 Tables).

Morris BJ, Carnes BA, Chen R, Donlon TA, He Q, Grove JS, Maskai KH, Willcox DC, Allsopp R, Willcox BJ. Genetic variation in the raptor gene is associated with overweight but not hypertension in American men of Japanese ancestry. American Journal of Hypertension 2015; 28: 508-517.

Morris BJ, Krieger JN. The literature supports policies promoting neonatal male circumcision in North America. Journal of Sexual Medicine 2015; 12: 1305.

Wamai RG, Morris BJ,* Bailey RC, Klausner JD, Boedicker MN. Male circumcision for protection against HIV infection in sub-Saharan Africa: the evidence in favour justified the implementation now in progress. Global Public Health 2015; 10: 639-666. (*Equal 1st authors)

Wamai RG, Morris BJ,* Bailey RC, Klausner JD, Boedicker MN. Debating male circumcision for HIV prevention: A one-sided argument does not represent a legitimate 'controversy' analysis: Reply to de Camargo et al. Global Public Health 2015; 10: 672-678. (*Equal 1st authors)

Cox G, Krieger JN, Morris BJ. Histological correlates of penile sexual sensation: Does circumcision make a difference? Sexual Medicine 2015; 3: 76-85.

Morris BJ, Krieger JN. Male circumcision does not reduce sexual function, sensitivity or satisfaction. Advances in Sexual Medicine. 2015; 5: 53-60.

Morris BJ, Klausner JD. In developed countries male circumcision prevalence is inversely related to HIV prevalence. (Commentary) Israel Journal of Health Policy Research 2015; 4: article 40; 1-4.

Morris BJ, Wiswell TE. 'Circumcision pain' unlikely to cause autism. Journal of the Royal Society of Medicine 2015; 108: 297.

Harrap SB, Morris BJ. Blood pressure genetics just don't add up. (Editorial) Circulation Cardiovascular Genetics 2015; 8: 541-543.

Morris BJ, Dampney RAL. Brain-stem micoRNAs implicated in hypertension. (Editorial Focus) Physiological Genomics 2015; 47: 386-387.

Morris BJ. Do the benefits of male circumcision outweigh the risks? A critique of the proposed CDC guidelines. (Critical Commentary on article by Earp BD) Frontiers in Pediatrics 2015; 3: article 88.

Morris BJ, Willcox DC, Willcox BJ, Donlon TA. FOXO3 – A major gene for human longevity. (Invited) Gerontology 2015; 61: 515-525.

Morris BJ. Implications of circumcision complications for hospital policy. Journal of Paediatrics and Child Health 2015; 51: 1244-1245.

Marques FZ, Romaine SPR, Denniff M, Eales J, Dormer J, Garrelds IM, Wojnar L, Musialik K, Duda-Raszewska B, Kiszka B, Duda M, Morris BJ, Samani NJ, Danser AHJ, Bogdanski P, Zukowska-Szczechowska E, Charchar FJ, Tomaszewski M. Signatures of miRNA-181a on the transcriptome of human kidney and blood pressure regulation. Molecular Medicine 2015; 21: 739-748.

Morris BJ, Donlon TA, He Q, Grove JS, Masaki KH, Elliott A, Willcox DC, Willcox BJ. Association analyses of insulin signalling pathway gene polymorphisms with healthy aging and longevity in Americans of Japanese ancestry. Journal of Gerontology A Biological Science and Medical Science 2014; 69: 270-273. (+ 8 page online supplement containing 1 Figure and 2 Tables).

Morris BJ, Green EC. Circumcision, male. In: Cockerham WC, Dingwall R, Quah SR (eds), The Wiley Blackwell Encyclopedia of Health, Illness, Behavior, and Society, 1st edition, John Wiley & Sons, 2014, pp 253-256, Online ISBN: 9781118410868, DOI: 10.1002/9781118410868, 4 pages.

Morris BJ, Tobian AAR. Reply to "Circumcision is a religious/cultural procedure, not a medical procedure" by J.S. Svoboda. JAMA Pediatrics 2014; 168: 294. [Invited]

Morris BJ. Reply to "Circumcision: A bioethical challenge" by Svoboda & Van Howe. Journal of Medical Ethics -2014: e Letter 16791. http://jme.bmj.com/content/early/2013/08/16/medethics-2013-101614/reply#medethics_el_16791

Morris BJ, Tobian AAR, Hankins CA, Klausner JD, Banerjee J, Bailis SA, Wiswell TE, Zoloth LS. Unethical not to recommend circumcision. Journal of Medical Ethics 2014; E-letter 16815. http://jme.bmj.com/content/early/2013/08/16/medethics-2013-101614/reply#medethics_el_16815

He Q, Morris BJ,* Grove JS, Petrovic H, Ross W, Masaki KH, Rodriguez B, Chen R, Donlon TA, Willcox BJ. Shorter men live longer: Association of height with longevity and FOXO3A genotype in American men of Japanese ancestry. PLoS One 2014; 9: article e94385, 1-8. (*author for correspondence)

Morris BJ, Bailis SA, Wiswell TE. Circumcision rates in the United States: Rising or falling? What effect might the new affirmative pediatric policy statement have? Mayo Clinic Proceedings 2014; 89: 677-686. Supporting video at: http://youtu.be/6Oq9GONsBlk) [Invited Review]

Morris BJ. Comment on: Circumcision rates in the United States: Rising or falling? What effect might the new affirmative pediatric policy statement have? MDLinx 2014; May 3. http://www.mdlinx.com/hospital-administration/news-article.cfm/5249736

Morris BJ, Hankins CA, Tobian AAR, Krieger JN, Klausner JD. Does male circumcision protect against sexually transmitted infections? – Arguments and meta-analyses to the contrary fail to withstand scrutiny. ISRN Urology 2014: article 684706: 1-23.

Morris BJ, Tobian AAR, Hankins CA, Klausner JD, Banerjee J, Bailis SA, Wiswell TE. Veracity and rhetoric in paediatric medicine: A critique of Svoboda and Van Howe's response to the AAP policy on infant male circumcision. Journal of Medical Ethics 2014: 40: 463-470.

Morris BJ. Comment on: Genetic variation in the raptor gene is associated with overweight but not hypertension in American men of Japanese ancestry. MDLinx 2014; Oct 3. http://www.mdlinx.com/cardiology/news-article.cfm/5590058

Morris BJ, Bailis SA, Wiswell TE. In reply – Bias and male circumcision. Mayo Clinic Proceedings 2014; 89: 1588-1589.

Morris BJ. Scientific evidence dispels false claims about circumcision. Canadian Urology Association Journal 2014; 8: 396-397.

Morris BJ. Seven sirtuins for seven deadly diseases of aging. Free Radical Biology and Medicine 2013; 56: 133-171. [Invited Review] [3rd highest download for this journal in 2013]

Morris BJ, Wiswell TE. Circumcision and lifetime risk of urinary tract infections: A systematic review and meta-analysis. Journal of Urology 2013; 189: 2118-2124.

Morris BJ. Circumcision of baby boys advocated for genital cancer prevention? UroToday 2013: http://www.urotoday.com/index.php?option=com_content&Itemid=796&catid=1138&id=60028&lang=en&view=article

Morris BJ, Krieger JN, Kigozi G. [Critique of:] Male circumcision decreases penile sensitivity as measured in a large cohort. [Bronselaer et al. BJU Int 2013; 111: 820-827.] BJU International 2013; 111: E269-E270.

Morris BJ. Lifetime reduction in UTIs by male circumcision. UroToday 2013: http://www.urotoday.com/Infections/lifetime-reduction-in-uti-risk-by-male-circumcision-beyond-the-abstract-by-brian-j-morris-dsc-phd-faha.html

Yang YHW, Markus MA, Mangs AH, Raitskin O, Sperling R, Morris BJ. ZRANB2 localizes to supraspliceosomes and influences the alternative splicing of multiple genes in the transcriptome. Molecular Biology Reports 2013; 40: 5371-5395.

Jackson KL, Marques FZ, Watson AMD, Rigo KP, Nguyen-Huu T-P, Morris BJ, Charchar FJ, Davern PJ, Head GA. A novel interaction between sympathetic overactivity and aberrant regulation of renin by miR-181a in BPH/2J genetically hypertensive mice. Hypertension 2013; 62: 775-781. (+ 8 page online supplement)

Bates MJ, Ziegler JB, Kennedy SE, Mindel A, Wodak AD, Zoloth LS, Tobian AR, Morris BJ.* Recommendation by a law body to ban infant male circumcision has serious worldwide implications for pediatric practice and human rights. BMC Paediatrics 2013; 13: article 136. (9 pages) (*Senior author for correspondence)

Morris BJ, Tobian AAR. Legal threat to infant male circumcision. JAMA Pediatrics 2013; 167: 890-891.

Morris BJ. Science supports infant circumcision, so should skeptics. The Skeptic (UK) 2013; 24: 30-33.

Cox G, Krieger JN, Morris BJ. The history of Jewish circumcision – A response to Lang. Journal of Medical Ethics 2013: e-Letter 16627. http://jme.bmj.com/content/39/7/429/reply#medethics_el_16627

Morris BJ, Krieger JN. Does male circumcision affect sexual function, sensitivity or satisfaction? – A systematic review. Journal of Sexual Medicine 2013; 10: 2644-2657.

SERVICE TO THE UNIVERSITY AND COMMUNITY
(2013 - 2015)

Service to learned societies

Member, Executive Committee, High Blood Pressure Research Council of Australia, Dec 2013 (NSW representative and Editor of Proceedings)

Session Chair

State of the Heart 2014 (joint meeting of the High Blood Pressure Research Council of Australia and other societies), Adelaide, South Australia, 26-28 Nov 2014

37th Annual Scientific Meeting of the High Blood Pressure Research Council of Australia, Melbourne, 2-4 Dec 2015

Editorial Board of Journal

Member, Editorial Board, Hypertension, 2002–

Award

The Irvine Page–Alva Bradley Lifetime Achievement Award for 2014, from the American Heart Association, Council on Hypertension (formerly Council for High Blood Pressure Research), at High Blood Pressure Research Scientific Sessions 2014, American Heart Association, San Francisco, 9-12 Sep 2014.

SPECIAL AWARDS & PRIZES
(2013 - 2015)

- 2014 - The Irvine Page–Alva Bradley Lifetime Achievement Award from the American Heart Association, Council on Hypertension (formerly Council for High Blood Pressure Research) - Brian J Morris

EXTERNAL FUNDING TO LABORATORY
(2013 - 2015)

Source	Project Title	Collaborators	Awarded	Duration	Amount
NHMRC	Regulation of placental renin-angiotensin system and placentation. (*Consulting fee = $15,000 per annum)	Lumbers ER Roberts C Broughton Pipkin F Morris BJ	$155,462* $155,462* $155,462*	2013 2014 2015	$155,462* $155,462* $155,462*

VASCULAR BIOLOGY LABORATORY & REDOX BIOLOGY GROUP

PAUL WITTING

ASSOCIATE PROFESSOR, PATHOLOGY

LAB OVERVIEW

The Redox Biology Group has developed within the Discipline of Pathology to now comprise ~9 researchers including 1.6 FTE postdoctoral scientists; 1 part-time research assistant, 5 postgraduate students and one honours students (2016).

Outcomes for the lab during 2013-2015 include the award of two postgraduate degrees (1 x MPhil; 1 x PhD) and one Honours completion (H-1), with another Honours completion set for mid 2013. The lab has also gained significant grant success: Bosch Equipment and Translational grants; ARC Discovery; a Judith Mason and Harold Stannett Williams Memorial (Mason) Foundation Grant-in-aid and a grant from the Australian Colorectal Society. These grants supplement ongoing funding from the National Heart Foundation and a commercial contract from Servier International. In terms of research publications the lab collectively published 5 papers in 2012 including major papers in high-ranking journals such as Journal of Biological Chemistry and Antioxidants and Redox Signaling.

PUBLICATIONS

(2013 - 2015)

Sivam, S., Witting, P., Hoyos, C., Maw, A., Yee, B., Grunstein, R., Phillips, C. (2015). Effects of 8 weeks of CPAP on lipid-based oxidative markers in obstructive sleep apnea: a randomized trial. Journal of Sleep Research, 24(3), 339-345.

Kleinbongard, P., Witting, P., Gedik, N., Freedman, B., Klocker, N., Heusch, G. (2015). Pleiotropic, heart rate-independent cardioprotection by ivabradine. British Journal of Pharmacology, 172(17), 4380-4390.

Chami, B., Barrie, N., Cai, X., Wang, X., Paul, M., Morton-Chandra, R., Sharland, A., Dennis, J., Freedman, B., Witting, P. (2015). Serum amyloid a receptor blockade and incorporation into high-density lipoprotein modulates its pro-inflammatory and pro-thrombotic activities on vascular endothelial cells. International Journal of Molecular Sciences, 16(5), 11101-11124.

Yao, M., Xie, C., Kiang, M., Teng, Y., Harman, D., Tiffen, J., Wang, K., Sved, P., Bao, B., Witting, P., Holst, J., Dong, Q. (2015). Targeting of cytosolic phospholipase A2a impedes cell cycle re-entry of quiescent prostate cancer cells. Oncotarget, 6(33), 34458-34474.

Duong, T., Chami, B., McMahon, A., Fong, G., Dennis, J., Freedman, B., Witting, P. (2014). Pre-treatment with the synthetic antioxidant T-butyl bisphenol protects cerebral tissues from experimental ischemia reperfusion injury. Journal of Neurochemistry, 130(6), 733-747.

Weekley, C., Jeong, G., Tierney, M., Hossain, F., Maw, A., Shanu, A., Harris, H., Witting, P. (2014). Selenite-mediated production of superoxide radical anions in A549 cancer cells is accompanied by a selective increase in SOD1 concentration, enhanced apoptosis and Se-Cu bonding. Journal of Biological Inorganic Chemistry, 19(6), 813-828.

Talib, J., Kwan, J., Suryo Rahmanto, A., Witting, P., Davies, M. (2014). The smoking-associated oxidant hypothiocyanous acid induces endothelial nitric oxide synthase dysfunction. The Biochemical Journal, 457(1), 89-97.

Getts, D., Terry, R., Getts, M., Deffrasnes, C., Müller, M., Van Vreden, C., Ashhurst, T., Chami, B., McCarthy, D., Wu, H., Ma, J., Witting, P., Campbell, I., Reilly, D., White, M., Cordwell, S., Chadban, S., Bao, B., King, N., et al (2014). Therapeutic inflammatory monocyte modulation using immune-modifying microparticles. Science Translational Medicine, 6(219), 1-14.

Weekley, C., Shanu, A., Aitken, J., Vogt, S., Witting, P., Harris, H. (2014). XAS and XFM studies of selenium and copper speciation and distribution in the kidneys of selenite-supplemented rats. Metallomics, 6(9), 1602-1615.

Weekley, C., Aitken, J., Witting, P., Harris, H. (2014). XAS studies of Se speciation in selenite-fed rats. Metallomics, 6(12), 2193-2203.

Alrabadi N., Chami B., Kim H-B., Maw A-M, Dennis J.M., Witting P.K. (2014) Hypochlorous acid generated in the heart following acute ischaemic injury promotes myocardial damage: a new target for therapeutic development. Trends in Cell & Mol. Biol., 9, 1-17.

McMahon, A., Parry, S., Benson, V., Witting, P., Le Couteur, D. (2013). Beneficial effects of the synthetic antioxidant tert-butyl bisphenol on the hepatic microcirculation in a rat model of diabetes mellitus. Acta Diabetologica, 50(4), 645-649.

Hua, S., Yao, M., Vignarajan, S., Witting, P., Hejazi, L., Gong, Z., Teng, Y., Niknami, M., Assinder, S., Richardson, D., Dong, Q. (2013). Cytosolic phospholipase A2alpha sustains pAKT, pERK and AR levels in PTEN-null/mutated prostate cancer cells. Biochimica et Biophysica Acta - Molecular and Cell Biology of Lipids, 1831 (6), 1146-1157.

Freewan, M., Rees, M., Sempertegui Plaza, T., Glaros, E., Lim, Y., Wang, X., Yeung, A., Witting, P., Terentis, A., Thomas, S. (2013). Human Indoleamine 2,3-Dioxygenase Is a Catalyst of Physiological Heme Peroxidase Reactions. Journal of Biological Chemistry, 288(3), 1548-1567.

Sutherland, G., Chami, B., Youssef, P., Witting, P. (2013). Oxidative stress in Alzheimer's disease: Primary villain or physiological by-product? Redox Report, 18(4), 134-141.

Wang, X., Cai, X., Freedman, B., Witting, P. (2013). Role of SAA in Promoting Endothelial Activation: Inhibition by High-Density Lipoprotein. In Sabina Janciauskiene (Eds.), Acute Phase Proteins, (pp. 77-101). Rijeka, Croatia: InTech Publishers.

Rayner, B., Figtree, G., Sabaretnam, T., Shang, P., Mazhar, J., Weaver, J., Lay, W., Witting, P., Hunyor, S., Grieve, S., Bhindi, R., et al (2013). Selective Inhibition of the Master Regulator Transcription Factor Egr-1 With Catalytic Oligonucleotides Reduces Myocardial Injury and Improves Left Ventricular Systolic Function in a Preclinical Model of Myocardial Infarction. Journal of the American Heart Association, 2(4), 1-9.

Shanu, A., Groebler, L., Kim, H., Wood, S., Weekley, C., Aitken, J., Harris, H., Witting, P. (2013). Selenium Inhibits Renal Oxidation and Inflammation But Not Acute Kidney Injury in an Animal Model of Rhabdomyolysis. Antioxidants & Redox Signaling, 18(7), 756-769.

Weekley, C., Aitken, J., Finney, L., Vogt, S., Witting, P., Harris, H. (2013). Selenium metabolism in cancer cells: The combined application of XAS and XFM techniques to the problem of selenium speciation in biological systems. Nutrients, 5(5), 1734-1756.

Cai, X., Freedman, B., Witting, P. (2013). Serum amyloid A stimulates cultured endothelial cells to migrate and proliferate: Inhibition by the multi-kinase inhibitor BIBF112. Clinical and Experimental Pharmacology and Physiology, 40(9), 662-670.

POSTGRADUATE AND HONOURS COMPLETIONS

(2013 - 2015)

PhD

2013 - Shane Antao

2013 - Anu Shanu

MPhil

2014 - Gloria Jeong

2013 - Mrs Farjaneh Hossain

BSc(Hons)

2013 - Beverly Manago

2013 - Nicola Barrie

2014 - Lujain Fayad

2014 - Thomas Hambly

2015 - Abigail Vallejo

Grad Dip

2014 - Ms Lucy Zhang (co-supervisor)

SERVICE TO THE UNIVERSITY AND COMMUNITY
(2013 - 2015)

- Editorial Board Member for Clin. Exp. Pharmacol. Physiol. (3-year appointment, March 2012) and Frontiers in Pharmacology (2-year appointment, March 2014).
- Invited International Chairperson at International Peroxidase Meeting / 6th Biennial SFRR (J+A) in 2013 and 8th International Conference on Heme Oxygenases, BioIron and Oxidative Stress in 2014.

SPECIAL AWARDS & PRIZES
(2013 - 2015)

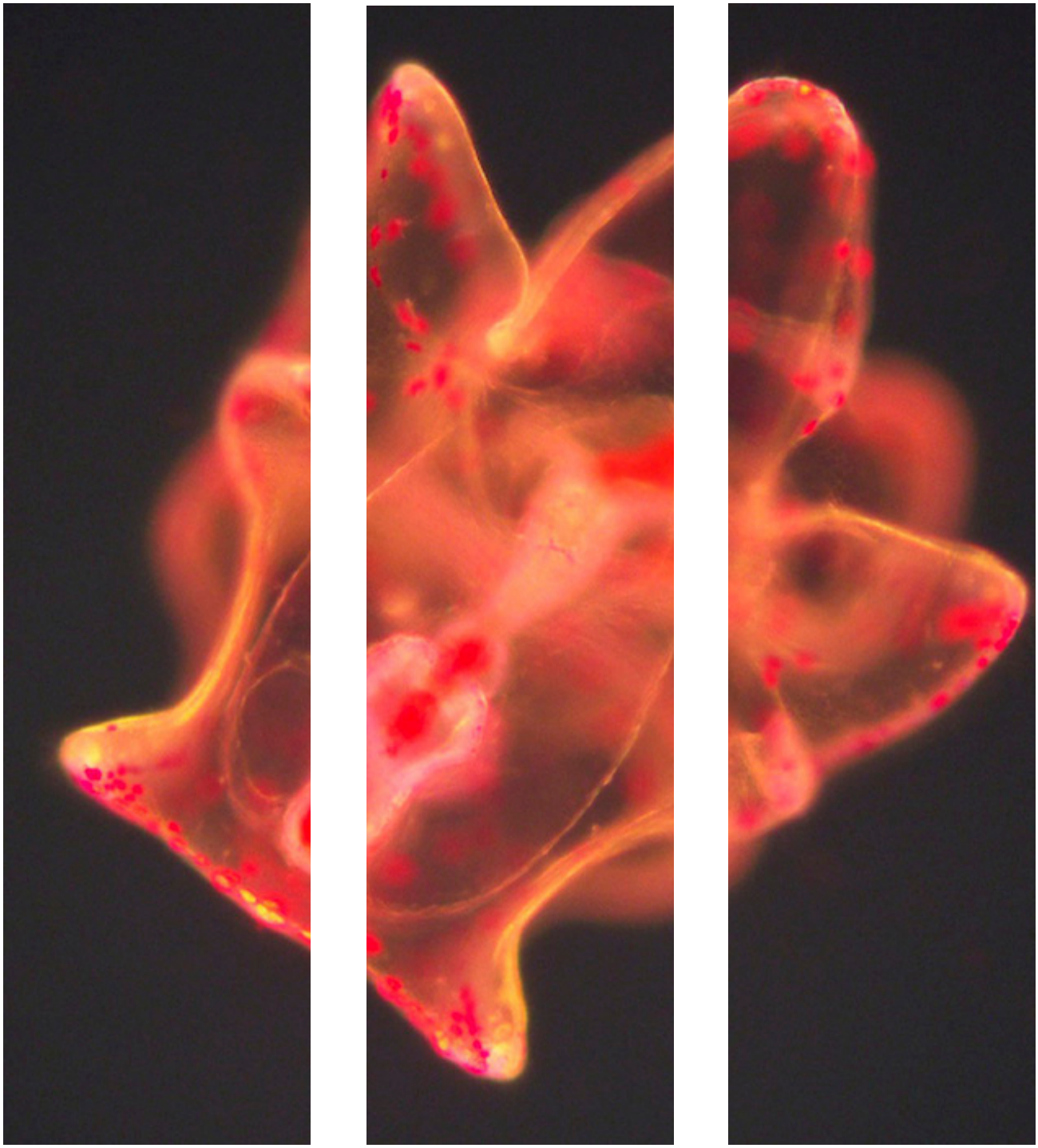
- 2013 - 2014: Adrina Varda - Notre Dame Vacation Scholarship
- 2014 - 2015: Priscilla Youssef - PhD (Medicine); Awarded the Bluesand Scholarship, SMS.
- 2012 - 2013: Michael Tierney - Medical Sci. Research Elective (identified Medical entry) & Medical Faculty Vacation Scholarship
- 2013 - 2014: Thomas Hambly - Medical Faculty Vacation Scholarship
- 2014 - 2015: Maryam Eghtedari - Medical Faculty Vacation Scholarship
- 2014: Abigail Vallejo - Redox Biology Vacation Scholarship
- 2015 - 2016: Balasubrahmanya Umashankar - Medical Faculty Vacation Scholarship

EXTERNAL FUNDING TO LABORATORY
(2013 - 2015)

Source	Project Title	Collaborators	Awarded	Duration	Amount
Sydney Medical Foundation GIA	Mantra Microscope	Sharland A, Abendroth A, New E, Alexander S, Byrne, King NJ, Witting PK, McLennan S, Braet F.	2015	1 year	$30,000
Bosch Equipment Grant	N2-generator for Mass Spectrometry	Witting PK, Michael Murray M, McLachlan A, Codd R, Byrne S and Xiaosuo	2015	1 year	$10,000
Rebecca Cooper Foundation	A role for neuroglobin in protecting neuronal cells in Alzheimer's disease	Witting PK and X-S Wang	2015	1 year	$20,000
USyd Equipment Grant	Live Cell Accessories for Raman and FTIR Imaging	Lay PA, Hawkins CL, Grau G, Witting PK, Cham K	2015	1 year	$39,000

Australian Institute of Nanoscience Technology (AINST) Accelerator grant	Nanoscale approaches to problems in biomedicine	Consortium – Team Leader King NJ (Witting PK, CIC)	2015	1 year	$300,000
Bosch Equipment Grant	Bruker ImagePrep for MALDI Mass Mapping	Witting PK, Stone JA, Murray M, King NC, Sunde M, Hambly B, Day M., Byrne S., Wang X.	2014	1 year	$40,000
Discipline of Pathology Equipment grant	Biotools multipipetters and 5.3 Mpixel Leica camera	Witting PK	2014	1 year	$5,500
SMS and Bluesand Foundations PhD Scholarship for Alzheimer's Research	Linking oxidative stress and the progression of Alzheimer's disease	Youssef P and Witting PK	2014-2016	3.5 years	$105,000
NHMRC Project Grant 1058508	Redox Control of the Immune Regulatory Protein Indoleamine 2,3-dioxygenase	Thomas SR, Witting PK, King NC	2014-2016	3 years	$557,500
NHMRC Project Grant 1061761	Lipophilic iron chelators as potential therapeutic agents in Parkinson's disease	Codd R, Double K, Liddel J, Witting PK	2014-2016	3 years	$596,200
Faculty of Medicine Grant-in-aid	Charles Perkin Centre – Academic Liaison	Witting PK	2013-2016	3 years	$180,000
Bosch Equipment Grant	Nitrogen generator, ancillary equipment and PM contract for Bosch Mass Spectrometry Facility	Witting PK, Codd R, Murray M, Hambly B, Sunde M, Wang X	2013	1 year	$51,500
Cancer Research Fund Infrastructure Grant	Robotic high-throughput Western Analysis for the Open Access, Multi-User Sydney Cancer Research Core Facility	Richardson DR (+consortium)	2013	1 year	$200,000
Bequest	Effect of CO2 insufflation for open colectomies: a RCT.	Witting PK and SB Freedman	2013	1 year	$50,000

NHMRC Equipment Grant	QX100 Droplet Digital PCR system	Richardson DR (+consortium)	2013	1 year	$74,800
NHMRC Equipment Grant	SF-61SX2/s stopped-flow fluorimeter/Upgrade of SX-17MV stopped-flow spectrometer	Clarke RJ, Lay PA, Witting PK, Rasmussen H, Matthews J, Davies MJ, Pattison D, Vandenberg J.	2013	1 year	$66,900
University of Sydney Bridging Support Grant	Pathological Responses to Sleep Disordered Breathing: Snoring, Endothelial Dysfunction and Carotid Atherosclerosis	Wheatley J, Amis T, Witting PK	2013	1 year	$30,000
ARC Discovery Grant DP130103711	Mode of action of the haem protein neuroglobin in protecting nerve cells	Witting PK	2013-2015	3 years	$265,000
NHF grant-in-aid G 11S5787	Approaches to inhibit Serum amyloid A-induced endothelial dysfunction and atherosclerosis	Witting PK, Freedman SB and Geczy C	2012-2013	2 years	$130,000
Philip Bushell Foundation Grant-in-aid	Can inhibitors of myeloperoxidase improve heart function after heart attack?	Witting PK	2012-2014	3 years	$72,000
Servier (PHA-16257-104-AUS) International Commercial Funded Research	Studies to evaluate the potential cardioproetctive mechanisms for the cardiotonic agent Ivabradine	Witting PK	2011-2013	3 years	$65,000
ARC Discovery Grant DP0985807	The fate of dietary selenium in vivo; a direct approach to linking chemical form with biological activity	Harris HH, Witting PK, Giles GI	2009-2014	5 years	$810,000



CANCER, CELL BIOLOGY & DEVELOPMENT

Investigators in this theme are using cell biological and other methods to investigate the mechanisms that regulate cell proliferation and differentiation. This general approach is applied to understanding basic cell physiology, cancer biology, developmental biology and the pathogenesis of infectious diseases.

There are a number of areas of particular research strengths within the Research Theme. These include: (i) hormonal control of cell function, including the role of hormones in promoting the growth of breast and prostate cancers, (ii) the regulation of gene expression and its importance in determining embryonic development, tumour progression and tissue differentiation, (iii) intracellular signalling systems, and (iv) the diagnosis and treatment of malignancies.

Over the next triennium it is planned to increase interactions of all the members of this Research Theme. In particular, closer links between the basic and clinical leukaemia and cancer researchers are proposed. Coordinated use of existing technologies and major equipment facilities will underpin greatly improved translational research outputs.

Desired impact on knowledge and/or practice:

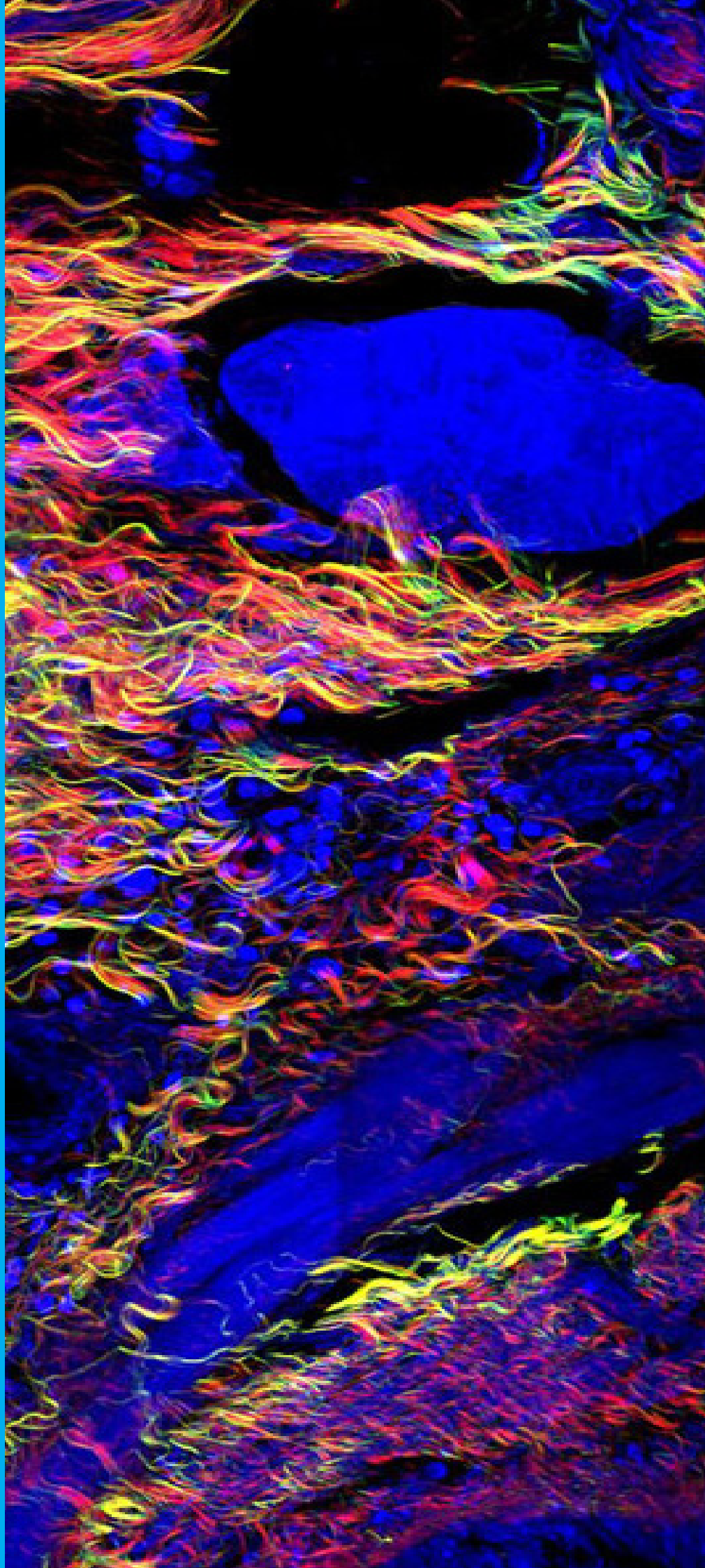
Basic Sciences: To develop a detailed understanding of (i) the causation, initiating factors and mechanisms of malignant transformation, (ii) control of development and reproduction, and (iii) epithelial function in health and disease.

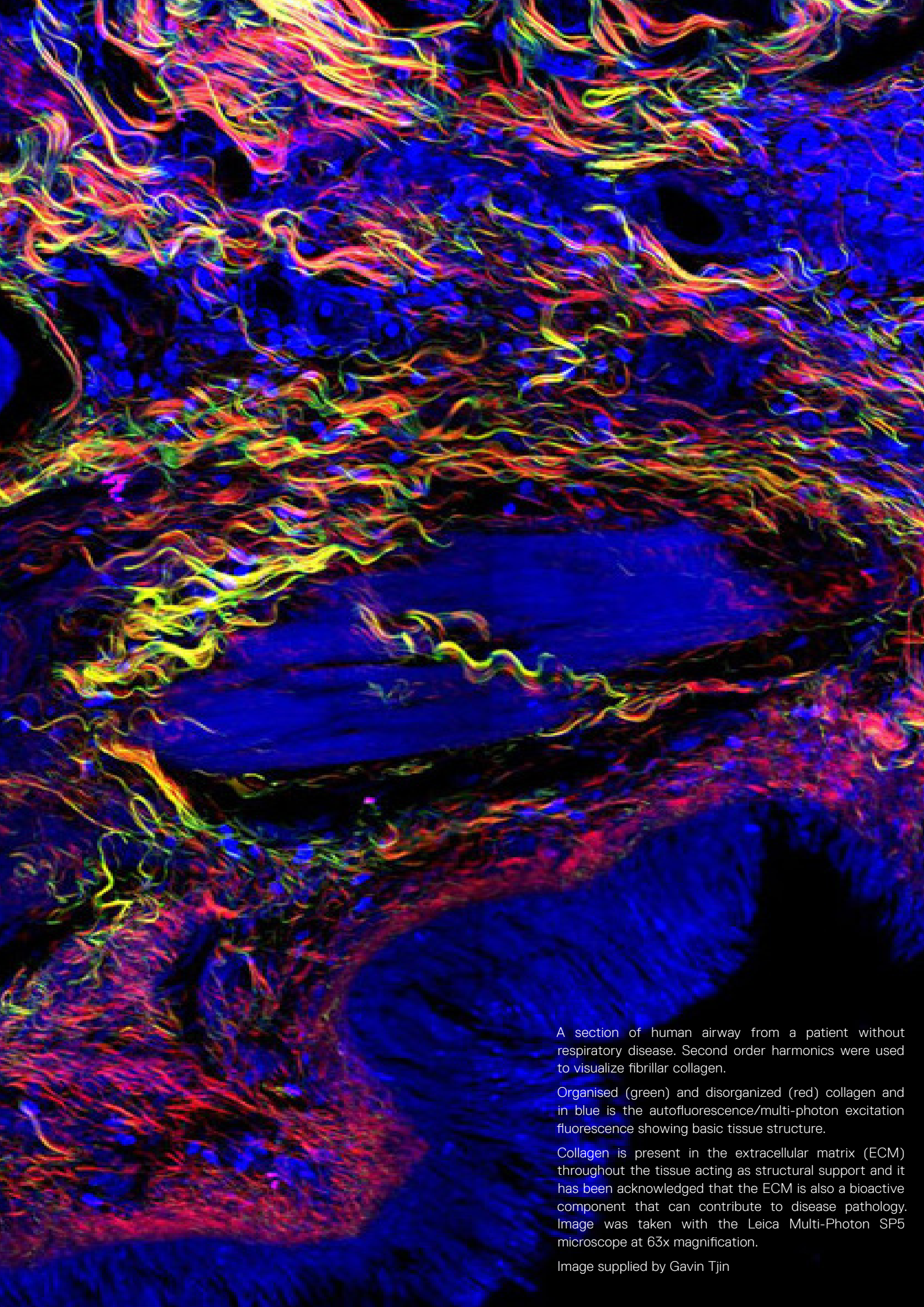
Innovation: To facilitate invention of innovative research techniques by scientifically "cross-cultural" collaboration, enabled by (1) links generated within the Research Theme and (2) links generated with members of other Research Themes.

Translation: To enable (1) an informed approach to the clinical abrogation, treatment or palliation of cancer and some infectious diseases, (2) new diagnostic methods for earlier reliable detection of disease and its associated pathology, (3) new methods of ensuring normal, uncomplicated reproduction, based on our findings in this Research Theme.

For more information about this theme visit

http://sydney.edu.au/medicine/bosch/research/cancer-cell-development/index.php





A section of human airway from a patient without respiratory disease. Second order harmonics were used to visualize fibrillar collagen.

Organised (green) and disorganized (red) collagen and in blue is the autofluorescence/multi-photon excitation fluorescence showing basic tissue structure.

Collagen is present in the extracellular matrix (ECM) throughout the tissue acting as structural support and it has been acknowledged that the ECM is also a bioactive component that can contribute to disease pathology. Image was taken with the Leica Multi-Photon SP5 microscope at 63x magnification.

Image supplied by Gavin Tjin

ANDROLOGY RESEARCH GROUP

STEPHEN ASSINDER

ASSOCIATE PROFESSOR, PHYSIOLOGY

LABORATORY PERSONNEL/ STUDENTS

Stephen Assinder	Associate Professor 2006 - present
Nicole Tom	PhD Student 2010 - 2014
Mohammad Ghalayini	PhD Student 2012 - 2014
Vicki Velonas	PhD Student 2012 - present
Bobbi Boumelhem	PhD studentr 2012 - present
Vanitha Bhoopalan	PhD student 2014 - present
Jonathan Surija	MPhil student 2014 - present
Angela Nova	BSc (Hons) Student 2015 - present

LAB OVERVIEW

The work of Andrology Research Group is concerned with issues of male health, with a focus on prostate disease. Prostate cancer is the most commonly diagnosed cancer in Australia, and is the second leading cause of cancer death in men. More than 2,700 men die of prostate cancer in Australia each year. Benign prostatic hyperplasia is the most common benign growth in men, resulting in severe morbidity.

RESEARCH ACTIVITIES

During the report peroid our research activities included (i) understanding how the loss of structural proteins involved in organization of the cell cytoskeleton contribute to the development of cancer cell phenotypes, (ii) hormone regulation of prostate cell behavior – in particular how oxytocin may be associated with abnormal growth of the prostate and castrate resistant prostate cancers (iii) dysfunction of cytokine signalling pathways, which are well-known as a factor in the development of cancer. Integration and regulators of the FGF and TGF-beta signalling pathways were the focus of collaborations within the Bosch Prostate Cancer Group and with Assoc Prof Frank Lovicu of the Bosch Institute.

PUBLICATIONS

(2013 - 2015)

Assinder, S., Beniamen, D., Lovicu, F. (2015). Cosuppression of Sprouty and Sprouty-Related Negative Regulators of FGF Signalling in Prostate Cancer: A Working Hypothesis. BioMed Research International, 2015, 1-10.

Assinder, S., Davies, K., Surija, J., Liu-Fu, F. (2015). Oxytocin differentially effects 3beta-hydroxysteroid dehydrogenase and 5alpha-reductase activities in prostate cancer cell lines. Peptides, 71, 149-155.

Velonas, V., Woo, H., Dos Remedios, C., Assinder, S. (2013). Current Status of Biomarkers for Prostate Cancer. International Journal of Molecular Sciences, 14(6), 11034-11060.

Hua, S., Yao, M., Vignarajan, S., Witting, P., Hejazi, L., Gong, Z., Teng, Y., Niknami, M., Assinder, S., Richardson, D., Dong, Q. (2013). Cytosolic phospholipase A2alpha sustains pAKT, pERK and AR levels in PTEN-null/mutated prostate cancer cells. Biochimica et Biophysica Acta - Molecular and Cell Biology of Lipids, 1831 (6), 1146-1157.

Dixon, K., Lui, G., Kovacevic, Z., Zhang, D., Yao, M., Chen, Z., Dong, Q., Assinder, S., Richardson, D. (2013). Dp44mT targets the AKT, TGF-β and ERK pathways via the metastasis suppressor NDRG1 in normal prostate epithelial cells and prostate cancer cells. British Journal of Cancer, 108(2), 409-419..

Ghalayini, M., Dong, Q., Richardson, D., Assinder, S. (2013). Proteolytic cleavage and truncation of NDRG1 in human prostate cancer cells, but not normal prostate epithelial cells. Bioscience Reports, 33(3), 451-464.

Sanchez-Perez, A., Brown, G., Malik, R., Assinder, S., Cantlon, K., Gotsis, C., Dunbar, S., Fraser, S. (2013). Rapid detection of haemotropic mycoplasma infection of feline erythrocytes using a novel flow cytometric approach. Parasites and Vectors, 6(1), 1-7.

Wee, N., Weinstein, D., Fraser, S., Assinder, S. (2013). The mammalian copper transporters CTR1 and CTR2 and their roles in development and disease. The International Journal of Biochemistry and Cell Biology, 45(5), 960-963.

SERVICE TO THE UNIVERSITY AND COMMUNITY

(2013 - 2015)

- Chair – University of Sydney Human research Ethics Committee

POSTGRADUATE AND HONOURS COMPLETIONS

(2013 - 2015)

PhD

2015 - Nicole Tom

MPhil

2014 - Mohammad Ghalayin

BSc(Hons)

2015 - Angela Novo

2013 - Kathryn Davies

EXTERNAL FUNDING TO LABORATORY
(2013 - 2015)

Source	Project Title	Collaborators	Awarded	Duration	Amount
NBCF Novel Concept Award	Chemotherapy transporters in Breast Cancer	Fraser S Assinder SJ	2013 2014		- $100,000
Bosch Translational Grant in Aid	Making “platinum-class” less exclusive. (Copper transporters as predictors of response to platinum based cancer chemotherapies).	Assinder SJ Fraser S	2013 2014		- $10,000
NHMRC Project Grant	Pharmacological Targetting	Richardson, D(CIA) Kovacevic Z(CIB) Assinder (AI)	 2014 2015		 $164,000 $164,000

CANCER THERAPEUTICS RESEARCH GROUP

KELLIE CHARLES

SENIOR LECTURER, PHARMACOLOGY

LAB OVERVIEW

Dr Kellie Charles is the head of the Cancer Therapeutics Research Laboratory. The focus of Dr Charles' research program is to understand the role of cancer-related inflammation on the outcomes of chemotherapy (i.e. toxicity, response and survival) in patients with advanced cancer so as to design, investigate and implement intervention strategies to improve patient survival.

RESEARCH ACTIVITIES

The key questions the Cancer Therapeutic Research Lab is addressing are:

1. What patient and tumour-specific factors influence the extent of cancer-related inflammation in patients?
2. How does cancer-related inflammation impact the clinical outcomes of chemotherapy and other modalities?
3. Are the changes to clinical outcomes observed in clinical trial patients with inflammation also reflected in real-world community cancer patients?
4. Is cancer-related inflammation amenable to pharmacological inhibition in vitro and in vivo and does this improve clinical outcomes in cancer patients with inflammation?

Dr Charles is chief investigator of 3 major clinical, patient-centred studies (Sydney 1000 Bowel Cancer Study, The STRICT Phase II Simvastatin Study and the Chemotherapy-dosing in Cancer-related inflammation study). Her team's work spans the breadth of the cancer research field from basic preclinical research, clinical trial analysis to population-based data linkage projects.

POSTGRADUATE AND HONOURS COMPLETIONS

(2013 - 2015)

MPhil

2015 - Phuoc Huynh

BMedSc(Hons)

2015 - Imogen Janus
2014 - Diana Shinko

SPECIAL AWARDS & PRIZES

(2013 - 2015)

2015 - Ben Harris - Sydney Vital Cancer Research Scholar Awarded

PUBLICATIONS
(2013 - 2015)

Diakos, C., Charles (nee Slaviero), K., Chua, W., Howell, V., Clarke, S. (2015). Biomarkers in Metastatic Colorectal Cancer. In Victor R. Preedy and Vinood B. Patel (Eds.), Biomarkers in Cancer, (pp. 601-629). Dordrecht: Springer.

Shen, C., Harris, B., Dawson, L., Charles (nee Slaviero), K., Hambley, T., New, E. (2015). Fluorescent sensing of monofunctional platinum species. Chemical Communications, 51(29), 6312-6314.

Diakos, C., Charles (nee Slaviero), K., McMillan, D., Clarke, S. (2014). Cancer-related inflammation and treatment effectiveness. The Lancet Oncology, 15(11), e493-e503.

Elens, L., Nieuweboer, A., Clarke, S., Charles (nee Slaviero), K., De Graan, A., Haufroid, V., Mathijssen, R., Van Schaik, R. (2013). CYP3A4 intron 6 C>T SNP (CYP3A4*22) encodes lower CYP3A4 activity in cancer patients, as measured with probes midazolam and erythromycin. Pharmacogenomics, 14(2), 137-149.

Elens, L., Nieuweboer, A., Clarke, S., Charles (nee Slaviero), K., De Graan, A., Haufroid, V., van Gelder, T., Mathijssen, R., Van Schaik, R. (2013). Impact of POR*28 on the clinical pharmacokinetics of CYP3A phenotyping probes midazolam and erythromycin. Pharmacogenetics and Genomics, 23(3), 148-155.

Guthrie, G., Charles (nee Slaviero), K., Roxburgh, C., Horgan, P., McMillan, D., Clarke, S. (2013). The systemic inflammation-based neutrophil-lymphocyte ratio: Experience in patients with cancer. Critical Reviews in Oncology / Hematology (online), 88(1), 218-230.

EXTERNAL FUNDING TO LABORATORY
(2013 - 2015)

Source	Project Title	Collaborators	Awarded	Duration	Amount
Sydney Catalyst Seed and Pilot Funding	Does chemotherapy dosing and toxicity explain differences in survival in cancer patients with systemic inflammation.	SA Pearson, J Martin, C Diakos, S Kao	2015	1 years	$45,000
Northern Translational Cancer Research Unit Seed Grant.	The STRICT (Simvastatin Therapy for Reducing Inflammation in Colorectal Cancer Trial) Pilot Study.	S.Clarke, C.Diakos, N.Pavlakis, M.Michael, P.Blinman, L.Horvath, D.Goldstein,	2013	1 year	$20,000

CANCER PROTEOMICS LABORATORY

RICHARD CHRISTOPHERSON

EMERITUS PROFESSOR,

MOLECULAR BIOSCIENCES

LAB OVERVIEW

The Cancer Proteomics Laboratory is linked to the Sydney University Proteome Research Unit (SUPRU) that has 4 mass spectrometers and all the other instrumentation required for analysis of thousands of proteins from a single extract from a cancer cell. The group is interested in identifying proteins that become differentially expressed in cancer cells after treatment with a drug such as a purine analogue (e.g., fludarabine) or an HSP90 inhibitor (e.g., SNX-7081). Many of these proteins are involved with DNA repair and/or apoptosis and provide a rationale for the anticancer activities of these drugs.

In addition, the group is interested in correlating patterns of expression of proteins in cancer cells with diagnosis and prognosis of the cancer. There is a particular focus on proteins found in the outer membranes of cells, several techniques have been established for their analysis including hydrazide coupling of N-linked glycoproteins, electrostatic repulsion hydrophilic interaction chromatography (ERLIC)-reverse phase two-dimensional liquid chromatography tandem mass spectrometry (ERLIC-RP-2DLC-MS/MS), and DotScan CD antibody microarrays. The types of cancers currently under investigation include leukaemia, lymphoma, colorectal cancer, melanoma, and glioblastoma. Proteins involved with invasiveness (metastasis) are being identified using glioblastoma cell lines.

RESEARCH ACTIVITIES

Fludarabine induces proteins that regulate apoptosis in leukaemia cells

The purine analogues, cladribine and fludarabine, are effective as single agents in treating chronic lymphocytic leukaemia (CLL) and hairy cell leukaemia (HCL). The mechanisms of action of these anticancer drugs against CLL and HCL are being investigated using CD antibody (DotScan) microarrays, two-dimensional fluorescence differential gel electrophoresis (DIGE), isobaric tags for relative and absolute quantitation two-dimensional liquid chromatography-tandem mass spectrometry (iTRAQ 2DLC-MS/MS), selected reaction monitoring (SRM) and Western blotting. We have found that both drugs induce significant changes in surface expression profiles on CLL cells, and in levels of proteins involved in apoptosis (see publications below).

Hsp90 inhibitors reduce oncogenic signalling proteins in leukaemia cells

Heat shock protein 90 (Hsp90) inhibitors such as 17-AAG and SNX-7081, are undergoing clinical trials for treatment of a variety of cancers. Hsp90 is a molecular chaperone that catalyzes the conformational maturation of a number of oncogenic signalling proteins with the hydrolysis of ATP. Inhibitors such as SNX-7081, prevent the binding of ATP to Hsp90, resulting in the release and degradation of signalling proteins required for the growth of cancer. We have found that several Hsp90 inhibitors induce significant changes in the surface expression profiles and cellular proteomes of CLL and other leukaemias. The results obtained provide insight on the mechanisms of action of these novel drugs.

Classification of leukaemias by cell surface profiling

DotScan antibody microarrays capture live leukaemia cells providing an extensive immunophenotype (surface expression profile or disease signature) for that leukaemia. This novel technology has been validated for classification of leukaemias by a clinical trial involving 796 patients. DotScan has also been used to identify significant changes induced in the immunophenotype of the human myeloid cell line, HL60, induced by all-trans retinoic acid (ATRA), Vitamin D and phorbol esters.

Surface profiling of colorectal cancers and detection of tumour-infiltrating lymphocytes (TILs)

DotScan has also been used to determine surface expression profiles of colorectal cancer (CRC) and melanoma cells from surgically resected specimens. Using fluorescence multiplexing, expression profiles of CRC cells and tumour infiltrating lymphocytes (TILs) have been obtained from cancerous polyps. TILs may be very important in the future for cancer prognosis and for therapy that involves their growth in culture and infusing them back into the patient for immunotherapy.

LABORATORY PERSONNEL/STUDENTS

(2013 - 2015)

Richard Christopherson	Emeritus Professor (1986 - present)
Larissa Belov	PhD Research Fellow (P/T)
Munther Alomari	PhD Postdoctoral Fellow
Erin Sykes	PhD student
Yandong Shen (with Dr Giles Best)	PhD student
Athina Manakas (with Prof Jacqui Matthews)	PhD student
Stephen P Mulligan	PhD MBBS FRACP Adjunct Professor
O. Giles Best	PhD Adjunct Senior Lecturer
Stephen D Lyons	PhD MBBS FRACOG Adjunct Senior Lecturer

PUBLICATIONS

(2013 - 2015)

Che Y, Best OG, Zhong L, Kaufman KL, Mactier S, Raftery M, Graves LM, Mulligan SP, Christopherson RI. (2013) J Proteome Res. 12, 1710-1722. Hsp90 inhibitor SNX-7081 dysregulates proteins involved with DNA repair and replication and the cell cycle in human chronic lymphocytic leukemia (CLL) cells.

Cooper MJ, Cox NJ, Zimmerman EI, Dewar BJ, Duncan JS, Whittle MC, Nguyen TA, Jones LS, Ghose Roy S, Smalley DM, Kuan PF, Richards KL, Christopherson RI, Jin J, Frye SV, Johnson GL, Baldwin AS, Graves LM. (2013) PLoS One. 8(6):e66755. Application of multiplexed kinase inhibitor beads to study kinome adaptations in drug-resistant leukemia.

Huang PY, Kohnke P, Belov L, Best OG, Mulligan SP, Christopherson RI. (2013) J Pharm Pharm Sci. 16, 231-7. Profiles of surface mosaics on chronic lymphocytic leukemias distinguish stable and progressive subtypes.

Huang PY, Best OG, Almazi JG, Belov L, Davis ZA, Majid A, Dyer MJ, Pascovici D, Mulligan SP, Christopherson RI (2014) Leuk Lymphoma 55, 2085-2092. Cell surface phenotype profiles distinguish stable and progressive chronic lymphocytic leukemia.

Kaufman KL, Mactier S, Armstrong NJ, Mallawaaratchy D, Byrne SN, Haydu LE, Jakrot V, Thompson JF, Mann GJ, Scolyer RA, Christopherson RI. (2014) Clin Exp Metastasis, Jan 17, PMID 24435119. Surface antigen profiles of leukocytes and melanoma cells in lymph node metastases are associated with survival in AJCC stage III melanoma patients.

Christopherson RI, Mactier S, Almazi JG, Kohnke PL, Best OG, Mulligan SP. (2014) Nucleosides Nucleotides Nucleic Acids. 33, 375-83. Mechanisms of action of fludarabine nucleoside against human Raji lymphoma cells.

Alomari M, Mactier S, Kaufman KL, Best OG, Mulligan SP Christopherson RI. (2014) J Prot Bioinform, S7: 005. doi:10.4172/jpb.S7-005 31/03/14. Profiling the lipid raft proteome from human MEC1 chronic lymphocytic leukemia cells.

Mactier S, Kaufman KL, Wang P, Crossett B, Pupo GM, Kohnke PL, Thompson JF, Scolyer RA, Yang JY, Mann GJ, Christopherson RI. (2014) Pigment Cell Melanoma Res. 27, 1106-1116. Protein signatures correspond to survival outcomes of AJCC stage III melanoma patients.

Rahman W, Tu T, Budzinska M, Huang P, Belov L, Chrisp JS, Christopherson RI, Warner FJ, Bowden DS, Thompson AJ, Bowen DG, Strasser SI, Koorey D, Sharland AF, Yang JY, McCaughan GW, Shackel NA. (2015) Transplantation. Sep;99(9):e120-6. doi: 10.1097/TP.0000000000000617. PMID: 25706280. Analysis of Post-Liver Transplant Hepatitis C Virus Recurrence Using Serial Cluster of Differentiation Antibody Microarrays.

Zhou J, Belov L, Chapuis P, Chan C, Armstrong N, Kaufman KL, Solomon MJ, Clarke SJ, Christopherson RI (2015) J Immunol Methods 416, 59-68. Surface profiles of live colorectal cancer cells and tumor infiltrating lymphocytes from surgical samples correspond to prognostic categories.

Mallawaaratchy DM, Buckland ME, McDonald KL, Li CCY, Ly L, Sykes EK, Christopherson RI, Kaufman KL (2015) J Neuropath Exp Neurol 74, 425-441. Membrane proteome analysis of glioblastoma cell invasion.

Huang PY, Mactier S, Armacki N, Giles Best O, Belov L, Kaufman KL, Pascovici D, Mulligan SP, Christopherson RI (2015). Leuk Lymphoma. Nov 16:1-11. PMID: 26422656. Protein profiles distinguish stable and progressive chronic lymphocytic leukemia.

Kaufman KL, Jenkins Y, Alomari M, Mirzaei M, Best OG, Pascovici D, Mactier S, Mulligan SP, Haynes PA, Christopherson RI. (2015) Oncotarget. 6, 40981-40997. The Hsp90 inhibitor SNX-7081 is synergistic with fludarabine nucleoside via DNA damage and repair mechanisms in human, p53-negative chronic lymphocytic leukemia.

Kaufman KL, Mactier S, Christopherson RI. (2015) Methods Mol Biol. Dec 13. PMID: 26659797. Surface Antigen Profiling of Surgical Melanoma Specimens.

EXTERNAL FUNDING TO LABORATORY

(2013 - 2015)

Source	Project Title	Collaborators	Awarded	Duration	Amount
CINSW	Translational Grant for melanoma	(with 5 other CIs, $750,000 pa, 5 y)	2013		$89,195
NHMRC	Postdoctoral Training Fellowship	K Kaufman	2013		$92,760
	Whittaker Bequest		2013		$139,299

Source	Project Title	Collaborators	Awarded	Duration	Amount
CINSW	Translational Grant for melanoma	(with 5 other CIs, $750,000 pa, 5 y)	2014		$89,195
	Whittaker Bequest		2014		$139,299
USyd	CDIP seed funding for demibodies		2014		$62,000
USyd	CDIP seed funding for DotScan test		2014		$50,000
	Whittaker Bequest		2015		$139,299

POSTGRADUATE AND HONOURS COMPLETIONS
(2013 - 2015)

PhD

2013 - Zoe Che

2014 - Trisha Almazi

2014 - Jerry Zhou

BSc(Hons)

2013 - Suzannah Hallal

2013 - Kieran Matik

2014 - Cassandra MacDonald

2015 - Athina Manakas

2015 - Yandong Shen

PATENTS
(2013 - 2015)

- Christopherson RI, Belov L, Wissmueller S and Leong C (2011) International Patent Application No PCT/AU2011/001300. Assay for disease detection.
- Christopherson RI, Matthews JM, Mackay JP (2013) European Patent 20060817559 (granted). Demibodies: dimerization-activated therapeutic agents.
- Christopherson RI, Matthews JM, Mackay JP (2013) US patent 20090130106 (granted). Demibodies: dimerization-activated therapeutic agents.
- Christopherson RI, Mulligan SP (2013) Australian Provisional Patent FID830042. Assay to stratify cancer patients.

MOLECULAR NUTRITION LABORATORY

ARTHUR D CONIGRAVE

PROFESSOR, MOLECULAR BIOSCIENCE

ACTING DEAN, SYDNEY MEDICAL SCHOOL

LAB OVERVIEW

The laboratory focuses on questions of the following type: 'What is the molecular basis of nutrient sensing in the control of ...(e.g., appetite, cell fate, digestion and absorption, bone building, calcium metabolism)'? It has special expertise in studies of nutrient-sensing class C G-protein coupled receptors.

RESEARCH ACTIVITIES

Professor Conigrave is interested in the links between nutrient-sensing receptors and the metabolic basis of health and disease with an emphasis on food intake and metabolic bone disease. His laboratory's work focuses on a subgroup of the G-protein coupled receptor superfamily ('class C') that includes amino acid sensors involved in triggering gut digestive and hormonal regulatory responses. Having identified binding sites for the nutrient sensors on GPCR class C, his team is characterising the downstream signaling pathways and resultant biological effects. He also has extensively studied the parathyroid gland and mechanisms of parathyroid hormone (PTH) secretion control by the CaSR in normal glands and adenomatous disease in primary hyperparathyroidism.

Professor Conigrave pioneered the theory underpinning the recognition of the CaSR as an L-amino acid sensor in the GI tract, thus coupling dietary protein-derived signals to the release of hormones that promote nutrient digestion and absorption and provide satiety signals. He is testing a novel CaSR mutant in a transgenic mouse setting, for defects in protein-dependent control of food intake. He also is investigating the class C GPCRs' ligand-dependent biased signaling effects including control of gene expression in metabolic pathways.

Additionally, his group has recently demonstrated that a protein of the Homer family plays a critical role in bone cell viability and function. They are investigating the in vitro and in vivo effects of alterations in the amounts of this protein and others of this family, present in bone cells, to determine whether these proteins could be targeted for treatment of osteoporosis and/or bone cancers.

LABORATORY PERSONNEL/ STUDENTS

Arthur Conigrave	Professor 1992 - present
Hee-Chang Mun	Postdoctoral Fellow 2005 - present
Vimesh Avlani	2009 - present
Mahvash Goolam	2008 - present
Alice P Brown	PhD student 2011 - present
Kimberly Edwards	2012 - present
Alice Huang	2012 - present

PUBLICATIONS

(2013 - 2015)

Cook, A., Mistry, S., Gregory, K., Furness, S., Sexton, P., Scammells, P., Conigrave, A., Christopoulos, A., Leach, K. (2015). Biased allosteric modulation at the CaS receptor engendered by structurally diverse calcimimetics. British Journal of Pharmacology, 172(1), 185-200.

Brennan-Speranza, T., Conigrave, A. (2015). Osteocalcin: An osteoblast-derived polypeptide hormone that modulates whole body energy metabolism. Calcified Tissue International, 96(1), 1-10.

Campion, K., McCormick, W., Warwicker, J., Bin Khayat, M., Atkinson-Dell, R., Steward, M., Delbridge, L., Mun, H., Conigrave, A., Ward, D. (2015). Pathophysiologic changes in extracellular pH modulate parathyroid calcium-sensing receptor activity and secretion via a histidine-independent mechanism. Journal of the American Society of Nephrology, 26(9), 2163-2171.

Brennan, S., Mun, H., Leach, K., Kuchel, P., Christopoulos, A., Conigrave, A. (2015). Receptor expression modulates calcium-sensing receptor mediated intracellular Ca2+ mobilization. Endocrinology, 156(4), 1330-1342.

Leach, K., Conigrave, A., Sexton, P., Christopoulos, A. (2015). Towards tissue-specific pharmacology: insights from the calcium-sensing receptor as a paradigm for GPCR (patho)physiological bias. Trends In Pharmacological Sciences, 36(4), 215-225.

Leach, K., Sexton, P., Christopoulos, A., Conigrave, A. (2014). Engendering biased signalling from the calcium-sensing receptor for the pharmacotherapy of diverse disorders. British Journal of Pharmacology, 171(5), 1142-1155.

Ujvari, B., Mun, H., Conigrave, A., Ciofi, C., Madsen, T. (2014). Invasive toxic prey may imperil the survival of an iconic giant lizard, the Komodo dragon. Pacific Conservation Biology, 20(4), 363-365.

Puckeridge, M., Chapman, B., Conigrave, A., Kuchel, P. (2014). Membrane flickering of the human erythrocyte: physical and chemical effectors. European Biophysics Journal, 43(4-5), 169-177.

Gosby, A., Conigrave, A., Raubenheimer, D., Simpson, S. (2014). Protein leverage and energy intake. Obesity Reviews, 15(3), 183-191.

Khan, M., Ward, J., Avlani, V., Leach, K., Christopoulos, A., Conigrave, A. (2014). Roles of intraloops-2 and -3 and the proximal C-terminus in signalling pathway selection from the human calcium-sensing receptor. FEBS Letters, 588(18), 3340-3346.

Conigrave, A., Ward, D. (2013). Calcium-sensing receptor (CaSR): Pharmacological properties and signaling pathways. Best Practice and Research: Clinical Endocrinology and Metabolism, 27(3), 315-331.

Conigrave, A., Ward, D. (2013). Calcium-sensing receptor (CaSR): Pharmacological properties and signaling pathways. Best Practice and Research: Clinical Endocrinology and Metabolism, 27(3), 315-331.

Avlani, V., Ma, W., Mun, H., Leach, K., Delbridge, L., Christopoulos, A., Conigrave, A. (2013). Calcium-sensing receptor-dependent activation of CREB phosphorylation in HEK293 cells and human parathyroid cells. American Journal of Physiology: Endocrinology and Metabolism, 304(10), E1097-E1104.

Puckeridge, M., Chapman, B., Conigrave, A., Kuchel, P. (2013). Corrigendum to Quantitative model of NMR chemical shifts of 23Na + induced by TmDOTP: Applications in studies of Na+ transport in human erythrocytes (Journal of Inorganic Biochemistry (2012) 115 (211-219)). Journal of Inorganic Biochemistry, 121, 196.

Huang, X., Hancock, D., Gosby, A., McMahon, A., Solon-Biet, S., Le Couteur, D., Conigrave, A., Raubenheimer, D., Simpson, S. (2013). Effects of dietary protein to carbohydrate balance on energy intake, fat storage and heat production in mice. Obesity, 21(1), 85-92.

Vandenberg, J., Conigrave, A., King, G., Kirk, K. (2013). From kinetics to imaging: an NMR odyssey-a festschrift symposium in honour of Philip William Kuchel. European Biophysics Journal, 42(1), 1-2.

Leach, K., Wen, A., Cook, A., Sexton, P., Conigrave, A., Christopoulos, A. (2013). Impact of clinically relevant mutations on the pharmacoregulation and signaling bias of the calcium-sensing receptor by positive and negative allosteric modulators. Endocrinology, 154(3), 1105-1116.

Ujvari, B., Mun, H., Conigrave, A., Bray (nee Adami), A., Osterkamp, J., Halling, P., Madsen, T. (2013). Isolation breeds naivety: Island living robs Australian varanid lizards of toad-toxin immunity via four-base-pair mutation. Evolution, 67(1), 289-294.

Brown, E., Conigrave, A. (2013). Preface. Best Practice and Research: Clinical Endocrinology and Metabolism, 27(3), 283-284.

Puckeridge, M., Chapman, B., Conigrave, A., Grieve, S., Figtree, G., Kuchel, P. (2013). Stoichiometric relationship between Na+ ions transported and glucose consumed in human erythrocytes: Bayesian analysis of 23Na and 13C NMR time course data. Biophysical Journal, 104(8), 1676-1684.

POSTGRADUATE AND HONOURS COMPLETIONS

(2013 - 2015)

PhD

2010 - Xin Huang

2010 - Li Laine Ooi

BMedSc

2010 - Alice Brown

BSc

2012 - Anna Bracken

2012 - Hannah Baddock

SPECIAL AWARDS & PRIZES

(2013 - 2015)

- 2013 - Maria Huang Australian Postgraduate Award

SERVICE TO THE UNIVERSITY AND COMMUNITY

(2013 - 2015)

- Deputy Dean of Sydney Medical School (2011 - 2016)

EXTERNAL FUNDING TO LABORATORY
(2013 - 2015)

Source	Project Title	Collaborators	Awarded	Duration	Amount
NHMRC	Allosteric modulation and biased signalling at the calcium-sensing receptor	Conigrave A, Christopoulos A	2012	3 years	$240,000
NHMRC	A solution to the parathyroid gland secretion problem	Conigrave A, Ward D	2011	3 years	$490,470
NHMRC	Interactions between protein leverage, variety, and dietary carbohydrate and fat content in the control of energy intake in humans	Simpson S, Conigrave A	2011	3 years	$562,540

CHEMICAL BIOLOGY IN DRUG DISCOVERY LABORATORY

DAVID I COOK

PROFESSOR OF CELLULAR, PHYSIOLOGY

LAB OVERVIEW

Our main research interest concerns the regulation of ion transport in epithelia such as in the kidney, lung, gut and exocrine glands, as well as ion transport aberrations in these tissues caused by cystic fibrosis, hypertension or infection.

RESEARCH ACTIVITIES

Our collaboration with Prof Arie Moran (Ben Gurion University of the Negev, Israel) and Prof Shmuel Muallem (NIH), has continued with funding support from the ARC. We have furthered our studies to elucidate the regulatory mechanisms underlying the activity of the cellular zinc transporter, ZnT1, especially with respect to its relationship to both Ca2+ release and the epithelial Na+ channel (ENaC). Cellular zinc is under tight regulatory control due to its toxicity, being the major cause of neuronal damage during brain ischaemia, seizures and trauma, but it has important cellular functions, for example in embryonic development. A second manuscript describing our recent findings was submitted for publication.

Our collaboration with Mahidol University (Bangkok) has also been productive. We continued to investigate the role of Cl– secretion in respiratory epithelial cells in response to H5N1 influenza. A manuscript describing our discoveries relating to the role of purinergic signalling in the induction of the proinflammatory cytokine response (cytokine storm) has also been submitted for publication.

LABORATORY PERSONNEL/ STUDENTS

David I Cook	Professor of Cellular Physiology 1986 – present
Anuwat Dinudom	Associate Professor Principal Research Fellow 1994 – present
Arie Moran	Professor Visiting Scholar 2011 – present
Dr Il-Ha Lee	Senior Research Associater 2004-2015
Dr Craig R Campbell	Research Associate 2010 – present
Dr Ken Okabakashi	Visiting Scholar 2012-2013

PUBLICATIONS
(2013 - 2015)

Shusterman E1, Beharier O, Shiri L, Zarivach R, Etzion Y, Campbell CR, Lee IH, Okabayashi K, Dinudom A, Cook DI, Katz A, Moran A. ZnT-1 extrudes zinc from mammalian cells functioning as a Zn2+/H+ exchanger. Metallomics 2014; 6: 1656-1663.

Lee IH, Song SH, Cook DI, Dinudom A. H-Ras mediates the inhibitory effect of epidermal growth factor on the epithelial Na+ channel. PLoS One 2015; 10: e0116938.

Tomoda A, Marunaka Y, Eaton DC, Dinudom A. Membrane transport: ionic environments, signal transduction, and development of therapeutic targets. Biomed Res Int 2015; 2015: 581626.

Lam YY, Ha CW, Hoffmann JM, Oscarsson J, Dinudom A, Mather TJ, Cook DI, Hunt NH, Caterson ID, Holmes AJ, Storlien LH. Effects of dietary fat profile on gut permeability and microbiota and their relationships with metabolic changes in mice. Obesity 2015; 23: 1429-1439.

SERVICE TO THE UNIVERSITY AND COMMUNITY
(2013 - 2015)

Official for Scientific Societies
David Cook
Treasurer, Federation of the Asian & Oceanian Physiological Societies, 2011–2015
Anuwat Dinudom
Treasurer, Federation of the Asian & Oceanian Physiological Societies, 2015–

In newspaper article
2015
David Cook
Sydney University medical students invented patients for assignments. Sydney Morning Herald, 6 Jun 2015. http://www.smh.com.au/national/education/sydney-university-medical-students-invented-patients-for-assignments-20150604-ghgsy2.html

Membership of Editorial Boards of Journals
David Cook
Cellular Physiology and Biochemistry, 2002–

Anuwat Dinudom
The Japanese Dental Science Review, 2013–
Clinical and Experimental Pharmacology and Physiology, 2013–14.
Biomedical Research International, 2015

Service to the University
David Cook
Deputy Dean for the Faculty of Medicine
Academic Director, Charles Perkins Centre, Camperdown, 2013–2014
Academic Director, Charles Perkins Centre, Westmead, 2015–

EXTERNAL FUNDING TO LABORATORY
(2013 - 2015)

Source	Project Title	Collaborators	Awarded	Duration	Amount
ARC	ZnT-1 regulates store operated calcium channels	Cook DI Moran A Muallem S	2012	2013-2015	$510,000
NHMRC	Regulation of epithelial sodium channels by caveolin	Cook DI Dinudom A	2011	2012-2014	$408,000
NHMRC	How avian influenza affects the lungs	Cook DI Dinudom A	2011	2012-2014	$623, 000

SUNLIGHT AND CANCER GROUP

KATIE DIXON

LECTURER AND RESEARCH FELLOW,

ANATOMY AND HISTOLOGY

LAB OVERVIEW

Skin cancer is highly prevalent in Australia, with two in three people being diagnosed by the age of 70. More cases of skin cancer are diagnosed each year, than that of breast, prostate, lung and colon cancer combined. Whilst non-melanoma skin cancers (squamous cell and basal cell carcinomas) are more common, melanoma is responsible for the majority of deaths related to skin cancer. The main etiological agent in the formation of skin cancer is exposure to ultraviolet radiation from the sun.

Work in this laboratory involves the investigation of the molecular mechanisms of ultraviolet radiation-induced skin carcinogenesis, as well as the inhibition of the growth and metastasis of melanoma. Interests outside of skin cancer include investigation of cell signalling pathways in cancer, with an emphasis on identification and targeting of tumour suppressor genes.

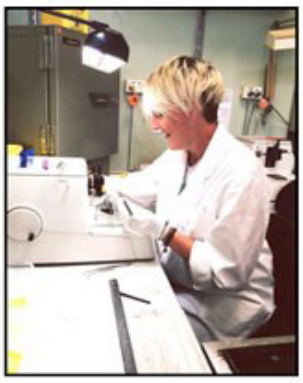
RESEARCH ACTIVITIES

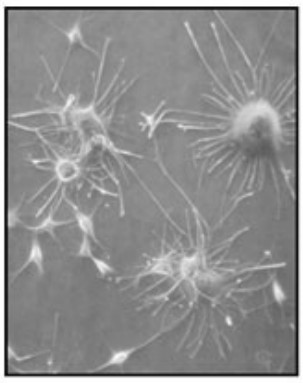
Novel findings by our laboratory have shown one such tumour suppressor protein to be suppressed following UV exposure. This, in combination with an increase in UV-induced DNA damage and a loss of repair enzymes, may ultimately lead to the development of non-melanoma and melanoma skin cancer.

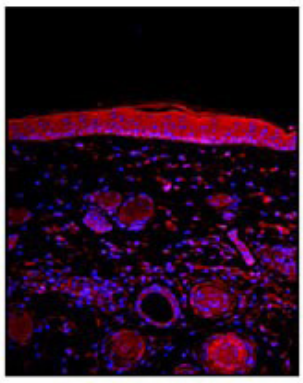
We have recently been successful in pharmacologically targeting this tumour suppressor gene to inhibit its UV depletion in normal skin, and to increase its levels in melanoma cells.

LABORATORY PERSONNEL/ STUDENTS

Dr Katie Dixon	Head of Laboratory Oct 2012 - current
Nicole Painter	Research Assistant May 2013 – May 2016
Artur Shariev	Hons & PhD Student Feb 2014 – current
Wade Howden	Research Assistant July 2014 – Dec 2015
Shelby Hochstetler	International Intern (USA) Jul 2013 – Dec 2013
Fernanda Nadal	International Intern (Brazil) Jul 2014 – Jun 2015







PUBLICATIONS
(2013 - 2015)

Tongkao-on, W., Carter, S., Reeve, V., Dixon, K., Gordon-Thomson, C., Halliday, G., Tuckey, R., Mason, R. (2015). CYP11A1 in skin: An alternative route to photoprotection by vitamin D compounds. Journal of Steroid Biochemistry and Molecular Biology, 148, 72-78.

Gordon-Thomson, C., Tongkao-on, W., Song, E., Carter, S., Dixon, K., Mason, R. (2014). Protection from Ultraviolet Damage and Photocarcinogenesis by Vitamin D Compounds. In Jorg Reichrath (Eds.), Sunlight, Vitamin D and Skin Cancer, (pp. 303-328). New York: Springer Science+Business Media.

McCarthy, B., Dixon, K., Halliday, G., Reeve, V., Mason, R. (2014). The Vitamin D Saga: Breaking Dawn. Immunology, Endocrine and Metabolic Agents in Medicinal Chemistry, 14(3), 137-151.

Dixon, K., Lui, G., Kovacevic, Z., Zhang, D., Yao, M., Chen, Z., Dong, Q., Assinder, S., Richardson, D. (2013). Dp44mT targets the AKT, TGF-β and ERK pathways via the metastasis suppressor NDRG1 in normal prostate epithelial cells and prostate cancer cells. British Journal of Cancer, 108(2), 409-419.

Tongkao-on, W., Gordon-Thomson, C., Dixon, K., Song, E., Luu, T., Carter, S., Sequeira, V., Reeve, V., Mason, R. (2013). Novel vitamin D compounds and skin cancer prevention. Dermato-Endocrinology, 5(1), 20-33.

Dixon, K., Tongkao-on, W., Sequeira, V., Carter, S., Song, E., Rybchyn, M., Gordon-Thomson, C., Mason, R. (2013). Vitamin D and Death by Sunshine. International Journal of Molecular Sciences, 14(1), 1964-1977.

POSTGRADUATE AND HONOURS COMPLETIONS
(2013 - 2015)

Grad Dip Sci

- 2014 - Artur Shariev

SERVICE TO THE UNIVERSITY AND COMMUNITY
(2013 - 2015)

Katie Dixon:

- 2015 – present: Secretary of Molecular and Experimental Pathology Society of Australasia.
- 2005 – 2015: Council member of Molecular and Experimental Pathology Society of Australasia.
- 2015 – present: Healthy Sydney University Working Group Member.
- 2013 – present: Editorial Board Member, Frontiers in Physiology.
- 2015: Invited speaker for the Molecular and Experimental Pathology Society of Australasia Conference, Hobart,

November.

- Chairperson of session (Vitamin D Basic Aspects) at the Molecular and Experimental Pathology Society of Australasia Conference, Hobart, November.
- 2014: Chairperson of session (Free Communications) at Australian Health and Medical Research Congress, Melbourne, November.

SPECIAL AWARDS & PRIZES

(2013 - 2015)

Artur Shariev:

- 2015: Recipient of Kumar Award for Best Oral Presentation by a postgraduate student at the Molecular and Experimental Pathology Society of Australasia Conference, Hobart, November.
- 2015 & 2014: Recipient of Travel Award to attend Molecular and Experimental Pathology Society of Australasia Conference, Hobart (2015) and Molecular and Experimental Pathology Society of Australasia Conference, Melbourne (2014)

Katie Dixon:

- Invited speaker for the Australian Health and Medical Research Congress, Melbourne, November.
- 2013: Invited to give opening plenary lecture at European Society of Photobiology Congress, Belgium, September, as recipient of Young Investigator Award.
- Invited to give seminar at Anderson Stuart Seminar Series, University of Sydney: "Breaking Dawn: Novel insights into sunlight and cancer".
- Chairperson of session (Photo-protection) at Joint meeting of Asia-Oceania Society for Photobiology and Molecular and Experimental Pathology Society of Australasia.

EXTERNAL FUNDING TO LABORATORY

(2013 - 2015)

Source	Project Title	Collaborators	Awarded	Duration	Amount
Sydney Medical School	Targeting melanoma with vitamin D	Dixon, K	2015	1 year	$30,000
National Health and Medical Research Council (NHMRC)/ Project Grants.	Is CYP11A1 critical for the vitamin D photoprotective system in skin;	Mason R, Halliday G, Tuckey R, Dixon K, Reeve V;	2014	3 years	$500,746
Cancer Institute New South Wales/ Early Career Fellow-ship.	Novel vitamin D-like compounds to reduce DNA and other molecular damage after UV radiation;	Dixon K;	2013	3 years	$600,000

CANCER GENETICS GROUP

QIHAN DONG

ASSOCIATE PROFESSOR

HEAD, CANCER BIOLOGY GROUP

LAB OVERVIEW

Based on United States statistics in 2014, there are 12 million people living with cancer. Hence, how to prevent cancer recurrence is of critical importance. Dong's team is investigating the mechanism of, and the way to prevent, cancer recurrence. Cancers are made up of both actively dividing and "resting" cancer cells. These "resting" (quiescent) cancer cells are thought to be central to recurrence, after actively dividing cancer cells are eliminated by chemo- or radio-therapy.

RESEARCH ACTIVITIES

Dong's team, using Gene Chip technology, has identified a list of genes that are aberrantly increased in their product levels in advanced form of prostate cancer compared with organ-confined prostate cancer. Importantly, some of these gene products are required for quiescent cancer cells to re-enter the cell cycle. Identification of these gene products will provide needed molecular targets for preventing cancer recurrence. In addition, the team has made progress in establishing a strategy to prevent cell cycle re-entry by quiescent cancer cells. Based on the principle of efficacy and no toxicity, the team has determined the potential of compounds isolated from edible plant and herbal medicines in blocking the transition from the quiescent to actively dividing state of cancer cells. The ultimate goal is to provide cancer survivors these interventions when their disease is in remission.

LABORATORY PERSONNEL/ STUDENTS

Qihan Dong	Associate Professor Head, Cancer Biology Group 2011 - present
Dr Mu Yao	Research Fellow 2011 - present
Sheng Hua	PhD Candidate 2011 - 2014
Dr Teng Ying	PhD Candidate 2011 - 2014
Amber Xie	PhD Candidate 2012 - present
Su Su Thae Hnit	PhD Candidate 2013 - present
Daniel Choe	Honours 2015

POSTGRADUATE AND HONOURS COMPLETIONS

(2013 - 2015)

PhD

2014 - Sheng Hua

2014 - Teng Ying

BMedSc(Hons)

2015 - Daniel Choe

SERVICE TO THE UNIVERSITY AND COMMUNITY

(2013 - 2015)

- Member of Review Editorial Board of Frontier in Integrative Physiology (http://www.frontiersin.org/integrative_physiology/editorialboard)
- Member of Editorial Board of Scientifica (Urology Section) (http://www.hindawi.com/journals/scientifica/editors/)

PUBLICATIONS
(2013 - 2015)

Hua, S., Vignarajan, S., Yao, M., Xie, C., Sved, P., Dong, Q. (2015). AKT and cytosolic phospholipase A2β form a positive loop in prostate cancer cells. Current Cancer Drug Targets, 15(9), 781-791.

Choi, J., Desai, R., Zheng, Y., Yao, M., Dong, Q., Watson, G., Handelsman, D., Simanainen, U. (2015). Androgen actions via androgen receptor promote PTEN inactivation induced uterine cancer. Endocrine-Related Cancer, 22(5), 687-701.

Hua, S., Vignarajan, S., Yao, M., Xie, C., Sved, P., Dong, Q. (2015). AKT and cytosolic phospholipase A2β form a positive loop in prostate cancer cells. Current Cancer Drug Targets, 15(9), 781-791.

Choi, J., Desai, R., Zheng, Y., Yao, M., Dong, Q., Watson, G., Handelsman, D., Simanainen, U. (2015). Androgen actions via androgen receptor promote PTEN inactivation induced uterine cancer. Endocrine-Related Cancer, 22(5), 687-701.

Meng, X., Yao, M., Zhang, X., Xu, H., Dong, Q. (2015). ER stress-induced autophagy in melanoma. Clinical and Experimental Pharmacology and Physiology, 42(8), 811-816.

Hnit, S., Xie, C., Yao, M., Holst, J., Bensoussan, A., de Souza, P., Li, Z., Dong, Q. (2015). p27(Kip1) signaling: Transcriptional and post-translational regulation. The International Journal of Biochemistry and Cell Biology, 68, 9-14.

Yao, M., Xie, C., Kiang, M., Teng, Y., Harman, D., Tiffen, J., Wang, K., Sved, P., Bao, B., Witting, P., Holst, J., Dong, Q. (2015). Targeting of cytosolic phospholipase A2a impedes cell cycle re-entry of quiescent prostate cancer cells. Oncotarget, 6(33), 34458-34474.

Gamsjaeger, R., Kariawasam, R., Gimenez, A., Touma, C., McIlwain, E., Bernardo, R., Shepherd, N., Ataide, S., Dong, Q., Richard, D., Cubeddu, L., et al (2015). The structural basis of DNA binding by the single-stranded DNA-binding protein from Sulfolobus solfataricus. The Biochemical Journal, 465(2), 337-346.

Hua, S., Xie, C., Yao, M., Dong, Q. (2014). Effect of Arachidonic Acid and its Producing Enzyme Phospholipase A2 alpha on Key Oncogenic Pathways in Prostate Cancer. In Jason M. OKeefe (Eds.), Arachidonic Acid: Sources, Biosynthesis and Health Effects, (pp. 135-164). New York: Nova Science Publishers, Inc.

Vignarajan, S., Xie, C., Yao, M., Sun, Y., Simanainen, U., Sved, P., Liu, T., Dong, Q. (2014). Loss of PTEN stabilizes the lipid modifying enzyme cytosolic phospholipase A via AKT in prostate cancer cells. Oncotarget, 5(15), 6289-6299.

Xie, C., Yao, M., Dong, Q. (2014). Proliferating cell unclear antigen-associated factor (PAF15): A novel oncogene. The International Journal of Biochemistry and Cell Biology, 50(1), 127-131.

Zheng, Z., He, X., Xie, C., Hua, S., Li, J., Wang, T., Yao, M., Vignarajan, S., Teng, Y., Hejazi, L., Dong, Q., et al (2014). Targeting cytosolic phospholipase A2 in colorectal cancer cells inhibits constitutively activated Protein Kinase B (AKT) and cell proliferation. Oncotarget, 5(23), 12304-12316.

Xie, C., Powell, C., Yao, M., Wu, J., Dong, Q. (2014). Ubiquitin-conjugating enzyme E2C: A potential cancer biomarker. The International Journal of Biochemistry and Cell Biology, 47, 113-117.

Xiao, W., Graham, P., Hao, J., Chang, L., Ni, J., Power, C., Dong, Q., Kearsley, J., Li, Y. (2013). Combination Therapy with the Histone Deacetylase Inhibitor LBH589 and Radiation Is an Effective Regimen for Prostate Cancer Cells. PloS One, 8(8), 1-14.

Hua, S., Yao, M., Vignarajan, S., Witting, P., Hejazi, L., Gong, Z., Teng, Y., Niknami, M., Assinder, S., Richardson, D., Dong, Q. (2013). Cytosolic phospholipase A2alpha sustains pAKT, pERK and AR levels in PTEN-null/mutated prostate cancer cells. Biochimica et Biophysica Acta - Molecular and Cell Biology of Lipids, 1831 (6), 1146-1157.

Dixon, K., Lui, G., Kovacevic, Z., Zhang, D., Yao, M., Chen, Z., Dong, Q., Assinder, S., Richardson, D. (2013). Dp44mT targets the AKT, TGF-β and ERK pathways via the metastasis suppressor NDRG1 in normal prostate epithelial cells and prostate cancer cells. British Journal of Cancer, 108(2), 409-419.

Ghalayini, M., Dong, Q., Richardson, D., Assinder, S. (2013). Proteolytic cleavage and truncation of NDRG1 in human prostate cancer cells, but not normal prostate epithelial cells. Bioscience Reports, 33(3), 451-464.

Garbutcheon-Singh, B., Myers, S., Harper, B., Ng, N., Dong, Q., Xie, C., Aldrich-Wright, J. (2013). The effects of 56MESS on mitochondrial and cytoskeletal proteins and the cell cycle in MDCK cells. Metallomics, 5(8), 1061-1067.

EXTERNAL FUNDING TO LABORATORY

(2013 - 2015)

Source	Project Title	Collaborators	Awarded	Duration	Amount
NHMRC	Pharmacological Targeting via AKT, PTEN, and TGF-beta Pathway Integration using Novel Therapeutics	Des Richardson, Stephen Assinder; Qihan Dong	2011	2011-2013	$623,495
ARC	Innovative Solutions for the Australian Food Processing Industry in the 21st Century.	Dehghani, A/Prof Fariba; Kavanagh, Dr John M; Barton, Em/Prof Geoffrey W; Langrish, Prof Timothy A; Gomes, A/Prof Vincent; Fletcher, Adj/Prof David F; Abbas, Dr Ali; Downard, A/Prof Kevin M; Dong, A/Prof Qihan; etc.	2014	2014-2016	$2.9M

LABORATORY OF BLOOD CELL DEVELOPMENT

STUART FRASER

LECTURER, PHYSIOLOGY

LAB OVERVIEW

The Laboratory of Blood Cell Development explores the mechanisms that allow healthy adult humans to produce over 2 billion new red blood cells per day, and to maintain homeostasis. We explore the processes leading to the production of the very earliest blood cells in the embryo through to diseases affecting blood cell production in humans.

RESEARCH ACTIVITIES

The Laboratory of Blood Cell Development has expanded its interest in visualising red blood cell production at the nano-scale by developing novel techniques for scanning electron microscope. We have also developed novel flow cytometric techniques for analysing adipose tissues. We have discovered a new cell type possibly involved in maternal-fetal immunology and have identified a unique expression profile of copper transporter-2 suggesting an unexpected role in embryonic development and gene regulation.

We have recently made some exciting findings using a new animal model of red blood cell production. We will explore this model further to ask a fundamental question in blood cell generation, why do mammalian red blood cells condense and expel their nuclei?

The Lab examines the processes that regulate the production of blood or haematopoietic cells. We generally use the mouse embryo as our model system. Since blood production is, however, an ongoing process in adults, we are also extending our findings to adult mouse bone marrow with the ultimate aim of expanding our work to human blood diseases. We also began developing methods to utilize mouse embryonic stem cells as a model system to monitor developmental processes leading to blood production in vitro.

LABORATORY PERSONNEL/ STUDENTS

Dr Stuart Fraser	Senior Lecturer 2010 - present
Janine Street	Research Assistant 2013 - 2014
Veronica Antas	PhD Candidate 2010 - 2014
Mohammad Al-drees	PhD Candidate 2012 - 2016
Badwi Bob Boumelhem	PhD Candidate 2012 - present
Kurt Brigden	PhD Candidate 2012 - present
Jia Hao Yeo	PhD Candidate 2013 - present
Chanukya Colonne	PhD Candidate 2011 - present (part-time)
Chelsea Pilgrim	Honours Student 2015
Henry Williams	Honours Student 2015
Austin Ko	Honours Student 2013
Jia Hao Yeo	Honours Student 2013

PUBLICATIONS

(2013 - 2015)

Fraser, S., Midwinter, R., Coupland, L., Kong, S., Berger, B., Yeo, J., Andrade, O., Cromer, D., Suarna, C., Lam, M., Maghzal, G., Stocker, R., et al (2015). Heme oxygenase-1 deficiency alters erythroblastic island formation, steady-state erythropoiesis and red blood cell lifespan in mice. Haematologica, 100(5), 601-610.

Morin-Adeline, V., Fraser, S., Stack, C., Slapeta, J. (2015). Host origin determines pH tolerance of Tritrichomonas foetus isolates from the feline gastrointestinal and bovine urogenital tracts. Experimental Parasitology, 157, 68-77.

Green, C., Fraser, S., Day, M. (2015). Insulin-like growth factor 1 increases apical fibronectin in blastocysts to increase blastocyst attachment to endometrial epithelial cells in vitro. Human Reproduction, 30(2), 284-298.

Al-Drees, M., Yeo, J., Boumelhem, B., Antas, V., Brigden, K., Colonne, C., Fraser, S. (2015). Making Blood: The Haematopoietic Niche throughout Ontogeny. Stem Cells International, 2015, 1-14.

Kaur, A., Brigden, K., Cashman, T., Fraser, S., New, E. (2015). Mitochondrially targeted redox probe reveals the variations in oxidative capacity of the haematopoietic cells. Organic and Biomolecular Chemistry, 13(24), 6686-6689.

Zhang, H., Nieves, J., Fraser, S., Isern, J., Douvaras, P., Papatsenko, D., D'Souza, S., Lemischka, I., Dyer, M., Baron, M. (2014). Expression of Podocalyxin Separates the Hematopoietic and Vascular Potentials of Mouse Embryonic Stem Cell-Derived Mesoderm. Stem Cells, 32(1), 191-203.

Antas, V., Brigden, K., Prudence, A., Fraser, S. (2014). Gastrokine-2 is transiently expressed in the endodermal and endothelial cells of the maturing mouse yolk sac. Gene Expression Patterns, 16(2), 69-74.

Acosta, J., Goldsbury, C., Winnick, C., Badrock, A., Fraser, S., Laird, A., Hall, T., Don, E., Fifita, J., Blair, I., Nicholson, G., Cole, N. (2014). Mutant Human FUS Is Ubiquitously Mislocalized and Generates Persistent Stress Granules in Primary Cultured Transgenic Zebrafish Cells. PloS One, 9(6), 1-9.

Vacaru, A., Isern, J., Fraser, S., Baron, M. (2013). Analysis of Primitive Erythroid Cell Proliferation and Enucleation Using a Cyan Fluorescent Reporter in Transgenic Mice. Genesis, 51(11), 751-762.

Funnell, A., Mak, K., Twine, N., Pelka, G., Norton, L., Radziewic, T., Power, M., Wilkins, M., Bell-Anderson, K., Fraser, S., Tam, P., et al (2013). Generation of mice deficient in both KLF3/BKLF and KLF8 reveals a genetic interaction and a role for these factors in embryonic globin gene silencing. Molecular and Cellular Biology, 33(15), 2976-2987.

Antas, V., Al-Drees, M., Prudence, A., Sugiyama, D., Fraser, S. (2013). Hemogenic Endothelium: A Vessel For Blood Production. The International Journal of Biochemistry and Cell Biology, 45(3), 692-695.

Guiu, J., Shimizu, R., D'Altri, T., Fraser, S., Hatakeyama, J., Bresnick, E., Kageyama, R., Dzierzak, E., Yamamoto, M., Espinosa, L., et al (2013). Hes repressors are essential regulators of hematopoietic stem cell development downstream of Notch signaling. The Journal of Experimental Medicine, 210(1), 71-84.

Sanchez-Perez, A., Brown, G., Malik, R., Assinder, S., Cantlon, K., Gotsis, C., Dunbar, S., Fraser, S. (2013). Rapid detection of haemotropic mycoplasma infection of feline erythrocytes using a novel flow cytometric approach. Parasites and Vectors, 6(1), 1-7.

Wee, N., Weinstein, D., Fraser, S., Assinder, S. (2013). The mammalian copper transporters CTR1 and CTR2 and their roles in development and disease. The International Journal of Biochemistry and Cell Biology, 45(5), 960-963.

Fraser, S. (2013). The Modern Primitives: Applying New Technological Approaches to Explore the Biology of the Earliest Red Blood Cells. ISRN Hematology, 2013, 1-21.

POSTGRADUATE AND HONOURS COMPLETIONS
(2013 - 2015)

PhD

2014 - Veronica Antas

BMedSc(Hons)

2013 - Austin Ko

2015 - Chelsea Pilgrim

2015 - Henry Williams

BSc(Hons)

2013 - Jia Hao Yeo

SPECIAL AWARDS & PRIZES
(2013 - 2015)

- 2013 - Jia Hao Yeo - Bogdan Dreher Prize
- 2014 - Jia Hao Yeo - Macintosh Scholarship
- 2015 - Henry Williams - Colin Dunlop Award

EXTERNAL FUNDING TO LABORATORY
(2013 - 2015)

Source	Project Title	Collaborators	Awarded	Duration	Amount
National Breast Cancer Foundation/ Novel Concept Awards	Chemotherapy transporters in breast cancer	Fraser S Assinder S	2014	2 years	$200,000
Feline Health Research Fund (FHRF)/ Research Support	A novel system for monitoring haemotrophic infection of feline erythrocytes; A novel system for diagnosing and monitoring haemotropic mycoplasma infection in cats	Fraser S Sanchez-Perez, A Malik R	2012	1 year	$5,500
Japan Society for the Promotion of Science-Joint Research Bilateral Program	Identification of target molecules for myelodysplastic syndromes (MDS) and its functional analysis	Fraser S, Inoue T (Kyushu Uni)	2014	2 years	$50,000
University of Sydney NHMRC Equipment Grant 2014	EVOS FL2 Auto Live Cell Imaging System	Mason RS, Fraser ST, Hambley T, Lovicu F, Cook DI	2014		$89,000
National Breast Cancer Foundation/ Conference Support Award	Cells and Development Meeting 2016	Fraser S	2015		$2,200

DERMATOLOGY RESEARCH LABORATORY

GARY HALLIDAY

PROFESSOR OF DERMATOLOGY, MEDICINE

LAB OVERVIEW

Prof Halliday works towards understanding the role of sunlight in skin carcinogenesis; particularly ultraviolet radiation suppression of immunity, induction of gene mutations, skin cancer cell biology and development of effective prevention. His research has largely been done in humans with the goal of being directly clinically relevant. His unit conducts both human and animal experimentation in parallel, so that animal experimentation can rapidly be translated to human studies. His research group is part of the Sydney Cancer Centre, the Bosch Institute, the department of Dermatology of Royal Prince Alfred Hospital, Sydney Catalyst Translational Research Centre, and the Central Clinical School of the University of Sydney.

RESEARCH ACTIVITIES

He has established one of the top photocarcinogenesis laboratories in the world because of access to both humans and animals for experimentation, and because of the experimental equipment established in his laboratories and the ability to translate laboratory research into clinical trials. Areas of current research include clinical trials into skin cancer prevention and treatment, and animal and human experimentation into effects of ultraviolet radiation on immune system, genetic mutations and cell biology.

LABORATORY PERSONNEL/ STUDENTS

Gary Halliday	Professor of Dermatology Permanent
Diona Damian	Professor of Dermatology Permanent
Guy Lyons	Associate Professor Hospital Scientist Permanent
Dr Jerry Wei	NHMRC research scientist 2012 - 2013
Dr Vanisri Raviraj	Research Fellow 2011 - current
Christa Boehm	Project Coordinator 2011 - 2015
Nicole Bryce	Research Fellow 2013 - 2014
Naomi Delic	PhD student 2013 - current
Andrew Farrell	PhD student 2011 - current
Andrew Chen	PhD student 2012 - current
Felix Marsh-Wakefield	PhD student 2013 - current
Rashi Minocha	M Phil student 2015 - current
Paul Sou	PhD student 2009 - 2015
Lai Kok	PhD student 2012 - 2015
Ben Thompson	M Phil student 2014 - 2015
Devita Surjana	PhD student 2010 - 2013
Seri Narti Edayu Sarchio	PhD student 2010 - 2014

POSTGRADUATE AND HONOURS COMPLETIONS (2013 - 2015)

PhD

2015 - Paul Sou

2015 - Lai Kok

2015 - Eric Song

2014 - Seri Sarchio

2013 - Devita Surjana

M Phil

2015 - Ben Thompson

PUBLICATIONS
(2013 - 2015)

Chen, A., Martin, A., Choy, B., Fernandez Penas, P., Dalziell, R., McKenzie, C., Scolyer, R., Dhillon, H., Vardy, J., Kricker, A., St George, G., Chinniah, N., Halliday, G., Damian, D. (2015). A Phase 3 Randomized Trial of Nicotinamide for Skin-Cancer Chemoprevention. New England Journal of Medicine, 373(17), 1618-1626.

Tongkao-on, W., Carter, S., Reeve, V., Dixon, K., Gordon-Thomson, C., Halliday, G., Tuckey, R., Mason, R. (2015). CYP11A1 in skin: An alternative route to photoprotection by vitamin D compounds. Journal of Steroid Biochemistry and Molecular Biology, 148, 72-78.

Thompson, B., Halliday, G., Damian, D. (2015). Nicotinamide enhances repair of arsenic and ultraviolet radiation-induced DNA damage in HaCaT keratinocytes and ex vivo human skin. PloS One, 10(2), 1-13.

Kim, B., Halliday, G., Damian, D. (2015). Oral Nicotinamide and Actinic Keratosis: A Supplement Success Story. In H. Peter Soyer, Tarl W. Prow, Gregor B.E. Jemec (Eds.), Actinic Keratosis, (pp. 143-149). Basel: S. Karger AG.

Wei, J., Kok, L., Byrne, S., Halliday, G. (2015). Photodamage: all signs lead to actinic keratosis and early squamous cell carcinoma. Current Problems in Dermatology, 46, 14-19.

Byrne, S., Hammond, K., Chan, C., Rogers, L., Beaugie, C., Rana, S., Marsh-Wakefield, F., Thurman, J., Halliday, G. (2015). The alternative complement component factor B regulates UV-induced oedema, systemic suppression of contact and delayed hypersensitivity, and mast cell infiltration into the skin. Photochemical & Photobiological Sciences, 14(4), 801-806.

Di Girolamo, N., Bobba, S., Raviraj, V., Delic, N., Slapetova, I., Nicovich, P., Halliday, G., Wakefield, D., Whan, R., Lyons, G. (2015). Tracing the fate of limbal epithelial progenitor cells in the murine cornea. Stem Cells, 33(1), 57-69.

Halliday, G., Byrne, S. (2014). An Unexpected Role: UVA-Induced Release of Nitric Oxide from Skin May Have Unexpected Health Benefits. Journal of Investigative Dermatology, 134(7), 1791-1794.

Hassan, N., Painter, N., Howlett, C., Farrell, A., Di Girolamo, N., Lyons, G., Halliday, G. (2014). Brm Inhibits the Proliferative Response of Keratinocytes and Corneal Epithelial Cells to Ultraviolet Radiation-Induced Damage. PloS One, 9(9), 1-13.

Thompson, B.C., Surjana, D., Halliday, G.M. and Damian, D.L. (2014). Nicotinamide enhances repair of ultraviolet radiation-induced DNA damage in primary melanocytes. Experimental Dermatology 23(7): 509-511.

Sarchio, S.N.E., Scolyer, R.A., Beaugie, C., McDonald, D., Marsh-Wakefield, F., Halliday, G.M. and Byrne, S.N. (2014). Pharmacologically antagonizing the CXCR4-CXCL12 chemokine pathway with AMD3100 inhibits sunlight-induced skin cancer. Journal of Investigative Dermatology 134(4): 1091-1100.

Halliday, G., Damian, D., Surjana, D. (2014). Nicotinamide enhances repair of ultraviolet radiation-induced DNA damage in primary melanocytes. Experimental Dermatology, 23(7), 509-511.

Chen, A., Damian, D., Halliday, G. (2014). Oral and systemic photoprotection. Photodermatology, Photoimmunology & Photomedicine, 30(2-3), 102-111.

McCarthy, B., Dixon, K., Halliday, G., Reeve, V., Mason, R. (2014). The Vitamin D Saga: Breaking Dawn. Immunology, Endocrine and Metabolic Agents in Medicinal Chemistry, 14(3), 137-151.

Song, E., Gordon-Thomson, C., Cole, L., Stern, H., Halliday, G., Damian, D., Reeve, V., Mason, R. (2013). 1alpha,25-Dihydroxyvitamin D3 reduces several types of UV-induced DNA damage and contributes to photoprotection. Journal of Steroid Biochemistry and Molecular Biology, 136(1), 131-138.

Leighton, S., Kok, L., Halliday, G., Byrne, S. (2013). Inhibition of UV-induced uric acid production using Allopurinol prevents suppression of the contact hypersensitivity response. Experimental Dermatology, 22(3), 189-194.

Surjana, D., Halliday, G., Damian, D. (2013). Nicotinamide enhances repair of ultraviolet radiation-induced DNA damage in human keratinocytes and ex vivo skin. Carcinogenesis, 34(5), 1144-1149.

Chen, A., Halliday, G., Damian, D. (2013). Non-melanoma skin cancer: carcinogenesis and chemoprevention. Pathology, 45(3), 331-341.

Halliday, G.M., Byrne, S.N., Lyons, J.G. and Damian, D.L. (2013). Photocarcinogenesis nonmelanoma skin cancer. In “Handbook of Photomedicine”. Editors Michael R. Hamblin and Ying-Ying Huang. CRC Press, Taylor and Francis Group, Boca Raton Cat#: K13978. Chapter 7 pp 69-79.

Sequeira, V., Rybchyn, M., Gordon-Thomson, C., Tongkao-on, W., Mizwicki, M., Norman, A., Reeve, V., Halliday, G., Mason, R. (2013). Opening of Chloride Channels by 1a, 24-dihyroxyvitamin D3 Contributes to Photoprotection against UVR-induced Thymine Dimers in Keratinocytes. Journal of Investigative Dermatology, 133(3), 776-782.

Sarchio, S., Scolyer, R., Beaugie, C., McDonald, D., Marsh-Wakefield, F., Halliday, G., Byrne, S. (2013). Pharmacologically antagonizing the CXCR4-CXCL12 chemokine pathway with AMD3100 inhibits sunlight-induced skin cancer. Journal of Investigative Dermatology, 134(4), 1091-1100.

Cho, E., Moloney, F., Cai, H., Au-Yeung, A., China, C., Scolyer, R., Yosuβ?, B., Raftery, M., Deng, J., Morton, S., Damian, D., Barnetson, R., Halliday, G., et al (2013). Safety and tolerability of an intratumorally injected DNAzyme, Dz13, in patients with nodular basal-cell carcinoma: a phase 1 first-in-human trial (DISCOVER). The Lancet, 381(9880), 1835-1843.

EXTERNAL FUNDING TO LABORATORY
(2013 - 2015)

Source	Project Title	Collaborators	Awarded	Duration	Amount
College of Dermato logists scientifis Research Fund	Clonal evolution during UV-induced squamous cell carcinogenesis	Lyons, J.G., Halliday, G.M. and Delic, N.	2015	1 year	$25,000
Cancer Council NSW	Skin cancer prevention and treatment by targeting sunlight-activated regulatory B cells	S. Byrne, G.M. Halliday and D. Damian.	2014	3 years	$360,000
National Health and Medi-cal Re-search Council	Is CYP11A1 critical for the vitamin D photoprotective system in skin?	R. Mason, G.M. Halliday, R. Tuckey, K. Dixon, and V.E. Reeve.	2014	3 years	$500,745
Multiple Sclerosis Research Australia	Targeting CNS-Autoimmunity with Sunlight-Activated Immune Regulatory Cells.	S.N. Byrne, G.M. Halliday, M.A. Grimbaldeston.	2013	3 years	$300,000
National Health and Medi-cal Re-search Council	Interactions between genes that cause cancer	J.G. Lyons, N. Saunders and G.M. Halliday	2012	3 years	$536,010
National Health and Medi-cal Re-search Council	Skin cancer prevention by oral nicotinamide	D.L. Damian, G. M. Halliday, A. Martin and P. Fernandez- Peñas.	2012	3 years	$586,691
National Health and Medical Research Council	Susceptibility of the basal layer of human epidermis to UVA oxidative damage due to pheomelanin and suboptimal DNA repair	G.M. Halliday and J.G. Lyons	2011	3 years	$540,048
Cancer Institute NSW Translational Program Grant.	Novel molecular therapeutic strategies targeting c-Jun for cutaneous melanoma	L. Khachigian, G.M Halliday and Catriona McNeil	2011	5 years	$3,750,000

LIPID METABOLISM LABORATORY

ANDREW HOY

SENIOR RESEARCH FELLOW, PHYSIOLOGY

LAB OVERVIEW

The Laboratory investigates the role that metabolism plays in diseases such as type 2 diabetes, obesity and cancer.

Lipid metabolism and insulin resistance: The accumulation of lipid in tissue responsible for regulating blood glucose levels, including skeletal muscle and liver, can lead to insulin resistance. The vast majority of fatty acids are stored in the lipid droplet as triacylglycerols. Hence, the lipid droplet is at the centre of intracellular lipid homeostasis. However, triacylglycerols are not mechanistically linked to the development of insulin resistance. Other lipid species that can arise from lipid processes that occur at the lipid droplet have been implicated. Our research in the review period continued in aiming to understand the role of the metabolic processes that occur at the lipid droplet that are altered with insulin resistance.

Lipid metabolism and cancer: Metabolic diseases such as obesity and insulin resistance are risk factors for some cancers. Cancer is characterized by a substantial shift in the metabolic phenotype, primarily towards non-oxidative metabolism and increased lipid synthesis. That said, the role of fatty acid metabolism in the sustained growth of cancer cells has yet to be fully elucidated.

RESEARCH ACTIVITIES

Our research has attempted to characterize the fatty acid metabolism of cancer cells and its potential as a therapeutic target.

LABORATORY PERSONNEL/ STUDENTS

Dr Andrew Hoy	Senior Research Fellow 2012 - present
Elham Hosseini-Beheshti	Postdoctoral Associate 2015 - present
Seher Balaban	PhD student 2012 - present
Quanqing (Helen) Gao	PhD student; ; in collaboration with Prof Dai Hibbs and A/Prof Thomas Grewal (Faculty of Pharmacy) 2012 - present
Holly Johnson	PhD student 2011 - present in collaboration with Dr Kim Bell-Anderson (Faculty of Science) 2015 - present
Harrison Shtein	MPhil student 2013 - present
Tim Nguyen	MPhil student 2013 - present
Sundeep Joshua Wason	MSc student; in collaboration with A/Prof Thomas Grewal (Faculty of Pharmacy) 2014
Shilpa Nagarajan	PhD student 2015 - present
Lisa Lee	Hons student 2014

PUBLICATIONS

(2013 - 2015)

Meex, R., Hoy, A., Mason, R., Martin, S., McGee, S., Bruce, C., Watt, M. (2015). ATGL-mediated triglyceride turnover and the regulation of mitochondrial capacity in skeletal muscle. American Journal of Physiology: Endocrinology and Metabolism (online), 308(11), E960-E970.

Meex, R., Hoy, A., Morris, A., brown, R., Lo, J., Burke, M., Goode, R., Kingwell, B., Kraakman, M., Febbraio, M., et al (2015). Fetuin B Is a Secreted Hepatocyte Factor Linking Steatosis to Impaired Glucose Metabolism. Cell Metabolism, 22(6), 1078-1089.

Gao, Q., Hanh, J., Varadi, L., Cairns, R., Sjoestroem, H., Liao, V., Wood, P., Balaban, S., Ong, J., Lin, H., Lai, F., Hoy, A., Grewal, T., Groundwater, P., Hibbs, D. (2015). Identification of dual PPARβ/β agonists and their effects on lipid metabolism. Bioorganic and Medicinal Chemistry, 23(24), 7676-7684.

Balaban, S., Lee, L., Schreuder, M., Hoy, A. (2015). Obesity and cancer progression: Is there a role of fatty acid metabolism? BioMed Research International, 2015, 1-7.

Wang, K., Hardie, R., Hoy, A., van Geldermalsen, M., Gao, D., Fazli, L., Sadowski, M., Balaban, S., Schreuder, M., Nagarajah, R., Wong, J., Metierre, C., Pinello, N., Otte, N., Bailey, C., Ritchie, W., Rasko, J., Holst, J., et al (2015). Targeting ASCT2-Mediated Glutamine Uptake Blocks Prostate Cancer Growth and Tumour Development. Journal of Pathology, 236(3), 278-289.

Kamili, A., Roslan, N., Frost, S., Cantrill, L., Wang, D., Austin, D., Bright, R., Groblewski, G., Straub, B., Hoy, A., Chen, Y., Byrne, J. (2015). TPD52 expression increases neutral lipid storage within cultured cells. Journal of Cell Science, 128(17), 3223-3238.

Briggs, D., Lockie, S., Benzler, J., Wu, Q., Stark, R., Reichenbach, A., Hoy, A., Lemus, M., Coleman, H., Parkington, H., et al (2014). Evidence That Diet-Induced Hyperleptinemia, but Not Hypothalamic Gliosis, Causes Ghrelin Resistance in NPY/AgRP Neurons of Male Mice. Endocrinology, 155(7), 2411-2422.

Abboud, M., Gordon-Thomson, C., Hoy, A., Balaban, S., Rybchyn, M., Cole, L., Su, Y., Speranza, T., Fraser, D., Mason, R. (2014). Uptake of 25-Hydroxyvitamin D by muscle and fat cells. Journal of Steroid Biochemistry and Molecular Biology, 144(Part A), 232-236.

Peoples, G., Hoy, A., Henry, R., McLennan, P. (2013). Autologous pump-perfused rat hind limb preparation for investigating muscle function and metabolism in vivo. Microcirculation, 20(6), 511-523.

Kim, M., Lee, K., Iseli, T., Hoy, A., George, J., Grewal, T., Roufogalis, B. (2013). Compound K modulates fatty acid-induced lipid droplet formation and expression of proteins involved in lipid metabolism in hepatocytes. Liver International, 33(10), 1583-1593.

Bell-Anderson, K., Funnell, A., Williams, H., Jusoh, H., Scully, T., Lim, W., Burdach, J., Mak, K., Knights, A., Hoy, A., Nicholas, H., Salis (nee Sainsbury), A., et al (2013). Loss of Kruppel-Like Factor 3 (KLF3/BKLF) Leads to Upregulation of the Insulin-Sensitizing Factor Adipolin (FAM132A/CTRP12/C1qdc2). Diabetes, 62(8), 2728-2737.

Boon J, Hoy AJ, Stark R, Brown RD, Meex RC, Henstridge DC, Newsome SA, Meikle PJ, Horowitz JF, Kingwell BA, Bruce CR, Watt MJ. Plasma ceramides are elevated in type 2 diabetes and promote skeletal muscle insulin resistance. Diabetes. 2013 Feb;62(2):401-10.

EXTERNAL FUNDING TO LABORATORY

(2013 - 2015)

Source	Project Title	Collaborators	Awarded	Duration	Amount
Sydney Medical School New Staff/ Early Career Researcher Scheme	Understanding the Link between Obesity and Breast Cancer	Hoy AJ	2013	1 Year	$25,000
Univ of Sydney Bridging Support Grant	Linking breast cancer progression to mammary gland lipid metabolism	Hoy AJ	2014	1 Year	$30,000
Univ of Sydney HMR+ Implement ation	Nutrient transporters: elucidating and targeting their function in cancer	Holst J James DE Rasko J Vandenberg R Ryan R Jormakka M Horvath L Hibbs D Cordwell S Hoy AJ	2015	1 Year	$130,000*
Univ of Sydney Faculty of Pharmacy Seed Funding Challenge	Assessing anti-obesity and anti-cancer drugs in the link between obesity and breast cancer	Grewal T Hibbs D Hoy AJ	2015	1 Year	$25,000
Movember Revolutionary Team Award	Exploiting alterations in lipid metabolism to improve diagnosis, treatment and molecular imaging of prostate cancer	Butler LM Tilley WD Scott AM Hoy AJ Wittert GA Swinnen JV	2015	3 Years	$500,000*

* ~$200,000 P.A TO THE HOY LAB

POSTGRADUATE AND HONOURS COMPLETIONS
(2013 - 2015)

BMedSc(Hons)

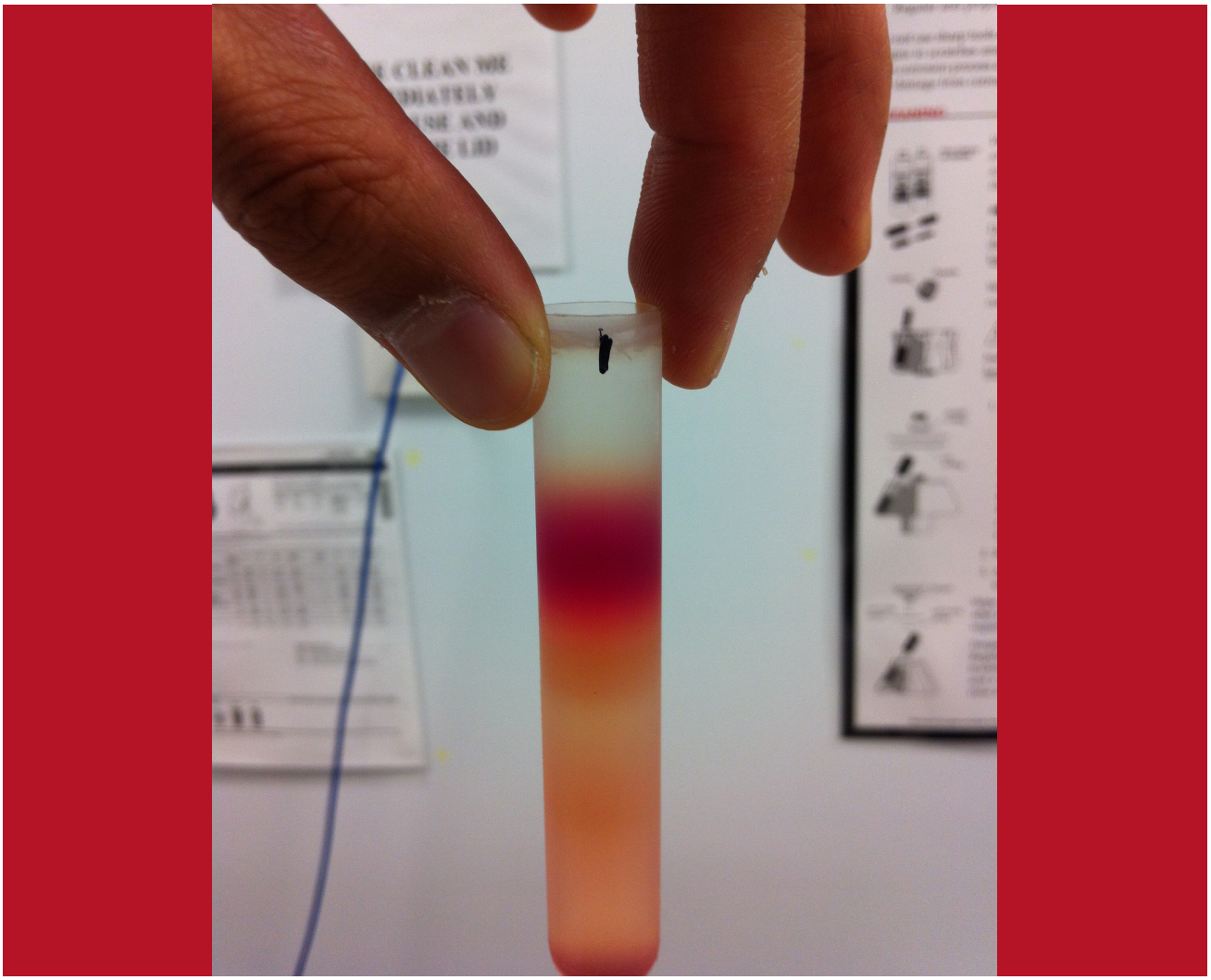
2014 - Lisa Lee

SPECIAL AWARDS & PRIZES
(2013 - 2015)

Scholarships and Fellowships Awarded

2014 - Dr Andrew Hoy - University of Sydney Bridging Support Fellowship

2015 - Dr Andrew Hoy - Sydney Medical School Helen and Robert Ellis Postdoctoral Research Fellowship



Liver tissue that has undergone ultracentrifugation to separate different organelles, using a sucrose gradient

LENS RESEARCH LABORATORY

FRANK LOVICU

PROFESSOR, ANATOMY & HISTOLOGY

LAB OVERVIEW

The work of the Lens Research Laboratory is primarily directed at identifying the molecules and mechanisms that govern the behaviour of cells of the ocular lens, in health, ageing and disease.

RESEARCH ACTIVITIES

Our studies have identified a number of molecules that play key roles in both normal and pathological lens development and growth. Using a range of in vitro and in vivo models, we are working to gain a better understanding of how these molecules are regulated in the eye. This is fundamental to identifying new therapeutics for retarding or preventing cataract, one of the most common and costly diseases of ageing.

LABORATORY PERSONNEL/ STUDENTS

Frank J. Lovicu	Professor Head
Dr Emma Collinson	Research Fellow 2012 - present
Jessica Boros	Research Assistant 2002 - present
Florence Cheung	PhDstudent, 2011 - 2014
Guannan Zhao	PhD student, 2011 - present
Souad Amed	MPhil student 2012 - present
Magda Wojciechowski	PhD student 2013 - present
Ana Cham	Graduate Diploma 2013
Tammy So	Honours student 2013
Fatima Wazin	Honours Student 2013
Austin Ko	Honours Student 2013
Jeremiah Matson	Exchange Student 2013
Tammy So	PhD Student 2014 - present
Fatima Wazin	PhD Student 2014 - present
Shannon Das	Honours Student 2014
Daisy Shu	PhD Student 2015 - present
Shannon Das	PhD Student 2015 - present
Dr Nasr Alrabadi	PhD Student 2015
Vanya Rufus	Honours Student 2015

PUBLICATIONS
(2013 - 2015)

Assinder, S., Beniamen, D., Lovicu, F. (2015). Cosuppression of Sprouty and Sprouty-Related Negative Regulators of FGF Signalling in Prostate Cancer: A Working Hypothesis. BioMed Research International, 2015, 1-10.

Zhao, G., Wojciechowski, M., Jee, S., Boros, J., McAvoy, J., Lovicu, F. (2015). Negative regulation of TGF-induced lens epithelial to mesenchymal transition (EMT) by RTK antagonists. Experimental Eye Research, 132, 9-16.

Shin, E., Zhao, G., Wang, K., Lovicu, F. (2015). Sprouty gain of function disrupts lens cellular processes and growth by restricting RTK signaling. Developmental Biology, 406(2), 129-146.

Dawes, L., Sugiyama, Y., Lovicu, F., Harris, C., Shelley, E., McAvoy, J. (2014). Interactions between lens epithelial and fiber cells reveal an intrinsic self-assembly mechanism. Developmental Biology, 385(2), 291-303.

Lovicu, F., Iyengar, L., Dawes, L., McAvoy, J. (2014). Lens Epithelial Cell Proliferation. In Shizuya Saika, Liliana Werner, Frank J. Lovicu (Eds.), Lens Epithelium and Posterior Capsular Opacification, (pp. 59-80). Tokyo, Japan: Springer.

Saika, S., Werner, L., Lovicu, F. (2014). Lens Epithelium and Posterior Capsular Opacification. Tokyo, Japan: Springer.

Wang, C., Dawes, L., Liu, Y., Wen, L., Lovicu, F., McAvoy, J. (2013). Dexamethasone influences fgf-induced responses in lens epithelial explants and promotes the posterior capsule coverage that is a feature of glucocorticoid-induced cataract. Experimental Eye Research, 111, 79-87.

Sugiyama, Y., Shelley, E., Wen, L., Stump, R., Shimono, A., Lovicu, F., McAvoy, J. (2013). Sfrp1 and Sfrp2 are not involved in Wnt/β-catenin signal silencing during lens induction but are required for maintenance of Wnt/catenin signaling in lens epithelial cells. Developmental Biology, 384(2), 181-193.

Dawes, L., Sugiyama, Y., Tanedo, A., Lovicu, F., McAvoy, J. (2013). Wnt-Frizzled signaling is part of an FGF-induced cascade that promotes lens fiber differentiation. Investigative Ophthalmology and Visual Science, 54(3), 1582-1590.

SERVICE TO THE UNIVERSITY AND COMMUNITY
(2013 - 2015)

Editor: Molecular Vision, 2014 -

Editor: Dataset Papaers in Medicine, 2012 -

Vice President (Asia-Pacific). International Society for Eye Research (ISER). 2015 -

Membership Committee Member. ISER: Pacific Rim (2009-2013)

Scientific Advisory Committee: Rebecca L. Cooper Foundation. 2015 -

Chair of the Paul Kayser International Award in Retina Research Prize Committee, 2015

International Advisory Committee Member for Asia-ARVO, Yokohama, Japan, 2015

Program Committee of "International Conference On the Lens". Kona, Hawaii (Jan, 2014). The Asian Cataract Research Group and The National Foundation for Eye Research.

Program Committee for the International Association for Research in Vision and Ophthalmology (ARVO). 2012-2015

Chair of Program Committee (Lens), ARVO. 2015

Coordinator Bosch Young Investigator Programs 2010 -

POSTGRADUATE AND HONOURS COMPLETIONS
(2013 - 2015)

PhD

2014 - Florence Cheung

BMedSc(Hons)

2014 - Fatima Watzin

BMedSc(Hons)

2014 - Tammy So

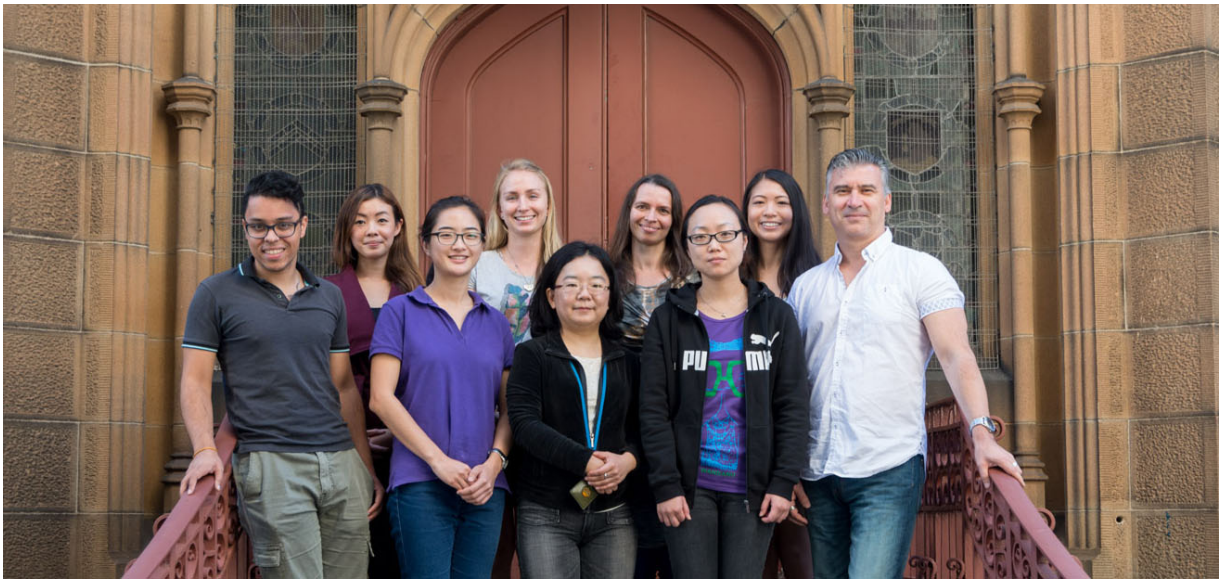
2014 - Austin Ko

SPECIAL AWARDS & PRIZES
(2013 - 2015)

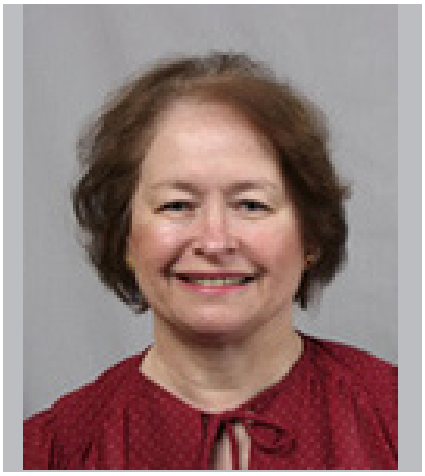
- Scholarship - Magda Wojciechowski
- Scholarship - Tammy So
- Scholarship - Fatima Wazin
- Scholarship - Daisy Shu
- Scholarship - Shannon Das
- Poster Prize (Int Meet,ARVO) - Fatima Wazin

EXTERNAL FUNDING TO LABORATORY
(2013 - 2015)

Source	Project Title	Collaborators	Awarded	Duration	Amount
NHMRC	Preventing blindness: Blocking TGFß-induced EMT and Cataract	Prof John McAvoy	2012	3 years	$332,175
NHMRC	Cilia and PCP in lens regeneration	Prof John McAvoy	2011	3 years	$399,462
ORIA	A Role for Planar Cell Polarity in lens regeneration	Prof John McAvoy, Dr Yuki Sugiyama	2015	1 year	$48,000
ORIA	Lens regeneration after cataract surgery'	Prof John McAvoy	2013	1 year	$48,000
Rebecca L. Cooper Foundation	Prevention of TGFß-induced cataract	-	2015	1 year	$18,549
NWG Macintosh Memorial Fund	Blocking TGFß-induced oxidative stress to prevent cataract	Dr Emma Collinson, Shannon Das	2014	1 year	$13,208
NIH/NEI	Studies on lens differentiation: a role for Wnt-Fz/PCP signaling	Prof John McAvoy	2012	4 years	$815,000



Left to right as follows:
Shannon Das, Tammy So, Daisy Shu, Magda Wojciechowski, Yuki Sugiyama, Lucy Dawes, Guannan Zhao, Alyssa Susanto, Frank Lovicu. Absent: Fatima Wazin



BONE & SKIN LABORATORY

REBECCA MASON

PROFESSOR OF ENDOCRINE, HEAD, PHYSIOLOGY

DEPUTY DIRECTOR, BOSCH INSTITUTE

LAB OVERVIEW

This Laboratory has two major areas of interest –

- Vitamin D physiology generally with a particular focus on protection from UV irradiation by vitamin D compounds;
- How muscle contributes to the maintenance of vitamin D status; and the physiology of bone remodelling, as it pertains to the prevention and treatment of osteoporosis.

RESEARCH ACTIVITIES

In 2013 - 2015 we studied how strontium, a new agent for the prevention of osteoporotic fractures, actually affects bone cells. This work, in collaboration with Prof Arthur Conigrave, showed that strontium affects bone cell function by mimicking the activities of the natural ion, calcium, to which strontium is related on the periodic table, though strontium is more potent in bone cells than in other tissues, and we identified some new pathways of action. Calcium has similar effects on bone cells to strontium and studies of agents that might target the calcium sensing receptor in bone cells as possible therapeutic agents for

In work carried out with Prof David Fraser, evidence was obtained for specific uptake and release mechanisms in muscle for the major circulating vitamin D metabolite. This mechanism may explain why the half-life of the major circulating metabolite of vitamin D, 25-hydroxyvitamin D is much longer than any other steroid and much longer than that of its binding protein in blood. Further studies on the mechanism of action of vitamin D compounds in photoprotection, carried out in collaboration with Prof Gary Halliday, Prof Diona Damian, Assoc Prof Vivienne Reeve and Dr Katie Dixon showed that these compounds protect skin cells in humans and mice from UV-induced DNA and other damage, including induced skin cancers, through a novel pathway. Work in our group showed that vitamin D-like compounds, which have less capacity to cause hypercalcaemia and are cheaper and more stable than the vitamin D hormone, also provide protection from the adverse effects of UV, including protection from DNA damage and UV-induced immunosuppression.

LABORATORY PERSONNEL/ STUDENTS

Rebecca S Mason	Professor 1988 - present
Mark Rybchyn	Research Fellow 2005 - present
Tara Brennan-Speranza	Research Fellow 2013 - 2015
Wannit Tongkao-On	PhD student 2010 - 2015 (p/t since 2014)
Myriam Abboud	PhD student 2012 - 2015
Eric Song	MMed student (p/t) 2010 - 2014
Sally Carter	MPhil student 2012 - 2014 (p/t since 2013)
Kevin Lee	MPhil student 2013 - 2015 (p/t since 2014)
Bianca McCarthyi	PhD student 2014 - present
Manori De Silva	PhD student 2015 - present
Ashley Yang	PhD student Jul 2015 - present
Jeremy Han	BSc(Hons) student 2015

PUBLICATIONS
(2013 - 2015)

Abboud MA, Gordon-Thomson C, Hoy AJ, Balaban S, Rybchyn MS, Cole L, Su Y, Brennan-Speranza TC, Fraser DR, Mason RS. Uptake of 25-hydroxyvitamin D by muscle and fat cells. J Steroid Biochem Mol Biol 2014; 144:232-236.

Ke L, Ho J, Feng J, Mpofu E, Dibley MJ, Feng X, Van F, Leong S, Lau W, Lueng P, Kowk C, Li Y, Mason RS, Brock KE. Modifiable risk factors including sunlight exposure and fish consumption are associated with risk of hypertension in a large representative population from Macau. J Steroid Biochem Mol Biol 2014; 144: 152-155.

Sun J, Lucas RL, Harrison SL, van der Mei I, Whiteman DC, Mason RS, Nowak M, Brodie AM, Kimlin MG. Measuring exposure to solar ultraviolet radiation using a dosimetric technique: Understanding participant compliance. Photochem Photobiol 2014; 90: 919–924.

Girgis CM, Mokbel N, Cha KM, Houweling PJ, Abboud M, Fraser DR, Mason RS, Clifton-Bligh RJ,
Gunton JE. The vitamin D rReceptor (VDR) is expressed in skeletal muscle of male mice and modulates 25-hydroxyvitamin D (25OHD) uptake in myofibers. Endocrinology 2014; 155: 3227–3237.

Saw RPM, Armstrong, BA, Mason RS, Morton RL, Shannon KF, Spillane AJ, Stretch JR, Thompson JF. Adjuvant therapy with high dose vitamin D following primary treatment of melanoma at high risk of recurrence: A placebo controlled randomised phase II trial. BMC Cancer 2014, 14: 780.

Mak JC, Klein LK, Finnegan T, Mason RS, Cameron ID. An initial loading-dose vitamin D versus placebo after hip fracture surgery: baseline characteristics of a randomized controlled trial (REVITAHIP). BMC Geriatr 2014; 14: 101.

Durvasula S, Gies P, Mason RS, Chen JS, Henderson S, Seibel M, Sambrook PN, March LM, Lord SR, Kok C. Vitamin D response of older people in residential aged care to sunlight derived ultraviolet radiation. Arch Osteoporosis 2014; 9: 197.

Gordon-Thomson C, Tongkao-On W, Song EJ, Carter SE, Dixon KM, Mason RS. Protection from UV damage and photocarcinogenesis by vitamin D compounds. Adv Exp Med Biol 2014; 810: 303-328.

Lee WH, Loo CY, Bebawy M, Young PM, Traini D, Luk F, Mason RS, Rohanizadeh R. Recent advances in curcumin nano-formulation for cancer therapy. Expert Opin Drug Deliv 2014; 11: 1183-1201.

McCarthy BY, Dixon KM, Halliday GM, Reeve VE, Mason RS. The vitamin D saga: Breaking dawn. Immunol Endocr Metab Agents Medicinal Chem 2014; 14: 137-151.

Klein LK, Mak JC, Mason RS, Cameron ID. Contemporary pain management in elderly patients after hip fracture surgery: Cross-sectional analyses at baseline of a randomized controlled trial. Clin J Pain 2015; 31: 788 – 793.

Tongkao-on W, Carter S, Reeve VE, Dixon KM, Gordon-Thomson C, Halliday GM, Tuckey RC, Mason RS. CYP11A1 in skin: An alternative route to photoprotection by vitamin D compounds. J Steroid Biochem Mol Biol 148: 72-78.

Lee WH, Bebawy M, Loo CY, Luk F, Mason RS, Rohanizadeh R. Fabrication of curcumin micellar nanoparticles with enhanced anti-cancer activity. J Biomed Nanotechnol 2015; 11: 1093-1105.

Ke L, Mason RS, Mpofu E, Dibley M, Brock KE. Vitamin D and parathyroid hormone status in a representative population living in Macau, China. J Steroid Biochem Mol Biol 2015; 148: 261-268.

Durvasula S, Mason RS, Kok C, Macara M , Parmenter TR, Cameron ID. Outdoor areas of Australian residential aged care facilities do not facilitate appropriate sun exposure. Aust Health Rev 2015; 39: 406-410.

Ke L, Mason RS, Kariuki M, Mpofu E, Brock KE. Vitamin D status and hypertension: a review. Integrated Blood Press Control 2015; 8: 13-35.

Gordon-Thomson C, Tongkao-On W, Song EJ, Carter SE, Dixon KM, Mason RS. Protection from UV damage and photocarcinogenesis by vitamin D compounds. Biosciences chapter 17. In: Reichrath L (ed). Sunlight, Vitamin D and Skin Cancer, 2nd edition, 2014, pp 303-328.

POSTGRADUATE AND HONOURS COMPLETIONS

(2013- 2015)

PhD

2015 - Wannit Tongkao-On

2015 - Myriam Abboud

MPhil

2014 - Eric Song

2014 - Sally Carter

2015 - Kevin Lee

BSc(Hons)

2015 - Jeremy Han

SPECIAL AWARDS & PRIZES

(2013 - 2015)

- 2014 - Australian Post-graduate Award – Wannit Tongkao-On
- 2014 - Australian Post-graduate Award – Myriam Abboud
- 2014 - SMS Faculty Award – Bianca McCarthy

2015 - SMS Faculty Award – Bianca McCarthy

2015 - APA – Myriam Abboud (till mid-year)

2015 - IPRS – Chen (Ashley) Yang (from mid-year)

OFFICIAL FOR SCIENTIFIC SOCIETIES, INCLUDING FOR NATIONAL AND INTERNATIONAL CONFERENCES

(2013 - 2015)

- Member, finance committee, International Workshops on Vitamin D, 2014–

SELECTED INVITED PRESENTATIONS AT NATIONAL AND INTERNATIONAL CONFERENCES

(2013 - 2015)

- Vitamin D and photoprotection. Australian and New Zealand Bone and Mineral Society, ASM, Melbourne, Sep 2013.
- Extra-skeletal effects of vitamin D. 9th Joint Meeting of Paediatric Endocrinology, Milan, Italy, Sep 2013.
- Vitamin D, what's new. Australian Society for Parenteral and Enteral Nutrition. ASM, Sydney, Nov 2013.
- Mason RS. An update on Vitamin D. Pediatric Endocrinology Group, Rambam Hospital, Technion, Haifa, Israel, Aug 2014
- Mason RS. Photoprotection by vitamin D compounds. Sydney Cancer Conference, Nov 2014.
- Rybchyn MS (Speranza TC, Conigrave AD, Mason RS). The upstream and downstream of CASR-dependent AKT signaling in human osteoblasts. Second Symposium on the Calcium-Sensing Receptor, San Diego, CA, USA, Mar 2015.
- Mason RS. Mechanisms of protection from UV-induced DNA damage by vitamin D compounds. Joint Meeting of the Molecular and Experimental Pathology Society of Australasia, the ANZ Bone and Mineral Society and the Matrix Biology Society of ANZ. Hobart, Tas, Nov 2015.

In newspapers
ABS statistics on vit D deficiency, by Lucy Caroll. Sydney Morning Herald / The Age, 15 April 2014
Vitamin D in winter, by Daniela Hutchens. Daily Telegraph, 7 May 2015

In magazine articles
Vitamin D in winter, by Sarah Marinos. Coles Baby & Toddler Magazine, May 2014
Vitamin D testing, by Katherine Boehringer. Medical Observer, 27 Nov 2014.

Television Interviews
ABS vitamin D statistics. Prime TV, 16 Apr 2014
Vitamin D deficiency. Interviewed by Angela Brown. HeathyMe TV. 14 Nov 2014
Melanoma. Save Your Life tonite, ABC2, 14 Nov 2014
Save your life tonight – Skin. Wild Fury Productions, ABC TV, 21 Dec 2014
Risks and benefits of sun exposure. Interviewed by Gabby Rogers. Channel 9 News , 6 pm, 30 Jul 2015

Radio Interviews

3AW Melb radio	ABS vitamin D statistics		April 16 2014
ABC Central West	ABS vitamin D statistics	Josh Becker	April 16 2014
BBC5 (phone)	ABS vitamin D statistics		April 16 2014
Melb 774	ABS vitamin D statistics	Dave O'Neill	April 22 2014
2UE	Vitamin D in workers	Clinton Maynard	May 7 2015

SERVICE TO GOVERNMENT AND THE PROFESSION

(2013 - 2015)

- Board Member, Osteoporosis, 2002–
- Member, working party, Sun and Health, Cancer Councils of Australia, 2004–
- Member, Technical Committee, Commission Internationale de L'Eclairage (International
- Commission of Illumination) – 6-66 (Maintaining summer levels of 25-hydroxyvitamin D during winter), 2012–

SERVICE TO THE UNIVERSITY AND COMMUNITY

(2013 - 2015)

- Deputy Director, Bosch Institute, 2010–
- Head, Discipline of Physiology, 2002–

EXTERNAL FUNDING TO LABORATORY

(2013 - 2015)

Source	Project Title	Collaborators	Awarded	Duration	Amount
NHMRC	Is CYP11A1 critical for the vitamin D photoprotective system in skin?	Mason RS, Halliday GM, Tuckey R, Dixon KM, Reeve VE	2014	3 years	$514,794
NHMRC	Engendering biased signalling at the human calcium sensing receptor (CaSR) to correct pathophysiology.	Leach K, Conigrave AC, Mason RS	2015	3 years	$644,154
NHMRC	Novel strategies for the treatment of bone disease by nutrient activators of calcium sensing receptors	Mason RS, Conigrave AD	2011	3 years	$451,299
ARC Linkage	Enhancing sunscreen DNA and photo-ageing protection.	Mason RS, Rohanizadeh R, Halliday GM	2010	3.5 years	$472,500 + $175,000 partner

Dr Mark Rybchyn, Bone and Skin Laboratory

CELL SIGNALLING LABORATORY

LENKA MUNOZ

SENIOR LECTURER,
PATHOLOGY

LAB OVERVIEW

Dr Munoz research focuses on understanding the signal transduction mechanisms that cause inflammatory and malignant diseases, and on deriving new approaches to disease treatment.

RESEARCH ACTIVITIES

These include:

- Role of MK2 in glioblastoma chemoresistance.
- Function of DYRK1A in brain cancer.
- Off-kinase targets and novel molecular mechanisms of kinase inhibitors.

POSTGRADUATE AND HONOURS COMPLETIONS

(2013- 2015)

BMedSc(Hons)

- 2014 - Athena Phoa
- 2014 - Ramzi Abbassi

EXTERNAL FUNDING TO LABORATORY

(2013 - 2015)

Source	Project Title	Collaborators	Awarded	Duration	Amount
CDIP/USyd	Novel drugs for brain cancer	Kassiou, Michael	2015	2015-2016	$55,000
NFMRI	Improving chemotherapy	Sole CI	2013	2013- 2016	$390,000

SERVICE TO THE UNIVERSITY AND COMMUNITY

(2013 - 2015)

- Munoz L, Gurgis F, Åkerfeldt M, Kassiou M. Novel anti-cancer compounds. PCT/AU2015/050044

PUBLICATIONS

(2013 - 2015)

Gurgis, F., Akerfeldt, M., Heng, B., Wong, C., Adams, S., Guillemin, G., Johns, T., Chircop, M., Munoz, L. (2015). Cytotoxic activity of the MK2 inhibitor CMPD1 in glioblastoma cells is independent of MK2. Cell Death Discovery, 1, 1-11.

Vinh, N., Devine, S., Munoz, L., Ryan, R., Wang, B., Krum, H., Chalmers, D., Simpson, J., Scammells, P. (2015). Design, Synthesis, and Biological Evaluation of Tetra-Substituted Thiophenes as Inhibitors of p38Î± MAPK. ChemistryOpen, 4(1), 56-64.

Abbassi, R., Johns, T., Kassiou, M., Munoz, L. (2015). DYRK1A in neurodegeneration and cancer: Molecular basis and clinical implications. Pharmacology & Therapeutics, 151, 87-98.

Munoz, L., Kavanagh, M., Phoa, A., Heng, B., Dzamko, N., Chen, E., Doddareddy, M., Guillemin, G., Kassiou, M. (2015). Optimisation of LRRK2 inhibitors and assessment of functional efficacy in cell-based models of neuroinflammation. European Journal of Medicinal Chemistry, 95, 29-34.

Phoa, A., Brown, S., Gurgis, F., Akerfeldt, M., Döbber, A., Renn, C., Peifer, C., Stringer, B., Day, B., Wong, C., Chircop (nee Fabbro), M., Kassiou, M., Munoz, L., et al (2015). Pharmacology of novel small-molecule tubulin inhibitors in glioblastoma cells with enhanced EGFR signalling. Biochemical Pharmacology, 98(4), 587-601.

Gurgis, F., Yeung, Y., Tang, M., Heng, B., Buckland, M., Ammit, A., Haapasalo, J., Haapasalo, H., Guillemin, G., Grewal, T., Munoz, L. (2015). The p38-MK2-HuR pathway potentiates EGFRvIII-IL-1-driven IL-6 secretion in glioblastoma cells. Oncogene, 34(22), 2934-2942.

Gurgis, F., Ziaziaris, W., Munoz, L. (2014). Mitogen-Activated Protein Kinase-Activated Protein Kinase 2 in Neuroinflammation, Heat Shock Protein 27 Phosphorylation and Cell Cycle: Role and Targeting. Molecular Pharmacology, 85(2), 345-356.

Yeung, Y., McDonald, K., Grewal, T., Munoz, L. (2013). Interleukins in glioblastoma pathophysiology: implications for therapy. British Journal of Pharmacology, 168(3), 591-606.

Eibl, C., Tomassoli, I., Munoz, L., Stokes, C., Papke, R., Gundisch, D. (2013). The 3,7-diazabicyclo[3.3.1]nonane scaffold for subtype selective nicotinic acetylcholine receptor (nAChR) ligands. Part 1: the influence of different hydrogen bond acceptor systems on alkyl and (hetero)aryl substituents. Bioorganic and Medicinal Chemistry, 21(23), 7283-7308.

Eibl, C., Munoz, L., Tomassoli, I., Stokes, C., Papke, R., Gundisch, D. (2013). The 3,7-diazabicylo[3.3.1]nonane scaffold for subtype selective nicotinic acetylcholine receptor ligands. Part 2: Carboxamide derivatives with different spacer motifs. Bioorganic and Medicinal Chemistry, 21(23), 7309-7329.

CELL AND REPRODUCTIVE BIOLOGY LABORATORY

CHRIS MURPHY

PROFESSOR OF HISTOLOGY AND EMBRYOLOGY AND
PROFESSOR OF FEMALE REPRODUCTIVE BIOLOGY,
ASSOCIATE DEAN & HEAD,
SCHOOL OF MEDICAL SCIENCES

LAB OVERVIEW

Professor Murphy leads a team of scientists involved in two distinct arms of research including: (a) studies on the structure of the plasma membrane of uterine epithelial cells and (b) research on the evolution of viviparity.

With regards to uterine receptivity, he is particularly interested in cell surface interactions between trophoblasts and the uterus during blastocyst implantation, in the histochemistry and cytochemistry of uterine epithelial cell surface molecules, especially carbohydrates, and general histochemical methodology. “We are attempting to understand the changes in subcellular structures affecting the process of plasma membrane transformation, including how cytoskeletal structures contribute to the changes in membrane structure and how ovarian hormones change the structure of the plasma membrane”, says Professor Murphy.

Additionally, having discovered the concept of plasma cell transformation and its extension to encompass all placental animals with live birth, Professor Murphy is collaborating with zoologist, Professor Mike Thompson at the University of Sydney to study the uterine mechanisms underlying the evolution of the process of birth from egg laying to live birth. Using lizards and marsupials as models, Professor Murphy is collaborating on studies to understand how the general phenomenon of plasma membrane transformation has evolved from egg-laying animals to mammals that undergo live birth including investigating whether the molecules underlying the structural changes are similar or different between egg-laying animals and those giving live birth.

RESEARCH ACTIVITIES

The work in this lab is centred around reproductive biology and medicine and in particular the biology of the uterus, implantation of the blastocyst and hormonal influences on the uterus. We are interested in how it is that the uterus manages to tightly regulate those times during the reproductive cycle when it will allow the blastocyst to attach but to prevent attachment and the beginning of a pregnancy at other times.

We are particularly interested in the plasma membrane of uterine epithelial cells and the molecular interactions that occur between the surface of these cells and the implanting blastocyst. We use a variety of methods including immunohistochemistry, protein analysis using western blots, investigate interactions between molecules by immunoprecipitation techniques and gene analysis by PCR. We use in vivo models as well as utilising a number of in vitro cell lines of human uterine epithelial cells and blastocyst culture. The work uses both animal and human tissues and involves basic cell biological research as well as work on human tissues of direct relevance to the human menopause and to In Vitro fertilisation (IVF) programmes.

The laboratory has extensive contacts with the Australian Centre for Microscopy and Microanalysis and the School of Biological Sciences, which includes a major project on the evolution of viviparity (live birth) and the development of the placenta. This work involves study on mammals and Australian lizards in particular, but also other animals, to understand the biology of different types of placentas. We also have collaborations with the Laboratory of Developmental Physiology where we do the majority of our cell culture work, which allows us to investigate the direct interaction between uterine epithelial cells and the implanting blastocyst.

Our clinical interests include one of the major diseases of the uterus which affects over a million Australian women - endometriosis - and we have collaborations with Westmead hospital to study this disease.

LABORATORY PERSONNEL/ STUDENTS

Chris Murphy	Bosch Professor 1984 - present
Dr Laura Lindsay	Lecturer 2003 - present
Dr Sam Dowland	Scholarly Teaching Fellow 2011 - present
Dr James van Dyke	Postdoctoral Fellow 2013 - 2015
Dr Camilla Whittington	Postdoctoral Fellow 2013 - present
Connie Poon	PhD student 2011 - 2014
Romanthi Madawala	PhD student 2011 - 2104
Jessica Dudley	PhD student 2013 - present
Melanie Laird	PhD student 2013 - present
Chad Moore	PhD student 2015 - present
Vie Nguyen	PhD student 2015 - present
Leigh Nicholson	PhD student 2013 - present
Kevin Danastas	PhD student 2014 - present
Sadaf Kalam	PhD student 2013 - present
Aiat Sharma	PhD student 2015 - present

PUBLICATIONS

(2013 - 2015)

Van Dyke, J., Lindsay, L., Murphy, C., Thompson, M. (2015). Carbonic anhydrase II is found in the placenta of a viviparous, matrotrophic lizard and likely facilitates embryo-maternal CO2 transport. Journal of Experimental Zoology Part B: Molecular and Developmental Evolution, 324B (7), 636-646.

Wu, Q., Fong, C., Thompson, M., Murphy, C. (2015). Changes to the uterine epithelium during the reproductive cycle of two viviparous lizard species (Niveoscincus spp.). Acta Zoologica: international journal for zoology, 96, 497-509.

Dudley, J., Murphy, C., Thompson, M., McAllan, B. (2015). Desmoglein-2 during pregnancy and its role in the evolution of viviparity in a marsupial (Sminthopsis crassicaudata; Dasyuridae). Journal of Morphology, 276, 261-272.

Poon, C., Madawala, R., Day, M., Murphy, C. (2015). EpCAM is decreased but is still present in uterine epithelial cells during early pregnancy in the rat: potential mechanism for maintenance of mucosal integrity during implantation. Cell and Tissue Research, 359(2), 655-664.

Madawala, R., Poon, C., Dowland, S., Murphy, C. (2015). PTRF is associated with caveolin 1 at the time of receptivity: but SDPR is absent at the same time. Histochemistry and Cell Biology, 143(6), 637-644.

Laird, M., Turancova, M., McAllan, B., Murphy, C., Thompson, M. (2015). Unlocking amniote live birth: The 'other' mammalian model. Journal and Proceedings of the Royal Society of New South Wales, 148(455-456), 52-59.

Whittington, C., Grau, G., Murphy, C., Thompson, M. (2015). Unusual angiogenic factor plays a role in lizard pregnancy but is not unique to viviparity. Journal of Experimental Zoology Part B: Molecular and Developmental Evolution, 324B (2), 152-158.

Danastas, K., Combes, V., Lindsay, L., Grau, G., Thompson, M., Murphy, C. (2015). VEGF111: New insights in tissue invasion. Frontiers in Physiology, 6, 1-5.

Grau, G., Thompson, M., Murphy, C. (2015). VEGF: Inflammatory paradoxes. Pathogens and Global Health, 109(6), 253-254.

Kaneko, Y., Murphy, C., Day, M. (2014). Calpain 2 activity increases at the time of implantation in rat uterine luminal epithelial cells and administration of calpain inhibitor significantly reduces implantation sites. Histochemistry and Cell Biology, 141(4), 423-430.

Madawala, R., Dowland, S., Poon, C., Lindsay, L., Murphy, C. (2014). Caveolins redistribute in uterine epithelial cells during early pregnancy in the rat: An epithelial polarisation strategy? Histochemistry and Cell Biology, 142(5), 555-567.

Poon, C., Lecce (Venuto), L., Day, M., Murphy, C. (2014). Mucin 15 is lost but mucin 13 remains in uterine luminal epithelial cells and the blastocyst at the time of implantation in the rat. Reproduction, Fertility and Development, 26(3), 421-431.

Lindsay, L., Murphy, C. (2014). Ovarian hyperstimulation affects fluid transporters in the uterus: a potential mechanism in uterine receptivity. Reproduction, Fertility and Development, 26(7), 982-990.

Laird, M., Thompson, M., Murphy, C., McAllan, B. (2014). Uterine Epithelial Cell Changes During Pregnancy in a Marsupial (Sminthopsis crassicaudata; Dasyuridae). Journal of Morphology, 275(10), 1081-1092.

Poon, C., Madawala, R., Day, M., Murphy, C. (2013). Claudin 7 is reduced in uterine epithelial cells during early pregnancy in the rat. Histochemistry and Cell Biology, 139(4), 583-593.

Kaneko, Y., Murphy, C., Day, M. (2013). Extracellular Matrix Proteins Secreted From both the Endometrium and the Embryo are Required for Attachment: A Study using A Co-Culture Model of Rat Blastocysts and Ishikawa Cells. Journal of Morphology, 274(1), 63-72.

Lecce (Venuto), L., Lindsay, L., Kaneko, Y., Murphy, C. (2013). ICAM-2 and lipid rafts disappear from the basal plasma membrane of uterine epithelial cells during early pregnancy in rats. Cell and Tissue Research, 353(3), 563-573.

Kaneko, Y., Day, M., Murphy, C. (2013). Uterine epithelial cells: Serving two masters. The International Journal of Biochemistry and Cell Biology, 45(2), 359-363.

POSTGRADUATE AND HONOURS COMPLETIONS

(2013 - 2015)

PhDs

2014 - Romanthi Madawala

2014 - Connie Poon

2015 - Sam Dowland

BMedSc(Hons)

2013 - Kevin Danastas - University Medal

2014 - Aditi Misra

2015 - Chad Moore

Grad Dip

2014 - Vie Nguyen

SPECIAL AWARDS & PRIZES

(2013 - 2015)

- 2013 - NWG Macintosh Memorial Grant - Sam Dowland
- 2014 - NWG Macintosh Memorial Grant - Connie Poon
- 2015 - NWG Macintosh Memorial Grant - Sam Dowland

SERVICE TO THE UNIVERSITY AND COMMUNITY

(2013 - 2015)

- Editorial board member for Journal of Morphology and Acta Histochemica
- Referee for a variety of journals including Theriogenology, Cellular Physiology and Biochemistry, Journal of Molecular Medicine, Histology and Histopathology, The Anatomical Record, Journal of Obstetrics and Gynecology, PLOS One, Biology of Reproduction, Journal of Maternal-Fetal and Neonatal Medicine
- Fellow of University Senate 2011 - present

EXTERNAL FUNDING TO LABORATORY

(2013 - 2015)

Source	Project Title	Collaborators	Awarded	Duration	Amount
ARC	The link between the angiogenesis of live birth and cancer: a lizard model.	G. Grau M.B Thompson	2012	3 years	$550,000
ARC	Lively reproduction: do common molecules underlie all vertebrate live birth?	B. M. McAllan M.B. Thompson	2013	3 years	$310,000

MOLECULAR PATHOLOGY & PHARMACOLOGY PROGRAM

DES RICHARDSON

PROFESSOR, PATHOLOGY

LAB OVERVIEW

Prof. Richardson, Professor of Cancer Cell Biology, NHMRC Senior Principal Research Fellow, heads a large research group, the Molecular Pharmacology and Pathology Program, in the Department of Pathology, Sydney Medical School.

Prof. Richardson's research concentrates on developing breakthrough anti-cancer drugs, that actively inhibit primary tumour growth, but also prevent resistance and block metastasis which is very important as these are major killers in cancer (for review see: Pharmacol.Res. 2015;100:255-60).

With his USYD-Team, Richardson invented, patented and commercialised the novel anti-tumour agent, DpC, which was licensed to CTHULHU-VENTURES, USA, leading to the international company, Oncochel Therapeutics LLC, USA, and its Australian subsidiary, Oncochel Therapeutics Pty Ltd (http://www.colmeddev.com/oncochel/). This milestone was achieved cooperatively with CDIP at USYD.

DpC belongs to a group of novel drugs called di-2-pyridylketone-thiosemicarbazones ("DpT agents") that are the subject of multiple international patent suites. Recently, DpC has undergone advanced preclinical development supported by multiple NHMRC-Development Grants and Oncochel Therapeutics Pty Ltd/ LLC (USA; a contract for US $6-million negotiated by Prof. Richardson).

Notably, this agent has entered multi-centre clinical trials as an orally-active agent for treating multiple advanced/ resistant cancers (NCT02688101).

This success story represents **a great example of cancer-drug development from "bench-to-bedside" at USYD**.

Worldwide, cancer is the "emperor of all maladies". In 2012, 8.2-million cancer-related deaths occurred and 14-million cases were diagnosed. This highlights the urgent need for innovative anti-cancer agents.

In fact, because cancer is continually evolving as it progresses, current "old-fashioned" drugs that possess only one target often fail within 6 months of initiating treatment due to resistance.

In contrast, DpC has the special "built-in" property of targeting multiple cancer targets that prevent drug resistance. Indeed, due to its unique activity-signature these agents inhibit the "TRIAD-OF-DEATH" in cancer, namely: **(1)** primary tumour growth; **(2)** resistance; and **(3)** metastasis. These crucial properties are described below:-

(1) DpC and the DpT agents potently inhibit primary tumour growth of a broad variety of belligerent cancers including lung, melanoma, pancreatic, brain, ovarian cancer, etc. with high selectivity; being >20-times more potent than the "gold-standard" chemotherapeutic, Doxorubicin.

(2) DpC and the DpT agents overcome drug resistance in cancer. This is crucial, as drug-resistance resulted in 7.6-million deaths in 2008 and this is expected to increase to 13.1-million in 2030.

(3) DpC and the DpT agents inhibit metastasis, which is responsible for a devastating 90% of cancer deaths and this occurs through their ability to increase the potent metastasis-suppressor, NDRG1.

Collectively, it would be difficult to fathom a more exciting and "real" contribution to health than a drug that has the potential to revolutionise cancer treatment. The fact it was developed at USYD from "bench to bedside" and led to the training of a generation of young scientists, underscores its excellence.

LABORATORY PERSONNEL/ STUDENTS

Des Richardson — Professor 2005 - present

Dr Zaynab Al-Eisawi — Postdoctoral Fellow (Volunteer) 2014 - 2015

Dr Laila Arzuman — Postdoctoral Fellow (Volunteer) 2015 - present

Dr Michale Huang — Postdoctoral Fellow 2012 - 2013; NHMRC Peter Doherty Early Career Fellow 2014 - present

Dr Nurul Husna — Postdoctoral Fellow 2013 - 2015

Dr Patric Jansson — Senior Postdoctoral Fellow 2008 - present

Dr Danuta Kalinowski — Postdoctoral Fellow 2013; Helen and Robert Ellis Postdoctoral Fellow 2014; NHMRC RD Wright Fellow Senior Lecture 2015 - present

Dr Zaklina Kovacevic — NHMRC Peter Doherty Early Career Fellow, and CINSW Early Career Fellow 2013 - present

Dr Darius Lane — Postdoctoral Fellow 2010; NHMRC Peter Doherty Fellow and CINSW Early Career Fellow 2011 - 2014; Sydney Medical School Foundation Fellow 2015 - present

Dr Hiu Lok — Postdoctoral Fellow 2006 - present

Dr Angelica Merlot — Postdoctoral Fellow 2014; NHMRC Peter Doherty Early Career Fellow, Early Career Fellow; CINSW Early Career Fellow 2015 - present

Dr Duraippandi Palanimuthu — Postdoctoral Research Fellow 2014 - present

Dr Sumit Sahni — Postdoctoral Fellow 2012 - present

Dr Darshi Siva — Postdoctoral Fellow 2014 - 2015

Lina Al-Akra — PhD student 2014 - present

Amy Anzovino — PhD student 2012 - present

Dong-Hun Bae — PhD student 2014 - present

Shannon Chiang — PhD student 2015 - present

Leyla Fouani — PhD student 2014 - present

Elaine Gutierrez — PhD student 2011 - 2015

Sukriti Krishan — PhD student 2014 - present

Goldie Lui — PhD student 2011 - 2015

Sharleen Menezes — PhD student 2014 - present

Angelica Merlot — PhD student 2010 - 2013

Rayan Moussa — PhD student 2010 - present

Jasmina Paluncic — Master student 2013 - 2014; PhD student 2015 - present

Nicole Seebacher — PhD student 2011 - 2015

Alexandra Stacy — PhD student 2012 - present

Christian Stefani — PhD student 2008 - 2015

Tetsuo Yamagishi — PhD student 2010 - 2013

Phatsapong Yingchoncharoen — PhD student 2013 - present

Kevin Park — PhD student 2014 - present

Jiaoyang Lu — International MSc student 2015

Eliska Mackova — International PhD student 2013

Wang Puxiongzhi — International PhD student 2014 - 2015

Jin Runsen — International PhD student 2012 - 2013

Liu Wensheng — International PhD student 2013 - 2014

Ru-Xing Xi — International PhD student 2015

Ashleigh Fordham — Honours student 2013

Leyla Fouani — Honours student 2013

Sukriti Krishan — Honours student 2013

Thomas Mills — Honours student 2013

Stephanie Nassenstein — Honours student 2013

Lina Al-Akra — Honours student 2014

Elizabeth Go Woon Lim — Honours student 2014

Penny Peres — Honours student 2015

Danson Wooi — Honours student 2015

Natalie Jukic — Honours student 2015

Rachal Poon — Honours student 2015 - 2016

Akanksha Arvind — Research Assistant 2013 - 2015

Vera Richardson — Research Assistant 2007 - present

PUBLICATIONS
(2013 - 2015)

Jansson, P., Yamagishi, T., Arvind, A., Seebacher, N., Gutierrez, E., Stacy, A., Maleki, S., Sharp, D., Sahni, S., Richardson, D. (2015). Di-2-pyridylketone 4,4-dimethyl-3-thiosemicarbazone (Dp44mT) overcomes multidrug resistance by a novel mechanism involving the hijacking of lysosomal P-Glycoprotein (Pgp). The Journal of Biological Chemistry, 290(15), 9588-9603.

Krishan, S., Richardson, D., Sahni, S. (2015). Adenosine Monophosphate-Activated Kinase and Its Key Role in Catabolism: Structure, Regulation, Biological Activity and Pharmacological Activation. Molecular Pharmacology, 87(3), 363-377.

Bucur, O., Almasan, A., Zubarev, R., Friedman, M., Nicolson, G., Sumazin, P., Leabu, M., Nikolajczyk, B., Avram, D., Kunej, T., Richardson, D., Grau, G., et al (2015). An updated h-index measures both the primary and total scientific output of a researcher. Discoveries, 3(3), 1-6.

Lane, D., Merlot, A., Huang, M., Bae, D., Jansson, P., Sahni, S., Kalinowski, D., Richardson, D. (2015). Cellular iron uptake, trafficking and metabolism: Key molecules and mechanisms and their roles in disease. Biochimica et Biophysica Acta. General Subjects, 1853 (5), 1130-1144.

Saleh Moussa, R., Kovacevic, Z., Richardson, D. (2015). Differential targeting of the cyclin-dependent kinase inhibitor, p21CIP1/WAF1, by chelators with anti-proliferative activity in a range of tumor cell-types. Oncotarget, 6(30), 29694-29711.

Seebacher, N., Richardson, D., Jansson, P. (2015). Glucose modulation induces reactive oxygen species and increases P-glycoprotein-mediated multidrug resistance to chemotherapeutics. British Journal of Pharmacology, 172(10), 2557-2772.

Stefani, C., Al-Eisawi, Z., Jansson, P., Kalinowski, D., Richardson, D. (2015). Identification of differential anti-neoplastic activity of copper bis(thiosemicarbazones) that is mediated by intracellular reactive oxygen species generation and lysosomal membrane permeabilization. Journal of Inorganic Biochemistry, 152, 20-37.

Potuckova, E., Roh, J., Machacek, M., Sahni, S., Stariat, J., Sestak, V., Jansova, H., Haskova, P., Jirkovska, A., Kalinowski, D., Richardson, D., et al (2015). In Vitro Characterization of the Pharmacological Properties of the Anti-Cancer Chelator, Bp4eT, and Its Phase I Metabolites. PloS One, 10(10), 1-20.

Krishan, S., Jansson, P., Gutierrez, E., Lane, D., Richardson, D., Sahni, S. (2015). Iron metabolism and autophagy: A poorly explored relationship that has important consequences for health and disease. Nagoya Journal of Medical Science, 77, 1-6.

Merlot, A., Kalinowski, D., Kovacevic, Z., Jansson, P., Lane, D., Sahni, S., Huang, M., Richardson, D. (2015). Making a case for albumin - a highly promising drug-delivery system. Future Medicinal Chemistry, 7(5), 553-556.

Sestak, V., Stariat, J., Cermanova, J., Potuckova, E., Chladek, J., Roh, J., Bures, J., Jansova, H., Prusa, P., Sterba, M., Kalinowski, D., Richardson, D., et al (2015). Novel and potent anti-tumor and anti-metastatic di-2-pyridylketone thiosemicarbazones demonstrate marked differences in pharmacology between the first and second generation lead agents. Oncotarget, 6(40), 42411-42428.

Lui, G., Kovacevic, Z., Menezes, S., Kalinowski, D., Merlot, A., Sahni, S., Richardson, D. (2015). Novel Thiosemicarbazones Regulate the Signal Transducer and Activator of Transcription 3 (STAT3) Pathway: Inhibition of Constitutive and Interleukin 6-Induced Activation by Iron Depletion. Molecular Pharmacology, 87(3), 543-560.

Merlot, A., Sahni, S., Lane, D., Fordham, A., Pantarat, N., Hibbs, D., Richardson, V., Doddareddy, M., Ong, J., Huang, M., Richardson, D., Kalinowski, D. (2015). Potentiating the cellular targeting and anti-tumor activity of Dp44mT via binding to human serum albumin: two saturable mechanisms of Dp44mT uptake by cells. Oncotarget, 6(12), 10374-10398.

Jirkovska, A., Roh, J., Lenová-Popelová, O., Jirkovsky, E., Hrušková, K., Potuckova, E., Jansova, H., Haskova, P., Martinková, P., Eisner, T., Kalinowski, D., Richardson, D., et al (2015). Synthesis and analysis of novel analogues of dexrazoxane and its open-ring hydrolysis product for protection against anthracycline cardiotoxicity in vitro and in vivo. Toxicology Research, 4(4), 1098-1114.

Lui, G., Kovacevic, Z., Richardson, V., Merlot, A., Kalinowski, D., Richardson, D. (2015). Targeting cancer by binding iron: Dissecting cellular signaling pathways. Oncotarget, 6(22), 18748-18779.

Wangpu, X., Yang, X., Zhao, J., Lu, J., Guan, S., Lu, J., Kovacevic, Z., Liu, W., Mi, L., Jin, R., Richardson, D., et al (2015). The metastasis suppressor, NDRG1, inhibits "stemness" of colorectal cancer via down-regulation of nuclear B-catenin and CD44. Oncotarget, 6(32), 33893-33911.

Liu, W., Kovacevic, Z., Peng, Z., Jin, R., Wang, P., Yue, F., Zheng, M., Huang, M., Jansson, P., Richardson, V., Kalinowski, D., Lane, D., Merlot, A., Sahni, S., Richardson, D. (2015). The molecular effect of metastasis suppressors on Src signaling and tumorigenesis: New therapeutic targets. Oncotarget, 6(34), 35522-35541.

Liu, W., Yue, F., Zheng, M., Merlot, A., Bae, D., Huang, M., Lane, D., Jansson, P., Liu, G., Richardson, V., Sahni, S., Kalinowski, D., Kovacevic, Z., Richardson, D. (2015). The proto-oncogene c-Src and its downstream signaling pathways are inhibited by the metastasis suppressor, NDRG1. Oncotarget, 6(11), 8851-8874.

Jansson, P., Kalinowski, D., Lane, D., Kovacevic, Z., Seebacher, N., Fouani, L., Sahni, S., Merlot, A., Richardson, D. (2015). The renaissance of polypharmacology in the development of anti-cancer therapeutics: Inhibition of the "Triad of Death" in cancer by Di-2-pyridylketone thiosemicarbazones. Pharmacological Research, 100, 255-260.

Sahni, S., Krishan, S., Palanimuthu, D., Richardson, D. (2015). The use of iron chelators in biocidal compositions: evaluation of patent, WO2014059417A1. Expert Opinion on Therapeutic Patents, 25(3), 367-372.

Lane, D.J.R., Bae, D.H., Merlot, A., Sahni, S. and Richardson, D.R. (2015) Duodenal cytochrome b (DCYTB) in iron metabolism: An update on function and regulation. Nutrients 7(4), 2274-2296 (Invited Review).

Krishan, S., Richardson, D., Sahni, S. (2014). AMP kinase (PRKAA1). Journal of Clinical Pathology, 67(9), 758-763.

Lane, D., Richardson, D. (2014). Can we target the alpha2-macroglobulin-hepcidin interaction to treat pathologic hypoferremia? Future Medicinal Chemistry, 6(1), 13-16.

Lane, D., Richardson, D. (2014). Chaperone turns gatekeeper: PCBP2 and DMT1 form an iron-transport pipeline. The Biochemical Journal, 462(1), e1-e3.

Filak, L., Kalinowski, D., Bauer, T., Richardson, D., Arion, V. (2014). Effect of the piperazine unit and metal-binding site position on the solubility and anti-proliferative activity of ruthenium(II)- and osmium(II)- arene complexes of isomeric indolo[3,2-c]quinoline-piperazine hybrids. Inorganic Chemistry, 53(13), 6934-6943.

Lane, D., Mills, T., Shafie, N., Merlot, A., Saleh Moussa, R., Kalinowski, D., Kovacevic, Z., Richardson, D. (2014). Expanding horizons in iron chelation and the treatment of cancer: Role of iron in the regulation of ER stress and the epithelial-mesenchymal transition. Biochimica et Biophysica Acta-Reviews on Cancer, 1845 (2), 166-181.

Serda, M., Kalinowski, D., Rasko, N., Potuckova, E., Mrozek-Wilczkiewicz, A., Musiol, R., Małecki, J., Sajewicz, M., Ratuszna, A., Muchowicz, A., Richardson, D., et al (2014). Exploring the anti-cancer activity of novel thiosemicarbazones generated through the combination of retro-fragments: dissection of critical structure-activity relationships. PloS One, 9(10), 1-15.

Anzovino, A., Lane, D., Huang, M., Richardson, D. (2014). Fixing frataxin: "ironing out" the metabolic defect in friedreich's ataxia. British Journal of Pharmacology, 171(8), 2174-2190.

Sahni, S., Merlot, A., Krishnan, S., Jansson, P., Richardson, D. (2014). Gene of the month: BECN1. Journal of Clinical Pathology, 67(8), 656-660.

Ataie-Kachoie, P., Pourgholami, M., Richardson, D., Morris, D. (2014). Gene of the month: Interleukin 6 (IL-6). Journal of Clinical Pathology, 67(11), 932-937.

Lok, H., Sahni, S., Richardson, V., Kalinowski, D., Kovacevic, Z., Lane, D., Richardson, D. (2014). Glutathione S-Transferase and MRP1 Form an Integrated System Involved in the Storage and Transport of Dinitrosyl-Dithiolato Iron Complexes in Cells. Free Radical Biology and Medicine, 75, 14-29.

Basha, M., Rodríguez, C., Richardson, D., Martínez, M., Bernhardt, P. (2014). Kinetic studies on the oxidation of oxyhemoglobin by biologically active iron thiosemicarbazone complexes: relevance to iron-chelator-induced methemoglobinemia. Journal of Biological Inorganic Chemistry, 19(3), 349-357.

Fang, B., Kovacevic, Z., Park, K., Kalinowski, D., Jansson, P., Lane, D., Sahni, S., Richardson, D. (2014). Molecular Functions of the Iron-Regulated Metastasis Suppressor, NDRG1, and its Potential as a Molecular Target for Cancer Therapy. Biochimica et Biophysica Acta. Molecular and Cell Biology of Lipids, 1845 (1), 1-19.

Sahni, S., Krishan, S., Richardson, D. (2014). NDRG1 as a molecular target to inhibit the epithelial-mesenchymal transition: the case for developing inhibitors of metastasis. Future Medicinal Chemistry, 6(11), 1241-1244.

Ellis, S., Kalinowski, D., Leotta, L., Huang, M., Jelfs, P., Sintchenko, V., Richardson, D., Triccas, J. (2014). Potent Anti-Mycobacterial Activity of the Pyridoxal Isonicotinoyl Hydrazone Analogue, 2-Pyridylcarboxaldehyde Isonicotinoyl Hydrazone: A Lipophilic Transport Vehicle for Isonicotinic Acid Hydrazide. Molecular Pharmacology, 85(2), 269-278.

Potuckova, E., Jansova, H., Machacek, M., Vavrova, A., Haskova, P., Tichotova, L., Richardson, V., Kalinowski, D., Richardson, D., Simunek, T. (2014). Quantitative Analysis of the Anti-Proliferative Activity of Combinations of Selected Iron-Chelating Agents and Clinically Used Anti-Neoplastic Drugs. PloS One, 9(2), 1-15.

Merlot, A., Richardson, D. (2014). Receptor Recognition and Lysosomal Targeting to Enhance Cytotoxicity of Novel Anti-Cancer Agents that Bind Iron and Copper. Vitamins & Trace Elements, 3(1), e125.

Stariat, J., Suprunova, V., Roh, J., Sestak, V., Eisner, T., Filipsky, T., Mladenka, P., Nobilis, M., Simunek, T., Klimes, J., Kalinowski, D., Richardson, D., et al (2014). Simultaneous determination of the novel thiosemicarbazone anti-cancer agent, Bp4eT, and its main phase I metabolites in plasma: application to a pilot pharmacokinetic study in rats. Biomedical Chromatography, 28(5), 621-629.

Potuckova, E., Hrušková, K., Bures, J., Kovarikova, P., Spirkova, I., Pravdıkova, K., Kolbabova, L., Hergeselova, T., Haskova, P., Jansova, H., Richardson, V., Lane, D., Kalinowski, D., Richardson, D., et al (2014). Structure-Activity Relationships of Novel Salicylaldehyde Isonicotinoyl Hydrazone (SIH) Analogs: Iron Chelation, Anti-Oxidant and Cytotoxic Properties. PloS One, 9(11), 1-17.

Lukmantara, A., Kalinowski, D., Kumar, N., Richardson, D. (2014). Synthesis and biological evaluation of 2-benzoylpyridine thiosemicarbazones in a dimeric system: Structure-activity relationship studies on their anti-proliferative and iron chelation efficacy. Journal of Inorganic Biochemistry, 141, 43-54.

Lane, D., Richardson, D. (2014). The Active Role of Vitamin C in Mammalian Iron Metabolism: Much More Than Just Enhanced Iron Absorption!. Free Radical Biology and Medicine, 75, 69-83.

Gutierrez, E., Richardson, D., Jansson, P. (2014). The Anti-Cancer Agent, Dp44mT, Overcomes Pro-Survival Autophagy by Two Mechanisms: Persistent Induction of Autophagosome Synthesis and Impairment of Lysosomal Integrity. The Journal of Biological Chemistry, 289(48), 33568-33589.

Lane, D., Merlot, A., Richardson, D. (2014). The lure of a LYR: The logistics of iron sulfur cluster delivery. Cell Metabolism, 19(3), 348-350.

Sahni, S., Bae, D., Lane, D., Kovacevic, Z., Kalinowski, D., Jansson, P., Richardson, D. (2014). The metastasis suppressor, N-myc downstream-regulated gene 1 (NDRG1), inhibits stress-induced autophagy in cancer cells. The Journal of Biological Chemistry, 289(14), 9692-9709.

Merlot, A., Kalinowski, D., Richardson, D. (2014). Unraveling the mysteries of serum albumin-more than just a serum protein. Frontiers in Physiology, 5, 1-7.

Jin, R., Liu, W., Menezes, S., Yue, F., Zheng, M., Kovacevic, Z.and Richardson, D.R. (2014) The metastasis suppressor, NDRG1, modulates β-catenin phosphorylation and nuclear translocation by mechanisms involving FRAT1 and PAK4. J. Cell Sci. 127:3116-30

Stefani, C., Jansson, P., Gutierrez, E., Bernhardt, P., Richardson, D., Kalinowski, D. (2013). Alkyl Substituted 2'-Benzoylpyridine Thiosemicarbazone Chelators with Potent and Selective Anti-Neoplastic Activity: Novel Ligands that Limit Methemoglobin Formation. Journal of Medicinal Chemistry, 56(1), 357-370.

Walcourt, A., Kurantsin-Mills, J., Kwagyan, J., Adenuga, B., Kalinowski, D., Lovejoy, D., Lane, D., Richardson, D. (2013). Anti-plasmodial activity of aroylhydrazone and thiosemicarbazone iron chelators: Effect on erythrocyte membrane integrity, parasite development and the intracellular labile iron pool. Journal of Inorganic Biochemistry, 129, 43-51.

Lane, D., Huang, M., Ting, S., Sivagurunathan, S., Richardson, D. (2013). Biochemistry of cardiomyopathy in the mitochondrial disease Friedreich's ataxia. The Biochemical Journal, 453(3), 321-336.

Merlot, A., Pantarat, N., Menezes, S., Sahni, S., Richardson, D., Kalinowski, D. (2013). Cellular Uptake of the Antitumor Agent Dp44mT Occurs via a Carrier/Receptor-Mediated Mechanism. Molecular Pharmacology, 84(6), 911-924.

Hua, S., Yao, M., Vignarajan, S., Witting, P., Hejazi, L., Gong, Z., Teng, Y., Niknami, M., Assinder, S., Richardson, D., Dong, Q. (2013). Cytosolic phospholipase A2alpha sustains pAKT, pERK and AR levels in PTEN-null/mutated prostate cancer cells. Biochimica et Biophysica Acta - Molecular and Cell Biology of Lipids, 1831 (6), 1146-1157.

Ford, S., Obeidy, P., Lovejoy, D., Bedford, M., Nichols, L., Chadwick, C., Tucker, O., Lui, G., Kalinowski, D., Jansson, P., Richardson, D., et al (2013). Deferasirox (ICL670A) effectively inhibits oesophageal cancer growth in vitro and in vivo. British Journal of Pharmacology, 168(6), 1316-1328.

Dixon, K., Lui, G., Kovacevic, Z., Zhang, D., Yao, M., Chen, Z., Dong, Q., Assinder, S., Richardson, D. (2013). Dp44mT targets the AKT, TGF-β and ERK pathways via the metastasis suppressor NDRG1 in normal prostate epithelial cells and prostate cancer cells. British Journal of Cancer, 108(2), 409-419.

Bambang, I., Lee, Y., Richardson, D., Zhang, D. (2013). Endoplasmic reticulum protein 29 regulates epithelial cell integrity during the mesenchymal-epithelial transition in breast cancer cells. Oncogene, 32(10), 1240-1251.

Huang, M., Austin, C., Sari, M., Suryo Rahmanto, Y., Ponka, P., Vyoral, D., Richardson, D. (2013). Hepcidin Bound to β2-Macroglobulin Reduces Ferroportin-1 Expression and Enhances Its Activity at Reducing Serum Iron Levels. Journal of Biological Chemistry, 288(35), 25450-25465.

Lane, D., Huang, M., Richardson, D. (2013). Hepcidin, show some self-control! How the hormone of iron metabolism regulates its own expression. The Biochemical Journal, 452(2), e3-e5.

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Stacy, A., Jansson, P., Richardson, D. (2013). Molecular Pharmacology of ABCG2 and Its Role in Chemoresistance. Molecular Pharmacology, 84(5), 655-669.

Lane, D., Saletta, F., Suryo Rahmanto, Y., Kovacevic, Z., Richardson, D. (2013). N-myc Downstream Regulated 1 (NDRG1) Is Regulated by Eukaryotic Initiation Factor 3a (eIF3a) during Cellular Stress Caused by Iron Depletion. PloS One, 8(2), 1-15.

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Yamagishi, T., Sahni, S., Sharp, D., Arvind, A., Jansson, P., Richardson, D. (2013). P-Glycoprotein Mediates Drug Resistance via a Novel Mechanism Involving Lysosomal Sequestration. The Journal of Biological Chemistry, 288(44), 31761-31771.

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Lukmantara, A., Kalinowski, D., Kumar, N., Richardson, D. (2013). Structure-activity studies of 4-phenyl-substituted 2'-benzoylpyridine thiosemicarbazones with potent and selective anti-tumour activity. Organic and Biomolecular Chemistry, 11(37), 6414-6425.

Lukmantara, A., Kalinowski, D., Kumar, N., Richardson, D. (2013). Synthesis and biological evaluation of substituted 2-benzoylpyridine thiosemicarbazones: Novel structure-activity relationships underpinning their anti-proliferative and chelation efficacy. Bioorganic & Medicinal Chemistry Letters, 23(4), 967-974.

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Lui, G., Obeidy, P., Ford, S., Tselepis, C., Sharp, D., Jansson, P., Kalinowski, D., Kovacevic, Z., Lovejoy, D., Richardson, D. (2013). The Iron Chelator, Deferasirox, as a Novel Strategy for Cancer Treatment: Oral Activity Against Human Lung Tumor Xenografts and Molecular Mechanism of Action. Molecular Pharmacology, 83(1), 179-190.

Kovacevic, Z., Chikhani, S., Lui, G., Sivagurunathan, S., Richardson, D. (2013). The Iron-Regulated Metastasis Suppressor NDRG1 Targets NEDD4L, PTEN, and SMAD4 and Inhibits the PI3K and Ras Signaling Pathways. Antioxidants & Redox Signaling, 18(8), 874-887.

Kalinowski, D., Jansson, P., Kovacevic, Z., Richardson, D. (2013). The redox-active, anti-cancer drug Dp44mT inhibits T-cell activation and CD25 through a copper-dependent mechanism. Redox Report, 18(2), 48-50.

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POSTGRADUATE AND HONOURS COMPLETIONS

(2013 - 2015)

PhD

2015 - Elaine Gutierrez (Awarded Peter Bancroft Prize at USYD for Thesis without corrections)

2015 - Goldie Liu (Awarded Peter Bancroft Prize)

2015 - Nicole Seebacher (Awarded Peter Bancroft Prize)

2015 - Christian Stefani (Accepted with minor corrections)

2013 - Tetsuo Yamagishi (Awarded Peter Bancroft Prize)

2013 - Angelica Merlot (In Line for Award Peter Bancroft Prize)

BSc(Hons)

2015 - Natalie Jukic

2015 - Penny Peres

2015 - Danson Wooi

2014 - Lina Al-Akra

2014 - Elizabeth Go Woon Lim

2013 - Ashleigh Fordham

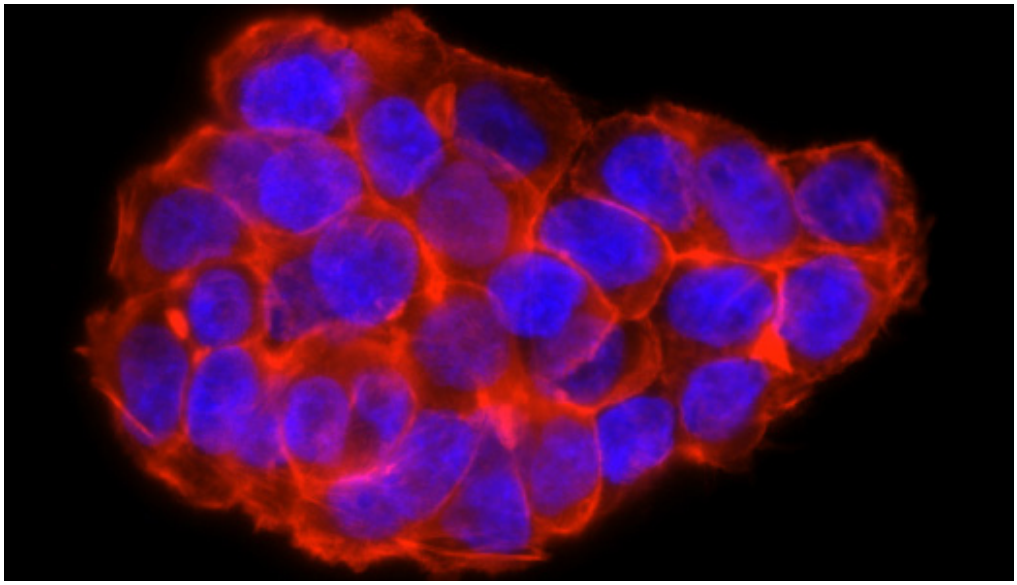
2013 - Leyla Fouani

2013 - Sukriti Krishan

2013 - Thomas Mills

2013 - Stephanie Nassenstein

Membranous expression of E-cadherin
of HT29 colon cancer parental cells
Image supplied by Zhiqiang Chen



SPECIAL AWARDS & PRIZES
(2013 - 2015)

Scholarships

- 2008 - Australian Post-graduate Award - Christian Stefani
- 2008 - Leukemia Research Scholarship - Tetsuo Yamagishi
- 2010 - Australian Post-graduate Award, NHMRC Dora Lush Award - Angelica Merlot
- 2010 - Rotary PhD Scholarship - Rayan Moussa
- 2011 - Australian Post-graduate Award - Elaine Gutierrez
- 2011 - Australian Post-graduate Award - Goldie Lui
- 2011 - Australian Post-graduate Award - Nicole Seebacher
- 2012 - Australian Post-graduate Award - Alexandra Stacy
- 2014 - Australian Post-graduate Award - Lina Al-Akra
- 2014 - Australian Post-graduate Award - Dong-Hun Bae
- 2014 - Australian Post-graduate Award - Leyla Fouani
- 2014 - Australian Post-graduate Award - Sukriti Krishan
- 2014 - Australian Post-graduate Award - Sharleen Menezes
- 2014 - Australian Post-graduate Award - Kevin Park
- 2015 - Australian Post-graduate Award - Shannon Chiang

Fellowships

Prof. Richardson, Des:

- National Health and Medical Research Council of Australia Senior Principal Research Fellowship (2009-2013 and 2014-2018)

Dr. Kalinowski, Danuta:

- Helen and Robert Ellis Fellowship from the Sydney Medical School Foundation USYD (2014)
- NHMRC RD Wright Fellowship (2015-2018)

Dr. Kovacevic, Zaklina:

- NHMRC Australian (Peter Doherty) Post-Doctoral Fellowship (2013-2016)
- CINSW Early Career Fellowship (2013-2016)

Dr. Huang, Michael;

- Awarded NHMRC Peter Doherty Fellowship (2014-2017)

Dr. Merlot, Angelica:

- NHMRC Peter Doherty Early Career Fellowship in my laboratory; NBCF Post-doctoral Fellowship (awarded 2015)
- CINSW Early Career Fellowship (awarded 2015)
- National Breast Cancer Foundation Post-Doctoral Fellowship (awarded 2015, declined in preference for the above fellowships)

Dr. Jansson, Patric:

- Cancer Institute NSW Early Career Development Fellowship (2011-2013)

Dr. Lane, Darius:

- NHMRC Australian (Peter Doherty) Post-Doctoral Fellowship (2011-2014)
- Cancer Institute NSW Early Career Development Fellowship (2011-2014)
- Bridging Support Fellowship, University of Sydney (2015)

Many of Prof. Richardson's students have achieved **"extreme scholarship"**, defined as multiple PhD scholarships, post-doctoral fellowships and multiple prizes - including the Peter Bancroft Prize for an Outstanding PhD Thesis without Corrections (4 PhD students received this Award in 2015 alone). Students also actively publish, many achieving substantial publications etc (6-14 articles/patents/reviews, etc. per student) in international journals.

In 2013, Prof. Richardson was awarded the Vice-Chancellor's Award for Excellence in Research Higher Degree Supervision and awarded a Citation by the Office of Learning and Teaching (Australian Government) for: "Sustained excellence in research higher degree supervision".

SERVICE TO THE UNIVERSITY AND COMMUNITY
(2013 - 2015)

The drug development in Prof. Richardson's laboratory led to the anti-cancer drug, DpC, which is in multi-centre clinical trials for advanced and resistant cancers (https://clinicaltrials.gov/ct2/show/NCT02688101).

Hence, Prof. Richardson has delivered "real", tangible outcome that will benefit worldwide-health to cancer sufferers. This has resulted in suites of international patents being supported by Oncochel Therapeutics Pty Ltd Australia and Oncochel Therapeutics LLC, USA

New innovative therapeutics are being developed and have been patented for the treatment of Alzheimer's disease and hepcidin-related pathologies, eg. the anaemia of chronic disease.

Prof. Richardson has contributed to the Editorial Boards of 41 international journals over his career including, J. Biol. Chem, Molecular Pharmacology, Biochemical Journal, Biochim Biophys Acta – Mol Cell Res, Pharmacol. Res, Int J Biochem. Cell Biol., Antioxidants Redox Signal. etc. He is an Executive Editor of Biochim Biophys Acta – General Subjects.

Between 2013-2015 he also personally contributed to approximately 90 invited presentations/speaker invitations at local, national and international conferences, departments and institutes. These include Gordon Conference Invitations, 5 invitations to speak in Israel in 2013 and 2014 as a Sir Zelman Cowen Universities Fund Exchange Fellow, invitations to speak throughout Japan in 2015 as a Japan Society for the Promotion of Science (JSPS) Invitation Fellow.

Prof Des Richardson

EXTERNAL FUNDING TO LABORATORY

(2013 - 2015)

Source	Project Title	Collaborators	Awarded	Duration	Amount
NHMRC Project Grant	Development of Iron Complexes for the Treatment of Friedreich's Ataxia & the Role of Frataxin in Iron Metabolism	Richardson, D.R., Suryo Rahmanto, Y. and Ponka, P	2011 2012 2013	3 years	$205,016 $195,016 $195,016
NHMRC Australian Training Fellowship	Transplasma membrane electron transport, ascorbate and iron uptake in chronic myeloid leukemia (K562) cells	Lane, D	2011	4 years	$274,000
NHMRC Project Grant	Investigating the cellular response to iron-depletion: The trilogy of ASK1, thioredoxin and ribonucleotide reductase	Richardson, D.R., Hawkins, C., Suryo Rahmanto, Y. , Lovejoy, D. and Ponka, P	2012	3 years	$533,675
NHMRC Project Grant	Pharmacology of Potential Anti-Tumour Agents: Iron and Copper Chelators of the ApT, BpT and DpT Classes	Richardson, D.R., Lovejoy, D.B. and Brunk, U.T	2012	4 years	$294,892
NHMRC Australian Training Fellowship	Targeting the Metastasis Suppressor NDRG1 for the Treatment of Pancreatic Cancer	Kovacevic, Z. Supervisor and Mentor: Richardson D.R.	2012	3 years	$294,892
NHMRC Australian Training Fellowship	Cellular response to modulation of iron levels.	Yu, Y. Supervisor and Mentor: Richardson D.R.	2012	3 years	$294,892
NHMRC Development Grant	Pre-clinical development of a novel chemotherapeutic for cancer therapy	Richardson, D.R., Lovejoy, D.B. and Mills, J.	2012	2 year	$570,000
NHMRC Project Grant	A Pharmacological Targeting Approach Implementing Albumin as a Carrier of a Novel Chemotherapeutic	Kalinowski, D., Lane, D., and Ponka P.	2013	3 years	$541,472

NHMRC Project Grant	Pharmacological Targeting of Integrated Oncogenic and Tumour Suppressive Pathways using Novel Therapeutics	Richardson, D.R., Kovacevic, Z., and Kalinowski, D.	2014	3 years	$493,901
NHMRC Project Grant	The Physiological Role of Glutathione-S-Transferase in the Intracellular Storage and Transport of Nitric Oxide and its Biomedical Effects	Richardson, D.R. and Hawkins, C.	2014	3 years	$526,894
NHMRC Australian Training Fellowship	Dissecting the Pathogenesis of the Severe Neurodegenerative Disease, Friedreich's Ataxia: Development of Novel Therapeutics	Huang, M.L-H. Supervisor and Mentor: Richardson D.R.	2014	4 years	$304,596
NHMRC Career Development Award, RD Wright Biomedical Career Development Fellowship	A Pharmacological Targeting Approach Implementing Albumin as a Carrier of a Novel Chemotherapeutic	Kalinowski, D. Supervisor and Mentor: Richardson D.R.	2015	4 years	$411,768
USyd NHMRC Equipment Grants		Richardson, D.R. and etc.	2013	1 year	$74,750
USyd NHMRC Equipment Grants	CLARIOstar Multimode Microplate Reader for Shared Use in the Open Access, Multi-User, Molecular Biology Core Facility	Richardson, D.R. and etc.	2014	1 year	$60,000
USyd NHMRC Equipment Grants	Hypoxic Chambers for Seahorse XF Extracellular Flux Analyzers for Shared Use in the Open Access, Multi-User, Bosch Molecular Biology Facility	Richardson, D.R., Scolyer, R., Ng, M, Murray, M. and Kril, J.	2014	1 year	$178,670

USyd NHMRC Equipment Grants	La Vision BioTec Ultramicroscope/light-sheet microscope	Murphy, C., Keay, K., Johnstone, D., Stone, J., Braet, F., Mason, R., Goldsbury, C., Lovelace, M., Richardson, D.R., Halliday, G., Lyons, G.,Hambly, B., Fraser, S., Weiss, A., Overall, R., Owens, T., Byrne, M., Chan-Ling, T.	2014	1 yesr	$ 198,038
USyd NHMRC Equipment Grants	NanoString nCounter SPRINT Profiler System for Shared Use in the Open Access, Multi- User, Bosch Molecular Biology Facility	Richardson, D.R., Scolyer, R., Long, G., Murray, M., and Slobedman, B.	2015	1 year	$199,000
NHMRC Equipment Grants	Advanced NanoSight NS300 System for Shared Use in the Open Access, Multi-User, Bosch Blackburn Molecular Biology Facility	Halliday, G., Richardson, D.R., Chan, K., Grau, G., and Shackel, N.	2015	1 year	$195,233
Muscular Dystrophy Association USA Research Grant	Development of Iron Complexes for the Treatment of Friedreich's Ataxia	Richardson, D.R.	2011	3 years	$450,000 USD
Shanghai Jiao Tong University Collaboration	Establishment of a Joint Cancer Cell Biology Laboratory in Department of Pathophysiology, Shanghai Jiao Tong University	Richardson, D.R.	2012	2 years	$60,000 11K matching funds from USYD, Faculty of Medicine.
Canadian Institutes of Health Research Grant	Chelation, Mobilization and Metabolism of Storage Iron	Ponka, P. and Richardson, D.R	2013	6 years	$591,202 CAD

Cancer Institute NSW Early Career Development Fellowship	Investigating the anti-cancer activity of ascorbate in relation to cellular iron-metabolism in leukaemias	Lane, D.J. (Richardson, D.R. - Supervisor and Mentor)	2011	3 years	$600,000
Cancer Institute NSW Early Career Development Fellowship	A Novel Targeting Strategy for the Design of New Chemotherapeutics that Overcome Drug Resistance in Lung Cancer: "High-Jacking" the Drug Efflux Pump, P-gp.	Jansson, P.J. (Richardson, D.R. - Supervisor and Mentor)	2011	3 years	$599,892
Cancer Institute NSW Early Career Fellowship	Targeting the metastasis suppressor for the treatment of pancreatic cancer	Kovacevic, Z. (Supervisor: D.R. Richardson)	2014	3 years	$455,394
Sir Zelman Cowen Universities Fund Exchange Fellowship to give lectures at the Hebrew University of Jerusalem, Israel		Richardson, D.R.	2013		$3,415
Cancer Research Fund Infrastructure Grant	Robotic High Throughput Western Analysis for the Open Access, Multi-User Sydney Cancer Research Core Facility	Richardson, D.R., Scolyer, R., Boyer, M., Halliday, G., Damian, D., Christopherson, R., Joshua, D., Kench, J.G. Hong, A,...etc.	2013		$200,000 + $91,800 funds from University
Cancer Institute NSW Research Equipment Grant	BioMark HD High-Throughput Real Time & Digital PCR System for the Open Access, Multi-Disciplinary Sydney Cancer Research Core Facility	Richardson, D.R., Scolyer, R.A., Lee, S., Halliday, G., Murray, M., Lay, P.A., Christie, M., Kench, J., Damian, D.,...etc.	2013		$326,895 and also $140,000 from Multiple University of Sydney Sources

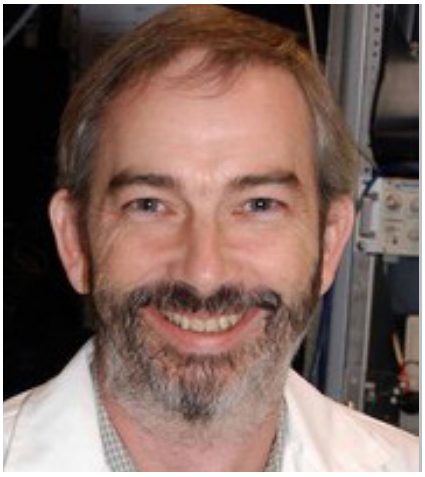
Cancer Institute NSW Research Equipment Grant	CYTOF Mass Cytometry Platform	Fasekas de St Groth, B., Weninger, W., Richardson, D.R., Halliday, G., Gunning, P., Hart, D., Mann, G., Goldys, E., Jin E.	2013	$500,000 and $392,964 from multiple other sources
University of Sydney, International Research Collaboration Award	Novel Aminoguanidine Schiff Base Chelators as Potential Anti-Cancer Agents	Domb, A. and Richardson, D.R.	2013	$15,300
Ramaciotti Equipment Grant	A light-sheet microscope; revolutionary technology for improved imaging of thick fluorescent samples, tissues and whole small organisms	Keay, K., Braet, F., Lyons, G., Hardikar, A., Stone, J., Murphy, C., Byrne, M., Leamey, C., Overall, R., Weiss, A., ...etc.	2013	$75,000
Ramaciotti Equipment Grant	QuantStudio 12K Flex OpenArray High-throughput Genetic Analysis System for Shared Use in the Open Access Multi-user Bosch Molecular Biology Core Facility	Stone, J., Black, J., Hardikar, A., Christie, M., Scolyer, R., King, N., Richardson, D.R., ...etc.	2013	$75,000
Bosch Small Equipment Grant		Jonstone, D., Stone, J., Chan-Ling, T., Leamey, C., Sawatari, A., Lovelace, M., Camp, A., ...etc.	2013	$14,480
Bosch Institute Small Equipment Grant	State-of-the-Art Hypoxia Chamber for Incubation at Physiological Oxygen Concentrations for the Multi-User Bosch Molecular Biology Facility	Richardson, D.R., Lai, D., Murphy, C., Lee, S., Zreiqat, H., McLennan, S., Twigg, S., Dong, Q., Murray, M., Allen, D., ...etc.	2013	$16,437

Bosch Institute Small Equipment Grant	Sysmex XS-1000i Automated Hematology Analyzer	Charles, K., Byrne, S., McLennan, S., Sharland, A., Lyons, G., Richardson, D.R., Halliday, G., King, N.	2013		$7,940
Bosch Institute Small Equipment Grant	Heated stage for PALM Laser Capture Microdissection microscope and accessories, enabling long-term live cell imaging and physiological experiments	Morris, M., Richardson, D.R., Gamble, J., Lovelace, M., dos Remedios, C., Mason, R., Murphy, C.R., Combes, V. and Grau,G.	2013		$4,008
Bosch Institute Small Equipment Grant	Rodent stereotax, Bone microdrill and WPI Pneumatic PicoPump PV830	Leamey, C., Sawatari, A., Chan-Ling, T., Camp, A., Richardson, D.R., Stone, J., Johnston, D.	2013		$3,650
Bosch Institute Translational Grant In Aid	Development of novel lipophilic vehicle drugs for markedly potentiating the activity of anti-tuberculosis agents.	Richardson, D.R.	2013		$20,000
Ramaciotti Biomedical Research Award	The Ramaciotti Centre for Human Systems Biology	Barbara Fazekas, Nicholas King, Adrian Smith, Iain Campbell, Stuart Cordwell, Louis Rendina,...etc.	2013	4 years	$1,000,000
Sir Zelman Cowen Universities Fund Fellowship	Travel to Israel	Richardson, D.R.	2014		$4,434

Sydney Medical School Early Career Researcher Scheme Grant		Merlot, A. (Richardson, D.R. - Supervisor and Mentor)	2014	$30,000
Sydney Medical School Early Career Researcher Scheme Grant		Huang, M. (Richardson, D.R. - Supervisor and Mentor)	2014	$30,000
Helen and Robert Ellis Fellowship to DSK		Kalinowski, D. (Richardson, D.R. - Supervisor and Mentor)	2014	$121,740, + $13,695 from Project Grants
CINSW Research Equipment Grant	Dual modality photoacoustic/ ultrasound imaging system for preclinical cancer studies	Kavallaris, M., Gunning, P., Hogg, P., Phillips, P., Power, C., Richardson, D.R. Wu, L.E.	2014	$350,000
Short-Term Study Abroad Project Supported by Xi'an Jiao Tong University, China	The Role of NDRG1 as a Growth & Metastasis Suppressor	Ru-Xing Xi, and Richardson, D.R. (Primary Supervisor)	2014	$6,000
Bosch Institute Small Equipment Grant	State-of-the-Art Nitric Oxide Analyser for the Multi-User Bosch Molecular Biology Facility	Richardson, D.R., Lai, D., Mason, R., Murphy, C.,Chan-Ling, T., Lovicu, F., ...etc.	2014	$26,000
Bosch Institute Small Equipment Grant	Heated Stage for a PALM Laser Capture Microscope	Morris, M., Richardson, D.R., Gamble, J.,...etc.	2014	$15,900

Bosch Institute Small Equipment Grant	Nuance FX Multispectral Imaging System	Owens, T., Camp, A., Ferguson, A., Merlot, A., Mooney, A.-M., Levina, A., Richardson, D.R., ...etc.	2014	$23,500
AMP Tomorrow Fund	The role of ascorbate as a novel anticancer therapeutic in two childhood cancers: leukaemia and neuroblastoma	Lane, D.J. Richardson, D.R. (Supervisor and Mentor)	2014	$33,000
Sydney Medical School Foundation, USyd	Finding Cancer's Achilles' Heel: Neoplastic Metabolism of Iron, Ascorbate and Polyamines	Lane, D. Richardson, D.R. (Supervisor and Mentor)	2014	$63,742
Sydney Medical School New Staff/ Early Career Researcher Scheme	Examining the Role of Autophagy in Metastasis Suppression and the Development of Metastasis Inhibitors	Sahni, S. Richardson, D.R. (Supervisor and Mentor)	2015	$30,000
Sydney Medical School New Staff/ Early Career Researcher Scheme	Chemical and Biological Characterization of Novel Multi-Functional Hybrid Aroylhydrazones and Thiosemicarbazones, "Adamantane-Chelators", for the Effective Treatment of Alzheimer's Disease	Palanimuthu, D. Richardson, D.R. (Supervisor and Mentor)	2015	$30,000
Bridging Support Fellowship, USyd		Lane, D.J. Richardson, D.R. (Supervisor and Mentor)	2015	$63,742
Multi-User Bosch MBF USyd Equipment Grant	Automated High Throughput Hypoxic Live Cell Imaging System for Shared Use in the Open Access	Halliday, G., Richardson, D.R. Venetia Long, G., Mason, R., Murphy, C.	2015	$170,573

CINSW Research Equipment Grant	Biacore T200 Molecular Interaction Analysis System for the Open Access, Multi-Disciplinary Sydney Cancer Research Core Facility	Richardson, D.R.	2015		$354,048
CINSW Research Equipment Grant	Portable Infrared Spectroscopy Equipment for Cancer Diagnosis, Research into Prevention of Cancer by Understanding the Role of Diet, and for Drug Development and Studies on Efficacy	Lay, P.A. Richardson, D.R.	2015		$102,000
SPARC Implementation Fund, USyd	Cancer invasion and metastasis: how actin networks control cell movement in 3-dimensional environments	O'Neill, G., Biro, M., Dehghani, R., Chrzanowski, W. and Richardson, D.R.	2015		$135, 717
Bosch Institute Small Equipment Grant	State-of-the-Art Tri-Carb® Liquid Scintillation Counter for the Multi-User Bosch Molecular Biology Facility	Richardson, D.R., Lai, D., Mason, R., ...etc.	2015		$17,000 (+$13,000)
Bosch Institute Small Equipment Grant	GenoGrinder system	McParland, B., Richardson, D.R.,... etc.	2015		$20,000
Bosch Institute Small Equipment Grant	Med Associates Fear Conditioning Equipment	Bagley, E.E., Richardson, D.R. and Chan-Ling, T.	2015		$6000 (+$1,050)
CINSW – Research Infrastructure Grant	Advanced Technical Support for the Open Access, Multi-Disciplinary Sydney Cancer Research Core	Richardson, D.R., Scolyer,R., Hersey, P., ...etc.	2015		$272,876
CTHULHU VENTURES LLC, Sausalito, San Francisco, CA, 94965	Development of DpC as an Anti-Tumour Agent: Pharmacological and Toxicological Investigations	Richardson, D.R. (Chief Investigator and Consultant)	2014	3 years	$6,000,000



DIABETES AND INSULIN SECRETION LABORATORY

PETER THORN

PROFESSOR, CHAIR IN CARDIOVASCULAR PHYSIOLOGY

LABORATORY PERSONNEL/ STUDENTS

Peter Thorn	Professor
Jun Low	Post Doc 2014
Yan Yun	Post Doc 2013 - 2014
Stefka Tasheva	Post Doc 2015 - present
Wei Ma	Post Doc 2015 - present
Michael Zavortink	Technician 2013 - 2014
Uda Ho	Technician 2015
Natasha Behrendorff	PhD - 2013
Oanh Hoang Do	PhD 2012 - 2015
Meihua Yu	PhD 2011 - 2014
Yanfeng Han	PhD 2012 - present
Wan Jun Gan	PhD 2013 - present
Christine Luddick	Honours 2015

LAB OVERVIEW

Our lab has three main projects:

1. Understanding the structure and functions that control insulin secretion within islets

Our data the suggest that insulin secretion is targeted towards the vasculature. Ongoing projects in the lab are designed to prove this targeting. The work involves advanced imaging techniques, molecular biology and electron microscopy. We use islets from mice and humans to identify key proteins and then test for their role in controlling insulin secretion.

2. Understanding the defects of insulin secretion that occur in disease

Changes in insulin secretion from beta cells are known to cause disease but despite a lot of work the basis of these changes is unclear. We have new data that shows that in a condition called prediabetes insulin secretion is dramatically upregulated. Using islets from diabetic mice and humans we are aiming to understand the principal mechanisms of control.

3. Refining cell-based therapies to cure diabetes

We are working with Drs James Hudson and Enzo Porello to engineer induced pluripotent stem cells to make them secrete insulin. Our experiments are testing some of the factors we are finding to be important in the control of beta cells in the islet with an aim to enhance the control of insulin secretion. For diabetic patients, cell replacement therapies have the promise, one day, to provide a cure for disease.

PUBLICATIONS

(2013 - 2015)

Thorn, P., Gaisano, H. (2015). Cell-to-Cell Communication and the Regulation of Pancreatic Function. Pancreas, 44(8), 1174-1175.

Maisonneuve, B., Roux, D., Thorn, P., Cooper-White, J. (2015). Effects of Synthetic Biomacromolecule Addition on the Flow Behavior of Concentrated Mesenchymal Cell Suspensions. Biomacromolecules, 16(1), 275-283.

Do, O., Thorn, P. (2015). Insulin secretion from beta cells within intact islets: location matters. Clinical and Experimental Pharmacology and Physiology, 42(4), 406-414.

Do, O., Low, J., Thorn, P. (2015). Lepr(db) mouse model of type 2 diabetes: pancreatic islet isolation and live-cell 2-photon imaging of intact islets. Journal of Visualized Experiments, 99, 1-8.

Yu, M., Niu, Y., Zhang, J., Zhang, H., Yang, Y., Taran, E., Jambhrunkar, S., Gu, W., Thorn, P., Yu, C. (2015). Size-dependent gene delivery of amine modified silica nanoparticles. Nano Research, 9(2), 291-305.

Yu, M., Niu, Y., Yang, Y., Hartono, S., Yang, J., Huang, X., Thorn, P., Yu, C. (2014). An approach to prepare polyethylenimine functionalized silica-based spheres with small size for siRNA delivery. ACS Applied Materials and Interfaces, 6(18), 15626-15631.

Yu, M., Karmakar, S., Yang, J., Zhang, H., Yang, Y., Thorn, P., Yu, C. (2014). Facile synthesis of ultra-small hybrid silica spheres for enhanced penetration in 3D glioma spheroids. Chemical Communications, 50(13), 1527-1529.

Low, J., Zavortink, M., Mitchell, J., Gan, W., Do, O., Schwiening, C., Gaisano, H., Thorn, P. (2014). Insulin secretion from beta cells in intact mouse islets is targeted towards the vasculature. Diabetologia, 57(8), 1655-1663.

Thorn, P. (2014). Measurement of Dynamic F-Actin Changes During Exocytosis. In A.I. Ivanov (Eds.), Methods in Molecular Biology: Vol 1174, Exocytosis and Endocytosis, (pp. 423-432). New York: Springer Science+Business Media.

Do, O., Low, J., Gaisano, H., Thorn, P. (2014). The secretory deficit in islets from db/db mice is mainly due to a loss of responding beta cells. Diabetologia, 57(7), 1400-1409.

Maisonneuve, B., Roux, D., Thorn, P., Cooper-White, J. (2013). Effects of cell density and biomacromolecule addition on the flow behavior of concentrated mesenchymal cell suspensions. Biomacromolecules, 14(12), 4388-4397.

Low, J., Mitchell, J., Do, O., Bax, J., Rawlings, A., Zavortink, M., Morgan, G., Parton, R., Gaisano, H., Thorn, P. (2013). Glucose principally regulates insulin secretion in mouse islets by controlling the numbers of granule fusion events per cell. Diabetologia, 56(12), 2629-2937.

Yu, M., Jambhrunkar, S., Thorn, P., Chen, J., Gu, W., Yu, C. (2013). Hyaluronic acid modified mesoporous silica nanoparticles for targeted drug delivery to CD44-overexpressing cancer cells. Nanoscale, 5(1), 178-183.

SERVICE TO THE UNIVERSITY AND COMMUNITY
(2013 - 2015)

- Treasurer to the Australian Physiological Society - 2013
- Editor for the online resource Pancreatologia 2013 -
- Editorial Board of Cell Calcium
- Editorial Board of the Journal of Biological Chemistry
- National Health and Medical Research Council, Academy Member 2013 - 2014
- National Health and Medical Research Council, Endocrinology Grant Panel Member 2015

POSTGRADUATE AND HONOURS COMPLETIONS
(2013 - 2015)

PhD

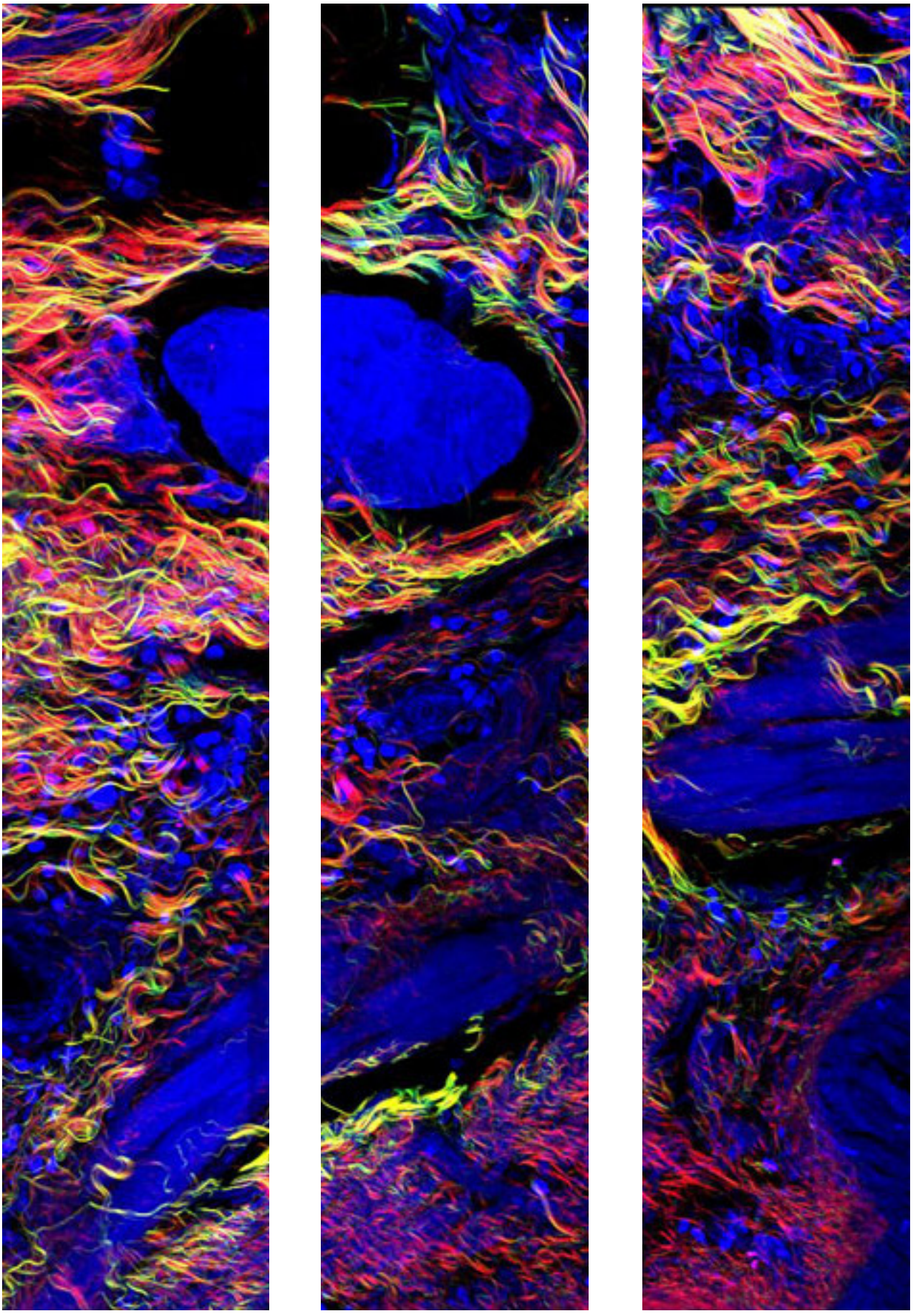
2014 - Meihua Yu

2014 - Jun Low

2013 - Natasha Behrendorff

EXTERNAL FUNDING TO LABORATORY
(2013 - 2015)

Source	Project Title	Collaborators	Awarded	Duration	Amount
Diabetes Australia	Control of insulin secretion	CIA Thorn	2015	1 year	$60,000
NHMRC Project	Control of insulin secretion	CIA Thorn CIB Gaisano CIC Gunton	2014-2017	3 years	$682,178
NHMRC Project	Control of acid secretion	CIA Thorn	2011-2014	3 years	$358,510
NHMRC Project	Control of insulin secretion	CIA Thorn CIB Gaisano	2010-2013	3 years	$573,390
ARC Discovery	Regulation of secretion	CIA Thorn CIB Thomas	2010-2013	3 years	$360,000
GO8-DAAD Exchange	Control of exocytosis	CIA Thorn CIB Thomas	2011-2013	2 years	$23,600
MEI (NHMRC Equipment)	A state of the art spinning disc confocal microscope		2015	-	$365,000
MEI (NHMRC Equipment)	A sensitive, high resolution QTOF mass spectrometer with nanoUPLC system		2015	-	$376,822



INFECTION, IMMUNITY & INFLAMMATION

Investigators in this Theme study a range of globally important infectious organisms, which cause severe disease and sometimes death, in large part to damage caused by an over-vigorous or badly targeted immune response. Organisms being studied include protozoa, bacteria and viruses:

protozoa, in particular malaria, which causes one of the highest death rates in the world, often in children

bacteria, including Chlamydia (greatest cause of infectious blindness; also infertility) and Salmonella (cause of severe gastrointestinal disease)

viruses, including RNA viruses such Flaviviruses, which together cause the greatest disease burden of encephalitic disease; respiratory syncytial virus and Rhinovirus, two viruses associated with asthma onset in children; influenza A virus, which in the 1918 pandemic killed more people than World War I and may cause the next pandemic of the H5N1 variant of "bird flu"; hepatitis C virus, one of the most likely causes of liver failure and liver cancer; human papilloma virus, which causes cervical cancer in women throughout the world; and DNA viruses, such as herpes viruses, including varicella virus, and cytomegalovirus, both of which are able to become latent after infection and re-activate whenever the immune response is compromised – for example, during malnutrition, transplantation or in AIDS infection.

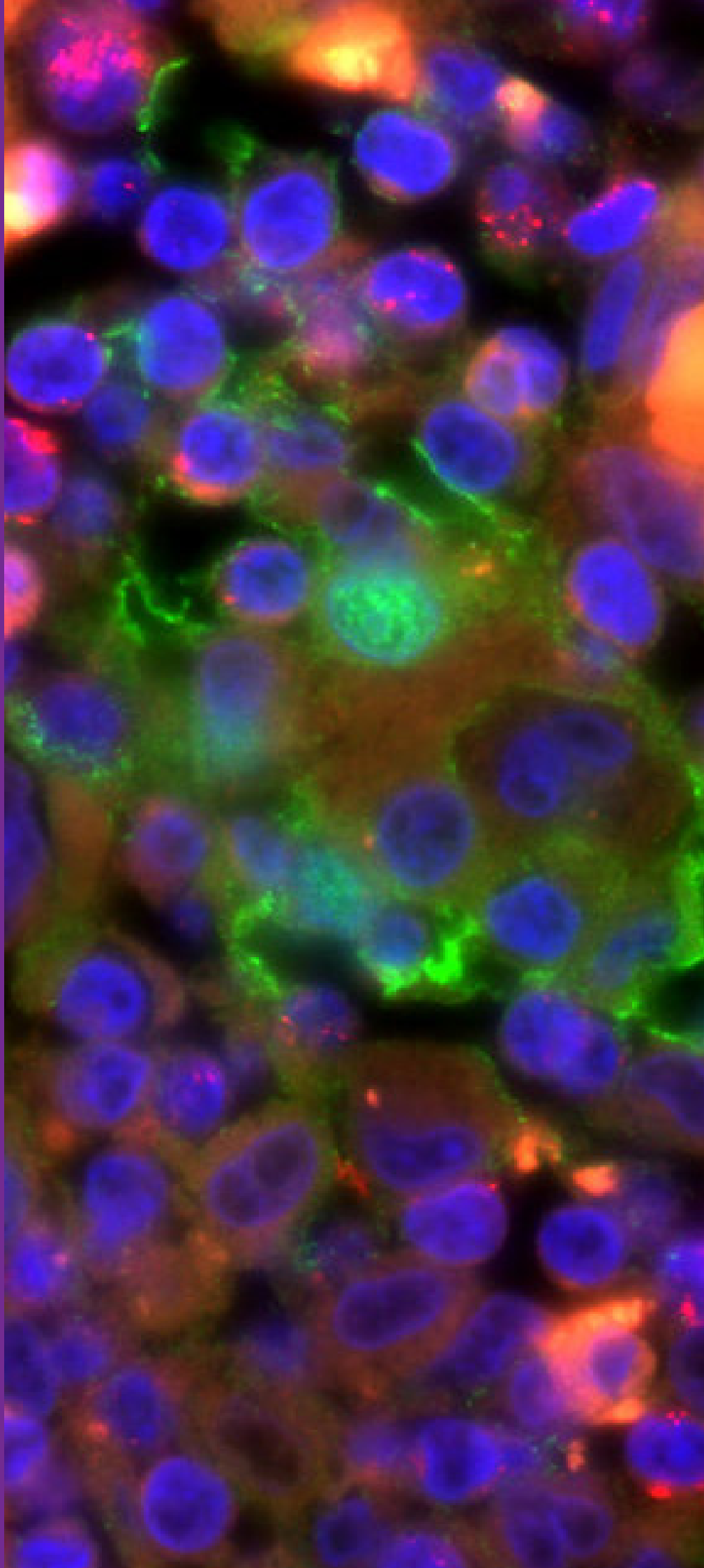
Desired impact on knowledge and practice

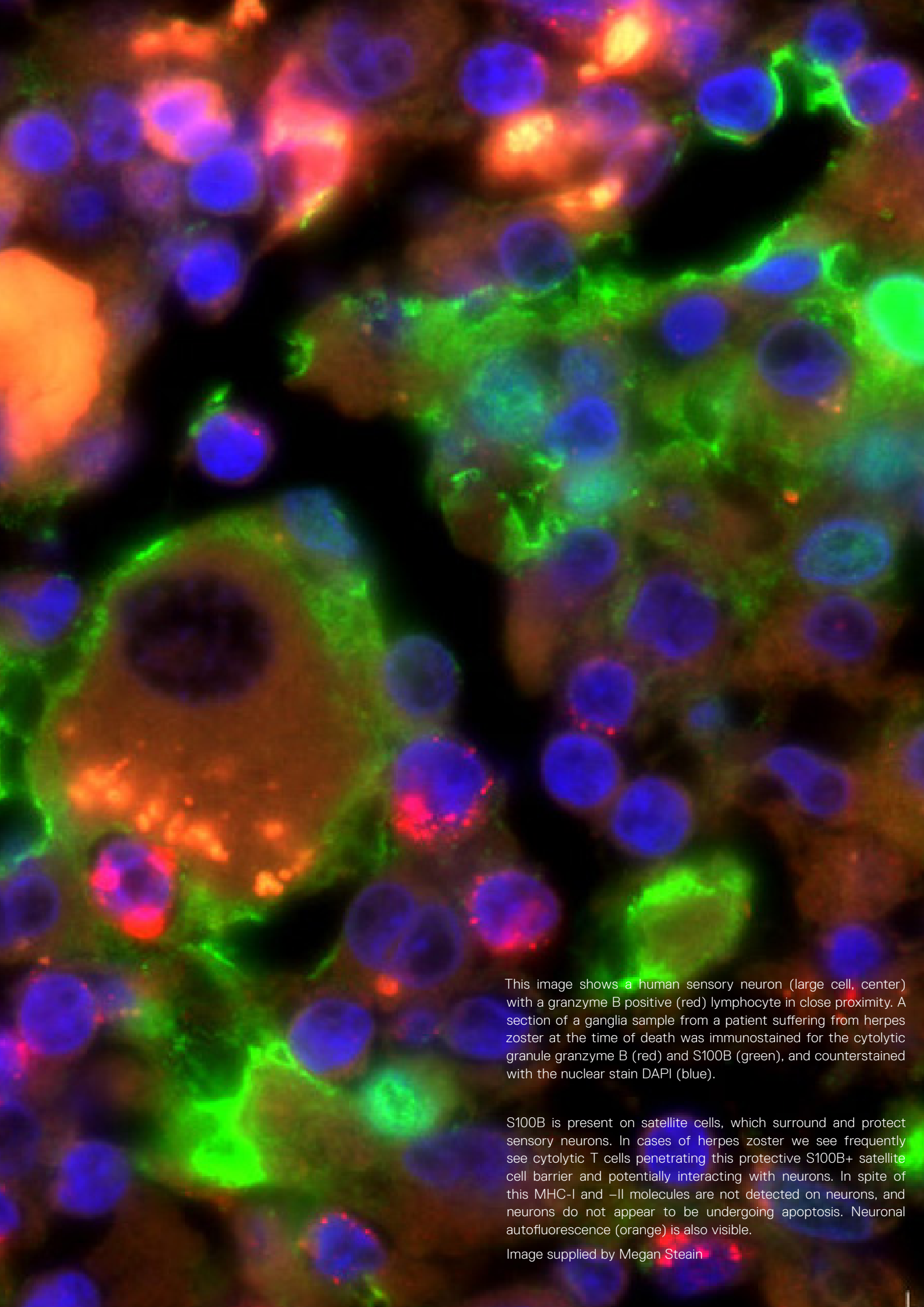
Basic Sciences: To develop understanding of mechanisms of immunopathological damage caused by infectious disease in relation to the generation of efficacious innate and adaptive immune responses.

Innovation: To facilitate invention of research techniques by collaboration within the Infectious Disease Theme and with members of other Themes.

Translation: To enable an informed approach to the clinical, treatment or palliation of immunopathology associated with virus infection, new diagnostic methods for earlier reliable detection of disease and new methods of prevention and/or control of infection.

For more information on this theme visit http://sydney.edu.au/medicine/bosch/research/infection-immunity-inflamation/index.php





This image shows a human sensory neuron (large cell, center) with a granzyme B positive (red) lymphocyte in close proximity. A section of a ganglia sample from a patient suffering from herpes zoster at the time of death was immunostained for the cytolytic granule granzyme B (red) and S100B (green), and counterstained with the nuclear stain DAPI (blue).

S100B is present on satellite cells, which surround and protect sensory neurons. In cases of herpes zoster we see frequently see cytolytic T cells penetrating this protective S100B+ satellite cell barrier and potentially interacting with neurons. In spite of this MHC-I and –II molecules are not detected on neurons, and neurons do not appear to be undergoing apoptosis. Neuronal autofluorescence (orange) is also visible.

Image supplied by Megan Steain

NEUROIMMUNOLOGY LABORATORY

IAIN CAMPBELL

PROFESSOR, MOLECULAR BIOSCIENCE

LAB OVERVIEW

The overall goal of our research is to understand the molecular and cellular basis of host defense and immunoinflammatory processes that contribute to disease in the central nervous system. During my time at Scripps our research was responsible for the development of a number of unique functional genomics approaches including the generation of novel transgenicmodeling strategies to express key proinflammatory and anti-microbial cytokine genes specifically in astrocytes in the CNS. The results of this research have considerably advanced knowledge of the causal role of cytokines and chemokines in inflammation and neurological disease and unraveled key mechanisms that control how these potent biological response modifiers communicate in the CNS to modulate cellular function and how this translates into altered behavior. Since relocating to Sydney and with the support of NIH and NHMRC funding the focus of our work has continued in this area.

Inflammation occurs in response to injury or infection of the central nervous system (CNS) and may cause significant damage to neural tissues leading to neurological impairment and disease. Cytokines are primary regulators of inflammation that are known to alter the activity of cells by binding to specific cell surface receptors that trigger signal transduction pathways resulting in altered gene expression. Evidence from previous work by our lab has shown that cytokines can act directly to cause neurological disease.

Addressing this gap in our knowledge is a major goal of our research.

RESEARCH ACTIVITIES

- Molecular pathobiology of cytokines and immunoinflammation in the CNS in various models including: EAE; viral meningitis; LPS-endotoxemia and nerve injury models
- Transgenic modelling of cytokine-induced neurological disease
- Molecular circuitry and disease-associated signal transduction and transcriptional pathways that mediate cytokine actions in the brain
- Genomic and proteomic profiling and target gene/molecule functional role in cytokine actions in the CNS
- Validation of novel molecular targets for therapeutic intervention in inflammatory diseases of the central nervous system

Evidence from previous work by our lab has shown that cytokines can act directly to cause neurological disease.

LABORATORY PERSONNEL/ STUDENTS

Iain Campbell	Professor 2004 - present
Magdalena Grill	Postdoctoral Fellow 2010 - 2014
Sue Ling Lim	Research Assistant 2006 - present
Laura Parker	Research Technician 2007 - present
Wen Li	PhD Student 2008 - 2014
Vicki Xie	PhD Student 2011 - present
Meng Hsu Ping	PhD Student 2012 - present
David So Ri Jung	PhD Student 2013 - present
Taylor Syme	PhD Student 2013 - present
Phillip West	PhD Student 2015 - present
Phillip West	Honours Student 2013
Lavenniah Annadoray	Hounours Student 2014
Stephanie Drake	Hounours Student 2014
Barney Viengkou	Hounours Student 2014
Glen Wu	Hounours Student 2015
Myriam Lambert	Hounours Student 2015

PUBLICATIONS
(2013 - 2015)

Almolda, B., de Labra, C., Barrera, I., Gruart, A., Delgado-Garcia, J., Villacampa, N., Vilella, A., Hofer, M., Hidalgo, J., Campbell, I., et al (2015). Alterations in microglial phenotype and hippocampal neuronal function in transgenic mice with astrocyte-targeted production of interleukin-10. Brain, Behavior, and Immunity, 45, 80-97.

Hsu, M., Frausto, R., Rose-John, S., Campbell, I. (2015). Analysis of IL-6/gp130 family receptor expression reveals that in contrast to astroglia, microglia lack the oncostatin M receptor and functional responses to oncostatin M. Glia, 63(1), 132-141.

Villacampa, N., Almolda, B., Vilella, A., Campbell, I., Gonzalez, B., Castellano, B. (2015). Astrocyte-targeted production of IL-10 induces changes in microglial reactivity and reduces motor neuron death after facial nerve axotomy. Glia, 63(7), 1166-1184.

Campbell, L., Simonin, A., Chen, C., Ferdous, J., Padula, M., Harry, E., Hofer, M., Campbell, I., Carter, D. (2015). Cryptococcus Strains with Different Pathogenic Potentials Have Diverse Protein Secretomes. Eukaryotic Cell (Online), 14(6), 554-563.

Terry, R., Deffrasnes, C., Getts, D., Minten, C., Van Vreden, C., Ashhurst, T., Getts, M., Xie, V., Campbell, I., King, N. (2015). Defective inflammatory monocyte development in IRF8-deficient mice abrogates migration to the West Nile virus-infected brain. Journal of Innate Immunity, 7(1), 102-112.

Grill, M., Syme, T., Nocon, A., Lu, A., Hancock, D., Rose-John, S., Campbell, I. (2015). Strawberry notch homolog 2 is a novel inflammatory response factor predominantly but not exclusively expressed by astrocytes in the central nervous system. Glia, 63(10), 1738-1752.

Van Belle, T., Pagni, P., Liao, J., Sachithanantham, S., Dave, A., Bel Hani, A., Manenkova, Y., Amirian, N., Yang, C., Morin, B., Campbell, I., et al (2014). Beta-cell specific production of IL6 in conjunction with a mainly intracellular but not mainly surface viral protein causes diabetes. Journal of Autoimmunity, 55, 24-32.

Millington, C., Sonego, S., Karunaweera, N., Rangel, A., Aldrich-Wright, J., Campbell, I., Gyengesi, E., Munch, G. (2014). Chronic Neuroinflammation in Alzheimer's Disease: New Perspectives on Animal Models and Promising Candidate Drugs. BioMed Research International, 2014, 1-10.

Almolda, B., Villacampa, N., Manders, P., Hidalgo, J., Campbell, I., Gonzalez, B., Castellano, B. (2014). Effects of Astrocyte-Targeted Production of Interleukin-6 in the Mouse on the Host Response to Nerve Injury. Glia, 62(7), 1142-1161.

Li, W., Hofer, M., Jung, S., Lim, S., Campbell, I. (2014). IRF7-Dependent Type I Interferon Production Induces Lethal Immune-Mediated Disease in STAT1 Knockout Mice Infected with Lymphocytic Choriomeningitis Virus. Journal of Virology, 88(13), 7578-7588.

Nocon, A., Ip, J., Terry, R., Lim, S., Getts, D., Muller, M., Hofer, M., King, N., Campbell, I. (2014). The Bacteriostatic Protein Lipocalin 2 Is Induced in the Central Nervous System of Mice with West Nile Virus Encephalitis. Journal of Virology, 88(1), 679-689.

Getts, D., Terry, R., Getts, M., Deffrasnes, C., Müller, M., Van Vreden, C., Ashhurst, T., Chami, B., McCarthy, D., Wu, H., Ma, J., Witting, P., Campbell, I., Reilly, D., White, M., Cordwell, S., Chadban, S., Bao, B., King, N., et al (2014). Therapeutic inflammatory monocyte modulation using immune-modifying microparticles. Science Translational Medicine, 6(219), 1-14.

Campbell, I., Erta, M., Lim, S., Frausto, R., May, U., Rose-John, S., Scheller, J., Hidalgo, J. (2014). Trans-Signaling Is a Dominant Mechanism for the Pathogenic Actions of Interleukin-6 in the Brain. The Journal of Neuroscience, 34(7), 2503-2513.

Zimmermann, J., Krauthausen, M., Hofer, M., Heneka, M., Campbell, I., Muller, M. (2013). CNS-Targeted Production of IL-17A Induces Glial Activation, Microvascular Pathology and Enhances the Neuroinflammatory Response to Systemic Endotoxemia. PloS One, 8(2), 1-13.

Roberts, K., Zeineddine, R., Corcoran, L., Li, W., Campbell, I., Yerbury, J. (2013). Extracellular Aggregated Cu/Zn Superoxide Dismutase Activates Microglia to Give a Cytotoxic Phenotype. Glia, 61(3), 409-419.

Giralt, M., Ramos, R., Quintana, A., Ferrer, B., Erta, M., Castro-Freire, M., Comes, G., Sanz, E., Unzeta, M., Pifarre, P., Campbell, I., et al (2013). Induction of atypical EAE mediated by transgenic production of IL-6 in astrocytes in the absence of systemic IL-6. Glia, 61(4), 587-600.

Li, W., Hofer, M., Nocon, A., Manders, P., Campbell, I. (2013). Interferon regulatory factor 7 (IRF7) is required for the optimal initial control but not subsequent clearance of lymphocytic choriomeningitis virus infection in mice. Virology, 439(2), 152-162.

Hofer, M., Campbell, I. (2013). Type I interferon in neurological disease-The devil from within. Cytokine and Growth Factor Reviews, 24(3), 257-267.

POSTGRADUATE AND HONOURS COMPLETIONS

(2013 - 2015)

PhD

2015 - Wen Li

BSc(Hons)

2014 - Rui Dan Xie

2015 - Lavenniah Annadoray

2015 - Stephanie Drake

2015 - Barney Viengkou

EXTERNAL FUNDING TO LABORATORY

(2013 - 2015)

Source	Project Title	Collaborators	Awarded	Duration	Amount
NHMRC	Role of strawberry notch in neuroinflammation	Campbell I	2013	4 years	$740,267

CHEMICAL BIOLOGY IN DRUG DISCOVERY LABORATORY

RACHEL CODD

ASSOCIATE PROFESSOR, PHARMACOLOGY

LAB OVERVIEW

My broad research expertise is in inorganic chemical biology and medicinal chemistry. I study the inorganic chemical biology of a class of bacterial metabolites known as siderophores that have a high affinity towards iron(III) and other metal ions of relevance to biomedicine and biomedical imaging. My cross-discipline research traverses chemistry (inorganic, organic, and medicinal), biochemistry, microbiology and biotechnology. My group has developed a water-compatible method in affinity chromatography to select for clinical bacterial metabolites from complex fermentation mixtures. This method is particularly successful for the streamlined isolation of bacterial siderophores and for the anticancer agent doxorubicin, and could have potential for green chemistry processing of pharmaceutics. This analytical method has allowed us to map low-abundant siderophore metabolomes in marine and terrestrial bacteria.

RESEARCH ACTIVITIES

My group has recently shed new light on the biosynthesis of the siderophore desferrioxamine B (DFOB), which is a clinical agent used to treat secondary iron overload, which occurs in people with inherited transfusion-dependent blood disorders. We mapped using LC-MS/MS the distribution of the pieces of the DFOB jigsaw during its biosynthesis in situ, which allowed us to determine the sequence of events of its assembly in the final stages. This knowledge has underpinned our pioneering methods that use the bacterial biosynthetic machinery to furnish new siderophores as drug candidates with potential for treating secondary iron overload disease, and as ligands with potential for metallo-radionuclide imaging of cancer.

We have also developed methods in metal-templated synthesis to deliver known and new macrocyclic siderophores. My group has used semi-synthetic chemistry to produce new DFOB analogues that have shown promise as iron(III) binding molecules in in vitro and in vivo (MPTP-mouse) models of Parkinson's disease. A number of the biological studies are conducted with collaborating researchers at the QIMR Berghofer Medical Research Institute, The Department of PET and Nuclear Medicine (RPAH), The University of Melbourne, the Florey Institute of Neuroscience and Mental Health, and the Children's Cancer Institute. In other projects, my group has discovered a highly innovative method to discover drugs from natural products. We also conduct more traditional drug design projects - with a twist - aimed to discover new inhibitors against histone deacetylases, which is a verified cancer target. My research innovations have resulted in one PCT (granted in 2012/2013 the US, AU, EU), two provisional patents (2015, 2016) and one provisional patent to be filed (2016).

LABORATORY PERSONNEL/ STUDENTS

Rachel Codd	Associate Professor 2013 - present
Michael Gotsbacher	Postdotoral Associate 2014 - present
William Tieu	Postdotoral Associate 2014 - present
Jiesi Gu	PhD Student 2012 - present
Thomas Telfer	PhD Student 2013 - present
Tomas Richardson-Sanchez	PhD Student 2014-present

PUBLICATIONS

(2013 - 2015)

Lifa, T., Tieu, W., Hocking, R., Codd, R. (2015). Forward and reverse (Retro) Iron(III) or gallium(III) desferrioxamine e and ring-expanded analogues prepared using metal-templated synthesis from endo -hydroxamic acid monomers. Inorganic Chemistry, 54(7), 3573-3583.

Locock, K., Tran, H., Codd, R., Allan, R. (2015). Hands-On Approach to Structure Activity Relationships: The Synthesis, Testing, and Hansch Analysis of a Series of Acetylcholineesterase Inhibitors. Journal of Chemical Education, 92(10), 1745-1750.

Nakano, I., Soe, C., Codd, R. (2015). Isolation of doxorubicin from a bacterial culture using immobilised metal ion affinity chromatography. RSC Advances, 5(58), 46437-46442.

Gu, J., Codd, R. (2015). The resolution of two clinical agents, bleomycin and desferrioxamine B, from a Streptomyces verticillus fermentation mixture using multi-dimensional immobilised metal ion affinity chromatography. RSC Advances, 5(5), 3443-3453.

Soe, C., Pakchung, A., Codd, R. (2014). Dinuclear [(VVO(putrebactin))2(m-OCH3)2] formed in solution as established from LC-MS measurements using 50V-enriched V2O5. Inorganic Chemistry, 53(11), 5852-5861.

Codd, R., Gu, J., Ejje, N., Lifa, T. (2014). New Applications of Immobilized Metal Ion Affinity Chromatography in Chemical Biology. In Gilles Gasser (Eds.), Inorganic Chemical Biology: Principles, Techniques and Applications, (pp. 1-35). Chichester: John Wiley & Sons.

Soe, C., Codd, R. (2014). Unsaturated Macrocyclic Dihydroxamic Acid Siderophores Produced by Shewanella putrefaciens Using Precursor-Directed Biosynthesis. ACS Chemical Biology, 9(4), 945-956.

Liddell, J., Obando, D., Liu, J., Ganio, G., Volitakis, I., San Mok, S., Crouch, P., White, A., Codd, R. (2013). Lipophilic adamantyl- or deferasirox-based conjugates of desferrioxamine B have enhanced neuroprotective capacity: implications for Parkinson disease. Free Radical Biology and Medicine, 60, 147-156.

Pakchung, A., Lifa, T., Codd, R. (2013). Solution species of Fe(III), Ga(III), In(III) or Ln(III) and suberodihydroxamic acid from electrospray ionization mass spectrometry. RSC Advances, 3(36), 16051-16059.

Ejje, N., Soe, C., Gu, J., Codd, R. (2013). The variable hydroxamic acid siderophore metabolome of the marine actinomycete Salinispora tropica CNB-440. Metallomics, 5(11), 1519-1528.

POSTGRADUATE AND HONOURS COMPLETIONS

(2013 - 2015)

PhD

2013 - Najwa Ejje

2013 - Tulip Lifa

SPECIAL AWARDS & PRIZES

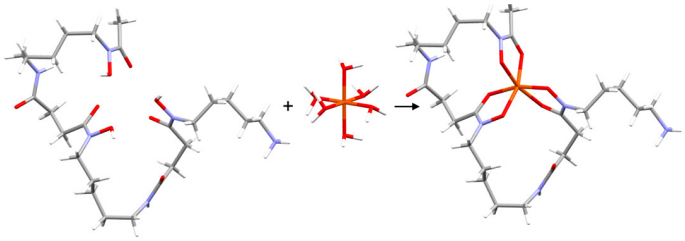
(2013 - 2015)

- 2015 - Sydney Medical School Award for Excellence in Research Supervision
- 2015 - Semi-Finalist in the Elsevier Green Chemistry Challenge

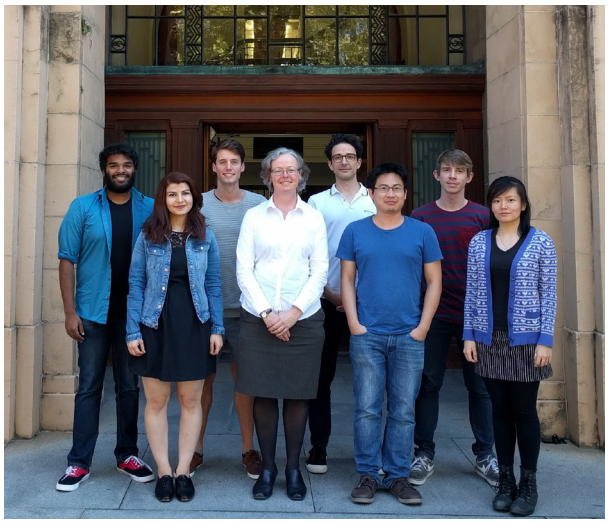
EXTERNAL FUNDING TO LABORATORY

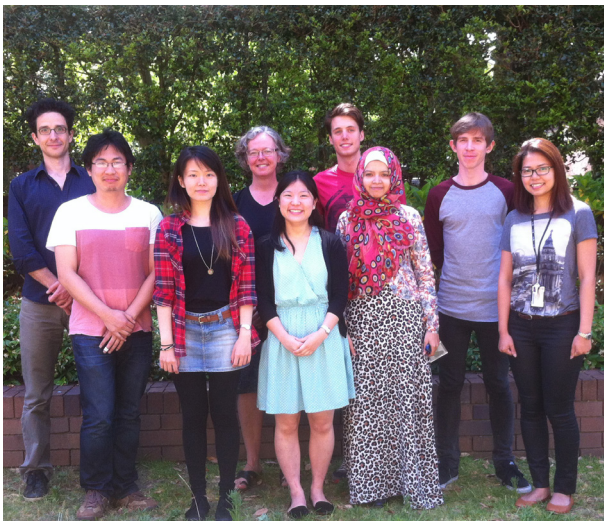
(2013 - 2015)

Source	Project Title	Collaborators	Awarded	Duration	Amount
NHMRC	Agents targeting iron in the brain in Parkinson's disease	Kay Double, Jeffrey Liddell, Paul Witting	2014	3 year	$596,000
ARC	Engineered Hydroxamic Acids for Zirconium-89 Positron Emission Tomography (PET) Imaging of Prostate Cancer	Andrew Katsifis	2014	3 years	$370,000



A/Prof Codd and her team study metal binding compounds produced by bacteria known as 'siderophores'. These compounds have applications in managing metal-ion-dependent pathologies. The molecule at left is a siderophore which has a high affinity for binding iron(III), as shown in the iron-siderophore complex at right.





Members of the Chemical Biology in Drug Discovery Laboratory,

left image, from left to right: Mr Athavan Sresutharsan, Ms Lydia Daniel, Mr Tomas Richardson-Sanchez, Prof Rachel Codd, Dr Michael Gotsbacher, Dr William Tieu, Mr Thomas Telfer, Ms Jiesi Gu;

right image, from left to right: Dr Michael Gotsbacher, Dr William Tieu, Ms Jiesi Gu, Prof Rachel Codd, Ms Isla Nakano, Mr Tomas Richardson-Sancez, Dr Tulip Lifa, Mr Thomas Telfer, Dr Cho Zin Soe

VASCULAR IMMUNOLOGY LABORATORY

GEORGES GRAU

PROFESSOR, PATHOLOGY

LAB OVERVIEW

Immunopathology of microvascular lesions, particularly of cerebral and pulmonary complications of infectious and auto-immune diseases, especially in cerebral malaria, septic shock and multiple sclerosis. Analysis of the cellular and molecular mechanisms of the interactions between microvascular endothelial cells and cells of the immune system. Experience in various in vivo and in vitro experimental systems as well as in clinical studies. More recently, focus on the neurovascular lesion of murine and human cerebral malaria, using co-culture model systems involving brain endothelium, P. falciparum infected erythrocytes, as well as circulating cells, particularly platelets and monocytes.

PUBLICATIONS

(2013 - 2015)

Ampawong, S., Chaisri, U., Viriyavejakul, P., Prapansilp, P., Grau, G., Turner, G., Pongponratn, E. (2015). A potential role for interleukin-33 and γ -epithelium sodium channel in the pathogenesis of human malaria associated lung injury. Malaria Journal, 14(1), 1-15.

Bucur, O., Almasan, A., Zubarev, R., Friedman, M., Nicolson, G., Sumazin, P., Leabu, M., Nikolajczyk, B., Avram, D., Kunej, T., Richardson, D., Grau, G., et al (2015). An updated h-index measures both the primary and total scientific output of a researcher. Discoveries, 3(3), 1-6.

Kam, A., Li, K., Razmovski-Naumovsk, V., Nammi, S., Chan, K., Grau, G., Li, G. (2015). Curcumin Reduces Tumour Necrosis Factor-Enhanced Annexin V-Positive Microparticle Release in Human Vascular Endothelial Cells. Journal of Pharmacy and Pharmaceutical Sciences, 18(4), 424-433.

Hochman, S., Madaline, T., Wassmer, S., Mbale, E., Choi, N., Seydel, K., Whitten, R., Varughese, J., Grau, G., Kamiza, S., et al (2015). Fatal Pediatric Cerebral Malaria Is Associated with Intravascular Monocytes and Platelets That Are Increased with HIV Coinfection. MBIO, 6(5), 1-12.

Latham, S., Tiberti, N., Gokoolparsadh, N., Holdaway, K., Couraud, P., Grau, G., Combes, V. (2015). Immuno-analysis of microparticles: probing at the limits of detection. Scientific Reports, 5, 1-13.

Hackett, M., Aitken, J., El Assaad, F., McQuillan, J., Carter, E., Ball, H., Tobin, M., Paterson, D., De Jonge, M., Siegele, R., Grau, G., Hunt, N., Lay, P., et al (2015). Mechanisms of murine cerebral malaria: Multimodal imaging of altered cerebral metabolism and protein oxidation at hemorrhage sites. Science Advances, 6(4), 7-16.

Hackett M., Aitken J.B., El-Assad F., Mcquillan J.A., Carter E.A., Ball H.I., Tobin M.I., Paterson D., De Jonge M.D., Siegele R., Cohen D.D., Vogt S., Grau G.E., Hunt N.H., Lay P.A. Biospectroscopic Insights into the Mechanisms of Murine Cerebral Malaria – Multi-Modal Spectroscopic Imaging Reveals Altered Cerebral Metabolism and Protein Oxidation at the Site of Tissue Hemorrhage. Science Adv 2015 1 (11) e1500911 DOI: 10.1126/sciadv.1500911.

Cohen, A., Combes, V., Grau, G. (2015). MicroRNAs and Malaria – A Dynamic Interaction Still Incompletely Understood. Journal of Neuroinfectious Diseases, 6(1), 1-12.

Whittington, C., Grau, G., Murphy, C., Thompson, M. (2015). Unusual angiogenic factor plays a role in lizard pregnancy but is not unique to viviparity. Journal of Experimental Zoology Part B: Molecular and Developmental Evolution, 324B (2), 152-158.

Danastas, K., Combes, V., Lindsay, L., Grau, G., Thompson, M., Murphy, C. (2015). VEGF111: New insights in tissue invasion. Frontiers in Physiology, 6, 1-5.

Gramaglia I., Velez J., Combes V., Grau G.E.R., Van Der Heyde H.C. (2015). Platelets do not kill blood-stage Plasmodium parasites but function in experimental cerebral malaria pathogenesis. Submitted.

Grau, G., Thompson, M., Murphy, C. (2015). VEGF: Inflammatory paradoxes. Pathogens and Global Health, 109(6), 253-254.

Lee J., Wen B., Bonhoure A., Carter E.A., Combes V., Grau G.E.R., Lay P.A. A New Method for Differentiating the Biochemistry of Microparticles Released from LPS-Activated versus Control Cells: FTIR Spectroscopy. Submitted.

Wen B., Latham S., Magenau A., Gaus K., Turville S., Combes V., Grau G.E.R. (2015). Endothelial internalisation and processing of monocyte derived microparticles in endotoxic shock. Submitted.

Khaw, L., Ball, H., Mitchell, A., Grau, G., Stocker, R., Golenser, J., Hunt, N. (2014). Brain endothelial cells increase the proliferation of Plasmodium falciparum through production of soluble factors. Experimental Parasitology, 145(1), 34-41.

Jaiswal, R., Grau, G., Bebawy, M. (2014). Cellular communication via microparticles: role in transfer of multidrug resistance in cancer. Future Oncology, 10(4), 655-669.

Hunt, N., Ball, H., Hansen, A., Khaw, L., Guo, J., Bakmiwewa, S., Mitchell, A., Combes, V., Grau, G. (2014). Cerebral malaria: gamma-interferon redux. Frontiers in Cellular and Infection Microbiology, 4, 1-12.

Grau, G., Hunt, N. (2014). Cytokines and Some of Their Effector Mechanisms in Cerebral Malaria Pathogenesis. In M. Hommel and P. G. Kremsner (Eds.), Encyclopedia of Malaria, (pp. 1-11). New York: Springer.

Ampawong, S., Chaisri, U., Viriyavejakul, P., Nontprasert, A., Grau, G., Pongponratn, E. (2014). Electron microscopic features of brain edema in rodent cerebral malaria in relation to glial fibrillary acidic protein expression. International Journal of Clinical and Experimental Pathology, 7(5), 2056-2067.

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El-Assaad, F., Combes, V., Grau, G., Jambou, R. (2014). Potential Efficacy of Citicoline as Adjunct Therapy in Treatment of Cerebral Malaria. Antimicrobial Agents and Chemotherapy, 58(1), 602-605.

El Assaad, F., Wheway, J., Hunt, N., Grau, G., Combes, V. (2014). Production, fate and pathogenicity of plasma microparticles in murine cerebral malaria. PLoS Pathogens, 10(3), 1-14.

Pai, S., Qin, J., Cavanagh, L., Mitchell, A., El-Assaad, F., Jain, R., Combes, V., Hunt, N., Grau, G., Weninger, W. (2014). Real-Time Imaging Reveals the Dynamics of Leukocyte Behaviour during Experimental Cerebral Malaria Pathogenesis. PLoS Pathogens, 10(7), 1-17.

Jaiswal, R., Luk, F., Dalla, P., Grau, G., Debawy, M. (2013). Breast Cancer-Derived Microparticles Display Tissue Selectivity in the Transfer of Resistance Proteins to Cells. PloS One, 8(4), 1-10.

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Latham, S., Chaponnier, C., Dugina, V., Couraud, P., Grau, G., Combes, V. (2013). Cooperation between beta- and gamma-cytoplasmic actins in the mechanical regulation of endothelial microparticle formation. The FASEB Journal, 27(2), 672-683.

Razakandrainibe, R., Combes, V., Grau, G., Jambou, R. (2013). Crossing the wall: The opening of endothelial cell junctions during infectious diseases. The International Journal of Biochemistry and Cell Biology, 45(7), 1165-1173.

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Lee, J., Siegele, R., Pastuovic, Z., Hackett, M., Hunt, N., Grau, G., Cohen, D., Lay, P. (2013). Light and heavy ion beam analysis of thin biological sections. Nuclear Instruments and Methods in Physics Research. Section B, 306, 129-133.

Gong, J., Luk, F., Jaiswal, R., George, A., Grau, G., Bebawy, M. (2013). Microparticle drug sequestration provides a parallel pathway in the acquisition of cancer drug resistance. European Journal of Pharmacology, 721(1-3), 116-125.

Walters, S., Kieckbusch, J., Nagalingam, G., Swain, A., Latham, S., Grau, G., Britton, W., Combes, V., Saunders, B. (2013). Microparticles from Mycobacteria-Infected Macrophages Promote Inflammation and Cellular Migration. The Journal of Immunology, 190(2), 669-677.

Lu, J., Luk, F., Gong, J., Jaiswal, R., Grau, G., Bebawy, M. (2013). Microparticles mediate MRP1 intercellular transfer and the re-templating of intrinsic resistance pathways. Pharmacological Research, 76, 77-83.

Liu, H., Zhang, W., Jia, Y., Yu, Q., Grau, G., Peng, L., Ran, Y., Yang, Z., Deng, H., Lou, J. (2013). Single-cell clones of liver cancer stem cells have the potential of differentiating into different types of tumor cells. Cell Death and Disease, 4(10), 1-11.

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SERVICE TO THE UNIVERSITY AND COMMUNITY

(2013 - 2015)

Boards of learned journals

- Current Neurovascular Research
- International Journal of Experimental and Clinical Pathology
- Open Parasitology Journal
- Open Neurology Journal
- Discoveries Journals
- Intensive Care Medicine
- Journal of Neuro-Infectious Diseases (formerly Journal of Neuroparasitology).

Memberships

- Memberships of Organising Committees include: the Neuroinfections Meetings, ANZMS, ASP and the 2014 Australian Society for Extracellular Vesicles (Chair Andy Hill, Melbourne).
- Since 2011 Prof Grau serves as Discipline Leader (Pathology) at the Sydney Institute for Emerging Infections and since 2013 as Regional Advisor (Europe) at the Faculty of Medicine, University of Sydney.
- Elected Member, General Committee, Australian-New Zealand Microcirculation Society, since 2012.
- Elected Member of the Board, Marie Bashir Institute, since June 2014.
- Regular peer-reviewer for high profile generalist journals such as Cell, Science, Nature, Nature Medicine, Nature Reviews Immunology and PNAS; first-rate medical research journals such as The New England Journal of Medicine, JAMA, The Lancet, PLoS Med, The Journal of Clinical Investigation; and pathophysiology / immunology journals such as The Journal of Experimental Medicine, Trends in Immunology, Immunological Reviews, PLoS Pathogens, American Journal of Pathology, PLoS One, Blood, and Journal of Immunology.

EXTERNAL FUNDING TO LABORATORY

(2013 - 2015)

Source	Project Title	Collaborators	Awarded	Duration	Amount
NHMRC	Microparticles are pathogenic elements in the pathophysiology of cerebral malaria	Combes V, Grau G, Wheway J	2012	3 years	$584,700
ARC	The link between the angiogenesis of live birth and cancer: a lizard model	Thompson M, Murphy C, Grau G	2012	3 years	$550,000
NHMRC	The astrocyte: a crossroads in cerebral malaria pathogenesis	Hunt N, Ball H, Grau G	2012	3 years	$577,350
NHMRC	Microparticles and Selective Trait Dominance in Multidrug Resistant Cancers	Bebawy M, Grau G, Combes V	2011	3 years	$396,273
NHMRC	Microparticles and Selective Trait Dominance in Multidrug Resistant Cancers	Bebawy M, Grau G, Combes V	2011	3 years	$60,000
UNSW Shared Research Support	The involvement of the kynurenine pathway in blood brain barrier disruption and its relevance for neuroinflammatory diseases	Guillemin G, Combes V, Grau G, Brew B	2011	3 years	$60,557

IMMUNOBIOLOGY AND NEUROPATHOLOGY LAB

MARCUS HOFER

LECTURER, MOLECULAR BIOLOGY AND GENETICS

LAB OVERVIEW

The brain is the most complex organ in the human body, containing over one hundred billion nerve cells. In contrast to other organs, the brain has a very limited capacity to regenerate and damage is often irreversible. One of the major ways the brain can become damaged is during inflammation. Inflammation is part of the process that the body uses to eliminate microbial infection but it also occurs during autoimmune disease and in response to external factors such as diet.

My research aims to understand the delicate balance of signalling factors that control inflammation in the brain and to explore the process of neurodegeneration. Part of my work focuses on how inflammation contributes to the development of neurodegenerative diseases such as Alzheimer's disease and Parkinson's disease. To do this, my laboratory uses both in vivo and in vitro models including cell culture, transgenic and knock-out mice, as well as experimental infection of mice with lymphocytic choriomeningitis virus (LCMV) or Zika virus, two models for viral encephalitis.

RESEARCH ACTIVITIES

1. Effects of Interferon Regulatory Factor 9 (IRF9) deficiency on the function of virus-specific CD8+ T cells during viral encephalitis.

Type I interferons (IFN-Is) are a family of proteins that are produced by the body in response to infection with microorganisms such as viruses. The IFN-Is transmit their effects by activating three factors, termed signal transducer and activator of transcription 1 (STAT1), STAT2 and interferon regulatory factor 9 (IRF9). We have previously shown that absence of either factor has distinct effects on the response of cells to IFN-Is. This finding is of great relevance as it suggests that altering the activity of these three factors may improve the use of IFN-Is as drugs while maintaining their effectiveness. Nevertheless, the role of each of the factors remains unknown.

In this project we are investigating the role of IRF9 in anti-viral immune responses in the CNS using intracranial infection of mice with LCMV as a model. In normal or "wild-type" (WT) mice, LCMV causes a lethal encephalitis when injected into the brain. Mice that lack IRF9 (called IRF9 KO mice) do not die following infection with LCMV. However, survival comes at the cost of virus persistence and a chronic immune response in the brain and peripheral organs. The lethal disease in WT mice is caused by a subgroup of white blood cells, termed CD8+ T cells. One of our research foci is to determine the effects of IRF9-deficiency on these CD8+ T cells.

2. Transactivation of STAT1 in inflammatory and autoimmune diseases of the central nervous system

Type I interferons (IFN-Is) play a seminal role in the activation of the innate immune response, linking it with the adaptive immune response. This large family of cytokines includes multiple subtypes of IFN-alpha and a single IFN-beta. By contrast, type II interferon consists only of a single member, IFN-gamma. IFN-gamma is a key mediator in the host defence against cerebral virus infections, but is also involved in the pathogenesis of several neurological disorders including the debilitating autoimmune disease multiple sclerosis (MS).

The biological effects of IFN-Is and IFN-gamma are mediated by two distinct signalling pathways. In both signalling pathways, activation of the signal transducer and activator of transcription 1 (STAT1) is essential. This step occurs via phosphorylation of tyrosine 701 (PY-STAT1). However, additional phosphorylation of serine 727 in STAT1 (PS-STAT1) is also critical for the cellular responses to IFNs. In humans, PS-STAT1 has been implicated in the pathogenesis of several malignant

LABORATORY PERSONNEL/ STUDENTS

Dr Marcus Hofer	Lecturer 2013 - present
Tamara Suprunenko	PhD Student 2015 - present
Barney Viengkhou	PhD Student 2015 - present
Judith Piegsa	MSc Student (Jena, Germany) 2015
Eric Tran	Honours Student 2013
Tamara Suprunenko	Honours Student 2014
Barney Viengkhou	Honours Student 2014
Pattama Songkhunawej	Honours Student 2015
Martina Fink	BSc Student (Konstanz, Germany) 2014

tumours. Furthermore, reduced PS-STAT1 levels correlate with more severe disease in patients with MS.

So far, most studies on PS-STAT1 have been done in vitro with limited results obtained in vivo and none concerning the CNS. Therefore, the aims of this project are to determine the contribution of S727 phosphorylation of STAT1 to neuroinflammatory diseases.

3. The contribution of diet to neurodegeneration

Diet is known to play an important role in metabolic diseases such as obesity and type 2 diabetes. However, recent studies have also linked diet to the development of neurodegenerative diseases including Alzheimer's disease. Neurodegenerative diseases pose a significant challenge to Australia's aging population and have no known cure. Understanding the impact of diet may lead to practical interventions to slow or prevent these diseases.

While the exact mechanisms that connect neurodegenerative diseases to diet remain unknown, several studies have revealed the potential for high-fat diets to trigger chronic inflammation and loss of nerve cells. In this project we explore this further by characterising the pathological responses of the brain that are induced by specific diets.

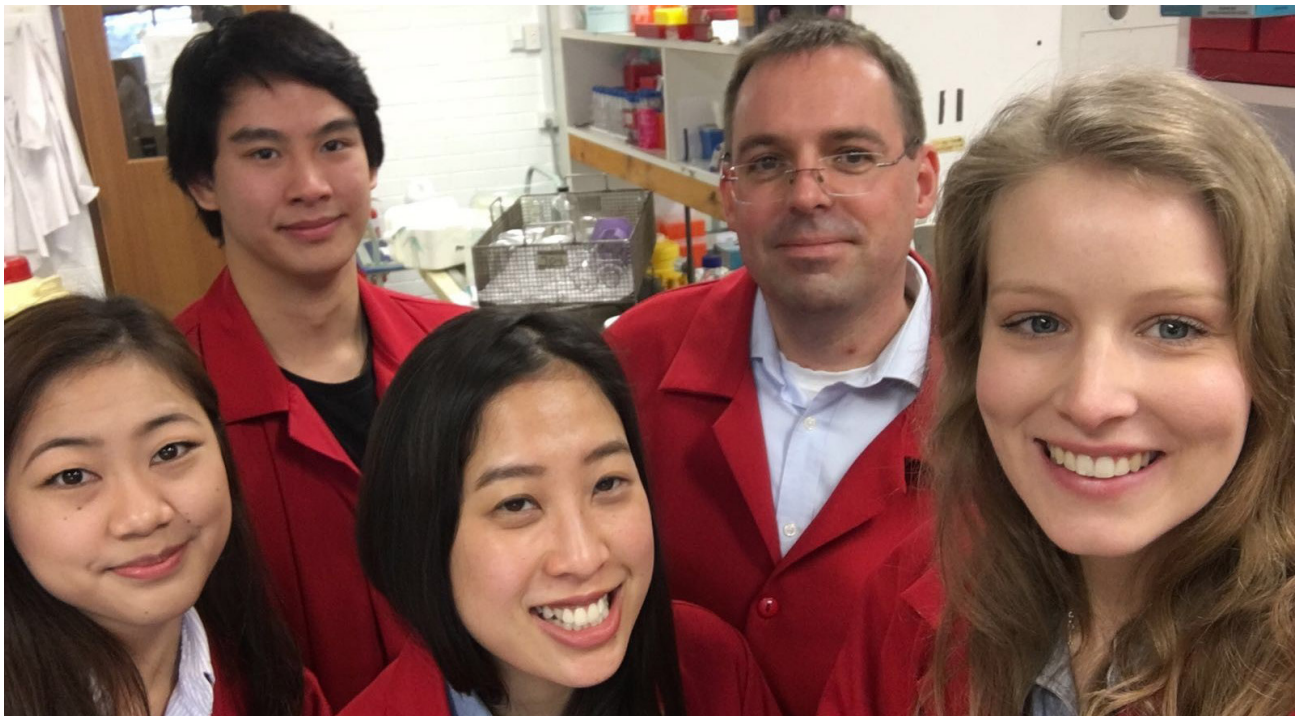
4. The phosphoproteome of IFN-alpha and IL-6 driven neurological diseases

Protein phosphorylation plays a pivotal role in many essential cellular processes. In this project we investigate the protein phosphorylation profile ("phosphoproteome") of the brain in response to two cytokines, interferon (IFN)-alpha and interleukin (IL)-6, known to mediate several distinct neurological diseases. Our underlying hypothesis is that the distinct neurological phenotypes caused by IFN-alpha and IL-6 are the consequence of the differential activation of signalling pathways that primarily involve protein phosphorylation cascades.

To determine the phosphoproteome in vivo and in vitro, we will perform high throughput proteomics on CNS tissue and primary glial cells (astrocytes and microglia).

5. Novel models for ZIKV encephalopathy in mice

Zika virus (ZIKV) has become a global health concern, suspected of causing microcephaly in newborns and neurological diseases in adults. There is an urgent need to develop suitable animal models to study these severe complications and for pre-clinical testing of potential therapies. However, most current models for ZIKV use either immune-compromised mice or require large virus titres, making it difficult to unlock the true pathophysiological mechanisms that underpin ZIKV neuropathology. In this project we aim to establish and characterise novel immune competent mouse models to study adult encephalitis and embryopathy.



Members of Molecular Immunopathology Unit,
from left to right: Pattama Songkhunawej, Barney Viengkhou, Chau Kim Le, Markus Hofer and Tamara Suprunenko

PUBLICATIONS
(2013 - 2015)

Almolda, B., de Labra, C., Barrera, I., Gruart, A., Delgado-Garcia, J., Villacampa, N., Vilella, A., Hofer, M., Hidalgo, J., Campbell, I., et al (2015). Alterations in microglial phenotype and hippocampal neuronal function in transgenic mice with astrocyte-targeted production of interleukin-10. Brain, Behavior, and Immunity, 45, 80-97.

Campbell, L., Simonin, A., Chen, C., Ferdous, J., Padula, M., Harry, E., Hofer, M., Campbell, I., Carter, D. (2015). Cryptococcus Strains with Different Pathogenic Potentials Have Diverse Protein Secretomes. Eukaryotic Cell (Online), 14(6), 554-563.

Visekruna, A., Linnerz, T., Martinic, V., Vachharajani, N., Hartmann, S., Harb, H., Joeris, T., Pfefferle, P., Hofer, M., Steinhoff, U. (2015). Transcription factor c-Rel plays a crucial role in driving anti-CD40-mediated innate colitis. Mucosal Immunology, 8(2), 307-315.

Mikaelyan A, Thompson CL, Hofer MJ, Brune A (2015). The deterministic assembly of complex bacterial communities in germ-free cockroach guts. Appl Environ Microbiol.

Hofer MJ, Cambell IL (2015): Immunoinflammatory diseases of the central nervous system – the tale of two cytokines. Br J Pharmacol April 27.

Teymoortash, A., Zieger, L., Hoch, S., Pagenstecher, A., Hofer, M. (2014). Distinct microscopic features of perineural invasion in adenoid cystic carcinoma of the head and neck. Histopathology, 64(7), 1037-1039.

Li, W., Hofer, M., Jung, S., Lim, S., Campbell, I. (2014). IRF7-Dependent Type I Interferon Production Induces Lethal Immune-Mediated Disease in STAT1 Knockout Mice Infected with Lymphocytic Choriomeningitis Virus. Journal of Virology, 88(13), 7578-7588.

Nocon, A., Ip, J., Terry, R., Lim, S., Getts, D., Muller, M., Hofer, M., King, N., Campbell, I. (2014). The Bacteriostatic Protein Lipocalin 2 Is Induced in the Central Nervous System of Mice with West Nile Virus Encephalitis. Journal of Virology, 88(1), 679-689.

Zimmermann, J., Krauthausen, M., Hofer, M., Heneka, M., Campbell, I., Muller, M. (2013). CNS-Targeted Production of IL-17A Induces Glial Activation, Microvascular Pathology and Enhances the Neuroinflammatory Response to Systemic Endotoxemia. PloS One, 8(2), 1-13.

Siegfried, A., Berchtold, S., Manncke, B., Deuschle, E., Reber, J., Ott, T., Weber, M., Kalinke, U., Hofer, M., Hatesuer, B., et al (2013). IFIT2 is an effector protein of type I IFN-mediated amplification of lipopolysaccharide (LPS)-induced TNF-γ secretion and LPS-induced endotoxin shock. The Journal of Immunology, 191(7), 3913-3921.

Li, W., Hofer, M., Nocon, A., Manders, P., Campbell, I. (2013). Interferon regulatory factor 7 (IRF7) is required for the optimal initial control but not subsequent clearance of lymphocytic choriomeningitis virus infection in mice. Virology, 439(2), 152-162.

Hofer, M., Campbell, I. (2013). Type I interferon in neurological disease-The devil from within. Cytokine and Growth Factor Reviews, 24(3), 257-267.

Hofer MJ, Rohlfs J, Teymoortash A, Pagenstecher A (2013). A 62-yer-old female with an intranasal mass extending into the lamina cribrosa. Brain Pathol 23(1):105-108.

Bujan B, Hofer MJ, Oertel WH, Pagenstecher A, Burk K (2013). Multiple system atrophy of the cerebellar type (MSA-C) with concomitant beta-amyloid and tau pathology. Clin Neuropathol. 2013 Jan 15.

POSTGRADUATE AND HONOURS COMPLETIONS

(2013 - 2015)

MSc

2015 - Judith Piegsa (awarded through University of Jena, Germany)

BSc(Hons)

2014 - Tamara Suprunenko

2014 - Barney Viengkhou

2015 - Pattama Songkhunawej

BSc

2014 - Martina Fink (awarded through University of Konstanz, Germany

Scholarships

2015 - Tamara Suprunenko (APA)

2015 - Barney Viengkhou (APA)

SPECIAL AWARDS & PRIZES

(2013 - 2015)

- 2014 - Selby Research Award

EXTERNAL FUNDING TO LABORATORY

(2013 - 2015)

Source	Project Title	Collaborators	Awarded	Duration	Amount
Multiple Sclerosis Research Australia (MSRA)	Investigating the impact of serine phosphorylation of the transcription factor STAT1 in multiple sclerosis	Hofer M.	2015	1 year	$24,700

MOLECULAR IMMUNOPATHOLOGY UNIT

NICHOLAS HUNT

PROFESSOR, PATHOLOGY

LAB OVERVIEW

Nick Hunt is well-known for his studies of the severe illness caused by malaria infection and also his interest in free radical biology and inflammation. He further has helped us to understand an important biochemical process, the kynurenine pathway of tryptophan metabolism, and how it affects normal physiology and may lead to disease. Recently, the pathogenesis of meningitis also has been investigated.

The Molecular Immunopathology Unit laboratory closed in December 2014, though Nick Hunt as an Emeritus Professor is still involved in projects with Sydney University researchers including Georges Grau, Peter Lay and Richard Payne. The MIU studied the processes switched on in the body in response to infectious agents. Of particular interest were malaria parasites and the bacteria that can cause meningitis (inflammation of the brain). Two of the major complications of infection with malaria parasites are cerebral malaria (disruption of normal brain functions) and pulmonary oedema (accumulation of fluid in the lung), and the staff and students of the MIU investigated these.

Each year, malaria and bacterial meningitis together cause more than 1 million deaths and as many cases of impaired brain function in survivors. But the precise mechanisms through which these problems occur in the body aren't understood. So the goal of our work was and is to identify the key processes, so as to discover new ways of preventing death and disability.

Our studies showed that the host's defences against malaria parasites and bacteria are usually very effective in eliminating the infectious agent, but in some cases may actually interfere with the way the brain functions – with dangerous consequences. We use the term "immunopathology" to describe those situations in which the immune system causes organ dysfunction and/or damage.

Our other major research area is a biochemical pathway that is very important in normal healthy body processes, including the body's defence against infection and cancer, and also in diseases of the brain and nervous system. This is known as the kynurenine pathway of tryptophan metabolism. Dr Helen Ball of the MIU was the first scientist to discover a new protein, indoleamine dioxygenase-2, that appears to regulate this pathway in some cells, and has been implicated in some cancers and inflammatory diseases.

RESEARCH ACTIVITIES

The MIU made several significant discoveries during this period:

- The cytokine interferon-gamma (IFN gamma) was shown to drive the fatal complications of bacterial meningitis (Andrew Mitchell, Belinda Yau, Helen Ball). This cytokine is necessary for the host's immune response, so our finding provided a clear example of the immunopathology of malaria infection.
- A greatly-improved method for testing the neurological deficits caused by bacterial meningitis was developed (Lay Khoon Too). Several genes that contribute to these neurological problems were identified.
- The biochemistry of indoleamine dioxygenase-2 was studied in depth and selective inhibitors of this enzyme were identified (Helen Ball, Supun Bakmiwewa, Amos Fatokun, Chris Austin).
- The endothelial cells that line the blood vessels in the brain were shown to potentiate the pro-inflammatory response that leads to illness and death in cerebral malaria (Tim Khaw). Furthermore, they produce a factor that helps the parasites to grow when attached to brain vessels.
- An improved bioassay for IFN gamma was developed (Felicita Jusof).
- A major contribution of the enzyme indoleamine dioxygenase-1 to the

LABORATORY PERSONNEL/ STUDENTS

Nicholas Hunt	Professor 1988 - 2014
Nicholas Hunt	Emeritus Professor 2014 - 2015
Helen Ball	Senior Research Fellow 2000 - 2014
Jin Guo	PhD Student 2010 - 2014
Lay Khoon Too	PhD Student 2011 - 2014
Belinda Yau	PhD Student 2011 - 2014
Felicita Jusof	PhD Student 2011 - 2015
Supun Bakmiwewa	PhD Student 2012 - 2015

hypotension of malaria and sepsis was discovered in work with Prof Roland Stocker. Based on this knowledge, work is continuing in his laboratory to produce new drugs to treat high blood pressure.

- Some naturally-occurring peptide anti-malarial compounds were identified (Jin Guo) in collaborative work with Dr Richard Payne (Chemistry). These have now been chemically modified to make them even more active.
- New analytical methods for measuring the biochemical activity of tiny areas of the brain were established and applied to malaria in work with Prof Peter Lay (Chemistry). In related work using similar technologies, new ways of predicting the severity of infectious diseases in patients are being developed.
- The efficacy of some new artemisinin-related drugs in combination with other anti-malarial compounds was determined (Jin Guo) in collaborative work with Prof Jacob Golenser (Jerusalem) and others.

PUBLICATIONS
(2013 - 2015)

Lam, Y., Ha, C., Hoffmann, J., Oscarsson, J., Dinudom, A., Mather, T., Cook, D., Hunt, N., Caterson, I., Holmes, A., Storlien, L. (2015). Effects of dietary fat profile on gut permeability and microbiota and their relationships with metabolic changes in mice. Obesity, 23(7), 1429-1439.

Guo, J., McQuillan, J., Yau, B., Tullo, G., Long, C., Bertolino, P., Roediger, B., Weninger, W., Taylor, G., Hunt, N., Ball, H., et al (2015). IRGM3 contributes to immunopathology and Is required for differentiation of antigen-specific effector CD8 T cells in experimental cerebral malaria. Infection and Immunity, 83(4), 1406-1417.

Hackett, M., Aitken, J., El Assaad, F., McQuillan, J., Carter, E., Ball, H., Tobin, M., Paterson, D., De Jonge, M., Siegele, R., Grau, G., Hunt, N., Lay, P., et al (2015). Mechanisms of murine cerebral malaria: Multimodal imaging of altered cerebral metabolism and protein oxidation at hemorrhage sites. Science Advances, 6(4), 7-16.

Vidal, C., Li, W., Nanan, B., Lim, C., Guillemin, G., Ball, H., Hunt, N., Nanan, R., Duque, G. (2015). The kynurenine pathway of tryptophan degradation is activated during osteoblastogenesis. Stem Cells, 33(1), 111-121.

Jortzik E., Zocher K., Isernhagen A., Mailu B., Rahlfs R., Viola G., Wittlin S., Hunt N.H., Ihmels H., Becker, K (2015). Acridizinium derivatives have a strong antimalarial activity and inhibit indoleamine dioxygenase. Antimicrobial Agents and Chemotherapy, 60, 115-25.

Too, L., Ball, H., McGregor, I., Hunt, N. (2014). A novel automated test battery reveals enduring behavioural alterations and cognitive impairments in survivors of murine pneumococcal meningitis. Brain, Behavior, and Immunity, 35, 107-124.

Khaw, L., Ball, H., Mitchell, A., Grau, G., Stocker, R., Golenser, J., Hunt, N. (2014). Brain endothelial cells increase the proliferation of Plasmodium falciparum through production of soluble factors. Experimental Parasitology, 145(1), 34-41.

Hunt, N., Ball, H., Hansen, A., Khaw, L., Guo, J., Bakmiwewa, S., Mitchell, A., Combes, V., Grau, G. (2014). Cerebral malaria: gamma-interferon redux. Frontiers in Cellular and Infection Microbiology, 4, 1-12.

Too, L., Mitchell, A., Yau, B., Ball, H., McGregor, I., Hunt, N. (2014). Interleukin-18 deficiency and its long-term behavioural and cognitive impacts in a murine model of pneumococcal meningitis. Behavioural Brain Research, 263, 176-189.

El Assaad, F., Wheway, J., Hunt, N., Grau, G., Combes, V. (2014). Production, fate and pathogenicity of plasma microparticles in murine cerebral malaria. PLoS Pathogens, 10(3), 1-14.

Pai, S., Qin, J., Cavanagh, L., Mitchell, A., El-Assaad, F., Jain, R., Combes, V., Hunt, N., Grau, G., Weninger, W. (2014). Real-time imaging reveals the dynamics of leukocyte behaviour during experimental cerebral malaria pathogenesis. PLoS Pathogens, 10(7), 1-17.

Conroy, T., Guo, J., Elias, N., Cergol, K., Gut, J., Legac, J., Khatoon, L., Liu, Y., McGowan, S., Rosenthal, P., Hunt, N., Payne, R. (2014). Synthesis of gallinamide A analogues as potent falcipain inhibitors and antimalarials. Journal of Medicinal Chemistry, 57(24), 10557-10563.

Aitken, J., Austin, C., Hunt, N., Ball, H., Lay, P. (2014). The Fe-heme structure of met-indoleamine 2,3-dioxygenase-2 determined by X-ray absorption fine structure. Biochemical and Biophysical Research Communications, 450(1), 25-29.

Too, L., McQuillan, J., Ball, H., Kanai, M., Nakamura, T., Funakoshi, H., McGregor, I., Hunt, N. (2014). The kynurenine pathway contributes to long-term neuropsychological changes in experimental pneumococcal meningitis. Behavioural Brain Research, 270, 179-195.

Too, L., Ball, H., McGregor, I., Hunt, N. (2014). The pro-inflammatory cytokine interferon-gamma is an important driver of neuropathology and behavioural sequelae in experimental pneumococcal meningitis. Brain, Behavior, and Immunity, 40, 252-268.

Guiguemde, W., Hunt, N., Guo, J., Marciano, A., Haynes, R., Clark, J., Guy, R., Golenser, J. (2014). Treatment of murine cerebral malaria by artemisone in combination with conventional antimalarial drugs: antiplasmodial effects and immune responses. Antimicrobial Agents and Chemotherapy, 58(8), 4745-4754.

Ball, H., Jusof, F., Bakmiwewa, S., Hunt, N., Yuasa, H. (2014). Tryptophan-catabolizing enzymes - party of three. Frontiers in Immunology, 5, 1-10.

El-Assaad, F., Wheway, J., Mitchell, A., Lou, J., Hunt, N., Combes, V., Grau, G. (2013). Cytoadherence of Plasmodium berghei-infected red blood cells to murine brain and lung microvascular endothelial cells in vitro. Infection and Immunity, 81(11), 3984-3991.

Khaw, L., Ball, H., Golenser, J., Combes, V., Grau, G., Wheway, J., Mitchell, A., Hunt, N. (2013). Endothelial cells potentiate interferon-γ production in a novel tripartite culture model of human cerebral malaria. PloS One, 8(7), 1-13.

Jusof, F., Khaw, L., Ball, H., Hunt, N. (2013). Improved spectrophotometric human interferon-gamma bioassay. Journal of Immunological Methods, 394(1), 115-120.

Fatokun, A., Hunt, N., Ball, H. (2013). Indoleamine 2,3-dioxygenase 2 (IDO2) and the kynurenine pathway: characteristics and potential roles in health and disease. Amino Acids, 45(6), 1319-1329.

Lee, J., Siegele, R., Pastuovic, Z., Hackett, M., Hunt, N., Grau, G., Cohen, D., Lay, P. (2013). Light and heavy ion beam analysis of thin biological sections. Nuclear Instruments and Methods in Physics Research. Section B, 306, 129-133.

Golenser, J., Hunt, N. (2013). Neglected Aspects of Drug Discovery -Microbiological Aspects. Current Clinical Pharmacology, 8(1), 73-80.

POSTGRADUATE AND HONOURS COMPLETIONS
(2013 - 2015)

PhD

2014 - Belinda Yau

2014 - Lay Khoon Too

2014 - Jin Guo

2015 - Felicita Jusof

SPECIAL AWARDS & PRIZES
(2013 - 2015)

- 2014 - Academic Excellence Award for Outstanding Teaching, Sydney Medical School

SERVICE TO THE UNIVERSITY AND COMMUNITY
(2013 - 2015)

Chief Editor, "Redox Report" (2013 – 2015)

Editorial Board, "American Journal of Pathology" (2013 – 2015)

Three PhD theses examined.

EXTERNAL FUNDING TO LABORATORY
(2013 - 2015)

Source	Project Title	Collaborators	Awarded	Duration	Amount
NHMRC	The astrocyte: a crossroads in cerebral malaria pathogenesis	Hunt N, Ball H, Grau G	2012	3 years	$577,000
NHMRC	Development of antimalarial drug leads through inhibition of food vacuole falcipains	Payne R, Hunt N, McGowan S, Charman S, Rosenthal P	2014	3 years	$628,000

VIRAL IMMUNOPATHOLOGY UNIT

NICHOLAS KING

PROFESSOR, PATHOLOGY

LAB OVERVIEW

We are interested in the neurotropic flavivirus, West Nile virus and Zika, and how our immune response, in trying to get rid of virus infection, lethally damages the host nervous system in this response.

RESEARCH ACTIVITIES

We are studying the pathogenesis of encephalitis to understand which components cause lethal damage in the brain and which are crucial for virus clearance.

We are also investigating early immune responses to infection in specialised organs and sites, including the brain, the skin, the genitourinary tract, the embryo and the eye, as being the key to modulating this process before damage occurs.

- Pathogenesis of flavivirus disease - immunopathology and immune responses to neurotropic flavivirus infection.
- Use of solid microparticles to interfere with macrophage-mediated inflammation and in the generation of tolerance
- Production and function of membrane microparticles in response to viral infection
- Blood-brain and blood-retinal barrier responses to viral infection
- Early responses to epithelial infection by neurotropic flaviviruses - dendritic cell and antiviral IDO responses to epithelial infection

LABORATORY PERSONNEL/ STUDENTS

Nicholas King	Professor 1988 - present
Zheng Lung Ling	Postdoctoral Fellow 2015 - present
Caryn van Vreden	PhD Student 2012 - 2015
Luis Munoz-Erazo	PhD Student 2012 - 2015
Paula Niewold	PhD Student 2013 - present
Luan Vu Dinh	PhD Student 2012 - present
Tom Ashurst	PhD Student 2012 - present
Darren Cox	PhD Student 2015 - present

PUBLICATIONS

(2013 - 2015)

Peterson, J., Kesson, A., King, N. (2015). A Simulation for Flavivirus Infection Decoy Responses. Advances in Microbiology, 5(2), 123-142.

Terry, R., Deffrasnes, C., Getts, D., Minten, C., Van Vreden, C., Ashhurst, T., Getts, M., Xie, V., Campbell, I., King, N. (2015). Defective inflammatory monocyte development in IRF8-deficient mice abrogates migration to the West Nile virus-infected brain. Journal of Innate Immunity, 7(1), 102-112.

Taylor, A., Foo, S., Bruzzone, R., Vu, D., King, N., Mahalingam, S. (2015). Fc receptors in antibody-dependent enhancement of viral infections. Immunological Reviews, 268(1), 340-364.

Van Vreden, C., Niewold, P., Vu, D., Munoz-Erazo, L., Getts, D., King, N. (2015). Flavivirus Encephalitis: Immunopathogenesis of Disease and Immunomodulation. In Paul Shapshak, John T. Sinnott, Charurut Somboonwit, Jens H. Kuhn (Eds.), Global Virology I - Identifying and Investigating Viral Diseases, (pp. 425-455). New York: Springer.

Getts, D., Shea, L., Miller, S., King, N. (2015). Harnessing nanoparticles for immune modulation. Trends in Immunology, 36(7), 419-427.

Yeung, A., Terentis, A., King, N., Thomas, S. (2015). Role of indoleamine 2,3-dioxygenase in health and disease. Clinical Science, 129(7), 601-672.

Wen, L., Zhu, M., Madigan, M., You, J., King, N., Billson, F., McClellan, K., Sutton, G., Petsoglou, C. (2014). Immunomodulatory Effects of Bone Marrow-Derived Mesenchymal Stem Cells on Pro-Inflammatory Cytokine-Stimulated Human Corneal Epithelial Cells. PloS One, 9(7), e101841.

Getts, D., Getts, M., King, N., Miller, S. (2014). Infectious Triggers of T Cell Autoimmunity. In Noel R. Rose, and Ian R. Mackay (Eds.), The Autoimmune Diseases, (pp. 263-274). San Diego: Academic Press.

Nocon, A., Ip, J., Terry, R., Lim, S., Getts, D., Muller, M., Hofer, M., King, N., Campbell, I. (2014). The Bacteriostatic Protein Lipocalin 2 Is Induced in the Central Nervous System of Mice with West Nile Virus Encephalitis. Journal of Virology, 88(1), 679-689.

Ashhurst, T., Van Vreden, C., Niewold, P., King, N. (2014). The plasticity of inflammatory monocyte responses to the inflamed central nervous system. Cellular Immunology, 291(1-2), 49-57.

Chami, B., Yeung, A., Van Vreden, C., King, N., Bao, B. (2014). The role of CXCR3 in DSS-induced colitis. PloS One, 9(7), e101622.

Getts, D., Terry, R., Getts, M., Deffrasnes, C., Müller, M., Van Vreden, C., Ashhurst, T., Chami, B., McCarthy, D., Wu, H., Ma, J., Witting, P., Campbell, I., Reilly, D., White, M., Cordwell, S., Chadban, S., Bao, B., King, N., et al (2014). Therapeutic inflammatory monocyte modulation using immune-modifying microparticles. Science Translational Medicine, 6(219), 1-14.

Ashhurst, T., Van Vreden, C., Munoz-Erazo, L., Niewold, P., Watabe, K., Terry, R., Deffrasnes, C., Getts, D., King, N. (2013). Antiviral macrophage responses in flavivirus encephalitis. Indian Journal of Medical Research, 138(Nov. 2013), 632-647.

POSTGRADUATE AND HONOURS COMPLETIONS
(2013 - 2015)

PhD

2013 - Zheng Lung Ling

2013 - Mahmoud Karimi Azardaryany

BMedSc(Hons)

2013 - Victoria Jones (APA)

2014 - Darren Cox (APA)

SERVICE TO THE UNIVERSITY AND COMMUNITY
(2013 - 2015)

Service to the Discipline

- Treasurer, International Union of Immunological Societies (IUIS) 2010 - 2016.
- Academic Director, Advanced Cytometry Facility USyd 2008 - present.
- Theme Leader, Member of Executive Leadership Group, Bosch Institute, USyd 2007- present.
- Conference Organisation: 42nd JSI Conference 2013
- Editor, J Exp Clin Virol.

Review Committees

- School of Pathology and Laboratory Medicine UWA, 2014,
- Nanoscale Science and Technology Research Strategic Review USYD 2014.

Examiner for:

- 8 PhD theses since 2013
- 2 Masters Theses

PATENTS
(2013 - 2015)

- Getts, DR and King NJC

Utilization of carboxylated microparticles in multiple disease orders and conditions, as well as methods of use and dosing strategies.

United States of America 2013

PCT 61/413,018

- Yeung, AWS, King, NJC and Thomas, SR

Detection of infectious pathogen and contagious disease

(IP2012-064- ROI-0 – USYD)

13 March 2014

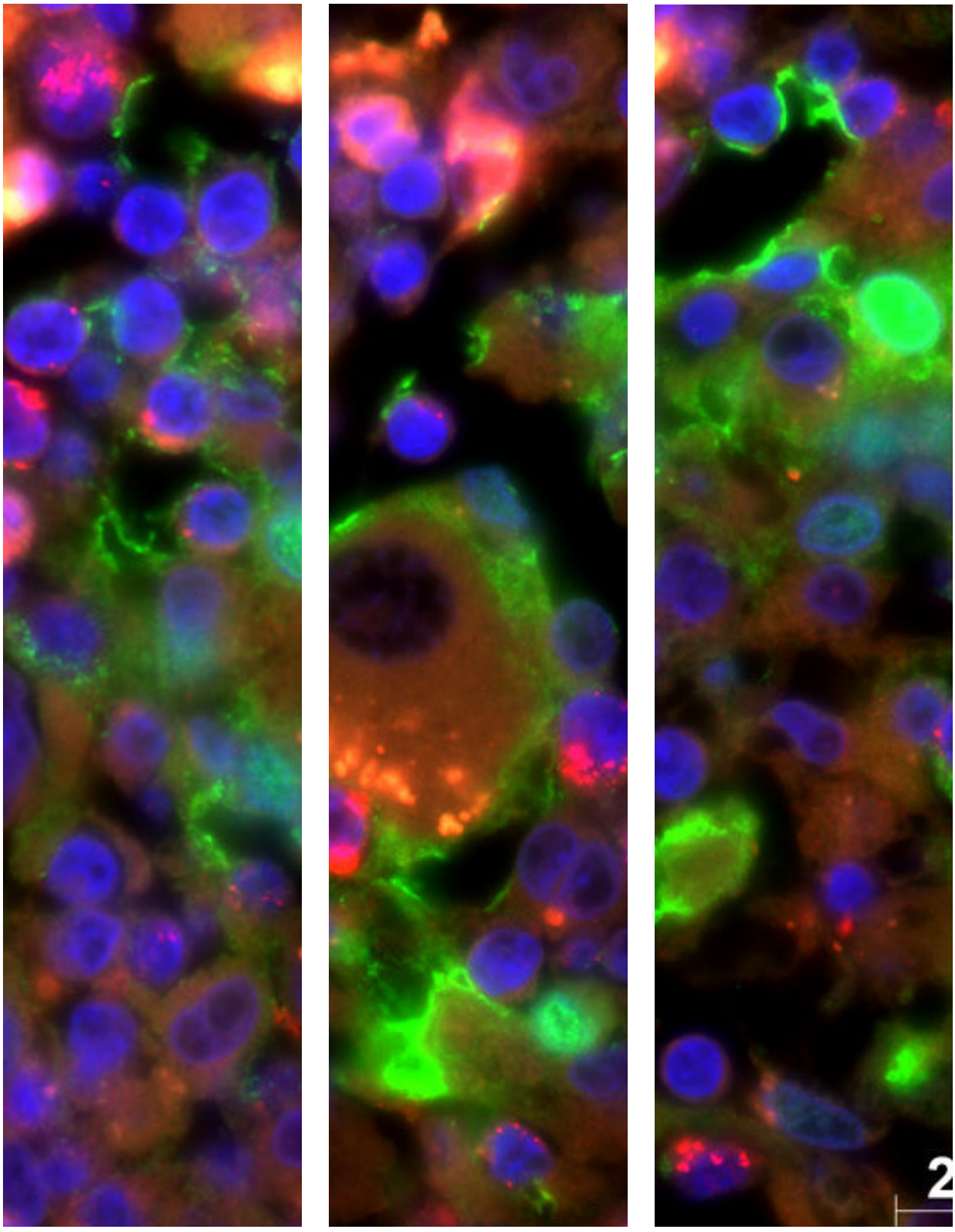
PCT/AU2014/000254

EXTERNAL FUNDING TO LABORATORY

(2013 - 2015)

Source	Project Title	Collaborators	Awarded	Duration	Amount
NHMRC	Immune modifying particles - a novel therapeutic strategy to treat West Nile Virus encephalitis	King N, Getts D	2012	4 years	$532,000
NHMRC	Role of Inflammation in Diabetic Cardiomyopathy	Twigg S, King N, McLennan S	2012	3 years	$476,000
NHMRC Equipment	Wide field super-resolution microscopy with ground state depletion -Exploring nanoscopic life in chronic diseases	Braet F, et al.	2013	1 year	$89,000
NHMRC Equipment	A high-throughput, bright-field and fluorescence digital slide scanning platform and service that is both research and teaching-focused and available University-wide.	King N, et al.	2013	1 year	$191,000
Ramaciotti Equipment Grant Scheme	QuantStudio 12K Flex OpenArray High-throughput Genetic Analysis System for Shared Use in the Open Access Multi-user Bosch Molecular Biology Core Facility	Stone J, et al.	2013	1 year	$74,000
Ramaciotti Equipment Grant Scheme	The Ramaciotti Centre for Human Systems Biology	de St Groth B, King N, Smith A, et al.	2013	3 years	$1,000,000
NHMRC	Redox Control of the Immune Regulatory Protein, Indoleamine 2,3-dioxygenase	Thomas S, Witting P, King N	2014	3 years	$558.000
ARC LIEF	CyTOF platform for the Advanced Cytometry Facility: overcoming fluorescence spectral barriers to truly multiparametric cytometry by mass spectrometry	King N, et al.	2014	1 year	$300,000
ARC LIEF	Imaging Cell and Tissue Architecture using Confocal and Super-Resolution Microscopy	Gunning PW, et al.	2014	1 year	$370,000
NHMRC Equipment	CLARIOstar Multimode Microplate Reader for Shared Use in the Open Access, Multi-user Bosch Molecular Biology Core Facility.	Richardson DR, et al.	2014	1 year	$60,000

NHMRC	Single molecule imaging laboratory.	Gaus K , et al.	2015	1 year	$560,000
AINST Accelerator Scheme	Nanoscale approaches to problems in biomedicine	King N, et al.	2015	1 year	$300,000
Bosch Equipment Grant	Bruker ImagePrep Station for MALDI Mass Mapping	Witting P, King N, Stone J, Murray M, Sunde M, Hambly B, Day M, Byrne S, Wang X.	2015	1 year	$40,000


2

ORGAN & TISSUE REPLACEMENT

This is the newest Research Theme in the Bosch Institute. It is undergoing rapid expansion and further development is anticipated in the next few years with the establishment of a program in Tissue Engineering. Tissue Engineering will be a critical tool for the development of novel therapies for diseases that currently rely on transplantation for treatment.

The past 10 years have seen enormous progress and development in the fields of nuclear reprogramming, stem cell biology, 3D bioprinting and bioengineering. These technologies combined are now being used to generate patient-specific therapeutic cell types such as pancreatic beta-cells, retinal cells and bone cells and tissue for the treatment of diseases such as diabetes, macular degeneration and osteoporosis.

Desired impact on knowledge and/or practice

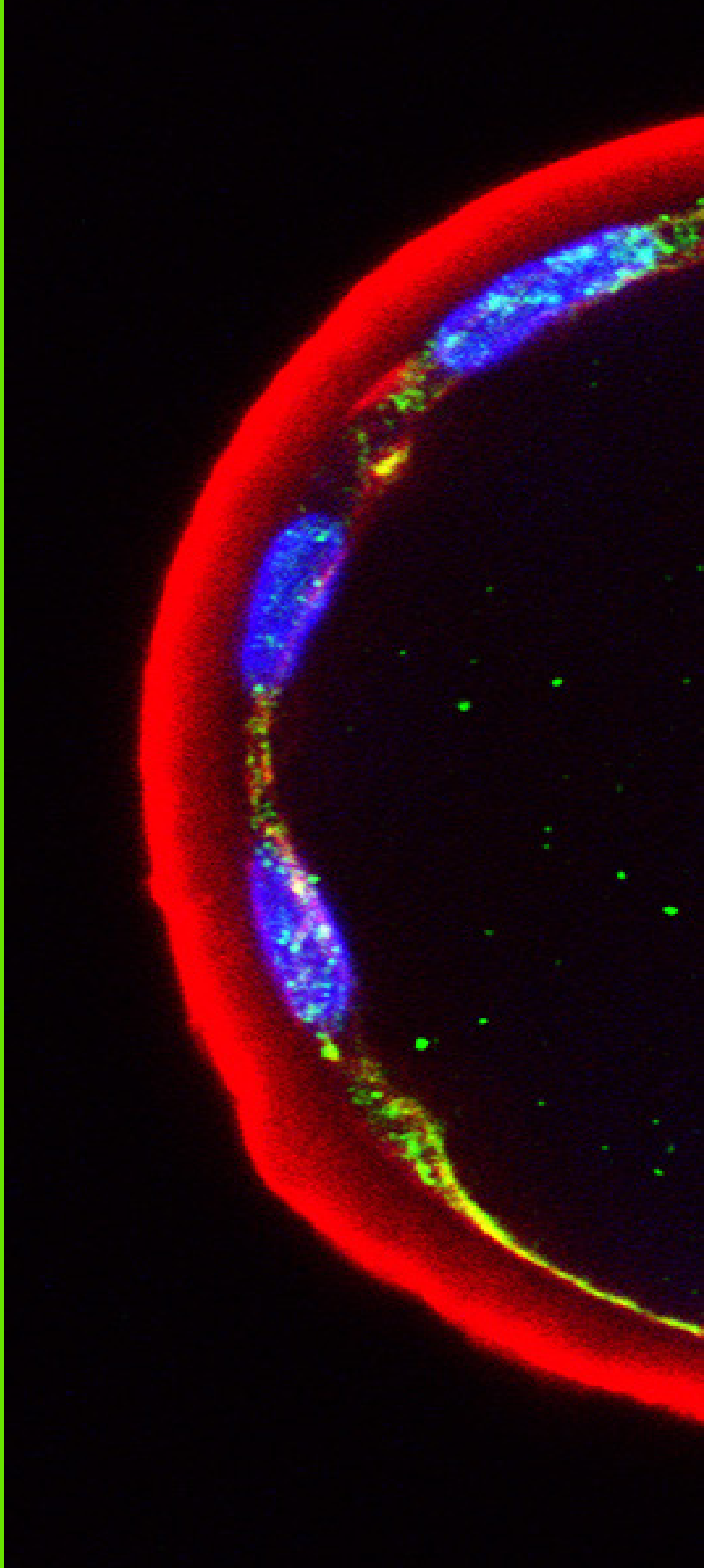
Basic Sciences: To link stem cell biology with bioengineering.

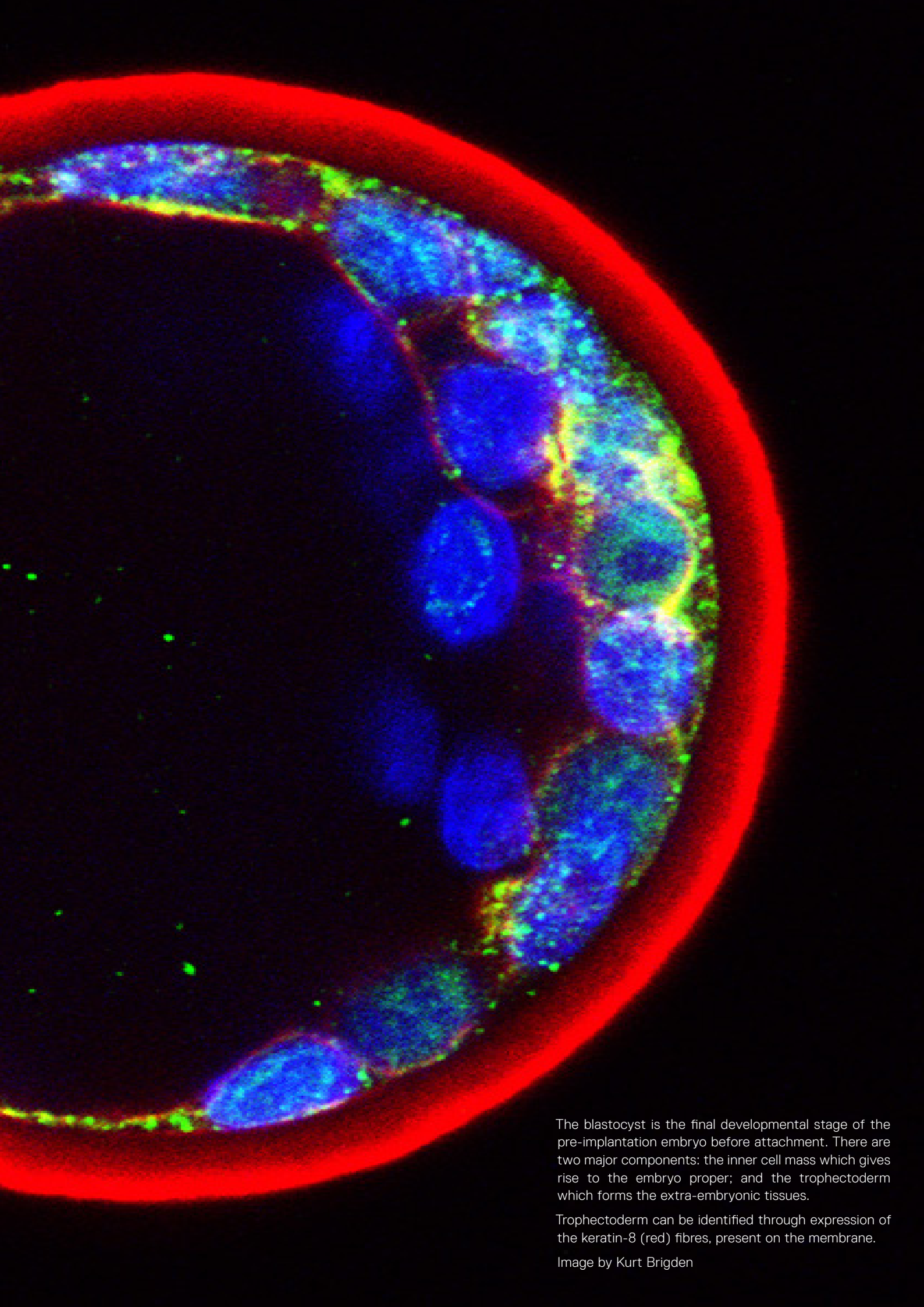
Innovation: To facilitate invention of innovative research techniques by scientifically "cross-cultural" collaboration, enabled by (1) links generated within the Research Theme and (2) links generated with members of other Research Themes.

Translation: To enable (1) new collaborations amongst Bosch Institute members. (2) To enable the fusion of stem cell biology, 3D bioprinting reprogramming with crucial elements of bioengineering such as novel scaffold development to generate patient-specific therapeutic cell types.

For more information on this theme visit

http://sydney.edu.au/medicine/bosch/research/organ-tissue-replacement/index.php





The blastocyst is the final developmental stage of the pre-implantation embryo before attachment. There are two major components: the inner cell mass which gives rise to the embryo proper; and the trophectoderm which forms the extra-embryonic tissues.

Trophectoderm can be identified through expression of the keratin-8 (red) fibres, present on the membrane.

Image by Kurt Brigden

ENDOCRINOLOGY AND DIABETES AND ITS COMPLICATIONS GROUP

SUSAN MCLENNAN

ASSOCIATE PROFESSOR, MEDICINE

CENTRAL CLINICAL SCHOOL

LABORATORY OVERVIEW

The laboratory based research undertaken in this group reflects the breadth of endocrine-related disease. Major diseases studied are diabetes and its complications, thyroid disease including cancer, prostate cancer and morbid obesity.

RESEARCH ACTIVITIES

The research undertaken includes basic and translational research including biomarker studies as well as the testing of findings and potential mediators of disease in preclinical models.

LABORATORY PERSONNEL/ STUDENTS

Stephen Twigg	Professor/ Head Endocrinology
Susan McLennan	Associate Professor Scientific Director
Paul Williams	Associate Professor Principal Scientist
Qihan Dong	Associate Professor Principal Scientist
Dr Danqing Min	Senior Hospital Scientist
Dr Xiaoyu Wang	Senior Research Fellow
Dr Mu Yao	Senior Research Fellow
Dr Charmaine Tam	Postdoctoral Fellow 2014 - present
Dr Jonny Teng	Postdoctoral Fellow
Sarah Aamidor	Research Assistant 2013 - 2014
James Bonner	Research Assistant 2013
Surya Sutanto	PhD Student 2013 - present
Alireza Rezaeizadeh	Research Assistant 2013 - present
Jing Ren	PhD student 2013 - 2015
Maryam Abdollahi	PhD student 2013 - 2015
Dr Katherine Williams	PhD student 2013 - present
Dr Albert Hseih	PhD student 2013 - present
William Song	PhD student 2013 - present
Frances Henshaw	PhD student 2006 - 2014
Auvro Mridha	PhD student 2011 - 2014
Kathy Meng	PhD student 2015
Soma Vignarajan	PhD student 2011 - 2014
Sheng Hua	PhD student 2011 - 2014
Chao Wang	Masters Student 2014 - present
Joanne Malek	Masters Student 2015 - present
Anh Tao	Honours student, PhD student 2015 - present
Linda Ban	Honours student, PhD student 2014, 2015
Rebecca Seehoo	Masters student 2015 - 2016
Daniel Choe	Honours student 2015
Alison Verhoeven	Honours student 2015

PUBLICATIONS
(2013 - 2015)

Song (Wen Chao), W., McLennan, S., Tam, C., Williams, P., Baxter, R., Twigg, S. (2015). CCN2 requires TGF-β signalling to regulate CCAA T/enhancer binding proteins and inhibit fat cell differentiation. Journal of Cell Communication and Signaling, 9(1), 27-36.

Williams, K.H., Burns, K., Constantino, M., Shackel, N.A., Prakoso, E., Wong, J., Wu, T., George, J., McCaughan ,G.W., Twigg, S.M. An association of large-fibre peripheral nerve dysfunction with non-invasive measures of liver fibrosis secondary to non-alcoholic fatty liver disease in diabetes. J Diabetes Complications. 2015 Jul 3. pii: S1056-8727(15)00268-8.

Williams, K., Vieira de Ribeiro, A., Prakoso, E., Veillard, A., Shackel, N., Brooks, B., Bu, Y., Cavanagh, E., Raleigh, J., McLennan, S., McCaughan, G., Keane, F., Gorrell, M., Twigg, S., et al (2015). Circulating Dipeptidyl Peptidase-4 Activity Correlates with Measures of Hepatocyte Apoptosis and Fibrosis in NAFLD in Type 2 Diabetes Mellitus and Obesity: A Dual Cohort Cross-Sectional Study. Journal of Diabetes, 7(6), 809-819.

Williams, K.H., Sullivan, D.R., Veillard, A.S., O'Brien, R., George, J., Jenkins, A.J., Young, S., Ehnholm, C., Duffield, A., Twigg, S.M., Keech, A.C. Low alanine aminotransferase levels and higher number of cardiovascular events in people with Type 2 diabetes: analysis of the Fenofibrate Intervention and Event Lowering in Diabetes (FIELD) study. Diabet Med. 2015 Oct 3. doi: 10.1111/dme.12972.

Duly, A., Alani, B., Huang, E., Yee, C., Haber, P., McLennan, S., Seth, D. (2015). Effect of multiple binge alcohol on diet-induced liver injury in a mouse model of obesity. Nutrition and Diabetes, 5, 1-9.

Tu, T., Calabro, S., Lee, A., Maczurek, A., Budzinska, M., Warner, F., McLennan, S., Shackel, N. (2015). Hepatocytes in liver injury: victim, bystander, or accomplice in progressive fibrosis? Journal of Gastroenterology and Hepatology, 30(12), 1696-1704.

Williams, K., Vieira de Ribeiro, A., Prakoso, E., Veillard, A., Shackel, N., Bu, Y., Brooks, B., Cavanagh, E., Raleigh, J., McLennan, S., McCaughan, G., Keane, F., Twigg, S., Gorrell, M., et al (2015). Lower serum fibroblast activation protein shows promise in the exclusion of clinically significant liver fibrosis due to non-alcoholic fatty liver disease in diabetes and obesity. Diabetes Research and Clinical Practice, 108(3), 466-472.

Tam, C., Power, J., Markovic, T., Yee, C., Morsch, M., McLennan, S., Twigg, S. (2015). The effects of high-fat feeding on physical function and skeletal muscle extracellular matrix. Nutrition and Diabetes, 5, 1-4.

Henshaw, F., Boughton, P., Lo, L., McLennan, S., Twigg, S. (2015). Topically Applied Connective Tissue Growth Factor (CTGF)/CCN2 Improves Diabetic Preclinical Cutaneous Wound Healing: Potential Role for CTGF in Human Diabetic Foot Ulcer Healing. Journal of Diabetes Research, 2015, 1-10.

Yao M, Xie C, Kiang MY, Teng Y, Harman D, Tiffen J, Wang Q, Sved P, Bao S, Witting P, Holst J, Dong Q. Targeting of cytosolic phospholipase A2α impedes cell cycle re-entry of quiescent prostate cancer cells. Oncotarget. 2015 Oct 27;6(33):34458-74.

Choi JP, Desai R, Zheng Y, Yao M, Dong Q, Watson G, Handelsman DJ, Simanainen U. Androgen actions via androgen receptor promote PTEN inactivation induced uterine cancer. Endocr Relat Cancer. 2015 Oct;22(5):687-701.

Hnit SS, Xie C, Yao M, Holst J, Bensoussan A, De Souza P, Li Z, Dong Q. p27(Kip1) signaling: Transcriptional and post-translational regulation. Int J Biochem Cell Biol. 2015 Nov;68:9-14.

Hua S, Vignarajan S, Yao M, Xie C, Sved P, Dong Q. AKT and cytosolic phospholipase A2α form a positive loop in prostate cancer cells. Curr Cancer Drug Targets. 2015;15(9):781-91.

Meng XX, Yao M, Zhang XD, Xu HX, Dong Q. ER stress-induced autophagy in melanoma. Clin Exp Pharmacol Physiol. 2015 Aug;42(8):811-6.

Calabro, S., Maczurek, A., Morgan, A., Tu, T., Wen, V., Yee, C., Mridha, A., Lee, M., D'Avigdor, W., Locarnini, S., McCaughan, G., Warner, F., McLennan, S., Shackel, N. (2014). Hepatocyte Produced Matrix Metalloproteinases Are Regulated by CD147 in Liver Fibrogenesis. PloS One, 9(7), e90571.

McGrath, K., Li, X., Whitworth, P., Kasz, R., Tan, J., McLennan, S., Celermajer, D., Barter, P., Rye, K., Heather, A. (2014). High density lipoproteins improve insulin sensitivity in high-fat diet-fed mice by suppressing hepatic inflammation. Journal of Lipid Research (Online), 55(3), 421-430.

Tu, T., Budzinska, M., Maczurek, A., Cheng, R., Di Bartolomeo, A., Warner, F., McCaughan, G., McLennan, S., Shackel, N. (2014). Novel aspects of the liver microenvironment in hepatocellular carcinoma pathogenesis and development. International Journal of Molecular Sciences, 15(6), 9422-9458.

Keane, F., Yao, T., Seelk, S., Gall, M., Chowdhury, S., Poplawski, S., Lai, J., Li, Y., Wu, W., Farrell, P., Vieira de Ribeiro, A., Osborne, B., Yu, M., Seth, D., Haber, P., Wang, C., Thomson, S., Twigg, S., McLennan, S., McCaughan, G., Gorrell, M., et al (2014). Quantitation of fibroblast activation protein (FAP)-specific protease activity in mouse, baboon and human fluids and organs. FEBS Open Bio, 4, 43-54.

Scott, C., Bonner, J., Min, D., Boughton, P., Stokes, R., Cha, K., Walters, S., Masolowski, K., Sierro, F., Grey, S., Twigg, S., McLennan, S., Gunton, J. (2014). Reduction of ARNT in myeloid cells causes immune suppression and delayed wound healing. American Journal of Physiology: Cell Physiology, 307(4), C349-C357.

Farrell, G., Mridha, A., Yeh, M., Arsov, T., Van Rooyen, D., Brooling, J., Nguyen, T., Heydet, D., Delghingaro-Augusto, V., Nolan, C., Shackel, N., McLennan, S., et al (2014). Strain dependence of diet-induced NASH and liver fibrosis in obese mice is linked to diabetes and inflammatory phenotype. Liver International, 34(7), 1084-1093.

Henshaw, F., Bolton, T., Nube, V., Hood, A., Veldhoen, D., Pfrunder, L., McKew, G., Macleod, C., McLennan, S., Twigg, S. (2014). Topical application of the bee hive protectant propolis is well tolerated and improves human diabetic foot ulcer healing in a prospective feasibility study. Journal of Diabetes and Its Complications, 28(6), 850-857.

Zheng Z, He X, Xie C, Hua S, Li J, Wang T, Yao M, Vignarajan S, Teng Y, Hejazi L, Liu B, Dong Q. Targeting cytosolic phospholipase A2 α in colorectal cancer cells inhibits constitutively activated protein kinase B (AKT) and cell proliferation. Oncotarget. 2014 Dec 15;5(23):12304-16.

Vignarajan S, Xie C, Yao M, Sun Y, Simanainen U, Sved P, Liu T, Dong Q. Loss of PTEN stabilizes the lipid modifying enzyme cytosolic phospholipase A_2α via AKT in prostate cancer cells. Oncotarget. 2014 Aug 15;5(15):6289-99.

Xie C, Yao M, Dong Q. Proliferating cell unclear antigen-associated factor (PAF15): a novel oncogene. Int J Biochem Cell Biol. 2014 May;50:127-31.

Xie C, Powell C, Yao M, Wu J, Dong Q. Ubiquitin-conjugating enzyme E2C: a potential cancer biomarker. Int J Biochem Cell Biol. 2014 Feb;47:113-7

Boughton, E., McLennan, S. (2013). Biomimetic scaffolds for skin tissue and wound repair. In Andrew J Ruys (Eds.), Biomimetic biomaterials: Structure and applications, (pp. 153-180). Cambridge: Woodhead Publishing Ltd.

McLennan, S., Abdollahi, M., Twigg, S. (2013). Connective tissue growth factor, matrix regulation, and diabetic kidney disease. Current Opinion In Nephrology And Hypertension, 22(1), 85-92.

Tan, J., McLennan, S., Williams, P., Rezaeizadeh, A., Lo, L., Bonner, J., Twigg, S. (2013). Connective tissue growth factor/CCN-2 is upregulated in epididymal and subcutaneous fat depots in a dietary-induced obesity model. American Journal of Physiology: Endocrinology and Metabolism, 304(12), E1291-E1302.

Williams, K., Shackel, N., Gorrell, M., McLennan, S., Twigg, S. (2013). Diabetes and Nonalcoholic Fatty Liver Disease: A Pathogenic Duo. Endocrine Reviews, 34(1), 84-129.

McLennan, S., Warner, F., Shackel, N. (2013). The role of CD147 in Liver Injury - “The truth is in the details” - letter to the editor. Journal of Hepatology, 58(4), 836-837

Ghalayini MK, Dong Q, Richardson DR, Assinder SJ. Proteolytic cleavage and truncation of NDRG1 in human prostate cancer cells, but not normal prostate epithelial cells. Biosci Rep. 2013 Jun 11;33(3).

Hua S, Yao M, Vignarajan S, Witting P, Hejazi L, Gong Z, Teng Y, Niknami M, Assinder S, Richardson D, Dong Q. Cytosolic phospholipase A2α sustains pAKT, pERK and AR levels in PTEN-null/mutated prostate cancer cells. Biochim Biophys Acta. 2013 Jun;1831(6):1146-57

Dixon KM, Lui GY, Kovacevic Z, Zhang D, Yao M, Chen Z, Dong Q, Assinder SJ,

Richardson DR. Dp44mT targets the AKT, TGF-β and ERK pathways via the metastasis suppressor NDRG1 in normal prostate epithelial cells and prostate cancer cells. Br J Cancer. 2013 Feb 5;108(2):409-19

Park FJ, Leung CH, Poon LC, Williams PF, Rothwell SJ, Hyett JA. Clinical evaluation of a first trimester algorithm predicting the risk of hypertensive disease of pregnancy. Aust N Z J Obstet Gynaecol. 2013 Dec;53(6):532-9.

POSTGRADUATE AND HONOURS COMPLETIONS

(2013 - 2015)

PhD

2015 - Maryam Abdollahi

2015 - Anar Ganbold

2015 - Frances Henshaw

2014 - Auvro Mridha

2014 - Sheng Hua

MPhil

2015 - Luisa Olaya Agudo

2014 - Lisa Liu

BSc(Hons)

2013 - 2015 4 students

SPECIAL AWARDS & PRIZES

(2013 - 2015)

Scholarships and Fellowships Awarded

- Surya Sutanto (APA)
- Maryam Abdollahi (IPRS and APA)
- Albert Hsiesh (PRSS)

EXTERNAL FUNDING TO LABORATORY
(2013 - 2015)

Source	Project Title	Collaborators	Awarded	Duration	Amount
NH&MRC APP1063515	The Role of the Hepatocyte and EMMPRIN in Liver Injury N Shackel, SV McLennan, G McCaughan	N Shackel, SV McLennan, G McCaughan	2014	3	$587,562
NH&MRC APP1009815	MMPs and poor wound healing in diabetes	McLennan SV, Min D, Twigg SM	2011	3	$374,000
Diabetes Australia Research Trust (DART)/ Research Grants	Exercise impairments and effects of aerobic interval training in young-onset type 2 diabetes; Wong J, Harmer A, Alison J, Ruell P, McLennan S; Diabetes Australia Research Trust (DART)/Research Grants.	Wong J, Harmer A, Alison J, Ruell P, McLennan S	2015	1	$60,000
Rebecca L Cooper Medical Foundation	Studies in diabetes and its complications		2013-2015	1	$20,000/yr

Left: Standing, Mr James Bonner, Right: A/Prof Susan McLennan and Dr Danqing Min

SUSAN MCLENNAN

McLennan Lab

(Left to Right)

Back Row:

Dr Albert Hseish, Dr Xiaoyu Wang, Professor Stephen Twigg (HOD), Susan Tukanui, A/Prof Susan McLennan, Maria Constantino, Dr Katherine Willliams, A/Prof Paul Williams, Mu Yao, Dr Agata Piotrowicz, Rebecca Seehoo, Sharon Clibbens, Jing Ren, Kathy Miao, Dr Charmaine Tam, Babu Maharajan, and Sheng Hua

Front Row:

Dr Danqing Min, Dr Glynis Ross, A/Prof Margaret McGill, Linda Ban, Veronica Dy, Alireza Rezaeizadeh, Christine Yee, Dr Maryam Abdollahi, Surya Sutanto, Taria Ng, and Dr Catherine Woolnough

EMBRYONIC STEM CELL LABORATORY

MICHAEL MORRIS

SESQUI SENIOR LECTURER IN EMBRYONIC STEM CELLS

PHYSIOLOGY

The Embryonic Stem Cell Laboratory has ongoing interests in two distinct areas: (i) Embryonic Stem Cells/Embryogenesis and (ii) 3D Structure of Membrane Proteins.

LAB OVERVIEW

Embryonic Stem Cells/ Embryogenesis

ES cells recapitulate many of the complex processes that occur during mammalian embryogenesis. This provides enormous experimental advantages because it is possible to identify molecules, signaling pathways, genetic and epigenetic events that contribute to stemness and that direct the differentiation of stem cells to specific cell fates. Thus, we use ES cells as an in vitro model to understand the molecular mechanisms of normal and abnormal development. We also develop protocols to direct the differentiation of ES cells to specific cell types that can be used in animal models of human disease.

In addition, we apply the knowledge we have gained from stem-cell behaviour in vitro to determine if the development of embryos themselves are controlled by the same or similar mechanisms. In particular, we focus on 3 key milestones in development which must be negotiated successfully: formation of the blastocyst, gastrulation, and neurogenesis.

3D Structure of Membrane Proteins

Membrane proteins are common and perform an enormous range of critical tasks in cells. However, it has continued to prove very difficult to obtain information on their 3D structures. Our research is directed towards developing computational tools that can be used to predict, refine, and compare the 3D structures of these proteins.

LABORATORY PERSONNEL/ STUDENTS

Michael Morris	Sesqui Senior Lecturer 2007 - present
Rachel Shparberg	PhD student 2013 - present
Tanya Saraogi	PhD student 2012 - present
Nicola Pitt	PhD student 2013 - present
Radu Zamfirescu	PhD student 2011 - present
Hannah Glover	MSc student 2014 - present
Mohammed Bahrami	MSc student 2014 - present
Jonathan Larach	MSc student 2013 - 2014
Holly Holliday	BMedSci (Hons) student 2013
Aneesha Chawla	BSc (Hons) student 2014 - 2015
Adam Yurka	BSc (Hons) student 2015
Kevin Sampang	Faculty of Medicine Summer Scholar 2012 - 2013
Sandra Li	Faculty of Medicine Summer Scholar 2013 - 2014
Tim Mason	Talented Student Program 2013 - 2015
Igor Reis	University of Sydney Study Abroad Internship Program 2014 - 2015

PUBLICATIONS
(2013 - 2015)

Sokouti B, Church WB, Morris MB, Dastmalchi S. (2015) Computational approaches in drug design for G protein-coupled receptors. In: Encyclopedia of Information Science and Technology, 3rd Edition, Khosrow-Pour M (ed.), IGI-Global, Hershey, PA, USA, pp. 479-489

Shparberg R, Glover H, Morris MB. (2015) Understanding the molecular mechanisms underlying mammalian neurogenesis using embryonic stem cells in Frontiers in Stem Cell and Regenerative Medicine Research, Bentham Science, in press

Tan BSN, Kwek J, Chong Kum Edwin Wong CKE, Saner N, Yap C, Felquer F, Morris , Gardner DK, Rathjen PD and Rathjen J. (2015) Src family kinases and p38 mitogen-activated protein kinases regulate pluripotent cell differentiation in culture, PLoS One, in press

Hamzeh-Mivehroud, M., Alizadeh, A., Morris, M., Church, W., Dastmalchi, S. (2013). Phage display as a technology delivering on the promise of peptide drug discovery. Drug Discovery Today 18, 1144-1157.

POSTGRADUATE AND HONOURS COMPLETIONS
(2013 - 2015)

BMedSc(Hons)

2013 - Holly Holliday (with medal)

BSc(Hons)

2014 - Aneesha Chawla

2015 - Adam Yurka

SPECIAL AWARDS & PRIZES
(2013 - 2015)

Scholarships and Fellowships Awarded

- 2013 - Kevin Sampang (Faculty of Medicine Summer Scholar)
- 2013 - Sandra Li (Faculty of Medicine Summer Scholar)

SERVICE TO THE UNIVERSITY AND COMMUNITY
(2013 - 2015)

Official for Scientific Societies

- Secretary and Public Officer, Australasian Society for Stem Cell Research, 2012–
- Member, Executive Committee, NSW Stem Cell Network, 2011–
- Member, Executive Committee, Sydney Centre for Developmental and Regenerative Medicine, 2009–

Conferences and Symposia Organized

- Organising Committee, 5th Australia and New Zealand regional meeting for the International Society for Cellular Therapy (ISCT ANZ) and 7th meeting of the Australian Society for Stem Cell Research (ASSCR), Lorne, Vic, 2014
- Convenor, 1st Annual NSW Reproduction Forum, Sydney, 2014

Invited Presentations

- The Future of Research Conference: Enhancing innovation, collaboration and translational approaches in research, 12 Dec 2014, Sydney.
- JI Day Event, 8th Australasian Society for Stem Cell Research Conference, Nov 2015, Hunter Valley.

Manuscripts Refereed for Journals

- Int J Biochem Cell Biol (5), Front Physiol (1)

Grant Application Assessed

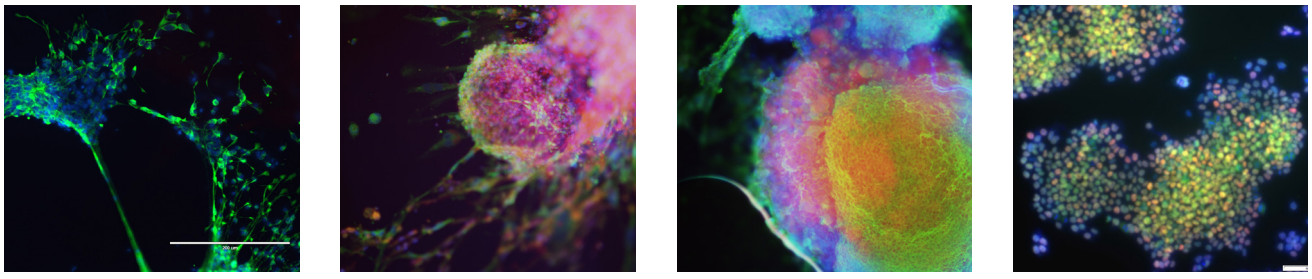
- NHMRC (2)

Editorial Boards of Journals

- Member, Editorial Board, Journal of Pediatric Biochemistry, 2009–
- Review Editor, Frontiers in Integrative Physiology, 2011–

Translation into Policy/Practice

- Submission, by Australasian Society for Stem Cell Research to TGA Public Consultation on regulation of autologous cell interventions
- Submission, by NSW Stem Cell Network, to TGA Public Consultation on regulation of autologous cell interventions



The first three images are pictures of neural embryoid bodies cultured from mouse embryonic stem cells, stained with neural markers BLBP (green)/NeuN red) and DAPI (blue). The last image is a picture of mouse embryonic stem cells stained with Oct4 (green), Nanog (red) DAPI (blue).

ELASTIN AND ELASTIC TISSUE ENGINEERING

ANTHONY WEISS

MCCAUGHEY CHAIR IN BIOCHEMISTRY,

PROFESSOR OF BIOCHEMISTRY AND MOLECULAR BIOTECHNOLOGY

LAB OVERVIEW

The Weiss Lab's research focuses on the assembly of human elastic tissue, damage and its repair. We are very interested in the amazing, self-assembling elastic protein tropoelastin and the use of synthetic elastin to repair elastic tissues in skin, artery, bladder and lung.

RESEARCH ACTIVITIES

Professor Weiss is the world-leader in tropoelastin biomaterials. His work is focused on the elasticity of the human body and his laboratory at the University of Sydney is the premier research centre for elastin-based biomaterials.

Elastin is the body's natural elastic material. Our bodies make precise copies of tropoelastin, the same natural component of elastin that is found in a newborn's skin and blood vessels. Professor Weiss says the body uses this precise replica of tropoelastin to make human elastic materials that can be used to augment and repair human tissues.

Our tissues need to be elastic to support life. Blood vessels need to respond elastically to every heartbeat for over two billion heartbeats in a lifetime. Our skin needs to be elastic to allow us to flex and bend. The lung expands and contracts with every breath. This is all due to elastin."

Professor Weiss is an inventor with multiple international patents. His key breakthroughs include the ability to make replacement body parts, such as replacement blood vessels and skin repair with 21st century naturally elastic biomaterials.

In addition to his Bosch Institute affiliation, Professor Weiss is the McCaughey Chair in Biochemistry, Professor of Biochemistry & Molecular Biotechnology, and Leader of Tissue Engineering & Regenerative Medicine at the Charles Perkins Centre at the University of Sydney, with conjoint affiliation Brains Korea 21 Plus Distinguished Visiting Professor in South Korea. He is a Fellow seven societies, including the Royal Society of Chemistry, Australian Academy of Technological Sciences and Engineering, and the American Institute for Medical and Biological Engineering. His lab has constructed a synthetic gene that enables large scale synthesis of full-length pure recombinant human tropoelastin, quantified its physical properties, led the discovery of tropoelastin's 3D solution structure, mapped multiple functional sites, demonstrated tropoelastin's extraordinary elasticity from the molecular to macro scale, discovered direct tropoelastin:integrin interactions and has made a range of tissue engineered materials based on these discoveries.

LABORATORY PERSONNEL/ STUDENTS

Anthony Weiss	Professor - present
Suzanne Mithieux	Postdoc - present
Giselle Yeo	Postdoc - present
Leping Yan	Postdoc - present
Kekini Kuppan	Technician - present

6 PhD, 5 Honours, 3 TSP

3 Visiting students

PUBLICATIONS
(2013 - 2015)

Yeo, G.C., Aghaei-Ghareh-Bolagh, B., Brackenreg, E.P., Hiob, M.A., Lee, P. and Weiss, A.S. (2015) Fabricated elastin. Adv. Healthcare Mater. 4, 2530–2556.

Wakelin, E.A., Fathi, A., Kracica, M., Yeo, G.C., Wise, S.G., Weiss, A.S., McCulloch, D.G., Dehghani, F., McKenzie D.R. and Bilek, M.M. (2015) Mechanical properties of plasma immersion ion implanted peek for bioactivation of medical devices. ACS Appl. Mater. Interfaces. 7, 23029-23040.

Bilek, M.M., Kondyurin, A., Dekker, S.A., Steel, B.C., Wilhelm, R.A., Heller, R., McKenzie, D.R., Weiss, A.S., James, M., Moeller, Q. (2015) Depth resolved structural and compositional characterization of ion-implanted polystyrene that enables direct covalent immobilization of biomolecules. J. Phys. Chem. C. 119,16793-16803.

Yu, Y., Wise, S.G., Michael, P.L., Bax, D.V., Yuen, G.S., Hiob, M.A., Yeo, G.C., Filipe, E.C., Dunn, L.L., Chan, K.H., Hajian, H., Celermajer, D.S., Weiss, A.S. and Ng, M.K. (2015) Characterization of endothelial progenitor cell interactions with human tropoelastin. PLoS One 10, e0131101.

Melnichuk, I., Choukourov, A., Bilek, M., Weiss, A.S., Vandrovcová, M., Bačáková, L., Hanuš, J., Kousal, J., Shelemin, A., Solař, P., Slavínská, D. and Biederman, H. (2015) Direct covalent coupling of proteins to nanostructured plasma polymers: a route to tunable cell adhesion. Appl. Surf. Sci. 351, 537-545.

Ozsvar, J., Mithieux, S.M., Wang, R. and Weiss, A.S. (2015) Elastin-based biomaterials and mesenchymal stem cells. Biomater. Sci. 3, 800-809.

Hibbert, S.A., Watson, R.E., Gibbs, N.K., Costello, P., Baldock, C., Weiss, A.S., Griffiths, C.E. and Sherratt, M.J. (2015) A potential role for endogenous proteins as sacrificial sunscreens and antioxidants in human tissues. Redox Biol. 5, 101-113.

Zhao, H.L., Yang, J., Tang, B.L., Chen, X.L., Su, H.N., Zhang, X.Y., Song, X.Y., Zhou, B.C., Xie, B.B., Weiss, A.S. and Zhang, Y.Z. (2015) Mechanistic insights into the elastin degradation process by the metalloprotease myroilysin from the deep-sea bacterium Myroides profundi D25. Marine Drugs. 13, 1481-1496.

Wang, Y., Mithieux, S.M., Kong, Y., Wang, X.Q., Chong, C., Fathi, A., Dehghani, F., Panas, E., Kemnitzer, J., Daniels, R., Kimble, R.M., Maitz, P.K., Li, Z. and Weiss, A.S. (2015) Tropoelastin incorporation into a dermal regeneration template promotes wound angiogenesis. Adv. Health. Mater. 4, 577-584.

White, J.D., Wang, S., Weiss, A.S. and Kaplan, D.L. (2015) Silk-tropoelastin protein films for nerve guidance. Acta Biomaterial. 14, 1-10.

Lin, Y., Wang, S., Chen, Y., Wang, Q., Burke, K.A., Spedden, E.M., Staii, C., Weiss, A.S. and Kaplan, D.L. (2015) Electrodeposited gels prepared from protein alloys. Nanomedicine 10, 803-814.

Yeo, G.C., Baldock, C., Wise, S.G. and Weiss, A.S. (2014) A negatively-charged residue stabilizes the tropoelastin N-terminal region for elastic fiber assembly. J. Biol. Chem. 289, 34815-34826.

Wise, S.G., Yeo, G.C., Hiob, M.A., Rnjak-Kovacina, J., Kaplan, D.L., Ng, M.K.C. and Weiss, A.S. (2014) Tropoelastin - a versatile, bioactive assembly module. Acta Biomaterial. 10, 1532-1541.

Heinz, A, Schräder, C.U., Baud, S., Keeley, F.W., Mithieux, S.M., Weiss, A.S., Neubert, R.H. and Schmelzer, C.E. (2014) Molecular-level characterization of elastin-like constructs and human aortic elastin. Matrix Biol. 38, 12-21.

Bax, D.V., Kondyurin, A., Waterhouse, A., McKenzie, D.R., Weiss A.S. and Bilek, M.M. (2014) Surface plasma modification and tropoelastin coating of a polyurethane co-polymer for enhanced cell attachment and reduced thrombogenicity. Biomaterials 35, 6797-6809.

Fathi, A., Mithieux, S.M., Wei, H., Chrzanowski, W., Valtchev, P., Weiss, A.S. and Dehghani, F. (2014) Elastin based cell-laden injectable hydrogels with tunable gelation, mechanical and biodegradation properties. Biomaterials 35, 5425-5435.

Hajian, H., Wise, S.G., Bax, D.V., Kondyurin, A., Waterhouse, A., Dunn, L.L., Kielty, C.M., Yu, Y., Weiss, A.S., Bilek, M.M.M., Bannon, P.G. and Ng, M.K.C. (2014) Immobilisation of a fibrillin-1 fragment enhances the biocompatibility of PTFE. Coll. Surf. Biointerf. 116, 544-552.

Fatoux-Ardore, M., Peysselon, F., Weiss, A.S., Bastien, P., Pratlong, F. and Ricard-Blum, S. (2014) Large-scale investigation of Leishmania interaction networks with the host extracellular matrix by surface plasmon resonance imaging. Infect. Immun. 82, 594-606.

Bax, D.V., Kondyurin, A., Waterhouse, A., McKenzie, D.R., Weiss A.S. and Bilek, M.M. (2014) Surface plasma modification and tropoelastin coating of a polyurethane co-polymer for enhanced cell attachment and reduced thrombogenicity. Biomaterials 35, 6797-6809.

Liu, H., Wise, S.G., Rnjak-Kovacina, J., Kaplan, D.L., Bilek, M.M., Weiss, A.S., Fei, J. and Bao, S. (2014) Biocompatibility of silk-tropoelastin protein polymers. Biomaterials 35, 5138-5147.

Lee, P., Bax, D.V., Bilek, M.M. and Weiss, A.S. (2014) A novel cell adhesion region in tropoelastin that mediates attachment to integrin alphaVbeta5. J. Biol. Chem. 17, 1467-1477.

Hiob, M.A., Wise, S.G., Kondyurin, A., Waterhouse, A., Bilek, M.M., Ng, M.K.C. and Weiss, A.S. (2013) The use of plasma-activated covalent attachment of early domains of tropoelastin to enhance vascular compatibility of surfaces. Biomaterials 34, 7584–7591.

Annabi, N., Selimović, S., Cox, J.P., Ribas, J., Afshar Bakooshli, M., Heintze, D., Weiss, A.S., Cropek, D. and Khademhosseini, A. (2013) Hydrogel-coated microfluidic channels for cardiomyocyte culture. Lab Chip 13, 3569-3577.

Almine, J.F., Wise, S.G., Hiob, M., Singh, N.K., Tiwari, K.K., Vali, S., Abbasi, T. and Weiss, A.S. (2013) Elastin sequences trigger transient proinflammatory responses by human dermal fibroblasts. FASEB J. 27, 3455-3465.

Annabi, N., Mithieux, S.M., Camci-Unal, G., Dokmeci, M.R., Weiss, A.S. and Khademhosseini, A. (2013) Elastomeric recombinant protein-based biomaterials. Biochemical Eng. 77, 110-118.

Annabi, N., Mithieux, S.M., Zorlutuna, P., Camci-Unal, G., Weiss, A.S. and Khademhosseini, A. (2013) Engineered cell-laden human protein-based elastomer. Biomaterials 34, 5496-5505.

Annabi, N., Tsang, K., Mithieux, S.M., Nikkhah, M., Ameri, A., Khademhosseini, A. and Weiss, A.S. (2013) Highly elastic micropatterned hydrogel for engineering functional cardiac tissue. Advanced Funct. Mater. 23, 4950-4959.

Hu, X., Tang-Schomer, M.D., Huang, W., Xia, X.X., Weiss, A.S. and Kaplan, D.L. (2013) Charge-tunable autoclaved silk-tropoelastin protein alloys that control neuron cell responses. Advanced Funct. Mater. 23, 3875-3884.

Reddel, C.J., Cultrone, D., Rnjak-Kovacina, J., Weiss, A.S. and Burgess, J.K. (2013) Tropoelastin modulates TGF-β1-induced expression of VEGF and CTGF in airway smooth muscle cells. Matrix Biol. 32, 407-413.

Mithieux, S.M., Wise, S.G. and Weiss, A.S. (2013) Tropoelastin - a multifaceted naturally smart material. Adv. Drug Delivery Rev. 65, 421-428.

Saitow, C., Wise, S.G., Weiss, A.S., Castellot, J. and Kaplan, D.L. (2013) Elastin biology and tissue engineering with adult cells. BioMolecular Concepts 4, 173-186.

Ghezzi, C.E., Rnjak-Kovacina, J., Weiss, A.S. and Kaplan, D.L. (2013) Multifunctional silk-tropoelastin biomaterial systems. Isr. J. Chem. 53, 777-786.

Rnjak-Kovacina, J. and Weiss, A.S. (2013) The role of elastin in wound healing and dermal substitute design. Chap. 5. pp. 57-66. In: Dermal Replacements in General, Burn, and Plastic Surgery (Kamolz, L.P., Lumenta, D. eds) Springer.

SPECIAL AWARDS & PRIZES
(2013 - 2015)

2015 Fellow of the Royal Australian Chemical Institute
2015 Innovator of Influence Award
2015 Applied Research Medal, Royal Australian Chemical Institute
2015 International Scientific Board, Indo-Italian Forum on Biomaterials & Tissue Engineering
2015 International Advisory Committee European Conference on Biomaterials
2014 Fellow of the Australian Academy of Technological Sciences and Engineering
2014 Entrepreneurship Award, FAOBMB
2014 Research Excellence Award, Australasian Society for Biomaterials and Tissue Engineering
2013 Fellow of the Royal Society of Arts, Manufactures and Commerce
2013 President, Matrix Biology Society of Australia and New Zealand
2013 International Advisory Committee TERMIS-AP
2013 Fellow of the Royal Society of Chemistry
2013 Fellow of the American Institute for Medical and Biological Engineering
2013 Barry Preston Prize, Matrix Biology Society of Australia and New Zealand
2013 NIH Interagency Modeling and Analysis Group
2013 NIH Integrated multiscale biomaterials experiment and modeling group (ImuBEAM)
2013 Elected to Council of the Australasian Society of Biomaterials and Tissue Engineering

EDITORIAL BOARDS

- ACS Biomaterials Science and Engineering (American Chemical Society)
- Applied Materials Today (Elsevier)
- Biomacromolecules (American Chemical Society)
- Biomaterials (Elsevier)
- Biomedical Materials (IOP)
- BioNanoScience (Springer)
- Tissue Engineering (Liebert)

PATENTS (2013 - 2015)

- WO/2013/044314. In vivo synthesis of elastic fiber. (Pending - AU, USA, EP, CA, CN, IN, SK, JP, BR). Inventors: WEISS, A.S.; MITHIEUX, S.M.
- WO/2013/01230. Elastic hydrogel. (Pending - AU, USA, EP, CA, CN, IN, SK, JP, BR). Inventors: ANNABI, N.; WEISS, A.S.; KHADEMHOSSEINI, A.
- WO/2014/089610. Scalable three-dimensional elastic construct manufacturing. (Pending - AU, USA, EP, CA, CN, IN, SK, JP, BR). Inventors: WEISS, A.S.; MITHIEUX, S.M.
- AU50069867 (awaiting WO reference) Formation of bone. (Pending - AU, USA, EP, CA, CN, IN, SK, JP, BR). Inventor: DEHGHANI, F., FATHI, A., MITHIEUX, S.M., WEISS, A.S.
- WO/2015/021508 Regeneration of damaged tissue. (Pending - AU, USA, EP, CA, CN, IN, SK, JP, BR). Inventor: WEISS,

EXTERNAL FUNDING TO LABORATORY (2013 - 2015)

Source	Project Title	Collaborators	Awarded	Duration	Amount
CRC for Cell Therapy	Advanced materials platforms		2013	4 years	$1,540,000
DVC Research/ SyReNS	ATVRE - Assistive Technologies for Virtual Rehabilitation Engineering	Feng D, Dehghani F, Weiss A,...etc	2013		
DVC Research/ Equipment Grant	Wide field super-resolution microscopy with ground state depletion - Exploring nanoscopic life in chronic diseases	Braet F, Weiss A, ...etc.	2013		
DVC Research/ Equipment Grant	An automated 3D electron microscopy imaging system comprising a 3View2 and field-emission scanning electron microscope	Liu Z, Chen M, Weiss A, ...etc.	2013		
Clive and Vera Ramaciotti Foundations	Nanotemper: State-of-the-art instrumentation for the characterization of protein interactions	Payne R, Matthews J, Weiss A, ...etc.	2013		
NHMRC APP1039072	Development of Endovascular Stents with Proactive Biocompatibility		2014	3 years	$428,470
Wellcome Trust Translation Award103328	Out-of-the-bag elastic meshes that accelerate wound repair		2014	2 years	$1,000,000
Technion Society of Australia (Vic)	3D Tissue Regeneration	Weiss A	2014		
NHMRC Equipment Grants	La Vision BioTec Ultramicroscope	Murphy C, Braet F, Byrne M, Weiss A, ...etc.	2014		
NHMRC APP1093307	Biothermosetting bone filler: an injectable osteoconductive repair material		2015	2 years	$587,542

BIOMATERIALS AND TISSUE ENGINEERING RESEARCH UNIT

HALA ZREIQAT

SENIOR RESEARCH FELLOW, SCHOOL OF AEROSPACE MECHANICAL AND MECHATRONIC ENGINEERING

The focus of our research is on engineering functional bone tissues by developing engineered synthetic grafts (scaffolds and ceramics) for the healing of traumatized or diseased bone.

LAB OVERVIEW

Millions of people worldwide suffer bone loss due to injury, infection, disease or abnormal skeletal development, and treatment frequently requires regeneration of new bone. Since each patient has only a limited amount of bone available for grafting, the demand for synthetic bone substitutes is high. Those currently available are far from optimal, but Professor Hala Zreiqat has developed a unique ceramic material that acts as a scaffold on which the body can regenerate new bone, then gradually degrades as it is replaced by natural bone.

The bone substitute my team and I have developed resembles natural bone in terms of architecture, strength and porosity. So it is strong enough to withstand the loads that will be applied to it, and also contains pores that allow blood and nutrients to penetrate it. In this way it is designed to encourage normal bone growth, and to eventually be replaced by natural bone in the body.

The fact that it actually 'kick starts' the process of bone regeneration makes it far superior to other available materials. Our tests also show that it will not be rejected by the body. In addition, we can make as many implants as we want from this material, so availability will not be a problem.

This material has the potential to positively affect the quality of life of millions of people globally, so we are hoping to see it in use clinically within the next 10 years.

LABORATORY PERSONNEL/ STUDENTS

Hala Zreiqat	Professor, Honorary Professor, Stomatology College of Shanghai JiaoTong University, China 2013 - present
Colin Dunstan	Associate Professor
Guocheng Wang	Research Associate 2009 -present
ZuFu Lu	Postdoctoral Research Fellow, 2009 - present
Yongjuan Chen	Postdoctoral Research Fellow 2007 - present
Barbara James	Research Assistant 1998 - present
Jiao Jiao Li	PhD student 2010 - present
Peter Newman	PhD student 2012 - present
Ben Davies	PhD student 2011 - present
Young Jung No	PhD student 2013 - present
Musharraf Hossain	PhD student 2011 - present

PUBLICATIONS
(2013 - 2015)

Li, J., Kim, K., Roohani-Esfahani, S., Guo, J., Kaplan, D., Zreiqat, H. (2015). A biphasic scaffold based on silk and bioactive ceramic with stratified properties for osteochondral tissue regeneration. Journal of Materials Chemistry B, 3(26), 5361-5376.

Zreiqat, H., Dunstan, C., Rosen, V. (2015). A Tissue Regneration Approach to Bone and Cartilage Repair. Cham: Springer.

Frohbergh, M., Newman, P., Simonaro, C., Zreiqat, H. (2015). Bone Tissue Engineering: Nanomedicine Approaches. In Robert A. Meyers (Eds.), Reviews in Cell Biology and Molecular Medicine, (pp. 153-178). Weinheim: Wiley - V C H Verlag GmbH & Co. KGaA.

Lu, Z., Li, J., Zreiqat, H. (2015). Bone-Biomimetic Biomaterial and Cell Fate Determination. In Hala Zreiqat, Colin R. Dunstan, Vicki Rosen (Eds.), A Tissue Regneration Approach to Bone and Cartilage Repair, (pp. 119-146). Cham: Springer.

Wang, G., Moya, S., Lu, Z., Gregurec, D., Zreiqat, H. (2015). Enhancing orthopedic implant bioactivity: Refining the Nanotopography. Nanomedicine, 10(8), 1327-1341.

No, Y., Roohaniesfahani, S., Lu, Z., Schaer, T., Zreiqat, H. (2015). Injectable radiopaque and bioactive polycaprolactone-ceramic composites for orthopedic augmentation. Journal of Biomedical Materials Research. Part B: Applied Biomaterials, 103(7), 1465-1477.

Kariem, H., Pastrama, M., Roohaniesfahani, S., Pivonka, P., Zreiqat, H., Hellmich, C. (2015). Micro-poro-elasticity of baghdadite-based bone tissue engineering scaffolds: A unifying approach based on ultrasonics, nanoindentation, and homogenization theory. Materials Science and Engineering C: Materials for Biological Applications, 46(2015), 553-564.

Newman, P., Lu, Z., Roohaniesfahani, S., Church, T., Biro, M., Davies, B., King, A., MacKenzie, K., Minett, A., Zreiqat, H. (2015). Porous and strong three-dimensional carbon nanotube coated ceramic scaffolds for tissue engineering. Journal of Materials Chemistry B, 3(42), 8337-8347.

Lu, Z., Roohaniesfahani, S., Li, J., Zreiqat, H. (2015). Synergistic effect of nanomaterials and BMP-2 signalling in inducing osteogenic differentiation of adipose tissue-derived mesenchymal stem cells. Nanomedicine: Nanotechnology, Biology, and Medicine, 11(1), 219-228.

Chen, Y., Roohaniesfahani, S., Lu, Z., Zreiqat, H., Dunstan, C. (2015). Zirconium Ions Up-Regulate the BMP/SMAD Signaling pathway and Promote the Proliferation and Differentiation of Human Osteoblasts. PloS One, 10(1), 1-17.

Lu, Z., Wang, G., Roohaniesfahani, S., Dunstan, C., Zreiqat, H. (2014). Baghdadite Ceramics Modulate the Cross Talk Between Human Adipose Stem Cells and Osteoblasts for Bone Regeneration. Tissue Engineering. Part A, 20(5-6), 992-1002.

Lu, Z., Wang, G., Zreiqat, H. (2014). Engineering Bone Niche Signals to Control Stem Cell Fate for Bone Tissue Regeneration. Archives of Stem Cell Research, 1(1), 1-2.

Roohaniesfahani, S., Wong, K., Lu, Z., Chen, Y., Li, J., Gronthos, S., Menicanin, D., Shi, J., Dunstan, C., Zreiqat, H. (2014). Fabrication of a novel triphasic and bioactive ceramic and evaluation of its in vitro and in vivo cytocompatibility and osteogenesis. Journal of Materials Chemistry B, 2(13), 1866-1878.

Davies, B., King, A., Newman, P., Minett, A., Dunstan, C., Zreiqat, H. (2014). Hypothesis: Bones Toughness Arises from the Suppression of Elastic Waves. Scientific Reports, 4(7538), 1-6.

Lu, Z., Roohaniesfahani, S., Zreiqat, H. (2014). Mimicking Bone Microenvironment for Directing Adipose Tissue-Derived Mesenchymal Stem Cells into Osteogenic Differentiation. In Gordana Vunjak-Novakovic, Kursad Turksen (Eds.), Biomimetics and Stem Cells: Methods and Protocols, (pp. 161-171). New York: Springer Science+Business Media.

No, Y., Roohaniesfahani, S., Zreiqat, H. (2014). Nanomaterials: the next step in injectable bone cements. Nanomedicine, 9(11), 1745-1764.

Zhao, X., Wang, G., Zheng, H., Lu, Z., Cheng, X., Zreiqat, H. (2014). Refining naotopographical features on bone implant surfaces by altering surface chemical compositions. RSC Advances, 4(97), 54226-54234.

Li, J., Kaplan, D., Zreiqat, H. (2014). Scaffold-based regeneration of skeletal tissues to meet clinical challenges. Journal of Materials Chemistry B, 2(42), 7272-7306.

Newman, P., Roohaniesfahani, S., Zreiqat, H., Minett, A. (2014). See the extracellular forest for the nanotrees. Materials Today, 17(1), 43-44.

Lu, Z., Wang, G., Dunstan, C., Chen, Y., Lu, W., Davies, B., Zreiqat, H. (2013). Activation and Promotion of Adipose Stem Cells by Tumour Necrosis Factor-Alpha Preconditioning for Bone Regeneration. Journal of Cellular Physiology, 228(8), 1737-1744.

Newman, P., Minett, A., Ellis-Behnke, R., Zreiqat, H. (2013). Carbon nanotubes: Their potential and pitfalls for bone tissue regeneration and engineering. Nanomedicine: Nanotechnology, Biology, and Medicine, 9(8), 1139-1158.

Zhao, X., Wang, G., Zheng, H., Lu, Z., Zhong, X., Cheng, X., Zreiqat, H. (2013). Delicate refinement of surface nanotopography by adjusting TiO2 coating chemical composition for enhanced interfacial biocompatibility. ACS Applied Materials and Interfaces, 5(16), 8203-8209.

Roohaniesfahani, S., Chen, Y., Shi, J., Zreiqat, H. (2013). Fabrication and characterization of a new, strong and bioactive ceramic scaffold for bone regeneration. Materials Letters, 107, 378-381.

Li, J., Gil, E., Hayden, R., Li, C., Roohaniesfahani, S., Kaplan, D., Zreiqat, H. (2013). Multiple Silk Coatings on Biphasic Calcium Phosphate Scaffolds: Effect on Physical and Mechanical Properties and In Vitro Osteogenic Response of Human Mesenchymal Stem Cells. Biomacromolecules, 14(7), 2179-2188.

Wang, G., Lu, Z., Zhao, X., Kondyurin, A., Zreiqat, H. (2013). Ordered HAp nanoarchitecture formed on HAp-TCP bioceramics by “nanocarving” and mineralization deposition and its potential use for guiding cell behaviors. Journal of Materials Chemistry B, 1(19), 2455-2462.

El Sayed, K., Marzahn, U., John, T., Hoyer, M., Zreiqat, H., Witthuhn, A., Kohl, B., Haisch, A., Schulze-Tanzil, G. (2013). PGA-associated heterotopic chondrocyte cocultures: implications of nasoseptal and auricular chondrocytes in articular cartilage repair. Journal of Tissue Engineering and Regenerative Medicine, 7(1), 61-72.

Zhang, W., Wang, G., Liu, Y., Zhao, X., Zou, D., Zhu, C., Jin, Y., Huang, Q., Sun, J., Liu, X., Xinquan, J., Zreiqat, H. (2013). The synergistic effect of hierarchical micro/nano-topography and bioactive ions for enhanced osseointegration. Biomaterials, 34(13), 3184-3195.

Roohaniesfahani, S., Dunstan, C., Li, J., Lu, Z., Davies, B., Pearce, S., Field, J., Williams, R., Zreiqat, H. (2013). Unique microstructural design of ceramic scaffolds for bone regeneration under load. Acta Biomaterialia, 9(6), 7014-7024.

SPECIAL AWARDS & PRIZES
(2013 - 2015)

- John and Eileen Haddon Memorial Plaque from the Rebecca L Cooper Medical Research Foundation (2015)
- Australia-Harvard Fellowship: AUD 10,000 (2013)

SERVICE TO THE UNIVERSITY AND COMMUNITY
(2013 - 2015)

Membership of Editorial Boards

Member, Editorial Board, International Journal of Biomaterials Research and Engineering

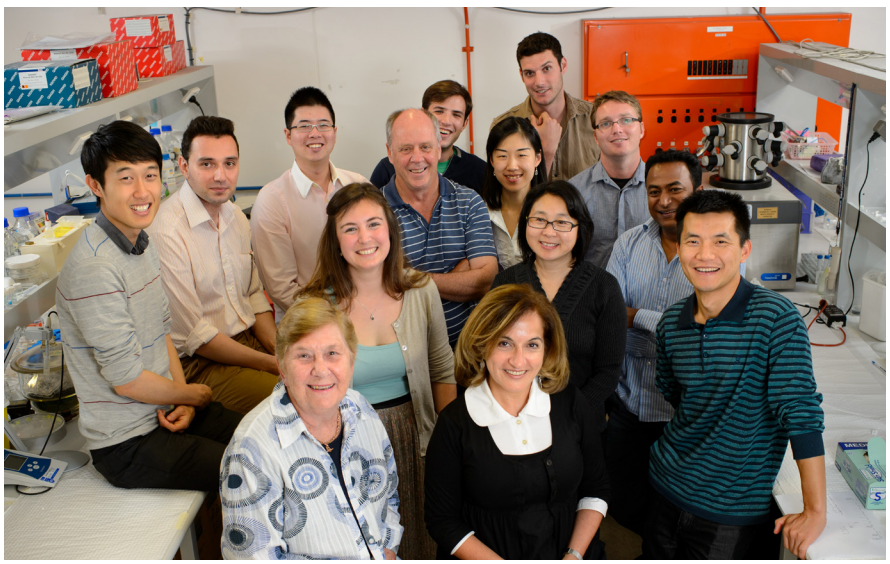
Member, Editorial Board, Recent Patents on Biomedical Engineering

Associate Editor, Journal of Biomimetics, Biomaterials, and Tissue Engineering

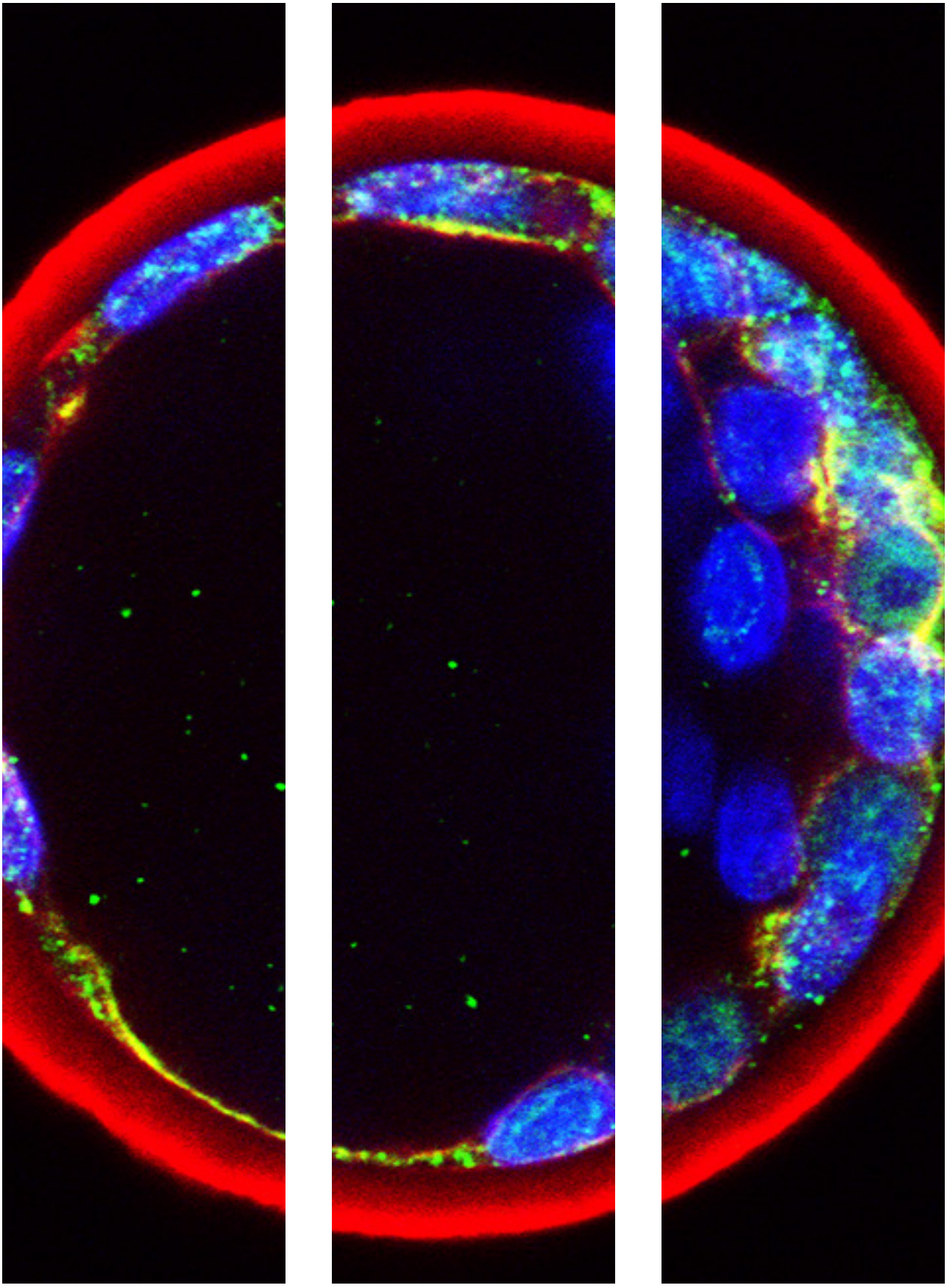
Editorial Board, Journal of Medical Engineering

EXTERNAL FUNDING TO LABORATORY
(2013 - 2015)

Source	Project Title	Collaborators	Awarded	Duration	Amount
NHMRC	Development of novel resorbable biomaterials for regeneration of human tissue	Zreiqat H	2011	4 years	$575,000



Back row (Left to Right): Young Jung No, S.I Roohani-Esfahani, William Lu, Mischa Junkiewicz, Peter Newman
3rd row: Colin Dunstan, Jiao Jiao Li, Ben Davies
2nd row: Annika van Hummel, Yongjuan Chen, MD. Musharraf Hossain
Front: Barbara James, Hala Zreiqat, Zufu Lu



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