

AITHM | AUSTRALIAN INSTITUTE
OF TROPICAL HEALTH & MEDICINE



JAMES COOK
UNIVERSITY
AUSTRALIA

Cairns
Singapore
Townsville



2015
ANNUAL
REPORT



**AITHM | AUSTRALIAN INSTITUTE
OF TROPICAL HEALTH & MEDICINE**

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The Australian Institute of Tropical Health and Medicine (AITHM) was formally established in 2013 with \$42.12M in funding from the Queensland Government. An additional \$42M was provided by the Commonwealth Government through the Australian Research Council Special Research Initiative (ARCSRI). This funding is enabling AITHM to build essential research programs and facilities in tropical health and medicine throughout Australia and the Asia-Pacific region. AITHM acknowledges the Australian and Queensland Governments for their support. AITHM also thanks the Division of Tropical Health and Medicine at James Cook University (JCU) for its ongoing multi-faceted support, including financial and strategic inputs. JCU's support is also recognised.



Australian Government
Australian Research Council



Queensland
Government



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About AITHM

The Australian Institute of Tropical Health and Medicine (AITHM) is a new and important health and tropical medicine research institute located across JCU's two campuses, in the wet and dry Tropics of northern Australia.

Based at James Cook University, the objective of AITHM is to lead improvements in tropical health and medicine through a significant portfolio of research addressing the critical health challenges in the Tropics. The goal of research within AITHM is to contribute to a growing knowledge based economy, the enhancement of Australia's biosecurity and adding value and efficiency to health service delivery.

Message from the Director

I'm delighted to present this third Annual Report of the Australian Institute of Tropical Health and Medicine (AITHM) as a record of our activities in 2015. The attraction of new research leaders to complement existing research strengths in tropical health and medicine was a high priority for AITHM in 2015. We attracted new talent in key areas such as Vector Biology, Infectious Disease, Biomedical Science, Biostatistics, Bioinformatics, and Health Economics. The recruitment of four new Professorial positions, and additional Principal and Senior Research Fellows to commence in 2015/2016, will significantly increase AITHM's research capacity, and will make a substantial contribution to AITHM's sustainability into the future.

The construction of new research infrastructure has continued throughout 2015. The Townsville AITHM building will be the best research laboratory of its type in northern Australia. Featuring a large high containment facility to undertake research on infectious diseases that threaten Australia's biosecurity, the Townsville site is due for completion in June 2016. Construction was initiated on our Cairns facility in 2015, and is due for completion in 2017. The Thursday Island research and community engagement facility is expected to be completed in 2016.

AITHM research programs were significantly supported by a \$1.5M Capacity-Building fund provided by the Queensland Department of Science, Information Technology and Innovation (DSITI). A number of other research projects were funded from industry and philanthropic sources, such as Janssen and the Bill & Melinda Gates Foundation, toward the development of novel drugs and vaccines. These translational projects mark a significant increase in prospects

for commercially viable outcomes from AITHM research.

AITHM has partnered with the Division of Tropical Health and Medicine at James Cook University, all five of the hospital and health services in northern Queensland and the Northern Queensland Primary Health Care Network, to form the Tropical Australian Academic Health Centre (TAAHC). TAAHC aims to improve the health of the northern Queensland population and grow prosperity in the tropical region through a partnership that enhances collective capability in health care, health and medical research, and workforce development. Thus TAAHC promises to be a significant opportunity for AITHM to facilitate research translation and build stronger collaborative research opportunities across northern Queensland.

The official launch of AITHM was held at Parliament House, Canberra in November, with attendance of the Minister for Education and Training, Senator the Hon. Simon Birmingham, Minister for Trade and Investment, the Hon. Andrew Robb, and Minister for Resources and Energy, and Northern Australia, the Hon. Josh Frydenberg, among others. I would like to thank all of my colleagues who have supported the development of AITHM throughout this year. Their support and collegiality is essential to the development of our new Institute. It gives me great satisfaction to see AITHM developing into a world-class research Institute that will contribute to the development of tropical health and medicine, both as a knowledge based industry to benefit the health of people throughout the Tropics.

Professor Louis Schofield
Director



Our Vision

AITHM aspires to excellence in tropical health and medical research, biotechnology and research education, supporting better health for people in the Tropics worldwide.

Our Values

Academic excellence, community partnerships, collaboration, respect, openness, and integrity.

Our Purpose

We are building a world-leading health and medical research institute, dedicated to solving problems of major importance to tropical Australia, South-East Asia, the Pacific and the Tropics worldwide, leading to improvements in health outcomes and health service delivery, and contributing to growing prosperity in the region.

Regions of the Tropics

AITHM delivers research aimed to improve health for people in the Tropics worldwide. The Tropics are diverse in terms of climate, environment, and culture. The Tropics is home to 40 per cent of the world's population or more than 2.8 billion people. By 2050, more than half the world's population is expected to live in the Tropics.¹

1. stateofthetropics.org

2015 AITHM highlights



AITHM was officially launched at Parliament House, Canberra on 30 November 2015.

Over 120 delegates attended AITHM's annual Australasian Tropical Health Conference, which was held at the Pullman Palm Cove from 20–22 September 2015. International speakers addressed the theme of *Emerging Priorities in Tropical Health* and included discussion on vaccine discovery and Immunobiology.

AITHM played a key role in the Federal Government's Northern Development Investment Forum held in Darwin.

Professor Schofield led the Tropical Health and Medicine component of the Australian Government's trade mission to India in January 2015, at the request of the Minister for Trade and Investment, the Hon. Andrew Robb.

Researchers from AITHM filed one provisional patent application in 2015.

AITHM is a founding collaborative partner in the newly formed Tropical Australian Academic Health Centre (TAAHC). This is a partnership between all the hospital and health services in northern Queensland, JCU and AITHM, and is the most significant research and clinical collaboration in northern Australia. The TAAHC has an important role as the first academic health centre to focus on tropical health, Indigenous health, and health service delivery in regional, rural and remote settings.

Professor Tom Burkot was elected to sit on the Expert Review Group for the World Health Organisation regarding the Global Technical Strategy, and the Malaria Control and Elimination Operation Manual.

Construction of the new \$31M AITHM Townsville facility commenced.

Construction of the new \$25.5M AITHM Cairns facility commenced.

AITHM Director, Professor Louis Schofield, provided a keynote presentation at the Queensland State Government's Advance Queensland Townsville Regional Forum.

AITHM progressed in the commercialisation of Tropical Health and Medical research outcomes.

Associate Professor Richard Franklin and Professor Peter Leggat, AM were invited participants in the 40th Anniversary Celebrations of the World Safety Organization, held during the 28th International Environmental and Occupational Safety and Health Professional Development Symposium, in Manila, Philippines. The conference also included the Global Safety Roundtable focusing on matters to be put forward for consideration by the United Nations Economic and Social Council.

Workforce

Attracting new research leaders to complement the existing research strengths in tropical health and medicine at JCU was a high priority for AITHM in 2015. AITHM aimed to attract new research capacity in Vector Biology, Infectious Disease, and Biomedical Science, as well as capacity in Biostatistics, Bioinformatics, and Health Economics.

The appointment of three new professorial research leaders in 2015/2016, will substantially increase AITHM's research capacity, reach and depth in national and international collaboration, and will make a substantial contribution to AITHM's sustainability in the future.

Professor Emma McBryde, who commenced in July 2015, will lead AITHM's Infectious Disease Modelling research. With a focus on Tuberculosis (TB), modelling and clinical research, Professor McBryde joins AITHM from the Burnet Institute and the University of Melbourne. Professor Denise Doolan, a molecular immunologist whose research is focused on malaria, commenced in February 2016 and joined AITHM from the Queensland Institute of Medical Research.

These new research leaders are joined by three new senior enabling appointments, to support AITHM research: two Senior Research Fellows – Dr Emily Callander, a Health Economist, previously at The University of Sydney, and Dr Matt Field a Bioinformatician who joins AITHM from the Australian National University; and Professor Adrian Esterman, a senior Biostatistician.

AITHM is committed to the development of new scientists and is supporting multiple PhD and post-doctoral fellow positions. Dr Sandip Kamath and Dr Michael Meehan join our allergen and infectious diseases programs.

Supporting a culture of research entrepreneurship, engagement and growth is core to AITHM's approach to staff appointments and support. AITHM seeks to inculcate culture and conditions that promote opportunities for growth, translation, and commercialisation of research findings. The collaborative opportunities provided by the Tropical Australian Academic Health Science Centre (TAAHC), AITHM and JCU's subscription to the Medical Research Commercialisation Fund (MRCF) are examples of the structures that reflect this priority.

2015 appointments to new positions

Dr Emily Callander, Senior Research Fellow – Health Economics

Dr Sandip Kamath, AITHM Research Fellow

Professor Emma McBryde, Professorial Research Fellow – Infectious Diseases Modelling and Epidemiology

Ms Julie Woodward, Operations Manager

Confirmed 2016 appointments to new positions

Professor Denise Doolan, Professional Research Fellow – Immunology of Infectious Disease

Professor Adrian Esterman, Professor – Biostatistics and Population Health

Dr Matt Field, Senior Research Fellow – Bioinformatics

Dr Michael Meehan, Research Fellow, Infectious Diseases Modelling and Epidemiology

AITHM's global impact

AITHM is conducting world leading research to benefit health in tropical regions. We are internationally recognised for research that is innovative and for transferring research outcomes for the benefit of the community. Some examples of AITHM's global reach are depicted below, with the numbers representing the quantity of current AITHM research collaborations in these locations.



AUSTRALASIA

QLD	64
NT	9
WA	30
NSW	7
VIC	31
ACT	1
SA	3
TAS	1
New Zealand	1

EUROPE

Great Britain	3
Scotland	1
Germany	3
Switzerland	1
Spain	1
Luxemburg	1
Austria	2
Norway	1

ASIA

PNG	5
Philippines	1
Fiji	2
Solomon Islands	5
Vietnam	5
Indonesia	2
South Korea	1
Thailand	2

SOUTH AMERICA

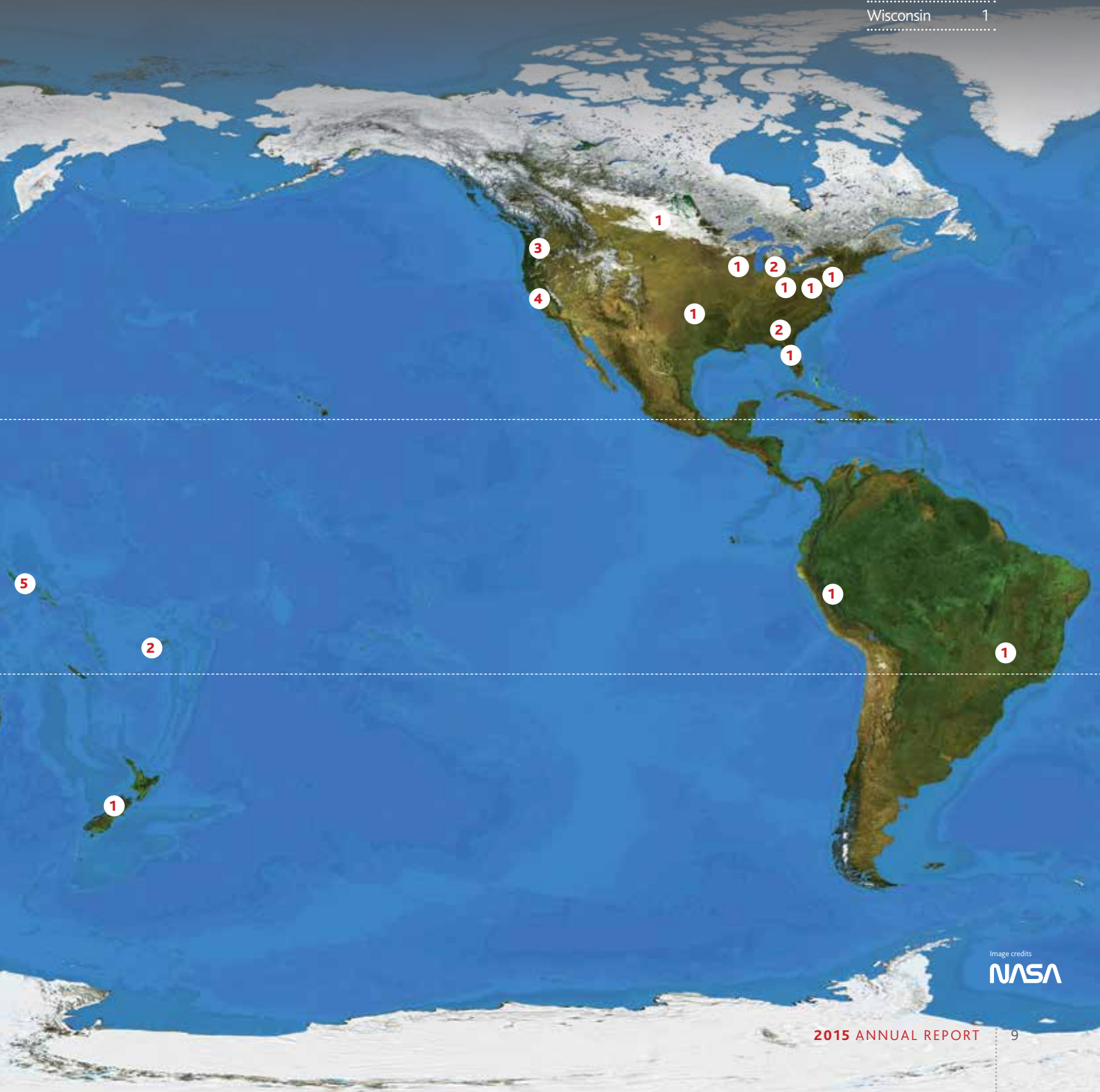
Brazil	1
Peru	1

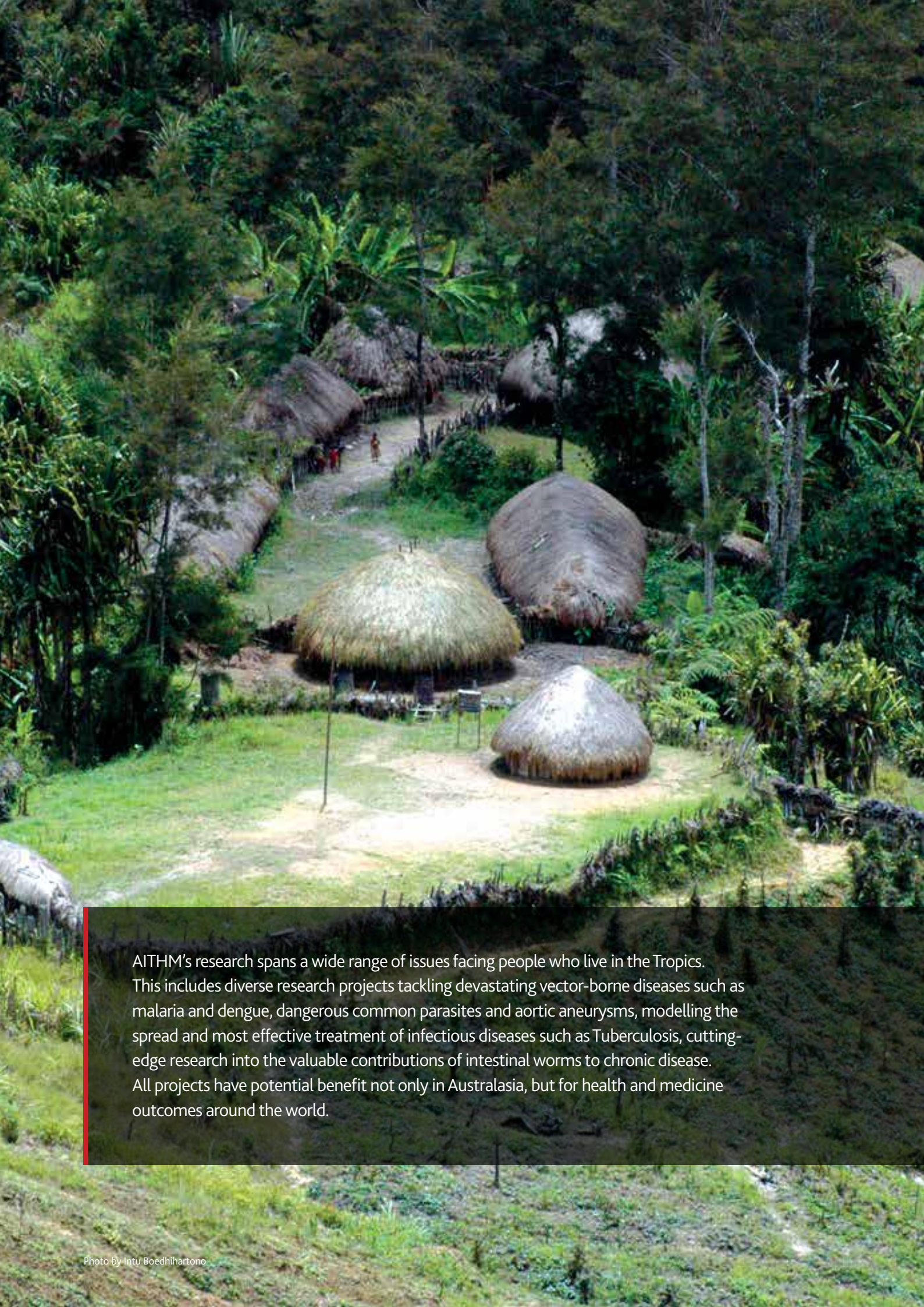
AFRICA

South Africa	1
Ethiopia	1

NORTH AMERICA

Canada	1
Georgia	2
Florida	1
California	4
Michigan	2
Maryland	1
Oklahoma	1
Pennsylvania	1
Washington	3
Ohio	1
Wisconsin	1





ALTHM's research spans a wide range of issues facing people who live in the Tropics. This includes diverse research projects tackling devastating vector-borne diseases such as malaria and dengue, dangerous common parasites and aortic aneurysms, modelling the spread and most effective treatment of infectious diseases such as Tuberculosis, cutting-edge research into the valuable contributions of intestinal worms to chronic disease. All projects have potential benefit not only in Australasia, but for health and medicine outcomes around the world.

Our Research

AITHM's research programs encompass public health, biomolecular, clinical, translational and health systems and are strongly focused on the health issues of most importance to tropical Australia, South-East Asia and the Pacific.

There are six research themes, with a strong emphasis on infectious and chronic diseases and health systems and public health. These themes enable cross-disciplinary research that seeks to move from basic science through to translation and impact.

Theme A

Re-emerging infectious diseases, vectors and Australia's health security (see p18)

Theme B

Health systems research (see p20)

Theme C

Chronic diseases with high prevalence in tropical Australia (see p22)

Theme D

Molecular development of therapeutics (see p24)

Theme E

Genetic and epigenetic aspects of disease (see p26)

Theme F

Occupational health and safety (see p28)

Research Centres

JCU and AITHM currently recognise and support significant groupings of researchers and research activity as University Research Centres, or as externally funded Research Centres.

Five of the six research themes emphasised by AITHM have one or more associated Centres. These Centres assist with management and support for individual AITHM programs and projects.



Centre for Biodiscovery & Molecular Development of Therapeutics (BMDT)

Co-Directors: Professor Alex Loukas and Professor Andreas Lopata

The BMDT provides an innovative approach to the development of compounds of therapeutic potential under its five key programs, with each program comprising its own project leader/s and team consisting of project researchers and early career researchers.

research.jcu.edu.au/bmdt



Centre for Biosecurity and Tropical Infectious Diseases

Co-Directors: Professor Nick Smith and Professor Natkunam Ketheesan

Infectious disease agents impose major costs on human and animal health and are constantly threatening to undermine biosecurity. Detection and control of tropical infectious diseases is a major global challenge.

research.jcu.edu.au/btid



Comparative Genomics Centre

Director: Professor Alan Baxter

The Comparative Genomics Centre studies the molecular basis of health and disease in a wide range of model organisms. It uses cutting-edge technologies to dissect interactions between complex microbial flora and the genomes of host animals to develop detailed models of disease initiation and progression. These approaches are being taken to improve our understanding of cancers, metabolic diseases, endocrine diseases, as well as immunological and psychiatric disorders. These insights are being applied to develop novel diagnostic tools and potential therapies.

research.jcu.edu.au/cgc

CNMR Centre for Nursing & Midwifery Research

Centre for Nursing and Midwifery Research (CNMR)

Director in 2015: Professor Jane Mills

The Centre for Nursing and Midwifery Research works collaboratively across disciplines to contribute to better health for people in the tropics by developing new prevention, diagnosis and treatment options for diseases that are of importance in the tropical world.

research.jcu.edu.au/cnmr



Queensland Research Centre for Peripheral Vascular Disease

Director: Professor Jonathan Colledge

The Queensland Research Centre for Peripheral Vascular Disease was established in 2010. The centre amalgamated the previously established James Cook University Vascular Biology Unit formed in 2002 and clinical research undertaken on peripheral vascular disease at The Townsville Hospital.

The centre focuses on research designed to improve understanding and ultimately improve management of peripheral vascular diseases. Current research undertaken in the centre includes pre-clinical work designed to identify novel treatment targets and risk predictors for peripheral vascular disease patients; studies aimed at better understanding mechanisms involved in peripheral vascular disease development and progression, and clinical studies and trials designed to identify or test novel therapies for peripheral vascular disease.

research.jcu.edu.au/qrcpvd

ABRC Anton Breinl Research Centre

Anton Breinl Research Centre for Health Systems Strengthening

Co-Directors: Professor Jacinta Elston and Professor Sarah Larkins

The Anton Breinl Research Centre brings together a multidisciplinary team of medical, nursing, public health and allied health researchers to build on JCU's strong record of rural, remote, Indigenous and tropical health research. The Centre's aim is to progress health equity in partnership with Australian Aboriginal and Torres Strait Islander peoples, rural and remote populations, tropical populations in neighbouring countries, and other underserved groups. The Centre hosts three streams of research:

1. Health systems strengthening and workforce development
2. Aboriginal and Torres Strait Islander health; and,
3. Responding to priority health challenges in our region.

research.jcu.edu.au/abrc



Centre for Research Excellence (CRE) in the Prevention of Chronic Conditions in rural and remote populations

Directors: Professor Robyn McDermott and Associate Professor Alan Clough

The Centre for Chronic Disease Prevention (CCDP) is committed to working with health services and communities in Far North Queensland to improve the management of chronic disease, particularly diabetes, heart and renal disease.

The Centre receives funding from Department of Health, Queensland and includes the Centre for Research Excellence: Prevention of chronic conditions in rural and remote high risk populations (funded through the Australian Primary Health Care Research Institute).

The Centre undertakes research related to prevention of chronic diseases in the community and improving primary health care practice and care pathways for chronic disease.

www.ccdp.jcu.edu.au

Professor Sabe Sabesan – PhD Graduate

The delivery of improved health systems in rural and remote communities, specifically in telehealth and the delivery of teleoncology, is the focus of research by Professor Sabe Sabesan. Professor Sabesan is a clinical oncologist who graduated with a PhD from JCU in 2015.



Photo by Ian Hitchcock

Professor Sabesan obtained his Bachelor of Medicine, Bachelor of Surgery degree from Flinders University in 1995 and then completed his internship in Alice Springs Hospital during 1996, where he became an advocate for equitable and exceptional patient care regardless of where a person lives.

Following his internship, Professor Sabesan worked at the Royal North Shore Hospital and Royal Brisbane Hospitals before being appointed as a medical oncologist at The Townsville Hospital in 2004. Professor Sabesan developed a passion for telehealth and has subsequently pioneered the use of telemedicine at The Townsville Hospital to treat patients with cancer who live in remote and rural areas.

“Despite improvements in rural workforce in recent years, access to specialist services closer to home remains limited for many rural and Indigenous patients. I was keen to develop a model whereby patients could talk with their doctors via videoconference, rather than make a long journey to see a specialist at a hospital,” Professor Sabesan said.

Professor Sabesan has since established a large teleoncology network in northern Queensland and proven the relevance of

teleoncology in routine practice, through evaluation and peer reviewed publications. Using evidence from his previous research, in collaboration with key clinicians in Queensland, he has led the development of an innovative remote chemotherapy supervision model, known as the Queensland Remote Chemotherapy Supervision model (QReCS), for state-wide implementation. Nationally, he developed the Australian Teleoncology Guidelines in collaboration with clinicians around Australia on behalf of the Clinical Oncology Society of Australia.

Additionally, Professor Sabesan led the development of The Tropical Centre for Telehealth Practice and Research. This partnership between The Townsville Hospital and Health Service (THHS), and AITHM continues to build on the important research being conducted in telehealth technology throughout northern Queensland.

“The Centre is the first of its kind in the health sector that brings together clinical service delivery and academia to lift the profile of the THHS and northern Queensland,” Professor Sabesan said.

Currently, Professor Sabesan is the program lead of the newly formed Tropical Centre for Telehealth Practice and Research, hosted by The Townsville Hospital which works closely with AITHM and the Anton Brienl Centre for Health Service Strengthening. He is also Chair of the Regional and Rural Group of the Clinical Oncology Society of Australia.

Professor Sabesan is also the Director of the Department of Medical Oncology of The Townsville Cancer Centre, The Townsville Hospital, and the Clinical Dean of the Townsville Clinical School, and the Northern Clinical Training Network (NCTN), JCU and THHS in Townsville.

As a world leading oncology specialist, Professor Sabesan is an emerging researcher directly translating telehealth research outcomes into practice for the improvement of health care delivery in rural and remote regions in northern Australia.

Dr Paul Giacomini – AITHM Postdoctoral Research Fellow

Dr Paul Giacomini is one of AITHM's leading Mucosal Immunologists and has been a Postdoctoral Research Fellow at the Centre for Biodiscovery and Molecular Development of Therapeutics in Cairns for four years. He began his tertiary education at the University of Adelaide with a Bachelor of Biomedical Science, and continued with his Honours and PhD training at the University of Adelaide.

After early post-doctoral research in the United States at the University of Pennsylvania, he returned to Australia to investigate the molecular and cellular mechanisms by which immune responses to parasitic helminths (worms) are initiated and regulated.

Dr Giacomini's passion for immunology was ignited by the potential to tackle one of the biggest problems in biology – studying an organism or cell to determine how it functions, and how that information can be translated to improve human health. "Most of my scientific training has been basic research using animal models of disease, which is essential for forming the basis for future discoveries. However, I was equally passionate about studying the human immune system in order to develop novel treatments for inflammatory diseases, or develop new cures for parasitic disease," Dr Giacomini said.

Dr Giacomini's recent research investigates key immune cells and cytokines involved in immunity to intestinal parasitic worms, as well as exploring the potential beneficial effects that worm infection may have in alleviating inflammation associated with autoimmune diseases. A recent opportunity to be involved in a clinical trial assessing the immune response of humans to hookworms, as well as determining whether the worm could have a beneficial impact on a common inflammatory disease, has now shaped Dr Giacomini's future research direction and became one of his key achievements.

"The trial involved only a small number of people, but it was important as a proof of principle that these worms, or the molecules they produce, may hold the key for suppressing coeliac disease symptoms. The results even surprised us; we found an almost complete suppression of gluten induced inflammatory responses in these people who had previously been on a strict gluten free diet, where they could then eat pasta with no ill effects," Dr Giacomini explained.

Dr Giacomini is now beginning to focus on a much larger trial that will begin in 2016. Dr Giacomini and his team, including research students, aims to analyse the hookworm and gluten-induced immunological responses in greater detail, while also using in vitro assays to test whether any specific proteins secreted by the worms can suppress the gluten responses. The idea is that such a protein could one day be developed in the lab as a pill-based medication, and infecting people with live hookworms will not be necessary.

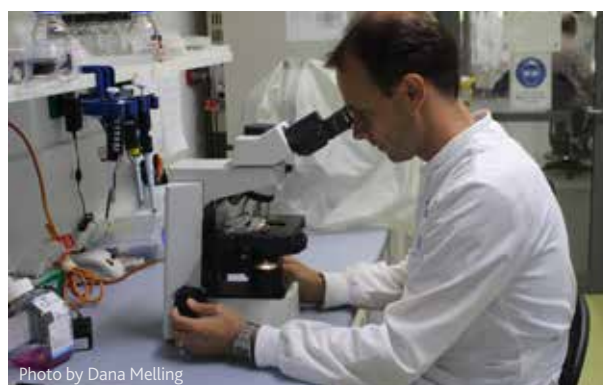


Photo by Dana Melling

In five to 10 years' time, Dr Giacomini hopes that AITHM will be running additional trials in coeliac disease as well as other inflammatory disorders, and his current group of PhD students are already thinking and planning for that far ahead.

"I've been a researcher in Professor Alex Loukas' lab for the past four years, and have had a lot of freedom and encouragement from him to be involved in a diverse range of projects, such as animal models of disease, basic research into immunology, infectious diseases, and parasitology. Now, as a relatively senior member of the group, I'm enjoying being involved with a number of students' exciting research projects," Dr Giacomini said.

Dr Giacomini explained that the AITHM is ideally placed to encourage students and researchers to capitalise on the biodiversity of the tropical regions of Australia to look for proteins and molecules that could have novel immunoregulatory properties. As a mucosal immunologist, he is excited to be overseeing new projects and hopes to start growing his own group to work on future discoveries.

"I'm passionate about this project, passionate to see what we can discover and what that means for the quality of life for people living with coeliac disease and other immunological disorders. There is so much we don't know about our intestinal immune system. Our bodies face an immense challenge every day in preventing our immune systems from attacking our own tissues or what we eat, but simultaneously having the ability to fight invading pathogens. That's where I see AITHM, and the group I work with discovering in the future," Dr Giacomini said.

Professor Emma McBryde – AITHM Professorial Research Fellow

AITHM Professorial Research Fellow Emma McBryde is a world-leading infectious disease specialist, and physician, as well as a tuberculosis epidemiologist. This background is supported by her research expertise in mathematical and statistical modelling. Professor McBryde began her career with a Bachelor of Medicine from the University of Queensland, followed by a Masters of Biostatistics at the University of Melbourne, and then a PhD from the Queensland University of Technology.



Professor McBryde was previously the Head of Epidemiology of Infectious Diseases at the Royal Melbourne Hospital, and Head of Modelling and Biostatistics at the Burnet Institute. She also held an National Health and Medical Research Council (NHMRC) research fellowship at the University of Melbourne.

With a naturally inquiring mind, Professor McBryde's passion for research was originally kindled by her interest in fundamental sciences, especially physics. This, compounded with work experience in a physics laboratory and a General Practitioner mother who encouraged her interest in all things medical, led to her pursuing a career in medicine, specialising in infectious disease. She later blended this into her interest in mathematics and created modelling tools for best practice control and prevention of infectious diseases.

Joining AITHM in mid-2015, Professor McBryde also received a Global Fund grant, enabling her to determine at a national level the best place to concentrate resources in order to combat tuberculosis. Professor McBryde has also undertaken work that focused on preventing and controlling tuberculosis across South-East Asia and the Pacific, with particular focus on the Philippines, Fiji and Papua New Guinea.

"I'm proud of our achievements this year [in 2015], we are building a


global impact as we target tuberculosis, this infection disease occurs all over the world, but mostly effects those living in poverty and in the prime of their lives; those who are young, and should be fit, healthy and productive. We have excellent support, including from the World Bank and we are starting to see inroads in preventing and controlling the disease, which is crucial," Professor McBryde said.

Throughout her career Professor McBryde has sought to understand the global phenomenon of infectious diseases improvements in international health outcomes, and inequities in care. "I'm passionate about science and mathematics, but I'm excited by what those disciplines can do to improve real-world outcomes. My latest studies allow me to model 1000 virtual reality trials to explore ideas and assumptions on combatting tuberculosis, and we can now figure out how best to allocate resources and to eventually eliminate infectious diseases," she explained.

Professor McBryde spends her time split at AITHM between leading tuberculosis research and supervising several postdoctoral students, including projects on preventing and controlling tuberculosis outbreaks in the Torres Strait, and conducting field studies in places such as Papua New Guinea. Professor McBryde enjoys a solid mix of qualitative and quantitative research work, in both the laboratory and the field.

Professor McBryde is also Director of the Australia Tuberculosis Modelling Network (AuTuMN), which is the world leader in tuberculosis research. She collaborates with other researchers at JCU, Melbourne University, Monash University, and the Burnet Institute. In the future she hopes these collaborations and her work at AITHM will see emerging infectious diseases outbreaks reduced or eliminated.

"The day-to-day of my job is a lot of fun; I work in a creative, collaborate way and get to experiment with mathematics. I'm following both my interests and my passions, but most importantly I am doing my all to combat tuberculosis, an infectious disease with 9.6 million cases reported in 2014 (WHO). The work we are doing is crucial and I hope to one day see it mean many infectious diseases become relegated to history," Professor McBryde said.

A close-up photograph of a person wearing a blue nitrile glove, holding a white pipette. The pipette is positioned over a multi-well plate, and a single drop of orange liquid is about to fall into one of the wells. The background is blurred, showing other laboratory equipment and lights.

"I'm following both my interests and my passions, but most importantly I am doing my all to combat tuberculosis, an infectious disease with 9.6 million cases reported in 2014 (WHO). The work we are doing is crucial and I hope to one day see it mean many infectious diseases become relegated to history."

Professor Emma McBryde
AITHM Professorial Research Fellow



Theme A

Photo by Yale Rosen

Re-emerging infectious diseases, vectors and Australia's health security

The research program for Theme A encompasses clinical, population and laboratory-based studies that address the security risks of infectious diseases such as Tuberculosis (TB) and vector borne diseases, and to improve health outcomes in the Tropics.

The proximity of Papua New Guinea (PNG) and the Asia-Pacific to northern Australia places the region at risk from emerging and re-emerging infectious diseases and vectors including:

- Drug-resistant TB
- Dengue fever
- Zika virus
- Japanese encephalitis
- Chikungunya
- Malaria
- Filariasis
- Parasitic diseases (gastro-intestinal helminths, avian influenza, melioidosis, cholera, and newly emerging pathogens).

Key researchers

Professor Tom Burkot

Professor Denise Doolan – *commencing in 2016*

Professor Natkunam Ketheesan

Professor Alex Loukas

Professor Emma McBryde

Professor Scott Ritchie

Professor Louis Schofield

Professor Nick Smith

Associate Professor Jeff Warner

Corresponding research centre

Centre for Biosecurity and Tropical Infectious Diseases

Theme A was a priority area of expansion in 2015, with the recruitment of Professor Emma McBryde, an infectious diseases physician and leading TB epidemiologist and mathematical modeller of infectious diseases. Professor McBryde has led consultancies for the Australian Agency for International Development (AusAID), the Department of Foreign Affairs and Trade (DFAT) and the Commonwealth Department of Health, and participated in work funded by the Bill & Melinda Gates Foundation on modelling to guide policy in TB. Commencing with AITHM in July 2015, Professor McBryde's work focused on accelerating AITHM's TB research program. This acceleration witnessed collaboration building with Queensland Health, and Cape York and Torres Strait communities for the delivery of both research and clinical services.

TB research was also supported by the Queensland Department of Science, Information Technology and Innovation (DSITI) funded Capacity-Building Grants, announced in 2015.

The key focus of Professor McBryde's TB research program is to establish a national research collaboration focused on TB transmission and modelling. This work is developing a tool for TB control policy development. It is being conducted in collaboration with national TB programs in the Asia-Pacific region, and is currently funded by the Global Fund.

Pivotal to the delivery of clinical and health services, Professor McBryde has also been appointed by Queensland Health to provide specialist physician services in the Torres Strait Islands and Cape York. This work is vital to the establishment of key relationships and health care delivery into a region exposed to biosecurity risks. The work includes the supervision of a research higher degree candidate, J'Belle Foster, who leads a Commonwealth funded Torres Strait/Papua New Guinea cross border TB project as well as the new Torres and Cape TB Control Unit. Supervised by Professor McBryde, this research will examine factors involving clustering of TB outbreaks in the Torres Strait Islands, both in residents and treaty visitors from Papua New Guinea. Critically, this research will result in direct knowledge transfer and expand the capacity of these regions to respond to TB.

In other TB research, emerging researchers had great success in investigating the double burden of Tuberculosis and Diabetes. Supervised by Professor Natkunam Ketheesan, Honours student, Tahnee Bridson had a paper accepted in the *American Journal of Tropical Medicine and Hygiene*. This research found patients from tropical regions with comorbid diabetes were seven times over represented in the TB patient population when compared with the

general population. An invited review published in *Immunology* by Dr Kelly Hodgson, in collaboration with The Townsville Hospital, highlighted the current status of the mechanisms of susceptibility to infection in patients with diabetes. In an emerging research area, a laboratory model of diabetes to study the impact on co-infections has now been extensively characterised by AITHM Senior Researcher Dr Jodie Morris and her colleagues.

Further expansion of the AITHM TB research team, including identification and development of emerging and early career researchers is planned for 2016. Through researchers such as Associate Professor Jeff Warner, who has strong links with Balimo (in the Western Province of PNG), AITHM is developing a number of field studies in TB, identifying factors that lead to successful and unsuccessful outcomes for patients with TB.

Theme A researchers also continued making significant contributions to emerging and re-emerging vector research through the Eliminate Dengue program - an international collaborative research project whose goal is to dramatically reduce dengue incidence in northern Queensland and other tropical regions. Mosquito researcher and medical entomologist, Professor Scott Ritchie, is a collaborating scientist on the Eliminate Dengue project with colleagues from Monash University. The program pioneers a method to control and eliminate dengue by releasing *Aedes aegypti* mosquitoes infected with the Wolbachia bacteria. The bacteria block the ability for the mosquito to transmit dengue virus. Long-term monitoring of release sites has shown Wolbachia is sustaining itself at high levels in the mosquito populations in most of Cairns and Townsville.

Following a successful Capacity-Building Grant application, Professor Ritchie's laboratory will conduct a risk assessment that tests if invasions of the Asian tiger mosquito, *Aedes albopictus* could completely displace the "dengue-proof" Wolbachia infected *Aedes aegypti*. His laboratory, led by Senior Research Officer Brian Johnson, has also produced novel mosquito traps that use sound lures to monitor both mosquito species. The team found a tone of 484 Hertz, the frequency of a female *Aedes aegypti*'s wing beat, brought 95 per cent of male mosquitoes to the trap. The invention of the audio trap is timely: male mosquitoes do not bite, but new anti-mosquito strategies involve capturing and sterilising males before releasing them to breed unsuccessfully with females. The team is now optimising the trap for field use, and collaborating with trap manufacturers to add the feature to their products.



Photo by Paul Zborowski



Photo by JCU Media



Theme B

Health systems research

This research theme has a broad remit focusing on health service delivery to rural, remote, and Indigenous populations, and health workforce development in tropical Australia and the Pacific. These populations share limited access to healthcare and demonstrably poorer health outcomes. Targeted research is necessary to improve access and outcomes.

In conjunction with rural, remote, Indigenous and Pacific communities, AITHM is undertaking studies to improve quality of care and workforce capacity. The program is also investigating the use of various models of care for telehealth and service delivery to regional and remote communities.

Key researchers

Dr Emily Callander

Professor Jacinta Elston

Professor Adrian Esterman – *commencing in 2016*

Professor Sarah Larkins

Professor Robyn McDermott

Professor Jane Mills (now RMIT)

Corresponding research centres

Anton Breinl Research Centre for Health Systems Strengthening

Centre for Nursing and Midwifery Research

AITHM further strengthened Theme B during 2015, with recruitment of a Health Economist. Health economics is a new and much needed capacity in AITHM. Economic analysis into public health interventions is vital in any examination of effectiveness. The recruitment of Dr Emily Callander to the team in 2015 strengthened AITHM's research areas of public health and health systems. Dr Callander specialises in measuring the social and economic impacts of poor health.

Dr Callander is currently working with researchers from Mater Research Institute, Menzies Health Institute, Gold Coast University Hospital, Mater Mothers Hospital, and the NHMRC Clinical Trials Centre on a number of clinical trials, which specifically measure the wider social and economic impacts of the interventions. This will further her research on the distribution of the economic impacts of chronic disease, specifically looking at the special needs of rural and Indigenous populations. Dr Callander is currently working with Professor Sarah Larkins and Professor Sabe Sabesan to investigate the additional impact of healthcare expenditure on access to care, and the compounding effect high out-of-pocket costs have when combined with low income and poor rates of labour force participation. This will improve AITHM's future research capacity and will provide much needed economic focus to improve public health interventions in northern Australia.

The Anton Breinl Research Centre for Health Systems Strengthening held a well-attended launch in August 2015, in conjunction with the Leaders in Indigenous Medical Education conference. Researchers from the Centre have been active in a range of research projects progressing a more responsive health system through collaborative research. The Health Systems Strengthening and Workforce Development stream has been leading an international prospective cohort study of health professional education through the Training for Health Equity Network. This work demonstrates that with attention to student selection, curriculum, location and postgraduate pathways it is possible to create a fit-for-purpose health workforce to address the health needs of underserved populations in a variety of contexts. The Aboriginal and Torres Strait Islander research stream is focussed on increasing the quality



of care provided in rural and remote Indigenous primary health care services, through learning from “high-improving” services and then attempting to scale up these quality improvement initiatives. This work involves widespread partnerships across northern Australia, notably with Indigenous peak bodies, Menzies School of Health Research, Queensland Health, and the Northern Territory Department of Health.

In other work, Centre researchers are helping rural children have healthy mouths through testing models of participatory oral health service planning with rural communities, working in partnership with communities in rural Malaita, Solomon Islands, to provide appropriate care for TB and soil-transmitted helminths, and using telemedicine services to broaden the reach of a range of health services.

Research conducted during 2015 within the Centre for Chronic Disease Prevention presented findings from the *Getting Better at Chronic Care* project to key stakeholders including clinicians and managers from participating services (Torres Cape Hospital Health Service (TCHHS), Apunipima Cape York Health Council, Mulungu Health Service and Gurriny Yealumucka Health Service) and Queensland Health policy makers. The project was a cluster randomised controlled trial of a health-worker led model of care based in the community, aimed at improving care processes and outcomes for adults with complex conditions including poorly managed diabetes. The main findings were that the model achieved some improvements in clinical indicators (mainly glycemic control for diabetes) and important reductions in preventable complications requiring hospitalisation. Importantly, all participating services indicated that they will adopt the health-worker led model of care with appropriate local adaptations, and also key elements of the training program and professional support developed during the trial.

The *Getting Better at Chronic Care* project has been translated into local clinical service models and has also given rise to several publications and local presentations to stakeholders. The economic evaluation is complete and results have been presented to the Queensland Health stakeholders and the Project Management Committee. The clinical impact was modest but significant, however the economic analysis suggested that a higher caseload per health worker would be more cost-effective. It is likely that the model will be adopted by TCHHS. Further planning meetings with TCHHS are scheduled, including rolling out Health Worker Training programs which can lead to Health Worker registration nationally.

In 2015, research highlights within the Centre of Research Excellence for Prevention of Chronic Conditions in Rural and Remote High Risk Populations included the establishment of a Research Translation Network within the stream of *Mental health and substance misuse in chronic disease*. Key stakeholders from the Research Translation Network received progress summary reports of the NHMRC-funded evaluation of the Alcohol Management Plans (AMP), which have been in operation in selected Cape York and Torres Strait communities since 2002. The evaluation used mixed methods approaches to assessing the impact of the AMPs on key health and community service use, together with extensive interviews and focus groups with affected community members and service providers. The implementation of these policies was variable, and many unintended consequences

were documented which have important policy implications. Stakeholders including representatives from local government, police and community justice groups have since met to discuss these implications.

Future research by the Centre for Chronic Disease Prevention will include a new collaboration with Melbourne University to develop an Indigenous-specific Cardiovascular Disease risk equation, funded by NHMRC. This will commence in 2016, and last for three years. Other funded projects include collaboration with University of Sydney researchers examining the impact of lifetime physical activity on morbidity and mortality, and the influence of the physical environment, including the impact of moving to new neighbourhoods.

In telehealth research, Professor Sabe Sabesan focused on the delivery of improved health systems in rural and remote communities, through telehealth and specifically teleoncology. A key highlight of this research was published in the *Medical Journal of Australia*. This research maintained that the uptake of telehealth in Australia has been growing steadily, but future growth is reliant upon clinical champions to take the lead. Most telehealth services in Australia are optional, which acts as a barrier to the growth and uptake of these models, despite the benefits to those living in rural communities. This research complemented other findings which determined that there were no significant differences between the patients treated in rural hospital in Mount Isa and the Townsville Cancer Centre patients, and further that it appears safe to administer chemotherapy in rural towns under the supervision of medical oncologists from larger centres via teleoncology. This research provides evidence that telehealth is an essential health care delivery mechanism in remote areas of northern Australia – where remoteness has previously meant lack of access to specialist services.

Plans for Theme B in 2016 will incorporate further work in improvements to Indigenous primary health care, funded through a Capacity-Building Grant. Led by Professor Sarah Larkins, the team will continue work into understanding how quality improvement initiatives in Indigenous primary health care services can be rolled out and supported on a broader scale through identification of issues that prevent success, and identifying interventions that overcome barriers. Additional goals of this project include future funding opportunities, strengthened relationships and collaborations with key partners, along with building research capacity of emerging Indigenous and non-Indigenous researchers.

A second Capacity-Building Grant in the field of health systems research will begin in 2016; *Trialling low-cost adjuvant therapy for sepsis*. Led by Professor Damon Eisen and Professor Emma McBryde, this project will entail collaboration with The Townsville Hospital and the University of Melbourne. Sepsis occurs much more frequently in tropical regions, with higher incidence again in Indigenous peoples. It is known that low-dose aspirin prevents sepsis deaths in animal models and retrospective human studies and has the potential to save lives in resource poor settings and reduce healthcare costs. This project in 2016 will forge strong collaborations between AIHBM and The Townsville Hospital and the research outcomes will then translate to remote communities.

Theme C



Chronic diseases with high prevalence in tropical Australia

This research theme focuses on the complex interactions between chronic and infectious diseases and the differing patterns of prevalence of these diseases between climatic zones, racial groups, and between metropolitan and rural and remote populations.

Chronic and infectious diseases that are prevalent in tropical Australia and the Asia-Pacific include diabetes, TB, heart disease and rheumatic heart disease. Current areas of research focus include:

- The prevention of chronic conditions such as diabetes and heart disease in rural and remote populations;
- The development of treatments for chronic food allergy conditions; and,
- The development of rodent models for the chronic diseases of rheumatic heart disease and diabetes.

Key researchers

Associate Professor Alan Clough

Professor Jon Golledge

Professor Adrian Esterman – *commencing in 2016*

Professor Natkunam Ketheesan

Professor Andreas Lopata

Professor Alex Loukas

Professor Emma McBryde

Professor Robyn McDermott


Professor Louis Schofield

Corresponding research centres

Centre for Chronic Disease Prevention

Queensland Research Centre for Peripheral Vascular Disease

Centre for Research Excellence (CRE) in the prevention of Chronic Conditions in rural and remote populations



The link between gut microbiome and propensity for chronic disease, including the link between intestinal worms and Type 2 Diabetes, and the use of the drug 'ice' in rural and remote communities were two highlights of this program in 2015.

Strongyloides stercoralis is an intestinal worm infection that is known to be common in the developing world and in some Indigenous communities of northern Australia. A two-year study, led by Professor Robyn McDermott from the Centre for Chronic Disease Prevention, sought to determine whether Ivermectin, the generally accepted treatment for this condition, could be confirmed as an effective treatment for parasitic infections in these populations. The study concluded that treatment was successful in this population and patients with existing Type 2 Diabetes is a risk factor for treatment failure, an observation of great interest in these communities where prevalence of both conditions is high.

PhD candidate, Russell Hayes, made an important and unanticipated finding in this study. His research indicated that there is a relationship between infection by *Strongyloides stercoralis* and reduced occurrence of Type 2 Diabetes in Australian Aboriginal populations. In a survey of 259 Australian Aboriginal adults in a remote community in northern Australia, people with previous infection were 61 per cent less likely to have a diagnosis of Type 2 Diabetes than those uninfected. In this remote community where prevalence of both *Strongyloides stercoralis* and Type 2 Diabetes is very high, infection with the intestinal worm appears to be associated with a significantly reduced risk of Type 2 Diabetes in adults. Understanding these types of infections is vital to establishing health care delivery to a region when Australian Aboriginal and Torres Strait Islander populations are disproportionately affected by Type 2 Diabetes and *Strongyloides* infections.

In 2016, further research in a larger population will be made possible with a DSITI funded AITHM Capacity-Building Grant. Professors McDermott and Loukas, and Dr Paul Giacomini will lead a study where exposure to intestinal worms, the gut microbiome, and metabolism in young adults will be analysed. This build collaboration between two strong research groups (Loukas and McDermott) within AITHM together in an exciting new collaboration that will combine skills from laboratory bench to epidemiology and the clinical setting. How good and bad bacteria shape predisposition for chronic disease later in life will be the focus of the research project.

AITHM research aims to have direct and meaningful impact on Indigenous communities in northern Australia, and is working with Aboriginal Australians to improve health literacy and health outcomes for communities in remote and rural Queensland.

Investigating addiction and substance abuse issues through meaningful engagement with northern Australian Aboriginal communities has been the long term focus for Associate Professor Alan Clough. Media reports indicated a growing disquiet among health professionals nationally about the use of crystal methamphetamine ('ice') in some Indigenous communities, however little data existed. Surveys of front line service providers together with interviews with community members in rural and remote Aboriginal communities found that the more remote communities were not yet seriously affected. In communities closer to regional towns and centres small groups of amphetamine users have been established for some time. More potent forms of amphetamine, including 'ice', are linked with serious mental health problems. If these more potent drug types become more readily available, problems are likely to become magnified in small isolated communities.

In 2016, researchers from the NHMRC funded Queensland Research Centre for Peripheral Artery Disease will undertake research into abdominal aortic aneurysm. A successful NHMRC grant worth over \$686K was awarded in late 2015 to Professor Jon Golledge and Dr Corey Moran, to facilitate their study titled *Blocking the factor XII-kallikrein pathway to limit abdominal aortic aneurysm*.

Artery weakening is present in two to five per cent of older adults and is an important cause of sudden death. The investigators have generated substantial preliminary data from a previous NHMRC project implicating the contact pathway in the process of artery weakening. This project will examine the ability of agents which are currently available or being developed for patient use in limiting the process of artery degeneration using established pre-clinical models.

AITHM is also demonstrating significant support for the Queensland Research Centre for Peripheral Artery Disease with funding for emerging research leaders within the group. The funding made available for three Research Fellow Positions who are supervising other research positions, is consistent with AITHM's desire to foster, develop and encourage emerging researchers.





Photo by Sandip Kamath

Molecular development of therapeutics

This research theme is concerned with pioneering the development of therapeutics vaccines and drugs, particularly in relation to tropical diseases and parasites such as malaria and hookworm. It also seeks to develop proteins, peptides and molecules from tropical fauna and flora (such as parasites and marine fauna).

The focus is on innovative, cross-disciplinary approaches to the development and trialling of compounds and targets. Current research includes:

- Vaccine development for malaria;
- Novel treatments developed from parasites;
- Treatment for allergic responses including marine and seafood components interaction with the immune system for the development of diagnostics and immunotherapeutics in the area of allergies;
- The discovery of proteins, peptides and small molecules derived from parasites, spiders and marine fauna that show promise as novel therapeutics for treating human inflammatory and chronic diseases or as vaccine targets;
- Metal complexes for treating drug-resistant bacterial infections; and,
- New ways to treat envenomations in the Tropics.

Key researchers

Professor Norelle Daly

Professor Geoff Dobson

Professor Denise Doolan – *commencing in 2016*

Professor Natkunam Ketheesan

Professor Andreas Lopata

Professor Alex Loukas

Professor Louis Schofield

Associate Professor Jamie Seymour

Professor Nick Smith

Corresponding research centre

Centre for Biodiscovery and Molecular Development of Therapeutics

In September 2015 Professor Louis Schofield, Director of AITHM, received an \$2.8M grant from the Bill & Melinda Gates Foundation, to pursue the pre-clinical development of a vaccine aimed at the goal of malaria eradication. With 214 million cases of malaria reported worldwide in 2014, the disease imposes a heavy burden in tropical regions, including Australia's near neighbours.

This new funding will enable a team of researchers from AITHM and the Walter and Eliza Hall Research Institute in Melbourne to collaborate and develop a broad spectrum vaccine effective against most species of human malaria. This prototype vaccine attempts to overcome several existing barriers by attacking most species and stages in the malaria life cycle. The next critical stage for this investigation will enable the project to move into a formal regulatory testing and manufacturing process with an end goal of a usable functioning vaccine.

Parasitology research in 2015 found that a worm that kills tens of thousands of people every year may also supercharge recovery from wounds. Dr Michael Smout and Professor Alex Loukas found that a growth factor secreted by a one-centimetre-long worm drives wound healing and blood vessel growth. However, an unfortunate consequence of this accelerated wound repair over many years is an increased risk of developing liver cancer. This discovery demonstrates that it is possible the growth factor could be used to accelerate the healing of chronic wounds such as diabetic ulcers, and to develop a vaccine against the worm-induced cancer. A vaccine would benefit the people directly at risk of cancer, but the growth factor would also benefit the developed world as a possible wound healing agent. Research planned for 2016 is investigating how this growth factor controls healing, and ultimate development of the discovery as both a healing agent and a vaccine is the primary goals of future research.

With NHMRC grant success in 2015, Dr Paul Giacomini and Dr John Croese (Prince Charles Hospital, Brisbane), are developing novel treatment modalities for coeliac disease using hookworms. Following a successful small pilot study in 2013, a larger group of 40 patients will be infected with hookworm larvae. The research will investigate if the parasite is effective in treating coeliac disease. Future research will see participants consuming gluten levels greater than those in the pilot study as they progress towards eating a normal diet. Scientists believe the key to the hookworm's anti-inflammatory power lies within the proteins that the worms secrete. Indeed, Professor Alex Loukas' group has identified a hookworm protein with anti-inflammatory properties in mouse models of asthma and inflammatory bowel diseases, and in partnership with the pharmaceutical giant, Janssen, they are developing a pre-clinical portfolio to progress towards clinical trials. The Loukas group has also developed a high throughput screen to trawl through the hookworm secretome, to identify novel anti-inflammatory proteins for therapeutic development into the future.

Research into the development of molecular therapeutics sourced from stonefish was a focus of research by Associate Professor Jamie Seymour. The project, in conjunction with Monash University, has examined the X-ray crystal structure of the lethal components present in stonefish venom. This has provided

an unexpected insight into a human immune response that is responsible for the failure of up to 30 per cent of bone marrow transplant therapies for treating leukaemia. The lethal component of stonefish venom, a protein called Stonustoxin, is an ancient relative of the human immune protein perforin. In humans, perforin is an essential weapon used to destroy virally infected and cancerous cells. The insights obtained from stonefish venom are now being used to develop immunosuppressants to improve the success rate of transplant therapies.

Professor Geoffrey Dobson and his team, PhD students Hayley Letson and Maddison Griffin are undertaking collaborative research with United States (US) Special Operations Command to develop effective treatment for blood loss, catastrophic shock, traumatic brain injury, and ways to reduce infection. In 2015 the team developed the world's first 'pharmacological tourniquet' for internal blood loss. They showed that their resuscitation drug treatment reduced internal blood loss by up to 60 per cent. There is currently no effective treatment for internal blood loss in the military or civilian pre-hospital settings. The team also investigated mechanisms behind blood loss in surgery and how this can be prevented or improved, with experiments in clot kinetics, propagation and firmness, and correcting coagulopathy via improved drug therapies and resuscitation techniques.

Professor Dobson and his team are now collaborating with leading trauma research groups in Denver and Camden, USA, and have signed research agreements with the US Navy, San Antonio, Texas, to advance the technology for military use. The JCU innovation also has extensive civilian pre-hospital applications in tropical, rural, and remote environments, retrieval medicine, low-income countries (trauma, post-partum hemorrhage), mass casualty incidents, and terrorist attacks. Translational studies are being planned.

In 2015, AITHM's Professor Andreas Lopata was involved in several commercial collaborations investing in the development of diagnostic tools for shellfish allergy, and also in therapeutics for shellfish allergy. The goal is to identify and develop more defined and fully characterised allergen preparations, specific for the Asia-Pacific region, and to expand currently available invitro diagnostics (IVD). This investment enables AITHM researchers to utilise detailed knowledge of molecular immune responses to allergens in children and adults, and allow early detection and better management for this often lifelong chronic disease. Further development of diagnostics and therapies for treatments will be the goal of this collaboration.

Furthering AITHM's reach in the area of commercialisation and industry engagement, (following a successful Capacity-Building Grant in 2015), an interdisciplinary project led by Professor Andreas Lopata will address the clinical needs for the worldwide epidemic of food allergy, by building the foundation for the development of immunotherapy for shellfish allergy. It will provide much needed characterisation of allergens in prawns and will lead to greater patient safety in Australia and development of component resolved immunotherapy for shellfish allergy for clinical translation and worldwide applicability.



Photo by Hayley Letson

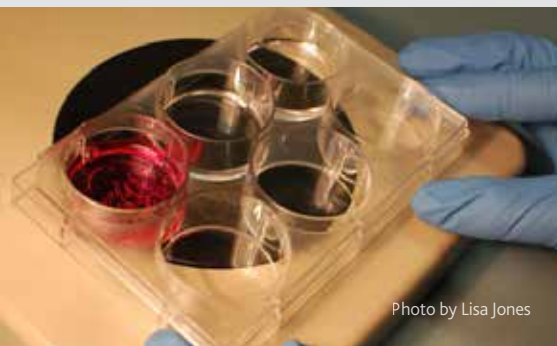


Photo by Lisa Jones



Photo by Sheree Marris

Theme E



Photo by Through The Looking Glass Studio

Genetic and epigenetic aspects of disease

Genetic and genomic research is fundamental to much of the research undertaken in AITHM's Theme A and Theme C. Activity in this theme focuses on providing genotyping, transcriptional profiling, deep sequencing, and bioinformatics knowledge and expertise to researchers. As research themes develop this theme will become increasingly important in the provision of evidence in research projects.

AITHM researchers in this theme are also working to determine the causes of autoimmune diseases, such as diabetes, gastritis and lupus, using both cellular and genetic techniques.

Key researchers

Professor Alan Baxter

Dr Ira Cooke

Dr Matt Field – *commencing in 2016*

Dr Lionel Hebbard

Dr Margaret Jordan

Associate Professor Bill Leggatt

Professor Andreas Lopata

Professor David Miller

Dr Alex Roberts

Associate Professor Patrick Schaeffer

Professor Adam Ye

Corresponding research centre

Comparative Genomics Centre

Key developments within Theme E during 2015 include the recruitment of a Research Fellow in Bioinformatics, the establishment of an AITHM Biobank and advances in the genetic identification of infectious diseases.

The recruitment of Dr Matt Field in the role of Senior Research Fellow, Bioinformatics, provides an important and new research capacity for our new Institute. Dr Field's skills in Bioinformatics will provide expert data analysis across diverse fields including infectious diseases, microbiome and biological determinants of chronic disease. Dr Field has worked at the Genome Sciences Centre in Canada, followed by five years at the Australian National University working with Professor Chris Goodnow in immunogenomics. His focus has been analysing large DNA-seq and RNA-seq genomic data specifically relating to the underlying genetic cause of diseases such as cancer and autoimmunity. A common theme in Dr Field's work has been the development of flexible and scalable bioinformatic workflows with a focus on reproducibility.

In other key developments planned for 2016, Dr Matt Field, will develop a Bioinformatics network throughout AITHM and Australia. The goal of this network is to embed bioinformatics into research teams and link these to the national agenda.

After planning throughout 2014, AITHM started to develop its Biobank in 2015. Supported through internal resources and staff as well as a Capacity-Building Grant, the AITHM Biobank, led by Dr Lynne Woodward, will enhance groups' ability to store and use biological samples. With samples in a shared Biobank there is greater opportunity, and ease, for samples to be used across research groups, with established procedures for ethics, ongoing storage and use of sample and data. 2016 will see engagement with local communities, both Indigenous and non-Indigenous, to gain public support, and thus participation, for the AITHM Biobank. This process will involve work to educate those communities on what a Biobank is, the

benefits and risks in participation, the potential outcomes and the rights of participants. Several key collaborators in the development of the AITHM Biobank include: The National Centre for Indigenous Genomics; Deakin University; Apunipima Cape York Health Council, and The Townsville Hospital and Health Service.

This Biobank development during 2016 will add significant capacity to the AITHM research, and support the work of many of the AITHM priority research areas, and facilitate new research connections and directions both within these groups and with external research institutions.

AITHM's Dr Margaret Jordan and Professor Alan Baxter are collaborating with the Royal Melbourne Hospital and Central Queensland University in a major research program using advanced network modelling to study risk factors for Multiple Sclerosis. The project team has identified a tightly controlled pathway affecting cell killing by a white blood cell population that is down-regulated in patients. The team will now investigate ways of manipulating the pathway in human cells in culture, and in genetically modified mice.

Professor Alan Baxter's research group is also collaborating with the Peter MacCallum Cancer Centre and Centre for Ophthalmology and Visual Science, which is investigating a gene that encodes a protein involved in killing immune responses. It is expressed in two white blood cell types that mediate many very early responses against cancers and viruses. It appears to play a role in the ability to kill cancer cells, and helps retain a special subset of NKT cells in the thymus.¹ This work is being undertaken as part of the Australian Phenomics Network and shapes AITHM as the leader in genetic identification of infectious diseases.

1. A specialised primary lymphoid organ of the immune system.



Photo by Through The Looking Glass Studio



Photo by Through The Looking Glass Studio

Photo by Through The Looking Glass Studio

Theme F



Occupational health and safety

In rural and remote areas, a major cause of morbidity and mortality involves accidents and injuries incurred in the workplace. AITHM researchers seek to reduce this morbidity and mortality through a program of occupational health and safety research, which focuses on accident and injury associated with key industries in northern Queensland.

Key researchers

Associate Professor Richard Franklin

Professor Peter Leggat, AM

In 2015, AITHM and senior JCU staff worked with the Mackay Hospital and Health Service to plan the best approach to further develop this area of occupational health and safety research. Key research undertaken within Theme F during 2015 included barriers to adopting safety work practices on farms, coaching for farmers, and the importance of interaction between regulators and those working in the agricultural industry with relation to quad bike laws.

Key research undertaken during 2015 led to a report titled, *Exploring the Barriers and Facilitators to Adoption of Improved Work Practices for Safety in the Primary Industries*. Led by Associate Professor Richard Franklin, the research found that almost half of all deaths on farms could be prevented, by implementing solutions and exploring what is stopping primary producers from improving their safety practices. Major barriers identified were universal and consistent across industries, and included attitudes, perceived cost, time and inconvenience to implement changes. However, the research demonstrated the creation of a culture of safety in the primary industries is possible, with strong leadership and positive attitudes from key people.

A second piece of research relating to workplace farm safety undertaken during 2015 by Dr Anna Blackman and Associate Professor Franklin, propose that if farmers were to employ coaching in their businesses, they would benefit from advances in

safety practices. The resulting associated improvements in overall farm productivity would also extend to a reduction in injury costs to the wider community. The cost of injuries and deaths on Australian farms is significant, and is estimated to be between \$0.5B and \$1.2B per year. This study provided a coaching model and proposed other significant safety interventions in farming communities to reduce this economic burden within agricultural settings.

Research also by Associate Professor Franklin published in the *Journal of Agromedicine*, considered the factors to be considered with quad bike regulation. Quad bikes are popular vehicles in agricultural occupational settings and are a leading cause of deaths in the Australian agricultural industry. Importantly, current regulations appear to have had limited impact on quad bike deaths. The findings indicated that interactions between regulators and the agricultural community are key in the development of sound policies that meet the standard required by regulation, monitoring, and implementation of safety policies into practice on farms. Further research in this area is anticipated in 2016, aligning with the Queensland Government's aim to improve quad bike safety.¹

1. worksafe.com.au

Photo by Andrew Rainkin



Photo by Tourism Queensland



Photo by Andrew Rainkin



Substance abuse in northern Australia

During 2014, concerns were reported by residents, community leaders and service providers in rural and remote Indigenous communities in northern Queensland about the appearance of 'new drugs'. In 2015 the Indigenous Leaders Forum of the Local Government Association of Queensland and the Queensland Police Service instigated research to investigate the impacts of amphetamine-type stimulants (ATS) including methamphetamine in northern and north-east Queensland. This research was led by AIITHM Associate Professor Alan Clough.



Photo by Jan Robertson



Photo by Michelle Fitts



Photo by Jan Robertson

The study surveyed 10 communities with around 1200 participants, investigating whether 'new drugs' were being used in the community. Simultaneously a web-based survey of front-line service providers across sectors including health, law enforcement, and emergency services was used to capture the impacts of alcohol and other drug use on workload (157 participants across outer regional, remote and very remote sites). In addition, Indigenous community members and service providers in selected localities were interviewed about the prevalence and impacts of methamphetamine use (11 sites across the region, 53 participants).

The use of methamphetamine was established in some outer regional and remote towns in the region. Evidence of this use appeared to decrease in the more remote sites, indicating that relative isolation currently provides some protection from access and uptake of new drugs. There was strong agreement among service providers in health and law enforcement that the major drug-related workload of frontline service providers was more often caused by alcohol, a combination of alcohol and drugs, or cannabis, than methamphetamine.

Associate Professor Clough is also evaluating strategies used to combat the high rates of injury and death linked to alcohol availability and misuse in rural and remote Indigenous communities. In 2002, the Queensland Government implemented AMPs to address what was seen as a public health crisis in 19

discrete communities. Some communities have seen a reduction in alcohol-related harm, however there has been an increase in the application of punitive measures to reduce access to illicit alcohol.

The Queensland Government recently announced \$6M funding for the health sector to fund treatment, mainly in southern regions of the State. However, AIITHM's analysis suggests that a focus on prevention in the northern and north-east regions will be more cost-effective and sustainable in the long term within an integrated and robust cross-sector strategy.

With no evidence-based interventions readily available, and to reduce the prospects of any possible increase in the use of 'ice' in the region in the future, Associate Professor Clough and his team suggest that there needs to be a coordinated cross-sectoral response, by health providers, facilitated by an appropriate office in Government to coordinate and oversee strategy implementation with a focus on prevention. The priority for very remote locations is to support supply reduction alongside advocacy, awareness-raising and preventative initiatives by the health sector across Queensland. A coordinated approach to upskill drug and alcohol and mental health workers to increase confidence in dealing with methamphetamine-related issues would also be of value. There is also a need for better engagement by drug and alcohol and mental service providers with community members and leaders in order to improve culturally safe service provision.

Collaboration

Tropical Australian Academic Health Centre

The Tropical Australian Academic Health Centre (TAAHC), currently being established in northern Queensland, represents a unique opportunity to create the world's first academic health centre with a focus on tropical health, Indigenous health, and health service delivery in regional, rural and remote settings. It will be the most significant collaboration in clinically oriented research in northern Australia.

The purpose of the TAAHC is to improve the health of the northern Queensland population, through evidence and grow the prosperity of the tropical region through an alliance that enhances collective capability in healthcare, health and medical research, and workforce development.

AITHM is a founding collaborative partner in the TAAHC. Other collaborating partners include: The Cairns and Hinterland Hospital and Health Service, Mackay Hospital and Health Service, North West Hospital and Health Service, Torres and Cape Hospital and Health Service, The Townsville Hospital and Health Service, the Northern Queensland Primary Health Network and JCU.

AuTuMN

Support by the Global Fund, the AuTuMN model has been developed by the modelling team led by Professor Emma McBryde at AITHM. The collaboration also incorporates members from the Optima group (Burnet Institute, Melbourne) for the modelling for dynamic simulation of TB transmission in the Asia-Pacific region.

It is a compartmental model of TB transmission, with differing strata to allow for population diversity. The model is intended to be more complex than would be necessary to simulate all currently conceived interventions, and to be flexible enough to incorporate interventions that may be considered in the future. The model has been used for epidemiological and economic analyses of four countries – China, India, South Africa, and the Western Province of Papua New Guinea – to guide TB responses in these regions. AuTuMN will be connected with a health economic model to compare the cost-effectiveness of different intervention scenarios. A formal optimisation process will be performed as an extension to the epidemiological and economic modelling described above to identify the optimal intervention mix that is expected to achieve the biggest impact for a defined level of available resources.

Rotarians Against Malaria

In 2014, AITHM's Professor Tom Burkot initiated a partnership with Rotarians Against Malaria (RAM), which resulted in co-funding for a scholarship for an international student. That scholarship winner was Edgar Pollard, from the Solomon Islands. He has chosen to undertake a PhD researching malaria, and will conduct fieldwork in the Solomon Islands, where the disease is endemic. Mr Pollard, who has a Master of Environmental Science from the University of the South Pacific, will be supervised by Professor Tom Burkot, the Director of VectorBorne Disease Network (VecNet) and a researcher at AITHM.

Commercialisation

Northern Australian Investment Forum

The Northern Australian Investment forum in 2015 was a seminal event in the Australian Federal Government's Northern Development agenda. Austrade used the opportunity to promote a wide variety of investment ready projects to a cohort of invited international investors. Industries including Tropical Health and Medicine were provided with the opportunity to be matched with investors. AITHM's involvement in the Northern Australian Investment Forum resulted in the successful establishment of new commercial partnerships. One new collaboration is with the international pharmaceutical company, Merck Global Health. Merck Global Health has an interest in tropical diseases in developing countries, and currently provides many millions of doses of praziquantel annually to treat schistosomiasis. Following a meeting at the Northern Investment Forum Professor Alex Loukas and Merck Global Health agreed to submit an application to the Australian Tropical Medicine Commercialisation scheme to discover vaccine and diagnostic antigens for schistosomiasis.

Janssen

In 2015, AITHM researcher Professor Alex Loukas continued work on an existing collaboration with Johnson & Johnson – the parent company of Janssen.

The Loukas collaboration with Janssen continued research into hookworm-derived anti-inflammatory biologics. The goal is to develop recombinant proteins, peptides or small molecules derived from hookworm secretions that suppress inflammation by promoting regulatory responses. This will enable the development of treatments to combat the epidemic of chronic inflammatory diseases such as Inflammatory Bowel Disease, Rheumatoid Arthritis, Psoriasis, Multiple Sclerosis and Coeliac Disease. It may also support responses to allergic inflammation such as asthma, food allergies, and allergic dermatitis.

Malaria vaccine development

In September 2015, Professor Louis Schofield, Director of AITHM, received an \$2.8M grant from the Bill & Melinda Gates Foundation, to pursue the pre-clinical development of a vaccine aimed at the goal of malaria eradication. This new funding will enhance collaboration between researchers at AITHM and the Walter and Eliza Hall Institute of Medical Research. The goal is to develop a broad spectrum vaccine effective against most species of human malaria. The major challenge is to overcome is the five malaria parasite species that infect humans; these parasites are complex and hard to target. The prototype vaccine attempts to overcome



Photo by Andrew Johnson

these barriers by attacking most species and stages in the malaria life cycle. This project is moving towards formal regulatory testing and a manufacturing process, so the research team can develop a usable, functioning vaccine that can be rolled out, subject to tests. This commercialisation of biotechnology is being led by AITHM in conjunction with national and international parties. The research team is grateful for the support of the Bill & Melinda Gates Foundation, which is vital to the next stages of this project.

Trade mission to India

A small group of AITHM and JCU representatives accompanied the Hon. Andrew Robb, Minister for Trade and Investment, to India in 2015. With discussions centered on securing a bilateral trade agreement, between the two countries, the intention of the meetings were to boost international trade and investment. Professor Louis Schofield led the Tropical Health and Medicine stream with support from Professor Alex Loukas and JCU's Manager of Innovation and Commercialisation, Dr Andrew Leech.

Medical Research Commercialisation Fund (MRCF)

AITHM, in partnership with JCU, is a member of the MRCF. Established in 2007, this investment collaboration supports early stage development and commercialisation opportunities from Australian medical research institutes and allied research hospitals. The MRCF is supported by AustralianSuper, StatewideSuper and the Australian Government under its IIF program, with support from the State Governments of Victoria, New South Wales, Western Australia, and Queensland.

Education

Cohort Doctoral Studies Program

The Cohort Doctoral Studies program is designed to assist doctoral students through their studies by providing a structured program of support where students enter the program together as interacting members of a cohort. The program provides students with specifically employed academic mentors, a network of peer support, and twice yearly on-campus week long intensive research skills training courses.

The program is particularly aimed at health professionals working either full time or part time in the areas of medicine and health (including nursing, rehabilitation sciences, sport and exercise sciences, and health promotion) but also includes students working in the chemical, biomedical, molecular and veterinary sciences.

The program welcomed 27 new students across two Cohort intakes in 2015, bringing the total number of students in the program to 93.

Five intensive research skills training weeks were provided for students in 2015. For the 27 students new to the program, these intensives served as an introduction to the Cohort and included a number of introductory workshops designed to assist students to develop the skills required for their research programs. For continuing students, these intensives were an opportunity to develop more advanced research skills and engage directly with their peers and academic mentors.

Four new academic mentors were also appointed to the program in 2015. These academic mentors provided much needed capacity to support the continued growth in Cohort student numbers. These mentors work with designated groups of students within the Cohort and provide support, advice, guidance and mentorship to the students across the duration of their studies.

2015 AITHM PhD Scholarships

AITHM advertised its first AITHM PhD Scholarship round in 2015, calling for applications from outstanding and highly motivated students with an interest in tropical health and medical research to undertake a PhD in one or more of AITHM research themes.

A total of 101 applications were received from domestic and international students. Following a rigorous review process, six candidates were awarded a 2015 AITHM PhD Scholarship. These candidates will undertake research in areas of key importance to AITHM's strategic objectives, such as vector biology and the molecular development of therapeutics. These scholarships were funded through the Australian Research Council's Special Research Initiative.

2015 AITHM PhD Scholarship recipients

.....
Mohadesh Dastpeyman

.....
Zainab Agha

.....
Ana Ramirez Lopez

.....
Mary O'Loughlin

.....
Filipa Moniz

.....
Desalegn Woldeyohannes

Construction



Photo by Brooke Fitzsimmons

Townsville

Construction of AITHM Townsville is scheduled for completion in June 2016. This building includes PC3, PC2 and animal holding spaces. Offices, meeting rooms and a Translational Research Facility will accelerate research collaboration between AITHM, JCU, and North Queensland Hospital and Health Services.



Architect impression

Cairns

An early works package is now complete and the principal contractor is expected to commence work in the second quarter of 2016. This building will include PC2, Animal and Insectary facilities to expand research capacity into vector borne diseases, and research translation in vaccine and drug discovery.

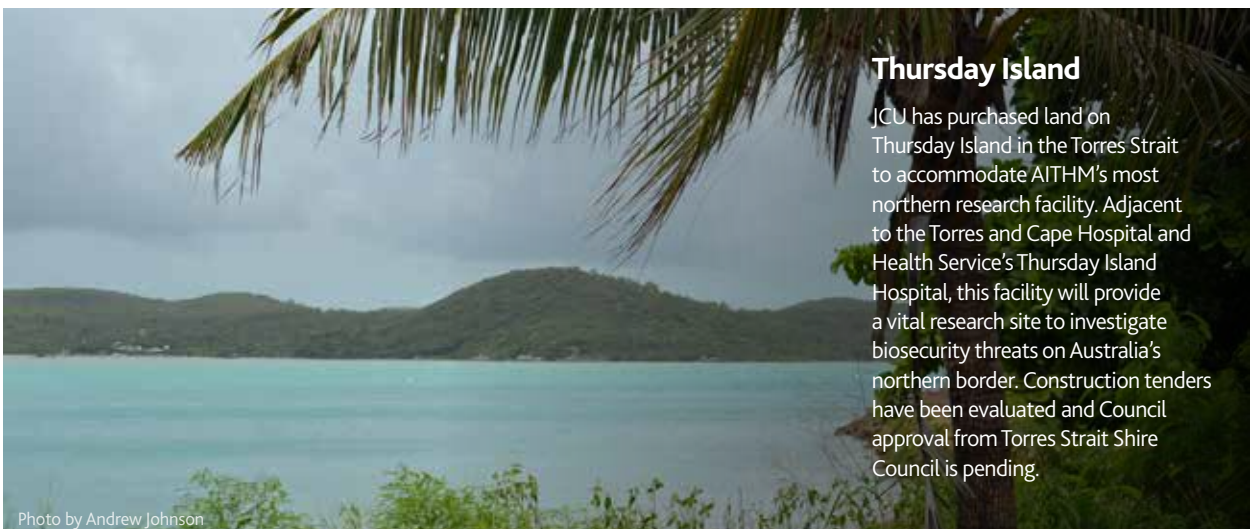


Photo by Andrew Johnson

Thursdays Island

JCU has purchased land on Thursdays Island in the Torres Strait to accommodate AITHM's most northern research facility. Adjacent to the Torres and Cape Hospital and Health Service's Thursdays Island Hospital, this facility will provide a vital research site to investigate biosecurity threats on Australia's northern border. Construction tenders have been evaluated and Council approval from Torres Strait Shire Council is pending.

Special Events, Communications, and Community Engagement

Special events

AITHM officially launched at Parliament House, Canberra



The official AITHM launch was held on 30 November 2015, at Parliament House, Canberra.

Federal Minister for Education and Training, Senator the Hon. Simon Birmingham provided the keynote comments and officially launched the Institute alongside speeches by the Hon. Andrew Robb, Minister for Trade and Investment, and the Hon. Josh Frydenberg, Minister for Resources and Energy, and Northern Australia.

Senior staff from AITHM and JCU also spoke, including Vice Chancellor and President, JCU, Professor Sandra Harding, Division of Tropical Health and Medicine Deputy Vice Chancellor Professor Ian Wronski AO, and AITHM Director Professor Louis Schofield.

This event formally acknowledged the launch of AITHM and provided the opportunity to showcase the work of the Institute to both Federal Government and Queensland State Government stakeholders. This presentation demonstrated the vital role of AITHM in the development of northern Australia as a centre of excellence for tropical health and medical research.

"The launch of the Australian Institute of Tropical Health and Medicine is a credit to James Cook University for leading research in the Tropics."

Senator the Hon. Simon Birmingham
Minister for Education and Training

Australasian Tropical Health Conference

The third annual Australasian Tropical Health Conference was held between 20–22 September, 2015 at the Pullman Sea Temple Resort in Cairns. It was attended by 120 delegates who listened to papers on the conference theme *Emerging Priorities in Tropical Health*. Topics included chronic infectious and non-infectious disease in the Tropics, vaccine discovery, molecular approaches to drug design, and Immunobiology.

International plenary speakers included Professor Hardy Kornfeld from the University of Massachusetts who spoke on the topic of *Sugar, Fat and Consumption* discussing the comorbidity between TB susceptibility in people suffering from Diabetes Mellitus.

Dr Phil Felgner, a founder of Antigen Discovery Inc and currently at the University of California, Irvine, presented on *Understanding the antibody response to infectious disease with whole proteome microarrays*. Dr Felgner's work contributes to a better understanding of the immune response to infectious diseases.



Combating vector-borne disease on a global scale was the subject of Professor Catherine Hill's presentation. Professor Hill, from Purdue University in the USA is also the Director of the Purdue Public Health Entomology Program. Her talk focused on the work of her research group which is developing novel small molecule and natural product inhibitors for vector control. Professor Hill is scheduled to join AITHM in 2016.

Peter Ryan, the Relationships Director from the Eliminate Dengue Program, a not-for-profit international research collaboration, spoke about evaluating the impact of Wolbachia interventions to control dengue transmission.

Associate Professor John Miles discussed his research, which focuses on human T cells and their ligands and the exploration of receptor genetics, engagement, functionality and repertoire evolution across a number of human pathologies. His presentation was titled *Our first steps towards understanding antigen-specific T cell clonotype choice in humans*.

Overall the conference was evaluated as a great success and critical to the growing research programs within AITHM.

BMDT retreat – September 2015

The Centre for Biodiscovery and Molecular Development of Therapeutics (BMDT) and the Centre for Biosecurity of Tropical Infectious Diseases (BTID) held their joint annual retreat in 2015 in conjunction with the AITHM annual conference. An outstanding group of international and national speakers were invited to the conference. BMDT speakers included Dr Phil Felgner from the University of California, Irvine, Professor Dianne Campbell from The Children's Hospital at Westmead in Sydney, and Professor Mark Morrison from The University of Queensland. BMDT and BTID hosted a workshop titled *Building for Research Success*, a thought-provoking interactive event coordinated by centre advisory board members which prompted researchers to contemplate the big issues facing research in the current and future environments. BMDT and BTID early career researchers and PhD students had an opportunity to pitch to retreat delegates on collaborative travel grants, three of which were successful and received centre funding.

Redefining Townsville – A World of Tropical Opportunity

Professor Louis Schofield joined Queensland Premier Annastacia Palaszczuk, Professor Sandra Harding, Vice Chancellor and President JCU, Dr Geoff Garrett, Queensland Chief Scientist and other speakers, at the recent Redefining Townsville summit, *A World of Tropical Opportunity*, to discuss Townsville's future in the tropical economy. This event provided opportunity to showcase the future of Tropical Health and Medicine in northern Queensland in a broader high profile economic development forum.

Northern Australia Investment Forum

The Northern Australian Investment Forum was the Australian Federal Government's leading investment showcase in support of the Northern Development agenda in 2015. Coordinated by Austrade, and hosted by Ministers Robb and Frydenberg, the Federal Government invited international investors to Darwin to showcase investment opportunities in agriculture resources and tropical health and medicine. A small delegation of AITHM senior scientists and staff promoted AITHM and commercialisation opportunities to investors in medical research.

This event was successful beyond expectations, with multiple relationships forged with investment partners, and applications for investment are currently under consideration.

Advance Queensland Regional Forum

AITHM Director, Professor Louis Schofield, showcased AITHM at an Advance Queensland Regional Forum in Townsville. Reflecting on collaboration opportunities, sharing examples of medical research translation, and highlighting that AITHM is well poised to service the growing demands from Asia, his presentation was well received by the 100-strong audience.



Communications

AITHM's communications strategy is multi-faceted, targeting local, national, and international audiences. Research outcomes and AITHM development milestones are promoted through media releases, an engaging website, social media, a quarterly newsletter, and community engagement activities.

Media

AITHM issued 29 media releases in 2015 via JCU's media team. This further generated over 715 commentaries worldwide across radio, television, print, and online.

Examples of media releases:

Cancer-causing parasite may accelerate wound healing

It's short, ugly and deadly. But James Cook University scientists have found a cancer-causing, parasitic worm could help patients recover from their wounds.

JCU scientists at the Australian Institute of Tropical Health and Medicine (AITHM) have discovered that the parasitic worm that kills tens of thousands of people every year may also supercharge recovery from wounds.

The oriental liver fluke, *Opisthorchis viverrini* is caught by eating raw fish. It infects millions of people in South East Asia and kills 26,000 people each year due to a parasite-induced bile duct cancer it causes, known as cholangiocarcinoma (CCA).

JCU scientists, Dr Michael Smout and Professor Alex Loukas found that a growth factor secreted by the one-centimetre-long worm drives wound healing and blood vessel growth. However, an unfortunate consequence of this accelerated wound repair over many years is an increased risk of developing liver cancer.

Dr Smout said the discovery means it's possible the growth factor could be used to accelerate the healing of chronic wounds such as diabetic ulcers and to develop a vaccine against the worm-induced cancer.

He said the vaccine would obviously benefit the people directly at risk of cancer, but the growth factor would also benefit the developed world as a possible wound healing agent.

"Diabetes is a big problem as we live longer and get heavier," he said. "There are increasing numbers of inflammatory diseases such as diabetes and associated non-healing wounds. A powerful wound healing agent designed by millennia of host-parasite co-evolution may accelerate the impaired healing processes that plague diabetic and elderly patients"

Dr Smout said the parasite could live for decades in the human body before CCA developed and it had an incentive to keep its host healthy while chewing away at its cells.

He said scientists are still learning how this growth factor controls healing, and ultimate development of the discovery as a healing agent or vaccine was still a number of years away.

Diabetes – TB link found in Australia

A 20-year study by Australian Institute of Tropical Health and Medicine researchers at James Cook University has found a strong link between diabetes and tuberculosis in tropical Australia.

Despite massive improvements in sanitation and antibiotic coverage over the last century, TB still remains the leading bacterial cause of death worldwide.

Previous studies conducted in developing countries where TB is endemic have demonstrated the connection between the two diseases.

But the study by AITHM and Townsville Hospital researchers, published in the *American Journal of Tropical Medicine and Hygiene*, has for the first time established a connection between diabetes and TB much closer to home.

Scientists looked at data from The Townsville Hospital over a 20-year period (1995-2014) and found patients with diabetes were much more likely to develop TB than the general population.

The study also revealed Indigenous Australians and overseas-born patients, primarily from Papua New Guinea, were over-represented in both the stand-alone TB group and in the TB-diabetes group. "If a person has diabetes they are up to seven times more likely to contract TB compared with the general population," said Tahnee Bridson, a researcher involved in the project.

According to the Director of Microbiology at The Townsville Hospital, Dr Robert Norton, people with diabetes suffered from "immune dysregulation" and were more prone to contracting the deadly infection.

"You can have TB your whole life and not know it, but if you suffer from diabetes and your immune system is not functioning well, it can flare up."

It had been assumed that higher standards of care for diabetic patients in Australia and the relative rarity of TB meant there was not as strong a link between the two ailments.

But the AITHM study showed that while the overall numbers were lower, the proportion of diabetics developing TB was the same as in less-developed countries.

Dr Norton said the findings support the view that there must be screening of patients with diabetes for latent TB in any setting.

"It is especially important because the prevalence of type two diabetes is increasing at a very significant pace," he said.

Scientists at AITHM are developing experimental models that will enable them to study the interaction between the bacteria that causes TB and immune cells with similar properties to those from patients with diabetes.

"Without such models we will not be able to study the defects that make patients with diabetes more susceptible to TB," according to Professor Natkunam Ketheesan. "Such models are useful in developing treatment protocols and prevention strategies."

It is estimated that if diabetes could be reduced by 35 per cent globally, 1.5 million TB deaths and 7.8 million infections could be prevented, making this an important area where further local research is warranted.

Website

The AITHM website was redesigned during 2015 to improve awareness and understanding of research programs and initiatives within AITHM. Often the first introduction to AITHM, the site now caters for multiple audiences providing access to latest research news, upcoming events, business development opportunities, and current newsletters.

The most visits to the website are from AITHM's Twitter account and the quarterly newsletter that drive readers to specific pages. The most frequently visited page is the home page followed by latest news, whereby visitors can select and review latest research discoveries.

Additional video content and recording of AITHM seminars will be expanded and hosted on the website in 2016 to emphasise the key research collaborations being undertaken within AITHM.

Social Media

AITHM has been active on social media through Twitter and Facebook posts during 2015. Given the ability to target specific audiences, Twitter has been the preferred channel for driving social media followers to established content channels such as the AITHM website.

Associate Professor Jamie Seymour introduced a new YouTube channel titled *The Nature of Science (TNOS)* which showcases scientific research using humour and creativity. The channel enables viewers to see behind the microscopes, beakers and re-breathers as the videos dig a little deeper into the research and discovery of the natural world.

In 2015, TNOS released five videos, which received combined views of nearly 17,000. TNOS Facebook page currently has 385 likes and the YouTube channel has 395 subscribers. There are a further eight more videos currently being filmed for release in early 2016.

Additionally, Dr Lynore Geia from the Centre for Nursing and Midwifery led a social media campaign titled *Let's talk about Indigenous Health: #IHMAYDay2016*. The 2016 social media campaign is now underway. It encourages Australian Aboriginal and Torres Strait Islander peoples to talk about Indigenous health and planning.

Newsletter

AITHM produced four newsletters in 2015. Three of these were portable document format (PDF) format and distributed via email with the introduction of an html format for the final newsletter of the year. The benefits of switching from pdf email distribution to the html newsletter enables tracking and analysis of opens, clicks and reporting on key statistics for both internal and external audiences.

Community engagement

AITHM engages with the wider community through a variety of outreach activities to exchange knowledge and research outcomes and to promote AITHM's role in delivering better healthcare in the Tropics.

In 2015, AITHM researchers were involved in significant outreach activities, events or programs led locally, nationally, and internationally. Examples of this activity include:

National Science Week

National Science Week was celebrated in August, with the official Queensland's National Science Week program launch held in Cairns. Queensland Chief Scientist Dr Geoff Garrett opened proceedings by performing an experiment onstage at The Tanks Arts Centre in Cairns.

AITHM researchers were involved in a number of science events that were open to the public across the week, including a collaboration between JCU parasitologists and artists resulting in a performance that combined dance, visual arts and multimedia to tell the story of some of the parasites that can threaten quality of life in the Tropics.

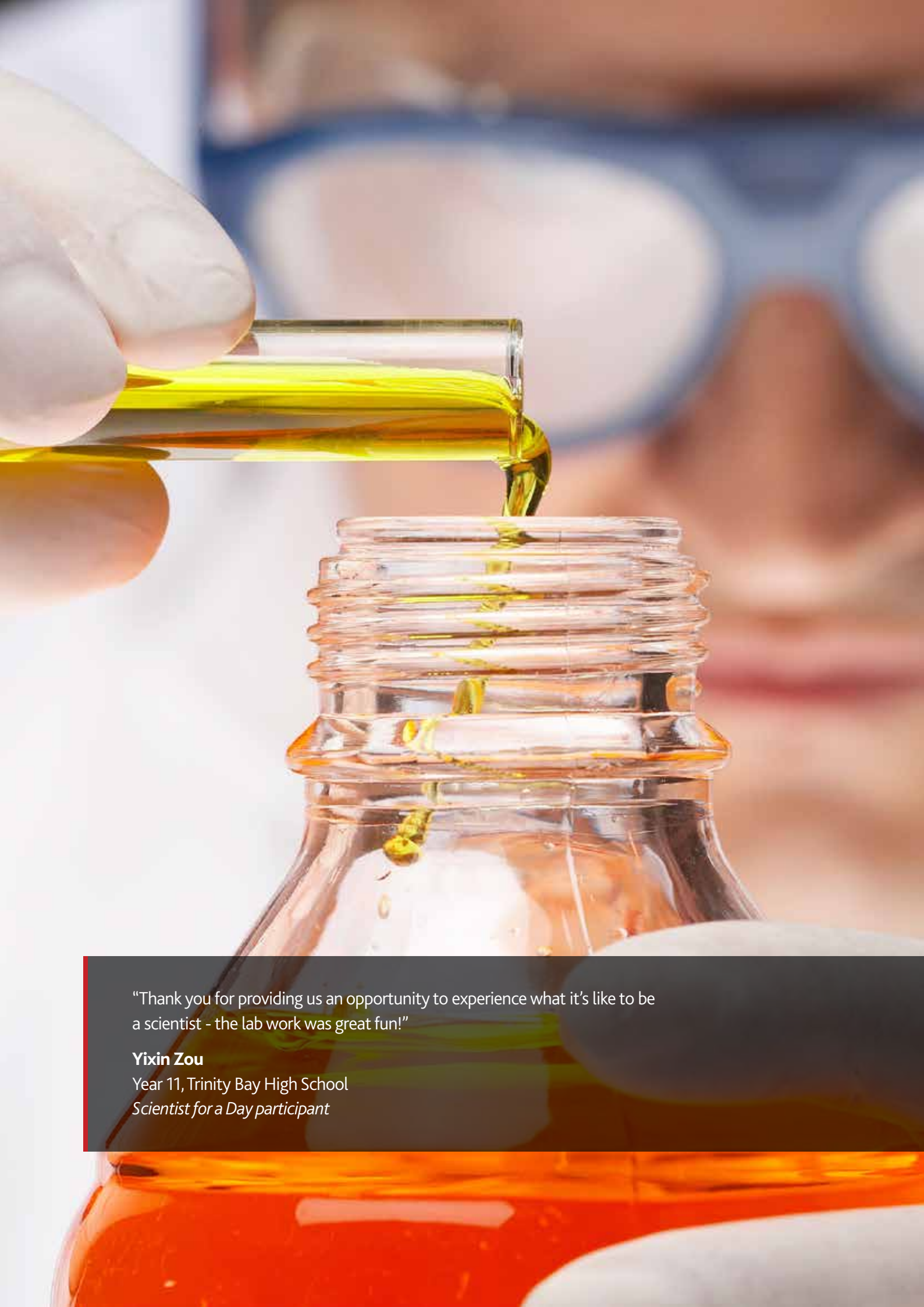
Science in schools

AITHM and its affiliated research centers deliver science engagement activities to schools. These activities are designed to connect students to science, and encourage and inspire an interest in science education along with connecting them to researchers in northern Queensland.

A highlight of the science in schools outreach in 2015 was the Scientist for a Day program led by the Centre for Biodiscovery and Molecular Development of Therapeutics and Biosecurity and Tropical Infectious Diseases. A group of Year 11 and 12 students from Cairns secondary schools was given the opportunity to work side-by-side with world renowned researchers during the three-day program. The program enabled hands-on experience with laboratory equipment, learning new skills, and inspired further education in science.

The students participated in:

2. Venomics: Students milked and fed spiders and analysed the spider venom using the mass spectrometer.
3. Parasitology: Students collected parasites and learnt how to analyse them using microscopes.
4. Microbes: Students collected samples from the environment.
5. Mosquitos: Students trapped mosquitos and learnt about identifying and rearing Wolbachia infected dengue mosquitos.



"Thank you for providing us an opportunity to experience what it's like to be a scientist - the lab work was great fun!"

Yixin Zou

Year 11, Trinity Bay High School
Scientist for a Day participant



Other school based activities during 2015 included, Emeritus Professor Jim Burnell conducted laboratory-based activities at The Cathedral School, Townsville, for four days of National Science Week, addressing the International School of Light with Year 12 students in conjunction with the Head of Science at the Cathedral School, Mrs Rebecca Smith (a JCU graduate).

Professor Burnell also delivered a lecture to the Year 12 chemistry class at Kirwan State High School, Townsville, which has now been included in the school's Year 12 curriculum. This activity continues to be run in conjunction with Mrs Eva Luque (a JCU graduate).

At the Northern Beaches State High School, Townsville, Professor Burnell delivered a talk on *Acids, Bases and Chemical equilibria* as part of the Scientist in Schools program, in conjunction with Ms Susan Stephens, Head of Science at Northern Beaches State High School.

Following the successful National Science Week activity, Centre for Biosecurity and Tropical Infectious Diseases researcher, Professor Nick Smith, and Ms Lisa Jones were invited to present parasitology school outreach programs at Dimbulah State School, Smithfield High School and Trinity Bay High School (this outreach activity also included presentations from Dr Kate Miller). The programs included:

- *Classy parasites* classification activity, with parasites under microscopes and a parasite classification activity
- DNA extraction with strawberries
- Tropical Parasites presentation (Professor Nick Smith) and interactive science show (Ms Lisa Jones).

The AITHM aquarium hosted Wooolooware High School, John Monash Science School and the Appalachian State University for science talks and tours during 2015 via Small World Journeys – a Cairns based educational tour company. Associate Professor Jamie Seymour was invited to Trinity Bay High School Science Week activities where he presented to Year 7 and Year 8 students regarding marine safety.

Festival of Life Science

The annual Festival of Life Science in November showcased research from JCU, The Townsville Hospital and many of AITHM's research partners. The festival boosts engagement and collaboration across partnerships and celebrates the work of molecular science, marine biology, and medicine. It included several academic presentations, student research presentations, and a photography competition sponsored by Olympus.

Public lectures

Members of AITHM are increasingly being invited to showcase their research in the field of tropical health and medicine, within JCU, nationally, and internationally. In addition to invited Conference presentations and public lectures during National Science Week, several additional key public lectures are featured below.

Professor Tom Burkot was invited to make several public lectures and presentations during 2015 including: Craig Lecture at the University of Notre Dame, *George Craig, Notre Dame and the Fight to Eradicate Malaria*; Presentation at the Rotary Against Malaria Annual Meeting, Brisbane, *Malaria Elimination: Will LLINs and IRS be enough?*

Professor Scott Ritchie presented at the Science & Society in the Tropics Public Lecture Series alongside Professor L Philip Lounibos. The presentation was titled Buzz off! How invasive mozzies complicate lives.

In celebration of the International Day of Immunology in April, an event was organised at JCU, Townsville by Dr Margaret Jordan and Dr Tammy Dougan as part of the Science and Society in the Tropics lecture series. Associate Professor Andreas Lopata, introduced the three main speakers who covered a diverse range of topics, including:

- Associate Professor Zoltan Sarnyai – Smouldering body, burning brain: How the immune system influences brain and behaviour
- Dr Sandip Kamath – The changing face of food allergy in Australia
- Dr Smriti Krishna – The role of inflammatory cells in AAA development.

Dr Klaus Gebel presented a talk titled *Why some vigorous physical activity could save your life* at the TEDxJCU Cairns event.

JCU Open Day

AITHM hosted booths and information sessions at both the Townsville and Cairns campus JCU Open Days. Open Day events are an opportunity for the public and potential future students to find out more about their local university. The AITHM booth in Townsville showcased some of the ground breaking and diverse research of the Institute, from hookworms to tuberculosis, and highlighted construction of the AITHM buildings in Townsville, Cairns and Thursday Island. JCU Open Day in Cairns featured tours of the aquarium and an in-depth look into parasitology. The feedback received from these open day activities was incredibly positive with an estimated 2500 visitors to AITHM exhibits.

2015 AITHM Seminar Series

AITHM hosted 38 Seminars in 2015, with 10 international speakers visiting during 2015. The aim of the seminar series is to enhance the exchange of research in the field of tropical health and medicine, foster new collaborations with research, business or industry partners, and to build and extend research networks and present research to a broad audience. It is an important outreach activity for AITHM.

Date	Presenter name	Affiliate Institution	Seminar title
Thursday 19 February	Dr Brant Bassam	Bio-Strategy Pty Limited	Digital Nucleic Acid Quantification: An Introduction to NanoString Technology
Thursday 26 February	Professor Denise Doolan	Queensland Institute of Medical Research (QIMR) - Berghofer Medical Research Institute	Translating genomic sequence data into effective public health intervention
Wednesday 11 March	Professor Sam Behar	University of Massachusetts	Pulmonary immunity and host resistance against tuberculosis
Thursday 12 March	Professor L. Philip Lounibos	University of Florida, Florida Medical Entomology Laboratory	Invasive Mosquitoes: Threats, Displacements and Health Risks
Wednesday 18 March	Professor Sabe Sabesan	Townsville Cancer Centre, The Townsville Hospital	Telehealth is part of core business
Wednesday 18 March	Dr Gustavo M. Cerqueira	James Cook University	Deciphering the <i>Acinetobacter baumannii</i> infection biology
Wednesday 15 April	Dr John Schneider	Mackay Clinical School, JCU, formally Institute of Public Health, UAE University	The Development and Validation of Guidelines for Work in Hot Environments in the Middle East
Wednesday 22 April	Dr David MacLaren and Mr Frank Zich	College of Medicine and Dentistry JCU and Australian Tropical Herbarium	Medicinal Plants, Traditional Knowledge and Conservation Management in Kwato, Solomon Islands
Friday 24 April	Professor Andrew Lloyd	Director of Inflammation and Infection Research Centre, University of NSW	Towards a Hepatitis C Vaccine
Thursday 30 April	Dr Ruth Ashbee	University of Leeds	Therapeutic Drug Monitoring of Antifungals
Wednesday 6 May	Dr Kah Heng Alexander Lim	Northern Territory Government	Surgery for genital lymphatic filariasis: A systematic review
Wednesday 13 May	Ms Rona MacNiven	University of Sydney, School of Public Health	Promoting physical activity among Australian Aboriginal and Torres Strait Islander People
Wednesday 20 May	Mr James Asugeni	Mental Health Instructor for Atoifi Hospital, Malaita Province Solomon Islands	Sea level rise and mental health in people living on low-lying and man-made islands of East Malaita, Solomon Islands
Wednesday 27 May	Dr Stuart Turville, Dr David MacLaren, Associate Professor Andrew Vallely	Dr Turville: The Kirby Institute, University of New South Wales. Dr MacLaren: James Cook University. Assoc Prof Vallely: James Cook University and Kirby Institute, University of New South Wales.	Correlates of HIV transmission: Integrating the basic biology of HIV transmission and real world epidemiology
Tuesday 2 June	Dr Mary Kavurma	The Heart Research Institute	A protective role for TRAIL in ischaemia
Friday 5 June	Professor Suresh Mahalingam	NHMRC Senior Research Fellow, Professor of Virology, Principal Research Leader, Emerging Viruses and Inflammation Research Group, Institute for Glycomics	Recent developments in alphavirus-induced arthritis

Date	Presenter name	Affiliate Institution	Seminar title
Wednesday 17 June	Mr Peter Thorning	Manager, Research Partnerships at the Office of Fair and Safe Work Queensland	Responsive Regulatory Approach
Friday 19 June	Professor Paul Brindley	The George Washington University	Lentivirus HIV-1 integrates widely throughout the genome of the human blood fluke <i>Schistosoma mansoni</i>
Wednesday 24 June	Dr Nora J Besansky	University of Notre Dame	A phylogenomic portrait of introgression in the <i>An. gambiae</i> complex
Wednesday 1 July	Dr Daniel Tisch	Case Western Reserve University	Acute Filariasis Morbidity Following Mass Drug Administration in Papua New Guinea
Friday 10 July	Professor Erol Fikrig	Yale University	New vaccination approaches against arthropod-borne illnesses – Lyme disease and beyond
Monday 13 July	Professor Adrian Esterman	University of South Australia	Introduction to Confounding and DAG's
Wednesday 22 July	Dr Mark Robertson	James Cook University	Streamlining the drug development process
Thursday 23 July	Professor Marc Tennant	International Research Collaborative – Oral Health and Equity, University of Western Australia	The role of Geographical Information Systems in Rural and Remote Health Systems Research
Tuesday 28 July	Professor Peter Lundqvist	University of Agricultural Sciences, Sweden	Strategies for injury prevention in Swedish agriculture
Wednesday 5 August	Professor Adrian Esterman	University of South Australia	Sample size calculations for Inferential Studies
Thursday 6 August	Professor Cam Donaldson	Glasgow Caledonian University	Enterprise, health and garlic bread: progress in researching new pathways to health and well-being in Scotland
Wednesday 12 August	Professor Geoff McFadden	University of Melbourne	Drug resistance in malaria parasites: not as smart as we thought they were
Wednesday 19 August	Geoffrey Gobert	QIMR Berghofer Medical Research Institute	Understanding host-schistosome interactions using transcriptomics
Monday 24 August	Professor Alan Shiell and Professor Penny Hawe	Centre for Excellence in Intervention and Prevention Science (Melbourne) and University of Sydney	Does 'system thinking' offer anything more than what we already know?
Monday 31 August	Prof Mark Morrison	The University of Queensland Diamantina Institute	The gut microbiome: The "x-factor" of Genotype x Environment x Lifestyle interactions affecting our health and wellbeing?
Tuesday 8 September	Rowena Asugeni	Atoifi Adventist Hospital, Malaita Province, Solomon Islands	Prevention of drug resistant TB in rural Solomon Islands: A health system response
Thursday 10 September	Professor Colby Zaph	Monash University	Epigenetic regulation of immunity and inflammation in the intestine
Friday 23 October	Professor Kirill Alexandrov	Institute for Molecular Bioscience, The University of Queensland	Synthetic biology – a vanishing line between natural and engineered biological systems
Monday 9 November	Dr William Polonsky	Behavioral Diabetes Institute, University of California, San Diego	The psychological side of diabetes: What health care professionals need to know
Friday 11 December	Dr John Croese	The Prince Charles Hospital, Chermiside, Brisbane	Hookworms and Gluten: A Pathogen and a Poison to Cure Coeliac Disease?
Friday 11 December	Dr Tony Rahman	The Prince Charles and Royal Brisbane Hospitals	NAFLD – Foie gras or Foie grosse

2015 Awards and Recognition



Dr Dylan Morris was awarded the *Sir John Monash scholarship* to undertake a Peripheral artery disease focused PhD at Oxford University, UK, and will commence in 2016. Dr Morris also received the *JCU Outstanding Early Career Alumni Award* for the College of Medicine and Dentistry and also the best oral presentation at the Queensland Royal Australian College of Surgeons.

Dr Sandip Kamath won the *National FameLab – Talking Science* final and represented AITHM at the International grand finals in Cheltenham, UK.

Dr Jenny Sando received the *JCU Outstanding Alumni Award* for the College of Health Care Services.

PhD candidate **Mr Michael Sheridan** won the *Early Career Environmental Health Officer of the Year* award from Environmental Health Australia for his development of an Australian first food recall app in collaboration with Professor Andreas Lopata. Mr Sheridan also won a prize from the Townsville Hospital Research Week and Townsville Public Health Unit to assist him with his travel and conference costs to present at The International Conference of Food and Environmental Science in Myanmar. Mr Sheridan was also invited to participate in *Fresh Science* media training and showcase a food safety app he has developed. Only 10 positions were offered to scientists in northern Queensland.

Ms Martina Koeberl won the best poster prize in the Food Allergy Section at the Australasian Society of Clinical Immunology and Allergy conference.

The Rising stars of Queensland Science campaign, promoted by DSITI, is intended to increase scientific literacy, to humanise science and scientists, and to encourage young Queenslanders to consider a career in science and technology. AITHM researchers **Dr Michael Smout** and **Dr Sandip Kamath** were highlighted as Rising Stars for this social media campaign.

PhD candidate **Malindu Fernando** won the best presentation for the Allied Health Symposium at Townsville Hospital Research Week and also the Battle of the Colleges Three Minute (3MT) Higher Degree Research student category with his presentation titled The link between walking and diabetic foot ulcers. Mr Fernando was also awarded the best paper at the Asia 2015 Diabetes Conference.

Reperio 2015 is a science based communications challenge where participants pitch to guest judges in short five minute bursts. Researchers must concisely present a scientific idea from a business point of view and address important commercial questions with regards to their technologies. The 2015 winners were:

- **1st – Zoltan Samyai** – *Novel therapeutic for the treatment of schizophrenia*
- **2nd – Mohan Jacob** – *Microwave pyrolysis of hospital waste and value-added end products*
- **3rd – Lionel Hebbard** – *Novel liver fibrosis therapeutic*
- The AITHM sponsored People's Choice Award (voted for by the audience) was Dr Zoltan Samyai.

Professor Peter Leggat, AM, was awarded *Chartered Generalist Occupational Health & Safety Professional*, from the Safety Institute of Australia. Professor Leggat also received the Mindset Visiting Scholarship, School of Geography, Faculty of Science, from the University of Nottingham along with an Education Award, from the World Safety Organization (for Public Health and Tropical Medicine, JCU).

Associate Professor Richard Franklin received the *Sustained Achievement and Contributions to the Field of Injury Prevention and Safety Promotion* – Australian Injury Prevention Network – 2015. This award is given to individuals who, over an extended period of time, contribute significantly to the field of injury prevention and safety promotion.

“The AITHM has emerged as a central research and innovation hub in North Queensland, providing early career researchers with excellent opportunities to forge cross-disciplinary collaborations as well as promoting translational research, thus making a significant impact on human health and environmental sustainability in the tropics.”

Dr Sandip Kamath

AITHM Research Fellow



Governance

AITHM values accountability, integrity and responsive leadership. These values inform the structure and operations of AITHM's governance and management structure.

AITHM Advisory Board

At its highest level, AITHM is governed through the AITHM Advisory Board: the key strategic body to drive the globally-oriented research agenda. The Advisory Board is responsible for making independent assessments and providing strategic advice to direct and sustain AITHM. It advises on high-level business management, research and commercialisation issues, and assesses recommendations from the Business Development Advisory Group and the AITHM Management Advisory Committee.

The Advisory Board is comprised of up to 12 members from a diverse range of external organisations and senior staff from JCU, and meets three times a year. AITHM would like to thank Ms Julie Squire for her contribution to the AITHM Advisory Board over the past 24 months, as her term on the Board ended in December 2015.

Membership:

- The Hon. Dr Michael Wooldridge, Independent Chair, Wooldridge Consulting (Chair)
- Professor Louis Schofield, Director, AITHM – *ex officio member*
- Professor Chris Cocklin, Senior Deputy Vice Chancellor, JCU
- Professor Ian Wronski, Deputy Vice Chancellor, Division of Tropical Health and Medicine, JCU
- Dr Jim Thompson, Chief Biosecurity Officer, Biosecurity Queensland
- Ms Julia Squire, Chief Executive, Townsville Hospital and Health Service
- Ms Julie Hartley-Jones, Chief Executive, Cairns and Hinterland Hospital and Health Service
- Dr Mark Wenitong, Medical Officer, Apunipima Cape York Health Council
- Professor Doug Hilton, Director, Walter and Eliza Hall Institute
- Additional Member(s) – in consultation with Australian Research Council

Management Advisory Committee

The Management Advisory Committee seeks close internal engagement with research leaders to leverage new and existing research strengths to provide solid foundations for AITHM, to identify new opportunities, and to develop operational policies.

The AITHM Management Advisory Committee comprises 27 senior JCU staff, and meets quarterly.

Membership:

- Professor Louis Schofield, Director, AITHM (Chair)
- Professor Ian Wronski, Deputy Vice Chancellor, Division of Tropical Health and Medicine, JCU
- Emeritus Professor Rhondda Jones, Deputy Director, AITHM
- Professor Alex Loukas, Centre for Biodiscovery and Molecular Development of Therapeutics, JCU
- Professor Jonathan Golledge, NHMRC National Centre of Research Excellence to Improve Management of Peripheral Arterial Disease, JCU
- Professor Robyn McDermott, Centre for Research Excellence in the Prevention of Chronic Conditions in Rural and Remote Populations, JCU
- Professor Alan Baxter, Comparative Genomics Centre, JCU
- Professor Nicholas Smith, Centre for Biosecurity and Tropical Infectious Diseases, JCU
- Professor Sarah Larkins, Anton Breinl Centre for Health Systems Strengthening, JCU
- Professor Jane Mills, Centre for Nursing and Midwifery Research
- Professor Sabina Knight, Mount Isa Centre for Rural and Remote Health, JCU
- Professor Richard Murray, Dean, College of Medicine and Dentistry, JCU
- Professor Lee Stewart, Dean, College of Healthcare Sciences, JCU
- Professor Peter Leggat, Dean, College of Public Health, Medical and Veterinary Sciences

- Dr Melissa Crowe, Director, Cohort Doctoral Studies Program
- Professor Emma McBryde, Representatives for researchers outside Level 1 or 2 Centres and Centres of Research Excellence
- Professor Damon Eisen, Representatives for researchers outside Level 1 or 2 Centres and Centres of Research Excellence
- Professor Jacinta Elston, Representatives for researchers outside Level 1 or 2 Centres and Centres of Research Excellence
- Associate Professor Jeff Warner, Associate Dean, Research Education, College of Public Health, Medical and Veterinary Sciences
- Associate Professor Anthony Leicht, Associate Dean, Research, College of Healthcare Sciences
- Professor Andreas Lopata, Associate Dean, Research, College of Public Health, Medical and Veterinary Sciences
- Dr Anne Swinbourne, Associate Dean, Research Education, College of Healthcare Sciences
- Associate Professor Bev Glass, Associate Dean, Research Education, College of Medicine and Dentistry
- Professor Helane Marsh, Dean, Graduate Research
- Professor Andrew Krockenberger, Dean, Research

Business Development Advisory Group

The Business Development Advisory Group identifies and recommends research, consultancy and commercialisation opportunities to the AITHM Board, consistent with the overall vision and strategic goals of AITHM.

With a membership of 11, the Business Development Advisory Group currently comprises external members, JCU staff involved in commercialisation activity, and representatives of JCU Research Centres with strong commercialisation interests.

Membership:

- Dr Andrew Johnson, Chief Operating Officer, AITHM, JCU (Chair)
- Professor Louis Schofield, Director, AITHM
- Professor Jonathan Golledge, NHMRC National Centre of Research Excellence to Improve Management of Peripheral Arterial Disease, JCU
- Professor Alan Baxter, Comparative Genomics Centre, JCU
- Associate Professor Andreas Lopata, ARC Future Fellow, Discipline of Biochemistry and Molecular Biology, JCU
- Professor Robyn McDermott, Centre for Research Excellence in the Prevention of Chronic Conditions in Rural and Remote Populations, JCU
- Dr Paul Giacomini, Research Fellow, AITHM
- Ms Lisa Davies Jones, Director Clinical Governance, Townsville Hospital and Health Service
- Mr Jasper Taylor, Director, Research Services, JCU
- Dr Andrew Leech, Manager Innovation and Commercialisation, Research Services, JCU
- Emeritus Professor Rhondda Jones, Director, Research Development, JCU

Review Committee

The AITHM Review Committee monitors the compliance of AITHM's budgets and reporting to the Financial Incentive Agreement between JCU and the Department of Science, Information Technology and Innovation (DSITI). AITHM's progress in achieving the Key Performance Indicators, and approval of the *AITHM Annual Report* and proposed budgets, including operational and infrastructure funding, is assessed by this committee.

Membership:

- Professor Robert Porter (Independent Chair)
- Dr Christine Williams, Assistant Director-General, Science Division, DSITI
- Professor Ian Wronski, Deputy Vice Chancellor, Division of Tropical Health and Medicine, JCU

Performance Measures

Key Performance Indicators are specified in AITHM's funding agreement with each of DSITI and ARC. Achievement against these Key Performance Indicators is addressed below.

DSITI Key Performance Indicators

These Key Performance Indicators are specified in the *Financial Incentive Agreement between State of Queensland through the Department of Science, Information Technology and the Arts (Formally DSITIA, now DSITI) and James Cook University regarding the award to James Cook University for the Australian Institute of Tropical Health and Medicine*.

Key Performance Indicators for Calendar Years – 2013 to 2017	Target	2015 outcomes
1. Governance		
Establish AITHM Board by 31 December 2013		Established 2013. Three meetings held in 2015.
Establish AITHM Business Development Advisory Group by 31 December 2013		Established 2013. Two meetings held in 2015.
Establish AITHM Management Committee by 31 December 2013		Established 2013. Four meetings held in 2015.
2. Operational and Funding Performance		
Secure on average \$1.65M per calendar year in external funding for research projects, reported as actual income for that year to AITHM.	\$1.65M per calendar year	AITHM secured \$6.04M in external funding for research projects in 2015.
3. Human Capital Development		
Increase the number of research, technical or business development staff employed in or affiliated with the AITHM to 100 within 5 years of establishment of the AITHM (established 1 July 2013)	100 within 5 years of establishment	In 2015, there were 26 academic staff employed within AITHM, 28 technical and administrative staff employed within AITHM and associated research centres; and over 200 academics affiliated with the research centres across the Division of Tropical Health and Medicine.
4. Education and Skills Development		
Capacity and capability of AITHM to educate and train post-graduate students in science research or entrepreneurial skills:		
From end of 2 years after establishment of AITHM (1 July 2013) maintain a minimum cohort of 40 PhD and Masters Degree students each year	A minimum cohort of 40 PhD and Masters Degree students per annum	There were 197 HDR students enrolled in the Division of Tropical Health and Medicine in 2015.
With expectation that 25% of these students graduate each year	10 per year	32 HDR students enrolled in the Division of Tropical Health and Medicine graduated in 2015.
5. Research and Development Excellence		
National and international recognition of AITHM as a centre of excellence in the field of tropical health research and development:		
Refereed scientific papers, published in national or international journals, books, book chapters and conference papers where AITHM researchers participate in the conference program	50 per annum	568 publications were published by researchers in the Division of Tropical Health and Medicine in 2015.

Key Performance Indicators for Calendar Years – 2013 to 2017	Target	2015 outcomes
6. Collaboration (Research) Ability of AITHM to maintain or increase collaborative research programs linked with local, national or international research, education and commercial partners:		
Visiting national and international scientists	10 per annum	More than 38 national and international scientists visited AITHM (see p42 – Seminar Series).
Within 5 years of establishment of the AITHM (1 July 2013) enter into 5 new collaborations with research, industry or business partners, including international collaborations	5 new collaborations within 5 years of establishment	<p>AITHM has exceed the target of 5 new collaborations within 5 years of establishment. New collaborations in 2015 included:</p> <p>Five year collaboration with Biopixel supporting science communication, utilising JCU research facilities in aquatic toxic organisms.</p> <p>Collaboration with CSIRO, University of Manitoba, QIMR to use RNA interference technology for mosquito population control.</p> <p>\$2.8M awarded by the Bill & Melinda Gates Foundation to AITHM researchers, in collaboration with the Walter and Eliza Hall Institute of Medical Research, to pursue the pre-clinical development of a vaccine aimed at the goal of malaria eradication.</p> <p>Collaboration with national Tuberculosis programs in the Asia-Pacific region to develop a tool for TB control policy development, funded by the Global Fund.</p> <p>Collaboration with Bioagents AG, Emory University and QIMR Berghofer to improve surveillance for dengue vectors.</p> <p>AITHM's Director Professor Louis Schofield played a leading role in Austrade's Life Science and Health Care Innovation Showcase mission to India.</p> <p>In 2015, AITHM became a founding collaborative partner in the Tropical Australian Academic Health Centre (TAAHC) together with the Cairns and Hinterland Hospital and Health Service, Mackay Hospital and Health Service, North West Hospital and Health Service, Torres and Cape Hospital and Health Service, Townsville Hospital and Health Service, the Northern Queensland Primary Health Network and JCU. The TAAHC represents a unique opportunity to create the world's first academic health centre with a focus on tropical health, Indigenous health and health service delivery in regional, rural and remote settings.</p>
15 conferences, seminars, forums or workshops organised by AITHM per annum focussed on exchange of research in the field of tropical health and medicine	15 per annum	<p>Australasian Tropical Health and Medicine Conference held 20–22 September, Palm Cove.</p> <p>38 AITHM Seminars focussing on significant tropical health and medicine research.</p> <p>See p35 – Special events, Communications and Community Engagement section for further conferences, seminars, forums and workshops.</p>

Key Performance Indicators for Calendar Years – 2013 to 2017	Target	2015 outcomes
7. Commercialisation		
Demonstrate that AITHM's research and development program will generate, protect and commercialise new intellectual property:		
Develop an AITHM Commercialisation Strategy, linked to the AITHM Business Plan, by 31 March 2014		The Commercialisation Strategy was finalised in May 2014 in consultation with DSITIA.
Through the activities of JCU's Manager, Innovation and Commercialisation, identify 5 'Discoveries' per annum ('Discoveries' means AITHM research outcomes for which JCU carries out due diligence activities including market testing and patent searches)	5 per annum	In 2015, the number of AITHM invention disclosures for 2015 was 13. In 2015, AITHM filed one provisional patent application (Loukas, Schistosomiasis vaccine antigens).
8. Impact		
Demonstrate leadership in transfer of research innovations into public policy and to the field of tropical science or industry:		
1 conference per annum focused on engaging end-users of technology eg. clinicians, field workers, policy-makers	1 per annum	AITHM held its annual Australasian Tropical Health Conference 20–22 September 2015. A wide range of national and international speakers and delegates from a variety of sectors participated (see p35).
1 case study per annum on research outcomes demonstrating research impact and benefit to Queensland derived from the AITHM Activities	1 per annum	A case study has been developed for Associate Professor Alan Clough (see p30 – Research section).
9. Community Engagement		
Capacity and capability of AITHM to inform and engage the community in the activities conducted at the AITHM:		
5 community events involving presentations by AITHM researchers on average per annum	5 on average per annum	In 2015 there were more than 20 community events involving presentations by AITHM researchers (see p39 – Community engagement section).
4 newsletters and 1 public lecture promoting AITHM research and research outcomes to the research community and the community in general	4 newsletters and 1 public lecture per annum	AITHM distributed 4 newsletters in January, April and December 2015 and January 2016. In 2015 there were more than 40 public lectures promoting AITHM research and research outcomes to the research community and the community in general (see p39 – Community engagement section).

ARC Key Performance Indicators

These Key Performance Indicators are specified in the *Funding Agreement between the Commonwealth of Australia as represented by the Australian Research Council and James Cook University regarding funding for the Special Research Initiative for Tropical Health and Medicine and the 2015 AITHM Australian Research Council Special Research Initiative Business Plan April 2015*, is addressed below. The Key Performance Indicators relating to appointments and publications account only for those appointments made under ARCSRI funding and the publications authored by those appointments.

Key Performance Indicators for Calendar Years – 2015–2021	Reporting Frequency	2015 Target	2015 Outcomes
Cairns	Year of completion		Detailed design completed July 2015, early works completed January 2016, civil infrastructure in place, tender process for principal contractor opened late 2015. On track for intended completion date April 2017.
Townsville	Year of completion		Principal contractor, Watpac, commenced construction 2015, all structural floors completed and roof in situ at end 2015, internal fit out well advanced at end 2015, scheduled for completion June 2016.

Key Performance Indicators for Calendar Years – 2015–2021	Reporting Frequency	2015 Target	2015 Outcomes
Research Outputs			
Refereed journal articles (peer reviewed in Scopus-listed publications). SRI funded positions only¹	Annual	10	Not applicable for 2015 due to delays in recruitment of senior researchers.
Publication Quality	Annual	In every year we expect the average Relative Citation Impact for publications to meet or exceed world average benchmarks for their disciplines, as defined in the most recent previous ERA evaluation.	Not applicable for 2015 due to delays in recruitment of senior researchers.
Management and administrative appointments in place	N/A	Director, COO and administrative staff (in place)	Director, Deputy Director, COO, Operations Manager and Communications Coordinator appointed, in accordance with AITHM ARC Business Plan 2015. Additional administrative staff appointed through other funding sources.
Senior Research Appointments (Enabling and Research Leaders)	Year of appointment	5	Professorial Research Fellow (Infectious Diseases Modelling), Professor Emma McBryde commenced 20 July 2015. 2016 commencements: Professorial Research Fellow (Immunology of infectious disease), Professor Denise Doolan commenced on 18 Jan 2016 Professorial Research Fellow (Biostatistics and Population Health), Professor Adrian Esterman commenced 1 Jan 2016 (0.2FTE) Professorial Research Fellow (Vector and Pathogen Control) Senior Research Fellow (Bioinformatics), Dr Matthew Field commenced 29 Feb 2016 Note: * Professor McBryde was funded from DSITI funds in 2015, and from ARC funds from 2016 onwards
ECR appointments (Postdoctoral Research Fellows)	Annual	2	Postdoctoral Research Fellow, Dr Sandip Kamath commenced 18 Aug 2015 Postdoctoral Research Fellow, Dr Brian Johnson commenced 8 Dec 2014 2016 commencements: Postdoctoral Research Fellow, Dr Michael Meehan commenced 13 Jan 2016
PhD stipends through AITHM	Annual	6	2 full scholarship stipends 1 top-up scholarship stipend 2 six-month extension scholarship stipends
PhD Completions	Annual	N/A in 2015	N/A in 2015
Mentoring programs Students supported by DTHM HDR Student Cohort Program	Annual	2	1 AITHM Scholarship recipient was supported by the DTHM HDR Student Cohort Program.

¹ The publications KPIs in AITHM business plan only accounts for the publications authored by the appointments made under ARCSRI funding.

Key Performance Indicators for Calendar Years – 2015–2021	Reporting Frequency	2015 Target	2015 Outcomes
Website describing recent outcomes from AITHM programs	Annual	Active maintenance of webpages providing regular updates of AITHMs research and outputs	AITHM developed and launched a new website in October 2015 – www.aithm.jcu.edu.au
Radio/TV interview focused on AITHM research	Annual	3	AITHM issued 29 media releases in 2015 and made over 700 commentaries worldwide across radio, TV, print and online. Some key radio/TV interviews focused on AITHM research included: 9 March 2015: Professor Andreas Lopata – Immunologists are studying the effects tropical foods have on children with allergies. 29 July 2015: Dr Tahnee Bridson – Researchers have found a link between diabetes and tuberculosis. 9 November 2015: Dr Paul Giacomini – Researchers looking into a possible cure for coeliac disease have come up with a novel treatment utilising hookworm larvae.
Public Lectures	Annual	2	In addition to the 38 AITHM Seminars, which are open to the general public, AITHM researchers delivered many public lectures, including public lectures as part of: <ul style="list-style-type: none"> • The Australasian Tropical Health Conference • National Science Week • The Festival of Life Sciences • Science and Society in the Tropics Dr Klaus Gebel also presented a talk titled <i>Why some vigorous physical activity could save your life</i> at the TEDxJCU Cairns event. Further information on AITHM public lectures is available in the 2015 AITHM Annual Report (see p41 – Public Lectures).
Social Media	Annual	Continuing activity and regular posts via Twitter and Facebook, YouTube and tweets	AITHM continued engaging with audiences via social media channels during 2015. Facebook posts: 86 Tweets: 152 YouTube posts: 4
International leadership positions held by initiative participants	Annual	6	Not applicable for 2015 due to delays in recruitment of senior researchers.
Visits in person months by international investigators	Annual	1	Visits in person months by international researchers to AITHM in 2015 total more than 7 months.
Advisory Board Membership	At Review	Breadth, balance and experience of the members of the Advisory Board.	Reported via Review process
Advisory Board Meetings	Annual	3	3
Advisory Board Contribution	At Review	Frequency, attendance and value added by Advisory Committee meetings.	Reported via Review process

Financial Statement

Australian Institute of Tropical Health and Medicine

Statement of Operating Income and Expenditure for the year ended 31 December 2015

Income	2013	2014	2015
	\$	\$	\$
Commonwealth Government Funding (ARCSRI)	0	10,000,000	3,053,731
State Government Funding (DSITI)	750,000	1,650,000	3,300,000
Host Institution Funding (James Cook University) – <i>refer to note 1</i>	1,962,831	4,291,759	4,933,253
External Research Grants & Consultancies – <i>refer to note 2</i>	2,318,804	4,310,298	6,274,975
Philanthropic Research Grants	0	400,000	0
Other Income	77,023	38,050	60,938
Total Income	5,108,658	20,690,106	17,722,896
Expenditure	2013	2014	2015
	\$	\$	\$
Core Operations			
Salaries	1,095,209	2,892,801	4,040,519
Equipment, Depreciation & Maintenance	690,064	1,339,392	1,008,770
Governance	0	34,298	55,283
Other Operating Expenditure	900,131	1,276,256	2,116,516
Capacity-Building Grants (DSITI) – <i>refer to note 3</i>	176,138	299,365	1,500,000
Philanthropic Research Grants	0	400,000	0
Research Maintenance, Small Equipment & Depreciation	0	0	0
External Research Grant Expenditure			
Salaries	1,027,721	1,630,202	1,845,074
Equipment, Depreciation & Maintenance	269,196	55,327	61,221
Other Research Grant Expenditures	1,304,251	2,490,580	2,463,703
Total Expenditure	5,462,710	10,418,222	13,191,086
Surplus/(Deficit)	-354,052	10,271,884	4,531,810

Notes

1. Host Institution Funding includes the James Cook University operating contribution and the James Cook University DSITI Strategic Support Contribution.
2. External Research Grants & Consultancies are incorporated in the financial results and, for consistency, prior years have been retrospectively adjusted. External Research Grant & Consultancies includes amounts for Research Industry Block Grant (RIBG) funding.
3. Capacity-Building Grants (DSITI) was listed as Research Development Grant Applications in prior year reports.

Journal articles (461)

1. Achee N; Gould F; Perkins T; Reiner R; Morrison A; Ritchie SA; Gubler D; Teyssou R; Scott T. (2015) A Critical Assessment of Vector Control for Dengue Prevention. *PLOS Neglected Tropical Diseases*, 9 (5). pp. 1-19
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4. Akhila DS; Mani MK; Rai P; Condon K; Owens L; Karunasagar I. (2015) Antisense RNA mediated protection from white spot syndrome virus (WSSV) infection in Pacific white shrimp *Litopenaeus vannamei*. *Aquaculture*, 435. pp. 306-309
5. Almeida OP; Hankey G; Yeap BB; Golledge J; Flicker L. (2015) Prevalence, associated factors, mood and cognitive outcomes of traumatic brain injury in later life: the health in men study (HIMS). *International Journal of Geriatric Psychiatry*, 30. pp. 1215-1223
6. Almeida OP; Hankey G; Yeap BB; Golledge J; Flicker L. (2015) Vitamin D concentration and its association with past, current and future depression in older men: *The Health In Men Study*. *Maturitas*, 81 (1). pp. 36-41
7. Almeida OP; Hankey G; Yeap BB; Golledge J; Norman PE; Flicker L. (2015) Depression, frailty, and all-cause mortality: a cohort study of men older than 75 years. *Journal of the American Medical Directors Association*, 16 (4). pp. 296-300
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9. Al-Motlaq MA; Mills JE. (2015) Using web logs' posts to understand Arab internet users' perspectives on recent health research findings. *Journal of Consumer Health on the Internet*, 19 (2). pp. 107-121
10. Arias Rodriguez A; Cinner JE; Jones RE; Pressey RL. (2015) Levels and drivers of fishers' compliance with marine protected areas. *Ecology and Society*, 20 (4). pp. 1-14
11. Ariel EM; Owens L. (2015) Action research to improve the learning space for diagnostic techniques. *Journal of Microbiology and Biology Education*, 16 (2). pp. 167-177
12. Ariel EM; Wirth WT; Burgess GW; Scott JL; Owens L. (2015) Pathogenicity in six Australian reptile species following experimental inoculation with Bohle iridovirus. *Diseases of Aquatic Organisms*, 115 (3). pp. 203-212
13. Asigau V; Lavu EK; McBride WJH; Biloh E; Naro F; Koana E; Ferguson JK; Laman M. (2015) Prevalence of patients with acute febrile illnesses and positive dengue ns1 tests in a tertiary hospital in Papua New Guinea. *American Journal of Tropical Medicine and Hygiene*, 92 (1). pp. 72-74
14. Asugeni J; MacLaren DJ; Massey P; Speare R. (2015) Mental health issues from rising sea level in a remote coastal region of the Solomon Islands: current and future. *Australasian Psychiatry*, 23 (6). pp. 22-25
15. Asugeni J; MacLaren DJ; Massey P; Speare R. (2015) Mental health issues from rising sea level in a remote coastal region of the Solomon Islands: current and future. *Australasian Psychiatry*, 23 (6). pp. 22-25
16. Atkin OK; Bloomfield KJ; Reich PB; Tjoelke MG; Asner GP; Bonal D; Bönisch G; Bradford MG; Cernusak L; Cosio EG; Creek D; Crous K; Domingues TF; Dukes J; Egerton J; Evans J; Farquhar GD; Fyllas NM; Gauthier P; Gloor EU; Gimeno T; Griffin K; Guerrieri R; He. (2015) Global variability in leaf respiration in relation to climate, plant functional types and leaf traits. *New Phytologist*, 206 (2). pp. 614-636
17. Au M; Ly S; Emeto TI. (2015) Emerging role of iron oxide nanoparticles in the diagnostic imaging of pancreatic cancer: a systematic review. *Annals of the Australasian College of Tropical Medicine*, 17 (1). p. 19
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23. Barnett FA. (2015) Postmenopausal women and physical activity: a challenge for healthy aging. *Journal of Aging Research*, 1. pp. 14-16
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28. Bauer IL. (2015) Do travel health researchers need to get out more? *Travel Medicine and Infectious Disease*, 13 (5). pp. 426-427
29. Bauer IL. (2015) Improving global health: is tourism's role in poverty elimination perpetuating poverty, powerlessness and 'ill-being'? . *Global Public Health*, pp. 1-20
30. Bauer IL. (2015) Looking over the fence: how travel medicine can benefit from tourism research. *Journal of Travel Medicine*, 22 (3). pp. 206-207
31. Bauer IL. (2015) Response to 'tourism citations in other disciplines'. *Annals of Tourism Research*, 53. pp. 99-100
32. Bauer IL. (2015) Where is travel medicine failing? Insights from high altitude trekking. *BMC Biome*, 16 April 2015.
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Conference items (56)

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2. Barnett FA; Sealey RM; Simmons LM. (2015) The efficacy of an exercise and lifestyle intervention for postmenopausal women living in North Queensland. Maturitas. In: EMAS 2015: 10th European Menopause and Andropause Society Congress, 20-22 May 2015, Madrid, Spain
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- High Performance Operation Plan Seminar Road to the 18th Asian Games, December 6 – 9, 2015, Bandung Indo
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 17. Franklin RC (2015) Shared Workplace: Problem definition and the challenge. Sugar Milling Industry Annual People and Safety Conference 2015. Ocean International Hotel, Mackay, Queensland, Australia 9-10 March 2015. (Invited Speaker)
 18. Franklin RC, King J, McBain-Rigg K (2015). Barriers and Facilitators to adoption of improved safe work practices in Australian Primary Industries. 12th Australasian Injury Prevention and Safety Promotion Conference, November 25-27, University of Sydney
 19. Franklin RC, King JC, McBain-Rigg, Lower T (2015). Improving safety and health in Australian Primary Industries by addressing the barriers and facilitators. 28th WSO International Environmental and Occupational Safety and Health Professional Development Symposium. October 25-28 2015, Solaire Resort & Casino, Paranaque City, Philippines
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 31. Lloyd JKF. (2015) Nationally Shared On-line Curriculum Resources for Veterinary Undergraduate Learning and Teaching in Animal Welfare and Ethics. James Cook University. In: HERDSA QLD Branch conference, 6 November 2016, James Cook University
 32. Lloyd JKF. (2015) Veterinarians taking the lead on animal welfare and ethics: What's all the fuss about captive marine mammals? CVE publications. In: Centre for veterinary education welfare and ethics symposium, December 2, 2015, Sydney
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 39. Mills JE. (2015) Exploring global trends in nursing and midwifery education. Presentations from the International Council of Nurses Conference. In: ICN 2015: International Council of Nurses Conference, 19-23 June 2015, Seoul, Korea
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3. Franklin R; McBain-Rigg KE; King JC. (2015) A synthesis and review of Primary Industries Health and Safety Partnership Publications. Rural Industries Research and Development Corporation, Canberra
4. Franklin R; McBain-Rigg KE; King JC; Lower T. (2015) Exploring the barriers and facilitators to adoption of improved work practices for safety in the primary industries. Rural Industries Research and Development Corporation, Canberra

Acronyms

3MT	Three Minute Thesis
AITHM	Australian Institute of Tropical Health and Medicine
AM	Member of the Order of Australia
AMP	Alcohol Management Plan
AO	The Order of Australia
ARC	Australian Research Council
ARCSRI	Australian Research Council Special Research Initiative
ATS	amphetamine-type stimulants
AusAID	Australian Agency for International Development
AuTuMN	Australia Tuberculosis Modelling Network
BMDT	Biodiscovery & Molecular Development of Therapeutics
BTID	Biosecurity and Tropical Infectious Diseases
CCA	Cholangiocarcinoma
CCDP	Centre for Chronic Disease Prevention
CNMR	Centre for Nursing and Midwifery Research
COO	Chief Operating Officer
CRE	Centre for Research Excellence
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CVD	cardiovascular disease
DFAT	Department of Foreign Affairs and Trade
DSITI	Department of Science, Information Technology and Innovation
DSITIA	Department of Science, Information Technology, Innovation and the Arts
Dr	Doctor

GESA	Gastroenterological Society of Australia
Hon	Honourable
ICFES	International Conference of Food and Environmental Science
IVD	invitro diagnostics
JCU	James Cook University
MRCF	Medical Research Commercialisation Fund
NCTN	Northern Clinical Training Network
NHMRC	National Health and Medical Research Council
PDF	portable document format
PhD	Doctor of Philosophy
PNG	Papua New Guinea
QIMR	Queensland Institute of Medical Research
QReCS	Queensland Remote Chemotherapy Supervision
RAM	Rotarians Against Malaria
RIGB	Research Industry Block Grant
RMIT	Royal Melbourne Institute of Technology
THHS	Townsville Hospital and Health Service
TAAHC	Tropical Australian Academic Health Centre
TB	Tuberculosis
TCHHS	Torres and Cape Hospital and Health Service
TNOS	The Nature of Science
US	United States
VecNet	VectorBorne Disease Network
WHO	World Health Organisation

The yellow fever mosquito (*Aedes aegypti*) can be recognised by distinctive white markings on its legs, and a lyre-shaped pattern atop the thorax. This mosquito originated in Africa, but is now found in tropical and subtropical regions throughout the world. *Aedes aegypti* is a vector for several important tropical pathogens such as dengue and Zika viruses. Only the female feeds on blood, which she needs to mature her eggs.



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