



AITHM | AUSTRALIAN INSTITUTE
OF TROPICAL HEALTH & MEDICINE

AITHM

OUR REGIONAL IMPACT // ANNUAL REPORT 2016

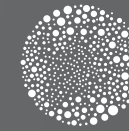


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AITHM

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AITHM gratefully acknowledges the funds received from the Queensland Government and the Commonwealth Government through the Australian Research Council Special Research Initiative (ARC SRI) and from the Division of Tropical Health and Medicine (DTHM) at James Cook University (JCU). This funding enables AITHM to build essential research capacity in tropical health and medicine for Australia and the region.

We also acknowledge the Traditional Owners of the land on which AITHM facilities operate, the Bindal and Wulgurukaba (Townsville), Yirriyandji (Cairns), Kaurareg (Thursday Island) and Yuibera (Mackay) peoples, and pay our respects to all Elders, past, present and future.



Australian Government





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 PURPOSE

AITHM is 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 improved health security, health service delivery and health outcomes, and contributing to growing prosperity in the region.

OUR KEY RESEARCH

As Australia's leading medical research institute dedicated to improving the health and wellbeing of tropical populations, with a focus on infectious disease, chronic disease, the intersection between chronic and infectious disease and health systems research, AIITHM delivers research outputs that are recognised worldwide.

Areas of research focus include:

Infectious disease

- Tuberculosis (TB)
- Vector borne diseases: malaria, dengue fever, Zika virus, chikungunya, filariasis
- Melioidosis
- Vector control – entomology
- Pathogenesis
- Soil transmitted helminths and flukes
- Group A streptococcal infections
- Schistosomiasis
- Opisthorchiasis

Chronic disease

- Diabetes
- Cardiovascular disease
- Peripheral vascular disease
- Food allergy

- Asthma
- Inflammatory bowel disease (IBD): Crohn's and colitis
- Coeliac disease
- Alcohol and drug abuse
- Schizophrenia

Intersection between infectious and chronic disease

- Pathogenesis
- Microbiota

Health systems research

- Telehealth
- Health systems
- Health economics
- Indigenous health
- Occupational health and safety

Translational

- Drugs
- Vaccines
- Diagnostics
- Clinical trials

Enabling disciplines

- Biobank
- Biostatistics
- Bioinformatics
- Database management
- Epidemiology
- Health workforce development
- Scaling up innovation to policy and practice

MESSAGE FROM THE DIRECTOR



Based in the Tropics of northern Australia, AIITHM was founded in 2013/4 with the aspiration to become a leading institute with a focus on translational tropical health and medicine research, preserving Australia's health security and enhancing health outcomes for people living in the Tropics at home and abroad. Our aspirations to lead tropical health and medicine, both 'home and away', have become a tangible reality this year.

At home, together with James Cook University, the Northern Queensland Primary Health Care Network and the Mackay, North-West, Townsville, Cairns and Hinterland and Torres and Cape Health and Hospital Services, AIITHM has been a founding member of the Tropical Australia Academic Health Centre (TAAHC). TAAHC is a new alliance and research governance structure that will improve health outcomes and regional prosperity through collective health research capability, and ensures domestic relevance and a clear translational pathway for AIITHM.

A leading example of relevant domestic health research has been our establishment of an Occupational Health and Safety research unit in Mackay in response to the re-emergence in the Queensland mining industry of black lung disease (pneumoconiosis). We aim to work with multiple parties towards a 'one-stop-shop' solution to this disease.

Abroad in the Asia-Pacific region, AIITHM is leading a consortium of institutions to provide expertise in strengthening partnerships and workforces for our near neighbours. Specifically, AIITHM plans to build the capacity of countries for early warning, risk reduction and management of national and global health risks, and provide innovative tools for policy evaluation and decision support, research mentorship, workforce development and mutual learning. The aim is to provide the Asia-Pacific region with a stronger health system surveillance and response capacity to support timely, effective responses to emerging and existing infectious disease threats such as TB and Zika virus.

The key to these achievements has been our people. The appointment of outstanding new research leaders complements our impressive existing research talents to create a fertile

eco-system of creativity and innovation. We now have world-class research capacity in both chronic and infectious diseases, the emerging intersection of these areas, health service delivery and the translation of services and products for tropical health solutions.

One of the highlights of 2016 was the opening of our new Townsville PC2 and PC3 facility in October by Senator the Hon. Ian Macdonald, the Queensland Premier, Annastacia Palaszczuk, and Queensland Minister for Innovation, Science and the Digital Economy Leeanne Enoch. We were also delighted to host Senator the Hon. Simon Birmingham and the Hon. Warren Entsch MP in Cairns to mark formally the commencement of construction of the AIITHM Cairns research facility that will bolster Australia's research and training abilities in virology, mosquito vectors, disease and transmission control as well as the development of new treatments and vaccines for tropical diseases. Key to building capacity and health security for our northern borders, AIITHM commenced construction of a research and training facility on Thursday Island, a critical piece of infrastructure for northern Australia.

In late 2016, the Australian Research Council undertook an independent scientific review of AIITHM and its progress to date. The report provided positive feedback and recognition of our achievements to date. The review also recommended the Institute focus on the value chain from innovation to application and impact, increase partnerships with external parties, and restructure and simplify its research themes. We look forward to implementing these recommendations in the year ahead.

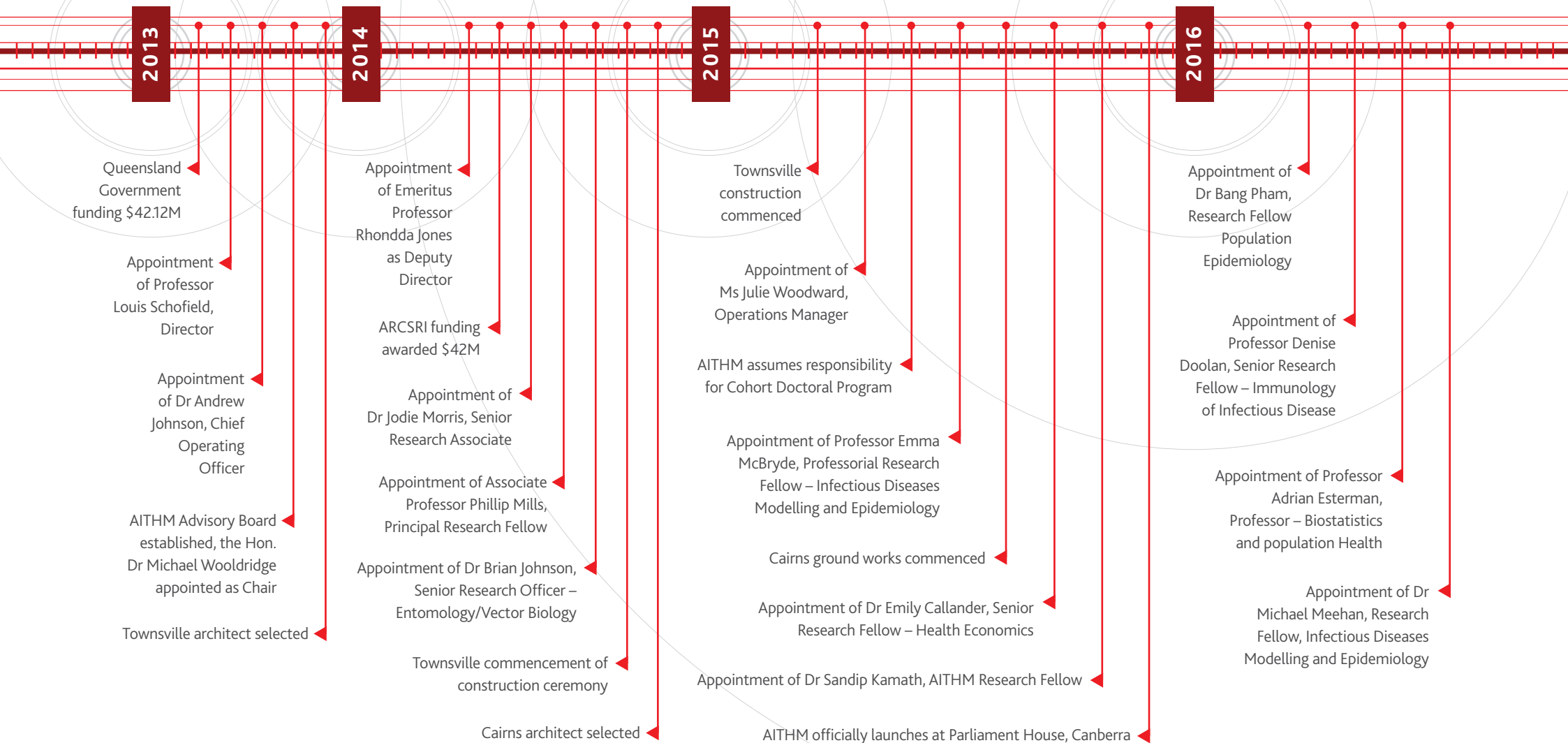
From a successful 2016, we look forward to 2017 as an opportunity to continue building translational value for society. I would like to thank all colleagues, the Board and the executive management team for another wonderful year. It is their contributions that are crucial to our growth and development as a world-leading Institute. I am tremendously proud to see the progress AIITHM is making in its significant contributions to the health of people throughout the Tropics.

Professor Louis Schofield
Director, AIITHM

A close-up, side-profile shot of a female scientist with dark hair, wearing a white lab coat and blue nitrile gloves. She is focused on her work, using a yellow and white pipette to transfer liquid into a multi-well plate. The background is a blurred laboratory environment with various glassware and equipment. A semi-transparent white box with a red vertical line is overlaid on the left side of the image, containing text.

We now have world-class
research capacity in both
chronic and infectious diseases

ACHIEVEMENTS TO DATE



2017

Appointment of Dr Vanina Guernier, Research Fellow, Infectious Diseases

Appointment of Dr Andreas Kupz, Research Fellow Infectious Diseases, returns to AITHM from Max Planck Institute

Thursday Island construction commenced

Cairns construction commenced

Appointment of Dr Matt Field, Senior Research Fellow – Bioinformatics

Appointment of Associate Professor John Miles, Principal Research Fellow, Molecular Immunology

Professor Maxine Whittaker, Dean of the College of Public Health, Medical and Veterinary Sciences, replaces Emeritus Professor Rhondda Jones as Deputy Director

Townsville officially opened

Work in AITHM's Translational Research Facility commenced

Appointment of Mr Daniel Lindsay, Research Fellow

Appointment of Dr Claire Loiseau, Postdoctoral Research Fellow, Molecular Immunology of Infectious Diseases

Appointment of Associate Professor Gunther Paul, Principal Research Officer, Occupational Health and Safety

Development work on new TB vaccine targets and best methods for delivery commenced

Work commences on developing allergen immunotherapy

Clinical trials for developing treatments for coeliac planned

Clinical trials for malaria vaccine targets planned

KEY RESEARCH



INFECTIOUS DISEASE

Infectious diseases are preventable yet remain a significant health burden for populations living in the Tropics, causing many millions of deaths annually and posing a threat to Australia's health security. Key research undertaken by AITHM includes clinical and translational research focused on major infectious diseases such as malaria, TB and dengue fever.

Research by AITHM aims to understand the epidemiology of important infectious diseases, how infectious diseases invade the body and then how they spread between populations. Research teams are developing new treatments, vaccines and other health interventions to improve how infectious diseases are managed and understand how individuals accept and respond to treatments. Importantly, AITHM infectious disease research protects Australia's borders, preserving our health security, and enhances health outcomes for our neighbouring tropical nations.



Protecting Australia's northern borders with TB intervention

The health security threat posed by cross-border multi-drug resistant tuberculosis (MDR TB), and designing an appropriate response has high priority within research planning at AITHM. This research plays a key role in addressing TB incursions from PNG into northern Australia and preventing TB outbreaks in Cape York and the Torres Strait, enhancing Australia's biosecurity.

Led by Professor Emma McBryde, key collaborations with Queensland Health and Cape York and Torres Strait Islander communities enable the delivery of research and clinical services. Appointed as the lead physician for the Torres and Cape Hospital and Health Service TB Program, Professor McBryde plays a key role in responding to TB outbreaks in the region.

Professor McBryde supervises PhD student J'Belle Foster who is Queensland Health's senior TB nurse. Professor McBryde and Ms Foster have established, with communities, health services and Primary Health Networks and hospital research programmes involving contact tracing, cluster identification and latent TB screening in the Cape and Torres Strait. These programs have strong community support, are already having an impact on TB policy for the region, and provide a mechanism for data collection and research into epidemiology and evidence for this national priority area. From this research work, risk

factors for TB clusters will be identified. TB control program management will also be analysed to examine delivery of the TB control program prior to and after the transition from centralised to decentralised care that occurred on 1 January 2016. Cost-effectiveness and efficiencies of service will be examined including time to diagnosis, time to treatment and time to contact tracing and prevention therapy.

Understanding and diagnosing TB in remote Papua New Guinea

Dr Jeff Warner, Dr Catherine Rush and Professor Emma McBryde are leading a team of students and researchers within AITHM, working closely with the people of the Western Province PNG on one of the most pressing of medical issues in the region. Using the tools of genomics, immunology and epidemiology, this work aims to improve diagnosis of TB, and identify the risk factors for the disease as well as ensuring a sustainable research program approach in this remote region.

Specifically, this work is establishing techniques to identify the type and burden of drug resistance TB and working with local collaborators supporting the TB control program in this region. In addition, immunological based techniques are helping to support the clinical diagnosis of (and therefore better direct treatments) combined with immunophenotyping, to better help understand the immunopathology of TB and the immunodiagnosis of the disease. Finally, research is also providing greater understanding of the clinical and molecular epidemiology (distribution and determinates) of the disease in the region using modelling and big data analysis techniques to improve treatments.

Tuberculosis research sites in Papua New Guinea

Several projects are underway investigating different aspects of TB in PNG. In Middle Fly province, AITHM researchers are investigating clusters of TB, examining TB genomes looking for their origins and evidence of drug resistance mutations. Teams are also investigating people's immune response to tuberculosis infection. In Kavieng, researchers are educating health workers about the co-epidemics of TB and diabetes. In Port Moresby researchers are commencing a clinical study on the risk of TB failure depending on individual pharmacology.

The Institute's new physical containment PC3 laboratory facilities in Townsville are essential to the program, allowing research on drug-resistance and vaccine development.

Mathematical modelling assesses TB interventions

Professor Emma McBryde and her research team are using mathematical models to predict outcomes relating to TB research interventions. These include estimating the value of short course chemotherapy for MDR TB, and estimating the burden of the impact of treatment of latent TB.

The team has developed a software tool through the Australian Tuberculosis Modelling Network (AuTuMN) collaboration with national TB programs in the Asia-Pacific and funded by the Global Fund for AIDS, TB and malaria, allowing countries to predict the effect of different TB control activities including costs and impact on TB epidemiology, specific to their context. This tool has been used in three countries to date: Fiji, the Philippines, and Bulgaria, with plans to extend its use beyond these countries later in 2017.

Furthermore, multistrain TB models are also being designed by AITHM Postdoctoral Research Fellow Dr Michael Meehan, and a growing cohort of postgraduate and early career researchers are joining work on the program.

New funding enhances TB vaccine progress

TB remains the biggest killer among infectious diseases around the world and is most prevalent in developing countries. In 2015, there were 1.8 million deaths associated with TB and more than 10.4 million new cases diagnosed globally. The development of new and effective TB vaccines is crucial as the only licensed anti-TB vaccine, Bacille Calmette–Guérin (BCG), does not effectively protect adults and therefore does not prevent disease transmission.

With successful National Health and Medical Research Council (NHMRC) funding of \$740K awarded during 2016, new research being led by Dr Andreas Kupz will focus on understanding the immune response to TB to generate new and better vaccines, protecting those most vulnerable and enhancing Australia's biosecurity from the threat of TB.

This project builds upon existing work and focuses on two streams of research. The first stream will genetically manipulate live BCG bacteria to create a recombinant vaccine strain designed to evoke an immune response. The second stream of the research will investigate how the vaccine is administered. Unlike other organs, immune cells within lungs often fail to elicit an effective immune response. By altering the method of administration, particular cells, known to produce an immune response can be targeted, and defend against TB.



Partnerships to tackle infectious diseases in the Tropics

To help prevent infectious disease epidemics in the Asia-Pacific region, AITHM is developing a program of research to provide expertise in strengthening partnerships and workforces for Australia's near neighbours. Professor Emma McBryde is leading this collaboration, which will strengthen the capacity of countries for early warning, risk reduction and management of national and global health risks that help the countries meet their IHR requirements in surveillance, laboratory capacity, planning and governance to prevent disease threats.

This work aims to provide the Asia-Pacific region with a stronger health system surveillance and response capacity to support timely, effective responses to emerging and existing infectious disease threats, including TB and Zika virus. The collaboration will partner with institutes in Australia and the Pacific region that can provide innovative tools for policy evaluation and decision support, research mentorship, workforce development and mutual learning.

Malaria vaccine development

Malaria remains a major public health threat throughout the Tropics, with significant mortality, morbidity and socioeconomic impact despite extensive worldwide efforts dedicated to the development of an effective intervention. AITHM is a leading malarial research group in Australia and a significant global player in malarial research.

At the AITHM laboratories in Cairns and Townsville, researchers are tackling the complex challenges posed by the disease, including the mosquitoes that transmit it and the five species of parasite that can infect humans.

AITHM is also currently working on three vaccines at various stages: fundamental proof-of-concept, pre-clinical development and clinical trial testing.

Development phase vaccine

Led by Professor Denise Doolan and funded by an NHMRC project grant, a research group is using a range of genome-based technology platforms with specimens from individuals naturally or experimentally exposed to malaria to understand the immune mechanisms and antigenic targets of protective immunity to malaria, in order to rationally design and develop effective vaccines and therapeutics. A particular focus is on the molecular profiling of adaptive immunity to Plasmodium infection in humans and animals using systems immunology, which links immunology with genomics and bioinformatics. The approaches being pursued in the Doolan lab should overcome the problem of poorly immunogenic, poorly protective vaccines that has plagued vaccine developers for many years.

"Focusing on the molecular building blocks that make up the malaria parasite and the human immune response, will enable us to find weaknesses in the host-parasite arsenal that will lead to effective control of malaria."

Professor Denise Doolan

Pre-clinical development of a pan-species, multi-stage vaccine for the malaria eradication agenda

AITHM has also developed a prototype vaccine that may overcome these complex challenges by attacking most species and stages in the malaria life cycle.

With funding of \$2.8M from the Bill and Melinda Gates

Foundation, \$1.06M from the Australian Tropical Medicine Commercialisation Grants Programme (Australian Trade and Investment Commission), and \$850K from an NHMRC Development Grant, Professor Louis Schofield's research team in collaboration with the WEHI in Melbourne and collaborators and Institutions around the world, is developing the manufacturing process required to take the vaccine to clinical trials. 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.

Clinical trial vaccine

ALTHM's third malaria vaccine candidate, a research project also led by Professor Louis Schofield, is currently undergoing clinical trials in Queensland. In collaboration with Professor James McCarthy from QIMR Berghofer, clinical trials are underway with results expected early 2018. The vaccine is a genetically attenuated live blood-stage malaria vaccine in which pathogen virulence factors have been ablated.

Monitoring mosquitoes to prevent disease transmission

Mosquito borne diseases continue to pose a very real threat to tropical populations around the region, and as such remain a threat to Australia's biosecurity. ALTHM's entomology team, led by Professor Scott Ritchie has partnered with Verily and CSIRO, and are studying the behaviour of male *Aedes aegypti* mosquitoes in far north Queensland. The aim of the partnership is to identify ways to reduce the wild population of mosquitoes to prevent the transmission of disease, enhancing Australia's biosecurity.

The female *Aedes aegypti*, highly prevalent in tropical regions, is responsible for transmitting the dengue, chikungunya and Zika viruses. However, this partnership will specifically focus on understanding the male mosquito with a planned mark, release and recapture program. This will enable the research team to better understand the mosquito population, where they move and how far, and if they have mated during their release. These male mosquitoes will be recaptured with traps and the information will be used to learn about mosquito behaviour in an effort to control these vector borne diseases, and protect Australia's northern borders from the spread of disease. Professor Ritchie has also been asked to consult for the WHO and the Brazilian Government on disease transmission and prevention.



CASE STUDY

MONITORING MOSQUITOES TO PREVENT DISEASE TRANSMISSION

During 2016, AIITHM vector control researcher, Professor Scott Ritchie worked in collaboration with Verily Life Sciences (an Alphabet company and Google affiliate) and CSIRO to study the behaviour of male *Aedes aegypti* mosquitoes in Far North Queensland and identify ways to reduce the wild population of these mosquitoes, preventing transmission of diseases like dengue and Zika and enhancing Australia's biosecurity.

The research uses the male mosquito, which doesn't bite and feeds off nectar, to reduce or remove populations of this disease-carrying mosquito species in large urban landscapes. Researchers investigated the behaviour of the male *Aedes aegypti* mosquito using a mark, release, recapture (MRR) study. After community engagement and support, the study released approximately 1000 male *Aedes aegypti* mosquitoes, marked with a dye to identify them for recapture, on 16 and 25 November and 5 December in small identified neighbourhood study sites. They were then recaptured through a network of 70 traps to see where they had travelled, how far, what time, and if they had mated with local female *Aedes aegypti* in that time. Initial results of the MRR Study revealed that, on average, the male mosquitoes flew less than 100 metres, although some flew up to twice that distance. The study found that the released males mated quickly, within the first two days of release. The females, marked with the dye transferred from the males when they mated, were found across the trap network the following week.

The long-term goal of the research is to show that the invasive *Aedes aegypti* mosquito can be suppressed, and even removed, from the urban landscape. In 2017, the research collaboration intends to carry out further studies in Innisfail which will involve releasing sterile male mosquitoes and testing mosquito production and release tools. This research will allow researchers to see how sterile male mosquitoes behave in the urban environment, and how well they compete with wild *Aedes aegypti* males for a mate.

These studies will only proceed after extensive engagement with, and support from, the Innisfail community, and with government regulatory approval. This next stage is supported by tools that Verily's engineers are developing in their laboratories in the United States of America (USA). The JCU cages are being used for experiments to help develop and evaluate a Sterile Insect Technology (SIT) for mosquito population control. The most compelling method for sterilising males is through use of a natural bacterium called Wolbachia. In contrast to the Eliminate Dengue project, which releases male and female Wolbachia infected mosquitoes that are unable to transmit diseases into the wild mosquito population, the SIT method aims to reduce or remove mosquitoes that transmit diseases by releasing sterile male mosquitoes only. The *Aedes aegypti* mosquito can be infected with Wolbachia by mating them with mosquitoes already infected with the bacterium. Wolbachia is then passed on to the next generation of mosquitoes in the lab rearing process. When males carrying Wolbachia mate with uninfected females, her eggs won't hatch, limiting numbers of next generation *Aedes aegypti*. Researchers around the world are currently trialling Wolbachia-based sterile insect technology, including in the US, China, Malaysia and Singapore.

By combining knowledge of mosquito populations and behaviour with Verily's technologies, this research collaboration aims to reduce or remove the invasive mosquito species from urban landscapes around the world where it spreads diseases, including dengue and Zika.

CHRONIC DISEASE

According to the WHO, chronic diseases are the leading cause of deaths worldwide, and in many cases can be prevented. Often long in duration and generally slow to progress, chronic disease can be influenced by genetics, lifestyle, socio-economic factors, and environment, and are expected to become more common as the population ages, and risk factors increase.

Key research undertaken by AITHM includes major chronic diseases such as; diabetes, cardiovascular disease, peripheral vascular disease, asthma, allergy, bowel disease, schizophrenia, and alcohol and drug abuse.

AITHM's multidisciplinary research aims to strengthen health systems and increase workforce capacity through collaborations with key industry and community partners, to advance the health and wellbeing of tropical and Indigenous populations through understanding the causes, preventions and treatment of chronic disease. Importantly, by translating these results into healthcare solutions such as new diagnostics, improved healthcare policy and community based interventions, AITHM and its partners will build capacity and strengthen health systems among these populations.

Collaborative approach to tackling smoking in Indigenous communities

Tobacco use is of particular concern for the health of Aboriginal and Torres Strait Islander peoples, amongst whom smoking prevalence is significantly higher than in the non-Indigenous population, and the rate is not falling as it is in the rest of Australia. Previous research by Professor Alan Clough's group, working closely with Indigenous populations as partners, demonstrates that reducing Indigenous smoking and harm from tobacco smoke is achievable, and continued government investment is justified.

National Heart Foundation Vanguard Grant: 'Top End' Smoke-free Spaces Project

The 'Top End' Smoke-free Spaces Project works alongside Indigenous collaborators, and is in the process of designing an intervention to encourage smoke free homes in remote

communities. The effects of incentives for householders combined with managing and monitoring indoor second-hand smoke exposure will be evaluated.

"Professor Clough's research into creating smoke-free spaces in Indigenous communities addresses a big health issue and should benefit the most vulnerable – children and the elderly, who are being exposed to passive smoking."

Stephen Vines, Heart Foundation Queensland CEO

Arnhem Land Progress Association (ALPA), Aboriginal Resource and Development Services (ARDS) and JCU 'Smoke-free Spaces Project'

The project is aimed at assisting and supporting households in Northern Territory Indigenous communities to create and extend smoke-free homes and areas. ALPA, ARDS,

and JCU will initially collaborate with three communities to understand how residents see second-hand smoke exposure and associated health risks. Two ARDS community engagement teams, each with extensive bilingual skills and experience in ARDS' Discovery Education Methodology, will then work with community leaders and households to develop effective explanations and support community-inspired ideas derived from cultural expectations and rules for the creation and expansion of smoke-free spaces.

(ICAN) QUIT in Pregnancy project

AITHM will host the (ICAN) QUIT in Pregnancy project in northern Australia and manage the Queensland and Northern Territory sites in collaboration with teams based at the University of Newcastle.

Based on a decade of work co-developing smoking cessation strategies with Aboriginal Community Controlled Health



Organisations, the (ICAN) QUIT in Pregnancy project resources have been specifically developed to be a health promotion platform for Aboriginal communities as they draw on the knowledge and expertise of the community.

Tackling chronic cardiovascular disease in the Tropics

Cardiovascular disease is prevalent in the Tropics, severely limiting the quality of life of sufferers and placing a heavy strain on ill-equipped health systems. AITHM research aims to reduce the burden of such diseases through strengthening health systems, building workforce capacity and developing effective therapies designed to make a significant difference both at an individual and community level. Research led by Professor Jonathan Golledge and the team at the Queensland Research Centre for Peripheral Vascular Disease (QRCVPD) is investigating potential drug and behavioural therapies to effectively treat patients suffering from Peripheral Artery Disease (PAD) and AAA.

The impact of behavioural counselling on PAD sufferers

PAD is the third most common form of atherosclerotic cardiovascular disease in the world. It carries a high social and human impact, significantly reducing the quality of life for sufferers. The WHO states that the prevalence of PAD in low income countries necessitates urgent action.

New research by the QRCVPD will study the efficacy of behavioural counselling provided by allied health professionals to promote physical activity among people with PAD, with the aim of developing an effective approach for health systems to manage the problem.

Physical activity is highly recommended for patients with PAD, and can improve quality of life by increasing walking capacity, and reducing pain, cardiovascular events, and the need for surgery. Professor Golledge and Clinical Researcher Lisan Yip will examine the impact of combined face-to-face and telephone counselling sessions, which encourage patients to participate in physical activity over a three month period. The specific purpose of the trial is to evaluate the efficacy and cost-effectiveness of brief behavioural counselling for common cardiovascular diseases which pose a significant burden.

New modelling needed to develop therapeutic approaches to manage PAD

Currently there are no drugs specifically aimed at managing PAD in patients who are unlikely to benefit from intervention approaches. While there is significant interest in new therapeutic approaches, the challenge for researchers remains the inability to translate the results of pre-clinical animal trials to human patients. Professor Golledge, AITHM Senior Research Scientists Dr Joe Moxon and Dr Smriti Krishna, and the QRCVPD team, have examined the problem and found that there needs to be more representative models to evaluate therapies that could potentially translate to clinical practice.

Drug therapy to treat abdominal aortic aneurysm

AAA is a silent killer and an important cause of sudden death in older people for which there is currently no drug treatment. The condition kills about one thousand Australians every year without warning through a weakening and widening of the main abdominal artery, which upon rupture often results in death. To date, no

medication has been found to effectively treat the condition with surgery the only option. QRCVPD researchers have joined an international effort to find an effective therapy to treat the age related degenerative disease, which is present in five per cent of men and one percent of women over the age of 65.

Professor Golledge and Dr Corey Moran along with other members of the QRCVPD team are participating in an international trial to examine the potential of Telmisartan, a drug used to combat high blood pressure, to treat patients with AAA. QRCVPD has also published research investigating the impact of anti-coagulants on inhibiting the growth of aortic aneurysm in animal models. The team found that the anti-coagulant reduced the severity of aneurysm in mice, suggesting the inhibition of coagulation factor FXa/FIIa may be a potential therapy for limiting AAA.

Preventing chronic disease through improving primary care pathways and practice in resource poor settings

AITHM research is working to combat the enormous human and economic cost of chronic disease on Indigenous populations in Australia, and on communities across the Tropics. Chronic disease including type 2 diabetes, heart, liver and renal disease, obesity, hepatitis and depression are increasingly common across transitional populations in northern Australia and throughout the region. They place increasing pressure on chronically weak health systems and come at a huge personal, economic and social cost for those living in the Tropics. AITHM research is focussed on not only tackling chronic disease at the patient level, but also on ways to develop and strengthen health systems and build workforce capacity to address the problem at a community and, more broadly, at a national level.

In 2016, AITHM's senior researcher in public health medicine, Professor Robyn McDermott led a number of key research projects

focused on preventing chronic disease through improving primary health care pathways and practice in resource poor settings. Professor McDermott and her research colleagues, in collaboration with a range of local, state and national institutions and rural/remote and Indigenous communities, with the Centre of Research Excellence Prevention of Chronic Conditions in Rural and Remote High Risk Populations, have been undertaking research in rural and remote communities to improve the management of chronic disease and health care systems along the care continuum.

The team is investigating community and health service based strategies such as obesity prevention, nutrition improvement to prevent the onset of chronic diseases such as diabetes, and renal and cardio vascular disease in healthy adults and children.

Diabetes and its complications pose a significant burden on health care systems. Indigenous Australians record a disproportionately high level of diabetes, are more likely to develop diabetes at a younger age, have higher rates of hospitalisation, and mortality rates from the disease are seven times higher than among non-Indigenous Australians. AITHM research is examining novel approaches to build capacity within health systems to address the problem at a community level.

Developing a simulation model to improve cardiovascular disease risk prediction and treatment.

Funded by NHMRC in conjunction with the University of Melbourne, and the Apunipima Cape York Health Council, Professor McDermott and her team from the Centre for Chronic Disease Prevention (CCDP) are building a simulation model to get better measures of risk of heart disease and premature death. This research is based on a large linked cohort of 2800 Indigenous adults from north Queensland remote communities, which looks at reasons for the excess cardiovascular risk in this group.





By developing a better understanding of the risks of chronic disease, AITHM research will enable health systems to better target workforce capacity to tackle the problem of chronic disease at its roots.

Designing culturally-based physical activity interventions to prevent obesity in Indigenous populations.

With support from the North Queensland Health Foundation (NQHF) and Apunipima Health Council, researchers are evaluating a culturally tailored eight week physical activity intervention among Aboriginal and Torres Strait Islander adults in rural communities. Overall levels of physical activity and step counts, metabolic markers, perceived quality of life and other health behaviours and outcomes are measured before, immediately, and one week after the intervention.

Economic evaluation of Indigenous health worker management of poorly controlled type 2 diabetes in north Queensland

New research published by the CCDP team investigated the economic value of intensive management by Indigenous health workers of Indigenous adults with poorly controlled type 2 diabetes in rural and remote Queensland. It was proposed that providing health workers with close linguistic and cultural links could play an important role in contributing to better health outcomes.

The research investigated the cost of the intervention over an 18 month trial across 12 rural and remote Indigenous communities in north Queensland. It found that The Getting Better at Chronic Care trial program, which cost \$10K per person, had little impact relative to the cost of the intervention. The research determined that there needs to be further exploration of approaches to improve chronic disease outcomes amongst this

unwell population, including holistic approaches that address the complex psychosocial, pathophysiological and environmental problems in highly disadvantaged populations.

Could worms help in the fight against type 2 diabetes?

Along with developing and strengthening health systems to combat the rampant increase in type 2 diabetes among Indigenous populations, AITHM researchers are also examining new therapeutic approaches to tackle this debilitating disease. The CCDP team has examined the role worm infections may play in reducing the instance of metabolic syndrome and ultimately type 2 diabetes. Metabolic syndrome is a clustering of three of five medical conditions that can lead to diabetes and cardiovascular disease, all of which place an enormous burden on health systems around the Tropics. In a bid to find new strategies to prevent or delay the onset of type 2 diabetes, Professor McDermott's team has conducted a review of the impact of helminth infections on metabolic outcomes in humans. Research has already established that helminth infection can play a role in modifying autoimmune and allergic diseases. Professor McDermott's findings suggest infection could also improve metabolic outcomes and prove a step forward in the battle against diabetes.

New diagnostics for allergies

Allergy has emerged as a major public health problem in both the developed and developing world over the past century, and is as prevalent in the Tropics as elsewhere in the world. Allergies affect nearly one billion people worldwide and cost \$9B a year to manage in Australia alone. Severe allergy can lead to impaired quality of life, and can be fatal. The economic impact of allergy is also felt in communities through lost productivity among workers. AITHM is taking a multi-pronged approach to tackling the problem with research focused on improving diagnosis and developing treatments for inflammatory responses in immune systems that lead to allergic reactions, which will enable health systems to better target the problem.



A new approach to allergy testing in Australia

Allergy testing in Australia has lagged behind the rest of the developed world with the ability to easily and effectively screen for a wide range of allergies hindered by the lack of a simple broad spectrum finger prick test. An AITHM research team led by Professor Andreas Lopata, in collaboration with Westmead Children's Hospital and Murdoch Children's Research Institute in Melbourne, is working to develop Australia's first wide spectrum finger prick allergy test using assay microarray, which would prove a huge leap forward in allergy tests in Australia, building testing capacity and ensuring resources are better targeted to tackle the problem.

The test provides comprehensive results diagnosing more allergies while at the same time proving significantly less invasive for children being tested. Assay microarray tests have been used extensively in Europe, and the research team is investigating if such a test could be proven effective in an Australian setting. If successful, the test would prove to be an excellent substitute for current methods. Requiring 200 times less blood than current tests, it is hoped it will provide an easy to administer, highly specific test covering more and providing faster and more accurate results.

AIP-2 protein successful in suppressing asthma

In 2016, AITHM has continued to expand its world leading research into hookworm protein as a potential treatment for inflammatory diseases. New research by the Institute's Dr Severine Navarro has found a protein secreted by hookworms, the AIP-2 protein, suppresses asthma in mice and shows promising results as a treatment for allergies in humans.

The work builds on previous AITHM research into possible treatments for IBD using hookworm secretions. Although very different diseases, both Asthma and IBD have a common defect in the regulation of the immune system, which results in overwhelming inflammatory processes. The researchers have since found that the hookworm proteins can promote regulatory T cells and suppress pro-inflammatory processes, protecting the gut and other organs such as the airways in the case of asthma.

The study tested a recombinant form of the AIP-2 protein on both mice and human cells. Mice treated with the worm protein showed an extensive suppression of inflammation after exposure to an allergen. The protein was also tested in vitro on human cells from people allergic to dust mites, a common asthma trigger. The research represents an important step forward in the exploration of therapeutic potential of hookworm protein and the development of a pill based treatment for chronic inflammatory and autoimmune disease.



INTERSECTION BETWEEN INFECTIOUS AND CHRONIC DISEASE

Patients with immune systems weakened by infection and malnutrition are more likely to go on to develop chronic diseases, such as cardiovascular disease or diabetes, while those with immune systems compromised by chronic illness are far more susceptible to infection than healthy individuals. AITHM research is increasingly focused on this intersection, or 'double burden', of chronic and infectious disease, which has a devastating impact across our region, especially among populations and health systems least able to cope. This 'double burden' is prevalent among the world's most socially and economically disadvantaged communities around the Tropics and comes at an enormous cost. It can be devastating for patients and their families, places huge economic pressure on individuals, families and communities, and poses a serious problem for already strained, and poorly developed health systems.

AITHM research focuses on how best to manage the burden on patients, while strengthening and building workforce capacity in struggling health systems, targeting resources where they are most effective in combating the problem.

The Institute's researchers examine the complex interaction between chronic and infectious disease, and the differing patterns of prevalence between climatic zones, racial groups and between urban and rural and remote populations. The research has a particular focus on those diseases which are endemic in our region, including diabetes, TB, heart disease and rheumatic heart disease. A main focus for AITHM in this field is how best to develop and support health systems capable of coping with the problem.

Mobile phones target TB and diabetes in Papua New Guinea

Following a successful AIITHM Capacity Building Grant, lead researcher Associate Professor Usman Malabu leveraged his initial results and secured a further US\$228K from the World Diabetes Foundation to train health care providers in PNG to diagnose and treat diabetes and TB with the help of mobile phones.

Both TB and diabetes are often silent killers, and it's important to address both diseases in tandem as you are three to four times more likely to develop TB in its severest form if you already have diabetes. PNG has one of the highest prevalence of TB in the world, with figures suggesting in some provinces it's more than 500 cases per 100,000 people per year.

People may not know they have the disease and once complications occur it may be too late to access treatment. Using mobile technology, this project will train local health care professionals to screen and identify which patients need close care. After medications are prescribed the mobile app will remind the patients to take their recommended doses, what to do if they miss a dose, and when to attend follow up clinic appointments. AIITHM's focus on managing TB amongst Australia's closest neighbours is part of its contribution to support better healthcare for people in the Tropics as well as reducing the spread of the disease.

The risk of severe infection in Indigenous adults is significantly increased by chronic conditions

Research has already established that Indigenous Australian adults are hospitalised for infection at a significantly higher rate than their non-Indigenous counterparts, placing a heavy human and financial toll on communities. AIITHM research led by Professor Robyn McDermott is working to address the double burden of infection and diabetes, which will help streamline the delivery of health services and build workforce capacity at a community level.

New research published by Professor McDermott demonstrates that the rate of hospitalisation for infection among Indigenous adults is greatly exacerbated by the presence of diabetes. Professor McDermott found that Indigenous adults with diabetes are twice as likely to be hospitalised for infection as Indigenous adults without diabetes, most likely for urinary tract infections, cellulitis or septicemia. Of those hospitalised, the length of stay for patients with the underlying chronic illness was almost twice that of those without diabetes, and recovery was much slower for patients with diabetes. The research suggests that early recognition and management of infection in patients with diabetes in the primary care setting may reduce the risk, and better control of glycaemia and its risk factors may improve the underlying immune dysfunction.

INTERSECTION BETWEEN CHRONIC AND INFECTIOUS DISEASE IN TROPICAL AUSTRALIA

Indigenous communities in northern Australia represent a relatively unique public health problem, where incidence of type 2 diabetes mellitus (T2DM) and infectious diseases approaches epidemic-type levels, hence more research is needed to identify the potential biological and lifestyle factors contributing to these epidemics.

A major project led by Professor Robyn McDermott, Dr Paul Giacomini, Dr Matt Field and Professor Alex Loukas has investigated associations between parasitic helminth infections and the prevalence of metabolic diseases such as T2DM and Metabolic Syndrome (MetS) in people living in remote Aboriginal communities of Northern Australia. Emerging evidence from the literature suggests that dysregulated metabolism may be a contributor to increased susceptibility to infections.

The research group's hypothesis is based on recent published findings about an Indigenous community in the Kimberley, in north Western Australia, where the presence of worm infections may protect against metabolic diseases by influencing the nature of immune responses. The group also hypothesised that the development of metabolic disorders is associated with alterations in the balance of good and bad bacteria in the intestine (the microbiota). The project involves parallel experimental animal model studies to define the protective role of worms and the microbiota in more detail and potentially identify the worm-derived molecules that might have an immune or metabolic regulatory effect.

The human study has incorporated the annual young people's health check in the Yarrabah community south of Cairns. As part of the study the research group collected demographic and medical history data, as well as biological material for use in exploratory studies. This includes serum and blood (for inflammatory and metabolic markers, as well as for detecting co-infections with bacteria, viruses or parasites), faeces and nasopharyngeal swabs (for microbiota analysis). The study involved 132 individuals from the community, and the serum, blood and demographic data have been received and entered into a database for statistical analysis. Tissue processing and gene sequencing for the microbiota analyses are in progress in collaboration with expert researchers from the South Australian Health and Medical Research Institute (SAHMRI).

The primary outcome of this research is to define whether the presence of specific

immune pathways, or bacterial species, is associated with protection against metabolic disease, or conversely, whether some immune parameters or bacteria are associated with a higher instance of metabolic diseases. While the data is still being analysed, the research group is undertaking a second young person's health check on Thursday and Mer Islands in the Torres Strait with a similar cohort, to see if the association between worms, bacteria and metabolic disease are conserved across distinct communities. The data derived from these ambitious studies will provide a unique and powerful resource for understanding the potential contributors for metabolic disease in northern Australian Aboriginal and Torres Strait Islander communities.

In parallel with these human studies, PhD student Zainab Agha has established an animal (murine) model of T2DM in the laboratory at AITHM Cairns. The project involves testing different species of parasitic worm to determine if infection can influence the progression of T2DM, and assess whether protection against diabetes involves a specific immune or microbiota pathway. Ms Agha has shown that two distinct species of worm, a hookworm like parasite and a whipworm-like parasite, both appear to reduce the severity of T2DM. These findings are consistent with previously published research and provides further evidence of the protective effects of worms, and the immune responses they elicit, in metabolic disease.

In addition to the live worm infection experiments, Ms Agha has also used the animal model to determine if specific molecules released by the worms have a similar protective effect. This novel research could potentially result in the identification of a therapeutic medication for metabolic disease, which would be far more acceptable and marketable than being infected with live worms. AITHM researchers have already conducted a preliminary experiment with a hookworm derived protein, and the data is currently being analysed. The research laboratory at AITHM Cairns is a world leader in identifying worm secretion molecules for inflammatory diseases, hence the team will have first access to a broadening portfolio of candidate molecules to test in this system.

HEALTH SYSTEMS

AITHM's health systems research brings together collaborations between researchers and health professionals to focus on improving models of health service delivery and increasing the health workforce capacity in tropical Australia and the region.

In conjunction with rural, remote, Indigenous and Pacific communities, AITHM is developing targeted research to improve access to healthcare, and improve health care delivery in these geographically remote communities.

Health economics shines light on true cost of health care

New research led by health economist Dr Emily Callander shows one in four chronically ill Australians is skipping healthcare because of high costs, providing clear data for government policy regarding out-of-pocket costs.

The study indicated that more than 40 per cent of people with depression, anxiety and other mental health conditions skipped healthcare treatment because of the cost. The study also found that more than one-third of people with asthma, emphysema and chronic obstructive pulmonary disease (COPD) could not afford the treatment they needed. This study is the first time comparisons had been made to estimate the relative amount of out-of-pocket expenditure between people with certain health conditions and people without a health condition, and how this affects access to care.

Poor health leads to income poverty

Research published by Dr Emily Callander demonstrated that developing chronic disease makes you more likely to fall into income poverty. Utilising five years of data,

gathered from 3,754 people across Australia, the study found that people who developed arthritis had an elevated risk of income poverty and an even greater risk of multidimensional poverty.

The purpose of this research was to examine the inverse of social determinants of health. Studying the living standards of people experiencing chronic disease is important, especially with conditions such as arthritis, as it is generally associated with morbidity rather than mortality and so the impact on people is best captured through the effect it has on their quality of life, which in this instance is particularly profound.

"As arthritis is an extremely common condition, especially in the elderly, it is likely an overlooked driver of poverty and that's an important area of research to dedicate more attention to."

Dr Emily Callander

Exploring the full cost of stillbirth

While acknowledging the heartbreaking emotional toll of stillbirth, AITHM's Health Economics team, led by Dr

Emily Callander, is looking at the full economic cost of the tragedy. The team will lead the Health Economics element of a new Centre of Research Excellence (CRE), based at the Mater Research Institute Brisbane. The team will evaluate the full economic cost of stillbirth and the economic implications of reducing it.

Stillbirth rates in Australia and New Zealand have remained steady for some time, with approximately 3000 babies being born still each year. This project will assess the economic impact of stillbirth, not only to the parents and family of the infant but also to the community, as sadly, the child will not have the opportunity to contribute to society. The quantification of these extended costs is essential for the robust design of economic evaluations of interventions to reduce stillbirth, which seek to include the costs of stillbirth when considering the benefits new treatments can produce.

This is particularly relevant in northern Australia, as stillbirth is more prevalent in Aboriginal and Torres Strait Islander populations. This funding will enable the Health Economics team to build capacity with an additional PhD student and a research assistant, who will become specialists in the health economics of stillbirth, with further collaborations with clinicians in this field.



Telehealth monitoring in rural and remote communities

Associate Professor Sabe Sabesan, in collaboration with the Anton Breinl Research Centre for Health Systems Strengthening has developed a trial incorporating community telehealth monitoring in an effort to reduce potentially preventable hospitalisations for high-risk people with chronic disease. The model uses telehealth technology in regional and remote locations to provide medical supervision arrangements. This enables regular checks of basic health indicators, observations and consultation via telehealth technologies, thus avoiding the need for patients suffering with chronic disease to travel large distances to visit their treating clinicians. The researchers are also trialling telehealth solutions to discuss smoking cessation with Indigenous cancer patients and their families.

Occupational Health and Safety research and black lung disease

In 2014, AITHM committed to the ARC Special Research Initiative to establish an Occupational Health and Safety (OHS) research unit in Mackay. This was consistent with AITHM's fundamental intent to undertake research of real health relevance, and particularly recognition of the importance of OHS to the region. The unit has rapidly become operational with new OHS recruits funded by the ARC. As a result AITHM has been well positioned to respond to the independent review into the re-emergence of black lung disease in Queensland, authored by Professor Malcolm Sim from Monash University and presented to the Queensland Minister for Natural Resources and Mines, Dr Anthony Lynham.

In collaboration with the JCU Research Centre in Mackay, AITHM aims to ensure researchers and clinicians can address the re-emergence of black lung disease. Outcomes from these collaborations will develop better assessment and diagnostic

processes, and better treatments and outcomes for those affected by the disease across Queensland and Australia.

The researchers aim to understand the current shortcomings of assessment processes, provide research aligned with the occupational health and safety remit, develop adequate healthcare guidelines, and improve health care delivery for the community.

The 'pharmacological tourniquet' – saving lives after massive internal bleeding

Internal blood loss is a major cause of death following traumatic injury and typically occurs within the crucial first hour before patients can receive lifesaving surgery. While major bleeding in extremities, such as arms or legs can be stemmed through the use of tourniquets, until now there have been few options to prevent abdominal bleeding.

Professor Geoffrey Dobson and Dr Hayley Letson have developed a world first 'pharmacological tourniquet', which when administered intravenously can treat shock and reduce abdominal bleeding by up to 60 per cent. This study was published in the prestigious journal *Trauma*

and *Acute Care Surgery*. The potentially revolutionary drug therapy has applications for both soldiers on the battlefield, and patients in regional and remote areas without immediate access to surgery.

The team has shown that a single small IV bolus of the fluid (ALM) over the first hour, followed by a stabilisation drip over the next four hours, reduced internal bleeding by up to 60 per cent. ALM resuscitates the body after hemorrhagic shock, reduces inflammation and protects vital organs including the heart and brain. As the fluid circulates around the body, it effectively kick starts the heart, raises blood pressure, and stops the blood thinning to reduce bleeding.

The treatment has extensive applications beyond the battlefield, providing first response treatment in mass casualty incidents and terrorist attacks, and has extensive pre-hospital applications around the region in tropical, rural and remote communities where access to surgical treatment is limited.

To help with translation into the field, the researchers have recently teamed up with trauma surgeons from the US Naval Medical Research Centre in San Antonio and the Trauma Team at the Denver Medical Center in Colorado.

CASE STUDY

HEALTH SYSTEMS STRENGTHENING, CAPACITY BUILDING AND KNOWLEDGE TRANSFER

The Anton Breinl Research Centre for Health System Strengthening (ABRC), a research centre at DTHM, has been researching health systems to improve equity in health care services for underserved populations, particularly rural, remote, Indigenous and tropical populations, and on training a health workforce with appropriate knowledge, attitudes and skills for this purpose.

Researchers have been working together to train an appropriate workforce in methodologies to effectively accomplish health system objectives. Enabled by an NHMRC project grant and an AITHM Capacity-Building Grant, Professor Sarah Larkins has led a team of researchers to understand 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 facilitate success and identify interventions that strengthen quality improvement. This project has secured funding, strengthened relationships and collaborations with key partners, and built research capacity amongst emerging Indigenous and non-Indigenous researchers. Much of the health systems research currently being undertaken is highly collaborative. The more input from target communities early on in the development of interventions, the more likely they are to be both cost effective and sustainable.

The ABRC continues to work with Queensland Health to roll out a low cost oral health promotion program in rural schools which brings together education and community health services in remote communities to increase access to oral health promotion. The ABRC has also submitted a funding application in collaboration with cancer researchers to establish a network of clinical trials that include remote centers with telemedicine support, which will leverage AITHM and

JCU funding support. AITHM is supporting research to evaluate the effectiveness of the telehealth models as they're rolled out, examining their safety, health outcomes and cost, in a bid to improve the design of the telehealth model.

ABRC researchers are working closely with AITHM's Health Economics unit, which has played an important role in building capacity in health systems research in north Queensland. Work led by Dr Emily Callander at AITHM, along with Professors Sabe Sabesan and Sarah Larkins investigates the additional impact of healthcare expenditure on access to care, and the compounding effect that high out-of-pocket costs have when combined with low income and poor labour force participation. This research will improve AITHM's future research capacity, and provide a much needed economic focus to improve public health interventions in northern Australia.

In conjunction with other AITHM researchers, notably Professor Emma McBryde, researchers from the ABRC including Professor Maxine Whittaker, Dr David MacLaren, Dr Karen Carlisle, Professor Sarah Larkins and PhD candidate Mr Humpress Harrington are partnering with Ministries of Health and other partners in Fiji and the Solomon Islands in work to strengthen capacity in implementation research around surveillance and response to communicable diseases.

ENABLING DISCIPLINES

In 2016, AITHM has continued to build and strengthen its capacity to support cutting edge research in line with its dedicated aim of solving major health problems in tropical Australia, South-East Asia, the Pacific and the Tropics worldwide. Leaders in enabling disciplines support research teams, and state-of-the-art facilities at AITHM, has continued to bolster the Institute's research teams to further develop their scope. The use of Big Data to streamline projects, and support from leading genetic and genomic research scientists is fundamental to the Institute's research into infectious and chronic diseases across the Tropics. Specifically, AITHM has focused on providing genotyping, transcriptional profiling deep sequencing and bioinformatics knowledge and expertise to researchers. This bioinformatics support provides new and enhanced research capacity, reduces information gaps and increases researcher efficiency by improving scalable workflows and automation.

As AITHM's research progresses, support and enabling work will continue to be in high demand, providing vital evidence for research teams. The recruitment of Senior Research Fellow in Bioinformatics, Dr Matt Field, has significantly enhanced the Institute's strength in this area. Dr Field's work has typically focused on the development of flexible and scalable bioinformatics workflows with a focus on reproducibility. A key development has been the creation of a bioinformatics network throughout AITHM and across Australia, embedding bioinformatics into research teams linked to the national agenda. His work provides important new research capacity for the Institute.

Also key to growing capacity in this area has been the continued development of AITHM's Biobank, which supports and enhances the Institute's ability to store and use biological samples.



Bioinformatics – using ‘Big Data’ to support health research

The biological sciences have entered a data-rich era due to the decreased cost and increased volume of sequence data. AITHM is leading the way with the development of in-house bioinformatics expertise to enable our researchers to incorporate cutting-edge bioinformatics methodologies in their projects. Bioinformatics as a field combines computer science, mathematics, biology and statistics to interpret and understand large biological data sets. Bioinformatics research is widely applicable across a variety of central AITHM research areas such as medical research, immunology, and microbiology. Bioinformatics uses techniques such as data mining, statistics, data-curation and analysis by utilising custom computer programmes designed to extract meaningful biological results from large data sets.

In 2016, Dr Matthew Field joined AITHM, to develop and provide innovative systems to support the Institute’s research. AITHM has active research projects across a wide variety of bioinformatic research areas such as microbiome, transcriptomics, and genomics and Dr Field is developing in-house analysis pipelines to support these projects. A large number of active AITHM research projects are studying the effect of the human microbiome on human health and Dr Field has developed in-house support for this analysis. Dr Field’s work will ultimately develop a complete microbiome workflow interface giving researchers access to the latest methodologies, developed specifically around the needs of AITHM projects, giving them a significant competitive advantage in their microbiome analyses.

Biobank establishment

Bio-medical research into human diseases requires large volumes of samples, reflecting the diversity of human populations. Biobanks are recognised as the optimal structures for storing human biological samples, from both ‘healthy’ people and those linked with disease diagnosis, while meeting the stringent legal and ethical requirements which guarantee human rights.

The establishment of a Biobank is vital to the research and training capacity of AITHM. The facility supports the work of AITHM’s priority research areas, including across both infectious and chronic diseases, and facilitates new research within these areas, and with external research institutions.

Once fully operational, AITHM’s Biobank will provide greater opportunity for samples to be used for cross-disciplinary research between groups to address health issues in the Tropics. The biobank has been strategic in providing leverage for generating projects for AITHM research groups which will, in turn, increase the utility of the biobank and further capacity.

External engagement and partnerships have been pivotal to the development of the AITHM Biobank. A solid partnership with the TAAHC initiative enables the Biobank as an available in-kind resource for participating health and hospital service members.

Active collaboration is also underway with the Sunshine Coast Hospital, to use the AITHM Biobank facility. Further, staff from the Baker IDI Heart and Diabetes Institute working with communities are currently collecting samples on Palm Island for Indigenous health that will use AITHM facilities for processing, leading to further links with research institutes that work on Indigenous health issues.

To date, the Biobank project has completed the physical infrastructure to establish a cold storage biobank, and resources include physical and software programs. Ethical approval for Phase 1 of the AITHM Biobank was obtained in February 2017, and recruitment of participants from the general community can now commence. This will include those already involved in AITHM projects, healthy controls and people belonging to specific groups which may be of future interest for AITHM research. Approval also covers the possibility of rolling over current samples, held within individual research groups, into the Biobank.

Queensland Health sites require Site Specific Approvals (SSA) before recruitment can begin. The SSA application is underway for the Townsville Hospital and Health Services, with others to follow as required. Research agreements between participating institutions and JCU must also be completed.

Phase 2 of the AITHM Biobank, will specifically involve Aboriginal and Torres Strait Islander communities. Extensive engagement with these communities has begun, with community support necessary before an application for approval of this phase. Critical work is underway with Townsville Hospital’s Indigenous Liaison unit and the National Centre for Indigenous Genomics (NCIG) to ensure individual and community consent is sought for research work, and to establish policies and procedures for the ethically acceptable collection, storage and use of biological material collected from Indigenous communities.

COLLABORATION

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 that strengthen health systems. AITHM also engages in a number of key international organisational collaborations, including the World Health Organization (WHO) Collaborating Centre on Lymphatic Filariasis, Soil-transmitted Helminths and other Neglected Tropical Diseases, the Asia Pacific Malaria Elimination Network, Roll Back Malaria, and a range of Department of Foreign Affairs and Trade (DFAT) initiatives.

Examples of AITHM's key partnerships are depicted below, with the numbers representing the quantity of current AITHM collaborations in these locations.

Australasia

Queensland	96
Northern Territory	6
Western Australia	13
New South Wales	24
Victoria	29
South Australia	5
Australian Capital Territory	2
Tasmania	1
New Zealand	7

Europe

Great Britain	7
Germany	3
Austria	3
Switzerland	4
Spain	2

The Netherlands	7
Portugal	1
Italy	2
France	1
Bulgaria	1
Norway	1
Denmark/Greenland	2
Sweden	1

Asia/Pacific

Papua New Guinea	12
Philippines	1
Fiji	5
Solomon Islands	7
Vietnam	1
Indonesia	3
Thailand	5

Malaysia	3
Taiwan	1
Samoa	4
China	1
Cambodia	1
Laos	1
Timor Leste	3
Japan	2

South America

Brazil	2
Mexico	1

North America

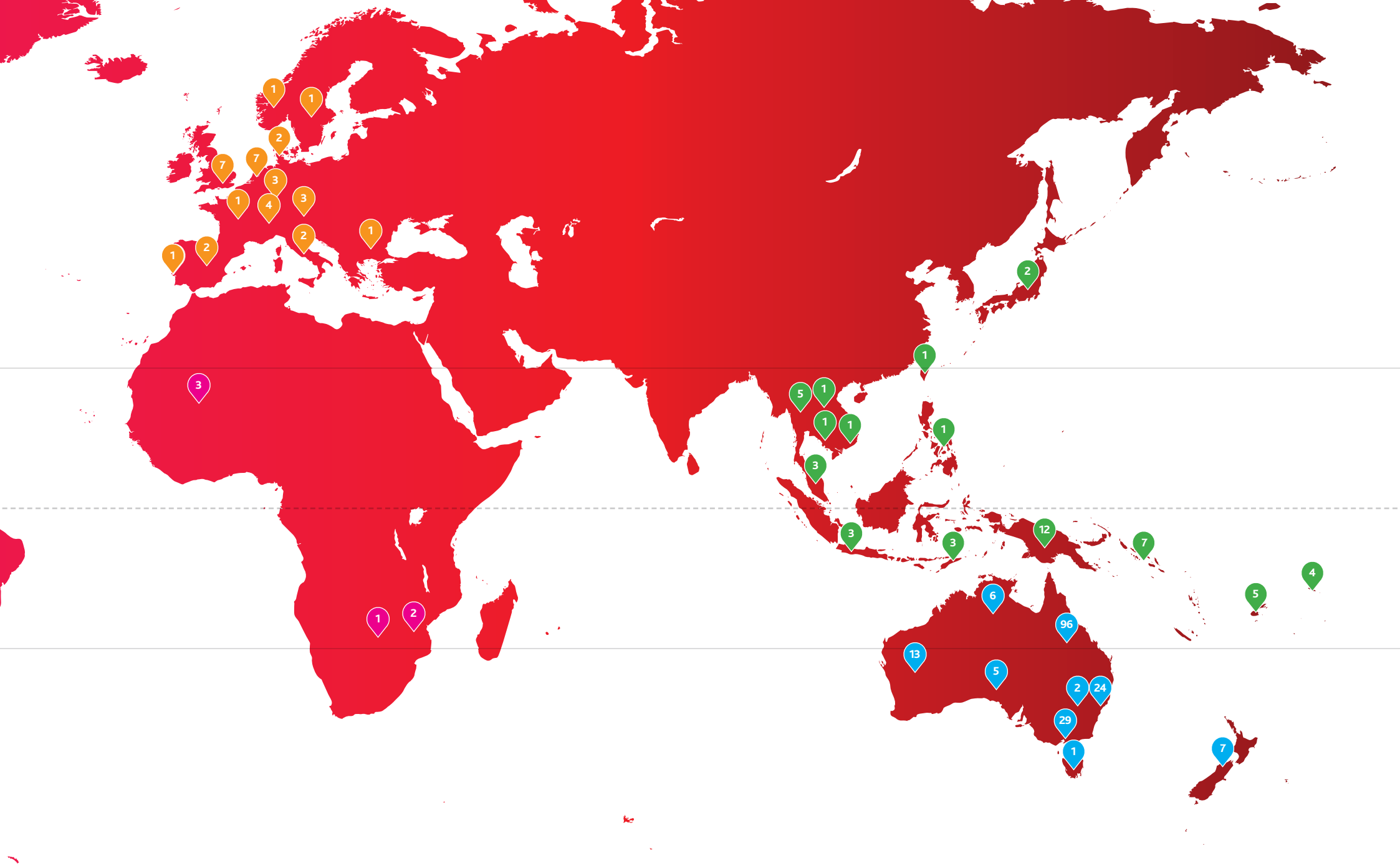
Washington State	5
Michigan	5
Marlyand	3

Washington DC	2
California	2
Ohio	1
Oklahoma	1
Texas	1
Florida	1
North Carolina	1
United States other	8
Canada	4

Africa

Mali	3
Mozambique	2
Zimbabwe	1

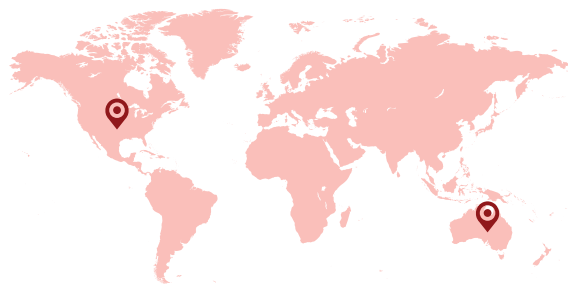




AITHM COLLABORATIONS

Some examples of AITHM's key collaborations in 2016 are indicated below:

Developing a vaccine for malaria



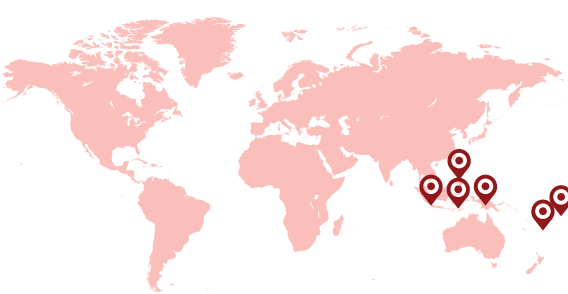
📍 Melbourne: Victoria, Durham: North Carolina, Baltimore: Maryland, Townsville: Queensland, Seattle: Washington State, Boulder: Colorado, Rockville: Maryland

Along with TB and human immunodeficiency virus (HIV), malaria remains one of the most serious infectious diseases of humanity and is a common and life-threatening disease throughout the Tropics. The WHO estimates that there are more than 100 countries and territories where there is a risk of malaria transmission, which poses a threat to Australia's biosecurity. AITHM is playing a significant role in developing two distinct vaccine platforms aimed at eradicating malaria. AITHM Director, Professor Louis Schofield is working in collaboration with researchers and pharmaceutical companies both in Australia and around the world to develop broad spectrum vaccines effective against most life stages of the various different strains and species of human malaria. Funded by the Bill & Melinda Gates Foundation, the Australian Tropical Medicines Commercialisation Fund and various NHMRC grants,

including NHMRC Development Grants, the current investment of \$5.5M supports national and international academic and industry collaboration including researchers from AITHM, the Walter and Eliza Hall Institute of Medical Research (WEHI), Queensland Institute of Medical Research-Berghofer (QIMR), QPharm, Duke University, the United States National Institute of Health, John Hopkins School of Medicine, Seattle Biomedical Research Institute, Corden Pharma SA and Fina BioSolutions LLC. A clinical trial of one vaccine candidate is due to start late 2017.

for Australia's near neighbours. It aims to provide the region with a stronger health system surveillance and response capacity to support timely, effective responses to emerging and existing infectious disease threats, including TB and Zika virus. The work will strengthen the capacity of countries for early warning, risk reduction and management of national and global health risks that help the countries meet their International Health Regulation (IHR) requirements in surveillance, laboratory capacity, planning and governance to prevent disease threats.

Partnerships to tackle infectious diseases in the Tropics



📍 PNG, Samoa, Fiji, Phillipines, Timor L'Este, Indonesia

AITHM's Professor Emma McBryde is leading a collaboration to help prevent disease epidemics in the Asia-Pacific region. The program of research will provide expertise in strengthening partnerships and workforces

Drug therapies to treat cardiovascular diseases: Abdominal aortic aneurysm

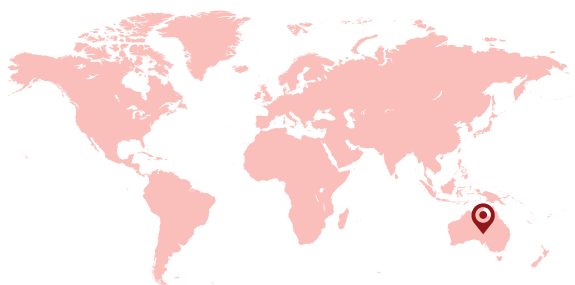


📍 Perth: Western Australia, Brisbane: Queensland, Adelaide: South Australia, Melbourne: Victoria, Townsville: Queensland, Leiden: Netherlands, Stanford: California

AITHM researchers are leading way in the battle against the 'silent killer' abdominal aortic aneurysm (AAA), a degenerative age related disease which kills about 1,300

older Australians each year. Professor Jonathan Golledge and his team at the QRCVPD, are collaborating with international medical researchers on a trial to assess a new therapy for arterial weakening using Telmisartan in the management of AAA. The \$1.169M NHMRC funded collaboration includes researchers from the University of Western Australia, University of Queensland, Baker IDI Heart and Diabetes Institute, Stanford University, University of Adelaide, Monash University, JCU Discipline of Public Health and Tropical Medicine and Leiden University.

Combating smoking in Indigenous communities

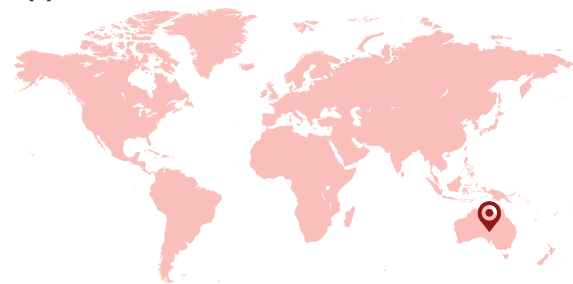


📍 Newcastle: New South Wales, Townsville: Queensland

Smoking remains a scourge in Indigenous communities throughout Australia, poses significant health risks to both mother and baby during pregnancy, and places a heavy burden on local health systems. AITHM's Professor Alan Clough, in collaboration with researchers from the University of Newcastle and the Hunter New England

Health Service, are working on programs to reduce the instance of smoking among pregnant women in Indigenous communities. The \$2.3M NHMRC Global Alliance for Chronic Diseases 'Indigenous Counselling and Nicotine (ICAN) QUIT in Pregnancy' project includes a cluster of randomised trials to implement culturally competent evidence-based smoking cessation for pregnant Aboriginal and Torres Strait Islander smokers.

Preclinical trials of the therapeutic applications of hookworm secretions

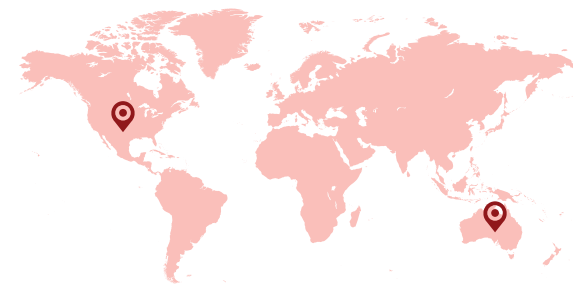


📍 Cairns: Queensland, Sydney: New South Wales

AITHM research has established the anti-inflammatory benefits of hookworm secretions in treating a range of chronic illness and allergies. Professor Alex Loukas and Senior Research Fellow Dr Severine Navarro from AITHM are collaborating with Janssen Cilag Pty Ltd on pre-clinical development of Ac-AIP-2 protein from hookworm. AITHM has expertise in the constitution of the hookworm-derived protein and its possible applications, while Janssen has expertise in the pharmaceutical and biopharmaceutical

business, and in particular has expertise in relation to immunological disorders such as Inflammatory Bowel Disease (IBD). The collaboration will explore additional research and development activities regarding the therapeutic application of the Ac-AIP-2 protein.

Reducing haemorrhage and traumatic brain injury



📍 Townsville: Queensland, Denver: Colorado, San Antonio: Texas

Professor Geoffrey Dobson and Dr Hayley Letson from AITHM are working in collaboration with The United States Department of Defence to further develop a Fluid Resuscitation and Stabilisation Drip for Uncontrolled Haemorrhage and Traumatic Brain Injury. The \$694K project investigates improved survival associated with improved cardiac function, reduced inflammation, less coagulopathy and fewer secondary complications. The 'ALM' therapy, consisting of adenosine, lidocaine and magnesium, has the potential to save lives and reduce morbidity on the battlefield by buying time for treatment, stabilisation and preparedness of casualties

for safer evacuation. The study also has broad-spectrum public purpose for pre-hospital trauma and aeromedical transport, especially in remote areas around the region. To help with translation into the field, the researchers have recently teamed up with trauma surgeons from the US Naval Medical Research Centre in San Antonio and the Trauma Team at the Denver Medical Center in Colorado.

Tropical disease – immunity, pathogenesis and vaccine development: global translation

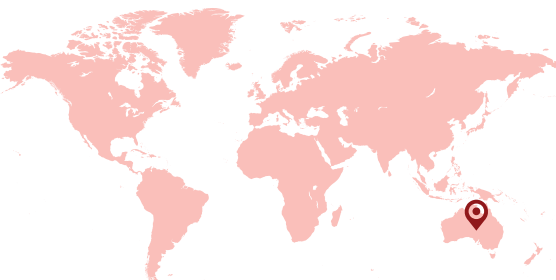


📍 Brisbane: Queensland x 4, United Kingdom, the Netherlands, Italy, Papua New Guinea, Malaysia, Indonesia, Thailand, Mali, Mozambique, Brazil, Spain

AITHM Professors Denise Doolan and Alex Loukas are participating in a large multi-national program to define the impact of infection on the host immune response. The program uses both standard and unique animal models and unrivalled access to controlled human experimental infections, clinical trials and longitudinal field studies. The \$17.1M program is being run in collaboration with

researchers at Griffith University, QMIR Berghofer Medical Research Institute, the Menzies Health Institute, University of Queensland, and researchers in the United Kingdom, the Netherlands, Italy, Papua New Guinea (PNG), Malaysia, Indonesia, Thailand, Mali, Mozambique, Brazil and Spain.

Tropical Australian Academic Health Centre (TAAHC) partnership



📍 Townsville: Queensland, North Queensland

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 one of the first academic health centres to focus on tropical health, Indigenous health, and health service delivery in regional, rural and remote settings.





REGIONAL WORKFORCE DEVELOPMENT

AITHM is actively positioning to lead initiatives to shape investment in new knowledge-based industries, recognising that tropical health and medicine is a rapidly developing area of competitive advantage for Australia. AITHM's Director, in collaboration with Professor Ian Wronski and senior staff within the Division of Tropical Health and Medicine, have shaped a number of proposals for state and federal politicians to highlight the significant opportunity to develop products and services in tropical health, including workforce development, for export to the growing economies of Asia. This activity leverages Professor Ian Wronski's leadership in establishing an Asia Pacific Economic Cooperation (APEC) Tropical Health Workforce Hub, through his position as a Board Member of the APEC Life Sciences Innovation Forum.

AITHM's Anton Breinl Centre for Health Systems Strengthening reflects JCU's significant expertise in rural, remote and Indigenous health workforce development, including clinical generalism,

innovative extension models, population health competencies, smart use of technology (including telehealth), lean and networked systems of delivery, and health systems management and leadership capabilities relevant to low-resource and underserved contexts. These priority themes for healthcare delivery and workforce innovation are closely aligned to those of our regional neighbours, who are striving to build health workforce teams capable of meeting changing patterns of disease and health care demand, in service to universal health care goals.

AITHM's work to position and grow health workforce innovation, training, research and mobility as an export industry builds on this expertise and capacity. It also provides an opportunity for AITHM to design and lead a series of projects and initiatives which address significant local and Asia Pacific challenges in health workforce development, composition, distribution and systems.

BUSINESS DEVELOPMENT, COMMERCIALISATION, INNOVATION AND RESEARCH

A major area of focus for AITHM is dedicated to research that seeks to move from basic science through to translation, commercialisation and impact.

AITHM's governing boards incorporate senior hospital and health service staff and representatives from other key stakeholders, facilitating transfer of AITHM research findings into beneficial outcomes.

AITHM, with JCU, is a member of the Medical Research Commercialisation Fund. This investment collaboration supports early stage development and commercialisation opportunities from Australian medical research institutes and allied research hospitals.

AITHM also maintains close relationships with governments and non-government organisations and AITHM research closely informs the development of health policy and other key initiatives, such as the Northern Australia Development Agenda.

In 2016, AITHM made five invention disclosures to the Innovation and Commercialisation team at JCU. These inventions resulted in new Intellectual Property (IP) being disclosed. Potential IP protection strategies and patent applications are currently being pursued for some of these inventions. A number of these inventions are also being marketed under confidentiality to potential industry partners with a view to further engagement with these partners to further collaborate or receive investment and progress these new technologies to the market.

Malaria vaccine development

Malaria is the third most serious infectious disease among people around the world, and is a particular scourge in the Tropics. A vaccine is urgently required and could prove a billion dollar proposition. In late 2015 AITHM Director, Professor Louis Schofield received a \$2.8M grant from the Bill & Melinda Gates Foundation to pursue the pre-clinical development of a broad spectrum vaccine designed to overcome the five malaria parasite species. These parasites are complex and hard to target with 11 distinct life stages, each with multiple redundant strategies for survival in the host.

A novel approach to treating inflammation using hookworms

Ulcerative Colitis (UC) is an inflammatory disease which primarily affects the colonic mucosa leading to bouts of bloody diarrhoea, abdominal cramps, and fever. AITHM researchers have developed an anti-inflammatory biologic to treat UC as well as other inflammatory diseases.

This 'first-in-class' biologic targets the underlying disease condition and has the potential to be disease modifying, unlike most current therapies which address only the symptoms of the disease. The researchers are seeking investment to enhance the preclinical data package and conduct further toxicology and safety trials in mice before progressing to clinical trials.

Immunotherapeutics for food allergy

Food allergy is a major public health problem, affecting 8 per cent of children and 10 per cent of infants and is estimated to impact 500 million people worldwide. Some food allergies, including peanut, fish and shellfish are not outgrown in adulthood and can cause life-threatening reactions. There are no currently approved medical therapies to cure food allergies or prevent the effects of allergy. In particular for fish and shellfish allergy, there are no therapies in development.

AITHM researchers are developing hypoallergenic proteins and immunopeptides using bio-molecular and immunological techniques to down-regulate the immune response to allergenic proteins. Use of such hypoallergenic proteins or peptides as immunotherapeutics allow those allergic individuals to slowly become tolerant to fish or shellfish overtime.

AITHM is working towards developing hypo-allergenic variants of these proteins for pre-clinical trials and is looking to partner with biopharmaceutical companies to progress the development of hypoallergenic proteins and immunopeptides.



Using peptides to accelerate wound healing

Chronic wounds, such as diabetic ulcers, contribute to high mortality rates and are a significant expense in the health system. Novel growth factor-based active peptides developed by AITHM show great promise in accelerating wound healing in punch-biopsy animal experiments.

These novel therapeutic peptides show significant acceleration of wound closure versus the market-leading product and have the potential to be 'best in class' therapeutics for both chronic and surgical wound models.

New paradigm in anti-inflammatory therapeutics

AITHM is seeking to partner with biotechnology or pharmaceutical companies to discover and develop hookworm-derived small molecules as an entirely new generation of anti-inflammatory therapeutics. The goal is to develop small molecules derived from hookworm secretions that suppress inflammation by promoting regulatory responses, notably the expansion and mucosal homing of regulatory T cells.

The market for inflammatory disease therapeutics is enormous, and growing at an unprecedented rate. Potential returns are high, in light of clinical options and potential risks. Obvious disease target areas where current standard of treatment is insufficient include autoimmune diseases such as IBD, rheumatoid arthritis, transplant diseases, psoriasis, multiple sclerosis and coeliac disease, and allergic inflammation such as asthma, food allergies and allergic dermatitis. AITHM has already identified individual molecules that confer protection against inflammatory diseases in animal models, and is working towards developing pre-clinical portfolios to accelerate these discoveries towards clinical trials.

RESEARCH CENTRES

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.

Major themes of work

Biodiscovery, molecular characterisation and design, molecular immunology, clinical translation

research.jcu.edu.au/bmdt

Centre for Biosecurity and Tropical Infectious Diseases (CBTID)

Director

Professor Denise Doolan
and Professor Natkunam Ketheesan

The goals of the CBTID are twofold: Expand knowledge and understanding of tropical infectious diseases and translate this into new tools to manage diseases and control their transmission, at both individual animal and population levels.

Harness the latest technologies in cell and molecular biology, proteomics, structural biology and immunology to better understand the interactions that occur between pathogens and their hosts, and to translate that understanding into the development of new vaccines and therapies.

Major themes of work

Epidemiology, transmission and surveillance programme, host-pathogen interactions

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.

Major themes of work

Bioinformatics and biotechnology, cancer metabolism, immunogenomics, medical epigenetics and genomics, microbial pathogens and molecular immunology

research.jcu.edu.au/cgc

Centre for Nursing and Midwifery Research

Director

Recruitment of a new Director underway during 2016

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.

Major themes of work

Indigenous futures, workforce and practice development, health professional education and clinical practice

research.jcu.edu.au/cnmr

JCU and AITHM currently recognise and support significant groupings of researchers and research activity as University Research Centres, or as externally funded Research Centres. These Centres assist with management and support for individual AITHM programs and projects.

Queensland Research Centre for Peripheral Vascular Disease

Director

Professor Jonathan Golledge

The Queensland Research Centre for Peripheral Vascular Disease was established in 2010. The centre amalgamated the previously established JCU 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.

Major themes of work

Arterial occlusive, aneurysmal, venous disease, myocardial infarction, stroke, renal impairment

research.jcu.edu.au/qrcpvd

Centre for Chronic Disease Prevention

Director

Professor Robyn McDermott

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 the Queensland Department of Health, 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 the prevention of chronic diseases in the community and improving primary health care practice and care pathways for chronic disease.

Major themes of work

Reduce disease progression by trialling new methods of primary health care, reduce risk factors for chronic disease, understanding health trends in remote populations, developing research capacity in the region.

ccdp.jcu.edu.au

Anton Breinl Research Centre for Health Systems Strengthening

Co-Directors

Professor Jacinta Elston
and Professor Sarah Larkins

The Anton Breinl Research Centre for Health Systems Strengthening 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 aims 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.

Major themes of work

Health systems strengthening and workforce development, Aboriginal and Torres Strait Islander health, responding to priority health challenges in our region

research.jcu.edu.au/abrc

GRANTS, FELLOWSHIPS, FUNDING, AWARDS

Dr Sandip Kamath NHMRC Peter Doherty Biomedical Early Career Fellowship – \$318,768

Dr Sandip Kamath is investigating hypoallergenic proteins as novel immunotherapeutic candidates for food allergy. The rate of food allergy has tripled over the past decade and is a leading cause of food related anaphylaxis in Australia. Allergen immunotherapy can help patients develop tolerance to the allergenic food. This research will investigate the potential of hypoallergenic derivatives of two major food allergens as novel desensitisation therapeutics, addressing an issue of significant importance to human health and paving the way for research on advanced therapeutics for paediatric food allergy.

Professor Jonathan Golledge Practitioner Fellowship, Developing improved management for peripheral artery diseases – \$569,219

One million Australians have peripheral artery disease. Professor Jonathan Golledge was awarded a Practitioner Fellowship to support research to improve care of artery disease. The aim of the work is to develop improved management approaches for patients with blocked and weakened arteries. This work is particularly important given the recognised management deficiencies for patients with artery disease and the relative little research being undertaken in this area.

Professor Alex Loukas Research Fellowship, Helminth secretomes: from vaccines to novel anti-inflammatory biologics – \$938,910

Billions of people in developing countries are infected with parasitic worms, but they have been eradicated from industrialised nations. Humans co-evolved with worms, so their recent removal has deprived us of signals required to keep inflammation in check. Professor Alex Loukas' work focuses on worm molecules that can be used to develop vaccines to combat these parasitic infections in developing countries, and as a novel platform of anti-inflammatory therapeutics for use in industrialised nations.

Dr Andreas Kupz NHMRC Project Grant, New strategies for improved tuberculosis vaccines – \$741,091.98

Tuberculosis is one of the most threatening infectious diseases worldwide due to the low efficiency of the only licensed anti-tuberculosis vaccine, BCG. This project aims to interrogate two previously neglected immune mechanisms and their potential to enhance vaccine-induced immunity by incorporating these mechanisms into new genetically modified BCG strains. We will also investigate alternative BCG vaccination routes to generate long-lived immune cells that can rapidly control the infection.

2016 ARC LEIF grant to upgrade the nuclear magnetic resonance facility for Northern Australia

Professor Norelle Daly and Professor Andrea Lopata, were part of a successful \$840,000 funding bid from the Australian Research Council Linkage Infrastructure, Equipment and Facilities (LIEF) 2016.

A nuclear magnetic resonance facility for modern molecular analysis will be used to network a new 500 MHz nuclear magnetic resonance (NMR) spectrometer and new consoles for existing instruments with an automated sample changer for a 600 MHz NMR spectrometer. This is designed to increase the capacity of Queensland-based researchers to undertake state-of-the-art studies in chemistry, drug design, and materials science. The new knowledge from these studies may lead to the development of new drugs, new crop protection agents and new photovoltaic materials.

Dr Paul Giacomini Queensland Science, Tall Poppy Award

Dr Paul Giacomini was announced as a 2016 Tall Poppy award winner. The award recognises and celebrates Australian intellectual and scientific excellence and encourages younger Australians to follow in the footsteps of outstanding achievers in the field of science.



CAREER PROFILE

DR SANDIP KAMATH – AITHM NHMRC RESEARCH FELLOW

Dr Sandip Kamath is one of AITHM's key researchers working in the field of allergy. His work focusses on identifying novel methods to understand allergenic proteins to help reduce food allergies in humans.

From an early age Dr Kamath had a deep fascination with science. A school lecture on how genes translated to proteins resulted in his passion for biotech research, with a focus on translational mechanisms. He also had a strong desire to see his work help people.

After graduating in Pharmaceutical Sciences from the University of Mumbai, and a year working for a pharma consultancy, Dr Kamath moved to Australia in 2006 to complete a Masters in Biotechnology at RMIT. He later joined Professor Andreas Lopata at JCU in Townsville to establish the Molecular Immunology Research Group in the College of Public Health, Medical and Veterinary Sciences. Under Professor Lopata's supervision he completed his PhD, focused on the identification and characterisation of major shellfish allergens for development of novel allergy diagnostics.

Dr Kamath's work examines the characterisation of allergenic proteins from different food and inhalant sources and their interaction with the human immune system through IgE antibodies. His broader research interests include paediatric food allergy diagnostics, occupational allergy and development of novel immunotherapeutic for food allergy.

He uses state-of-the-art proteomic and molecular cloning techniques to elucidate specific antigenic regions of allergenic proteins, with an aim of designing and generating hypoallergenic constructs for potential therapeutic applications. His research also investigates how allergens get stronger, and how they react and respond to each other.

Dr Kamath joined AITHM as a Post-Doctoral Research Fellow in 2015 where he has developed collaborations with institutes in Norway and Canada. In 2016 he was awarded an NHMRC Fellowship to continue his work.

In 2017, Dr Kamath will undertake an internship with the venture capital section of the MRCF to understand the commercialisation and start-up process, the gap between research and venture capital, research translation and commercialisation, and links between IP, patents and clinical trials.

EDUCATION AND TRAINING

A defining feature of AITHM is its ability to translate research into education and workforce development through both JCU undergraduate and postgraduate programs, and improvements to clinical practice respectively.

The Cohort Doctoral Studies Program

AITHM's Cohort Program assists and nurtures students through a cohort model, providing seminars, workshops, peer learning and writing workshops. The program provides doctoral students with academic mentors, a peer support network, and two week-long on-campus intensive research training courses.

The Program, established in 2011, is aimed at health professionals working either full or part time in areas of medicine and health, including health promotion, nursing, and rehabilitation, sports and exercise sciences. It also includes students working in the fields of chemical, biomedical, molecular and veterinary sciences.

In 2016, there were 121 students in the program across 11 Cohorts. This includes students who are supported by an AITHM PhD Scholarship, whose scholarship award includes automatic entry into the Cohort program.

To date, there have been eight Higher Degree by Research completions. This is in addition to one Master of Public Health and seven Graduate Certificate Research Methods who have transitioned or are in the process of transitioning to a PhD at JCU. Retention rate in the program is still high at 88 per cent, and student outputs total more than 120 peer-reviewed publications in less than five years.

AITHM has also facilitated mentoring programs and professional development training courses for new staff and students and external stakeholders. Leveraging on the existing JCU media training opportunities, several AITHM researchers have undertaken a two-day media training intensive, with further media training scheduled for 2017. Further to this, a training package specifically for digital media has been presented to staff and students to further complement the existing social media training provided within AITHM's Cohort Program.

2016 AITHM PhD Scholarships

AITHM PhD projects are available across the Institute's key research areas, including infectious disease, chronic disease prevention and health systems research.

The Institute first called for applications for PhD scholarships in 2015 and then again in 2016. Both rounds attracted very strong candidates with an interest in tropical health and medical research.

Six HDR students have now commenced with full AITHM scholarships and six with top-up scholarships (offered to those who successfully applied for alternative scholarship schemes); two more full scholarship students will commence in 2017 and one in 2018. These students have AITHM members as primary supervisors and many receive additional support from the Cohort Doctoral Studies Program.

Some topics include:

- High-throughput screen of the hookworm secreted proteome for novel therapeutics to treat asthma
- Development of a shellfish allergy model to evaluate the degree of cross-reactivity between prawn and abalone
- Patient experience of health service delivery for people living with chronic conditions in Cairns
- Harnessing proteins secreted by hookworms to develop a new platform of anti-inflammatory drugs for treating auto-immune disease
- Schistosome exosomes – immunobiology and vaccine efficacy
- Assessment of the potential impacts of climate change on health in Cambodia, and how to evaluate which factors contribute most to the risk of these impacts
- Structure-function relationships of disulfide-rich peptides
- Novel biopharmaceutical for food allergy

JCU's Graduate Research School offers Postgraduate and Early Career Researchers a large range of free courses throughout the year to assist in developing their skills. Some examples include research candidature workshops, writing, editing and communication workshops, presentation skills, and project design and analysis.

SPECIAL EVENTS, COMMUNICATIONS AND ENGAGEMENT

Special Events

Australasian Tropical Health Conference 2016 22–23 September 2016, Brisbane Convention & Exhibition Centre

The fourth annual Australasian Tropical Health Conference was held in Brisbane in September and focused on the theme, 'The intersection between Chronic and Infectious Disease'. The conference brought together researchers from across Australia and around the world to discuss the specific and unique challenges associated with tropical health and medicine.

Leading national and international researchers presented on the following topics:

- Epigenetics
- Innate immune imprinting
- Vaccination
- Aetiology of chronic disease
- Intersection of chronic and infectious disease
- Indigenous health transition

Cairns Commencement of Construction Ceremony

AITHM hosted the federal Minister for Education and Training, Senator the Hon. Simon Birmingham and the Member for Leichhardt the Hon. Warren Entsch MP as they turned the first sod to mark the commencement of construction for AITHM's world-class tropical health research and training facility in Cairns.

The new facility at JCU's Cairns campus will build Australia's research and training capacity in virology, disease and transmission control as well as the development of new treatments and vaccines for tropical diseases.

AITHM Official Opening Townsville

Australian research into tropical health and medicine received a major boost in 2016 with the opening of AITHM's \$31M world-class infectious diseases research facility at JCU's Townsville campus.

The Queensland Premier, the Hon. Annastacia Palaszczuk MP, along with Queensland Minister for Innovation, Science and the Digital Economy the Hon. Leeanne Enoch MP and Senator the Hon. Ian Macdonald officially opened the new facilities.



Public lectures

In 2016 AITHM researchers continued to showcase their research in the field of Tropical Health and Medicine and have increasingly been invited to present their work through public lectures at JCU, around the country and on the international stage.

For example, AITHM Director, Professor Louis Schofield addressed the Developing Northern Australia Conference in Darwin in June, chaired a session and presented at

the 2016 Centre for Biodiscovery and Molecular Development of Therapeutics and Centre for Biosecurity of Tropical Infectious Diseases Annual Retreat on Fitzroy Island in July, and spoke at the Grand Challenges Meeting, Keystone Symposium on *Translational Vaccinology for Global Health* in London in October.

Professor Maxine Whittaker presented at a range of conferences and symposia, including presenting on *the Elimination of malaria in the Pacific* at the International Conference on Tropical Medicine and Malaria in Brisbane, and on *Tropical infectious diseases, vectors and Australia's health security* at the Queensland Biosecurity Pest Species Symposium.

Professor Scott Ritchie presented lectures on dengue, chikungunya and Zika virus in India and Sri Lanka in May and June 2016, and a lecture on vector borne disease in Mexico, also in June.

Professor Alex Loukas, Professor Denise Doolan, Dr Kate Miller and Dr Paul Giacomini all presented public lectures as part of AITHM's involvement in National Science Week.

In April, AITHM researchers, Professor Andreas Lopata, Professor Natkunam Ketheesan and Associate Professor Catherine Rush gave lectures at the Day of Immunology public lecture event in Townsville, which was also video linked to Cairns.

Seminars

AITHM hosted 20 Seminars in 2016, including eight international speakers. The Seminar Series provides an opportunity for the exchange of research in the field of tropical health and medicine and is an important outreach activity for the Institute. The series aims to build and extend networks and present research to a broad audience, fostering new collaborations with researchers, business and industry.

2016 Seminars

13 Apr	Associate Professor Matthew Todd	The University of Sydney
21 Apr	Dr James Kazura	Case Western Reserve University
29 Apr	Professor Andrew Lloyd	University of NSW
11 May	Dr Peter White	Imperial College London
20 May	Dr Andrew van den Hurk	Queensland Health
14 Jun	Associate Professor Andrew Lonie	The University of Melbourne

15 Jun	Associate Professor Kathy Andrews	Griffith University
15 Jul	Mr Len Pelentsov	University of South Australia
15 Jul	Andrea Fielder	University of South Australia
21 Jul	Dr Abdullah Mamun	University of Queensland
25 Jul	Dr Mary Steen	University of South Australia
1 Aug	Professor Sri Sriprakash	Queensland Institute of Medical Research
15 Aug	Dr John Harty	University of Iowa
16 Aug	Professor Stefan Kaufman	Max Planck Institute For Infection Biology
26 Sep	Dr Peter Crompton	National Institute of Health, Intramural Research Program
10 Oct	Professor Maria Elena Bottazzi	Baylor College of Medicine
21 Nov	Dr Jack Panopoulos	FlowJo, LLC
28 Nov	Dr Fabio Luciani	University of New South Wales
8 Dec	Dr Stefan Stieglitz	University of Duisburg-Essen, Germany
15 Dec	Associate Professor Julie Brimblecombe	Menzies School of Health Research

Workshops

AITHM researchers have coordinated and been involved with a number of workshops during 2016. For example, Professor Scott Ritchie gave a joint workshop on tackling the scourge of dengue with Sri Lankan health officials at Sri Lanka's National Dengue Control Unit in Colombo as part of a DFAT sponsored program supporting that nation's efforts to combat the disease.

Professor Ray Muller and Associate Professor Petra Buttner gave workshops on Quantitative Surveys, looking at Bias in Analytical Study Designs and Bias in Quantitative Analytical studies, while Dr Klaus Gebel led a Quantitative Studies master class on systematic reviews of quantitative studies in the health sciences.

Professor Adrian Esterman ran workshops on Statistics and Sample Surveys, examining the introduction to Stata statistical software and an introduction to sample surveys.

Community and strategic engagement

In 2016 AITHM communicated its research outcomes and engaged with the wider community through a range of informative and entertaining events locally, nationally and internationally, and senior researchers engaged with government and potential industry partners.

Throughout the year, AITHM Director Louis Schofield represented the Institute on a number of strategic engagement opportunities including the Medical Research Future Fund Consultation in Brisbane and travelled to Madang in PNG to participate in PNGIMR Malaria Colloquium. Professor Schofield also spoke at the Developing Northern Australia Summit in Darwin, attended the ARC Directors Forum in Sydney and the Department of State Development and the Defence Materials Technology Centre, Medical Countermeasures Programs in Brisbane.

Professor Scott Ritchie flew to Brazil in February 2016, at the invitation of the Brazilian Ministry of Health as part of the international effort to control the spread of the Zika virus where he provided valuable insights, explaining the use of indoor residual spray and providing training in the effort to control and prevent future outbreaks of the disease.

To celebrate the International Day of Immunology, AITHM researchers hosted a public lecture on Infection and Immunology in the Tropics with key topics including the threat of the Zika virus, bacterial infections and immunity.

AITHM senior researchers participated in various National Science Week activities. For example, Professor Denise Doolan and Professor Alex Loukas each gave presentations at the Pecha Kucha – Inspired by Science event in Cairns.

Associate Professor Jamie Seymour hosted the inaugural JCU Underwater ROV Challenge at the University's Aquarium facility. As part of the challenge, students from five Cairns high schools competed to see who had built the best underwater robot.

Research Fellow Dr Paul Giacomini presented a TEDx talk in Cairns, *Worming your way to good health*. In his 20 minute presentation Dr Giacomini discussed his research into the potential benefits of parasitic worms for human health. The TEDx video of the presentation is hosted on YouTube, and has already been viewed several hundred times.

AITHM celebrated International Women's Day with a social media campaign featuring the work of the Institute's many leading women researchers, including Professor Denise

Doolan, Professor Norelle Daly, Dr Emily Callander, Dr Jodie Morris, Dr Smriti Krishna and Dr Alexandra Trollope.

The Institute's Dr Jamie Seymour presented at a public symposium on marine stingers at JCU in Cairns. Dr Seymour covered a range of topics relating to stingers, highlighting the effects of marine stinger venom, stinger identification and first aid treatment for stings.

Media and communications

AITHM plays a leading national and international role in promoting awareness and understanding of tropical health and medicine, and communicating its research outcomes around the world.

The Institute has developed and implemented a multifaceted communications strategy to reach local, national and international audiences through traditional and digital media channels, an engaging website, quarterly newsletter and community engagement. AITHM actively engages on social media, with Twitter and Facebook profiles expanding its digital footprint.

AITHM's media profile continued to expand in 2016. The Institute issued 23 media releases through JCU Media, and AITHM researchers have been increasingly approached to provide expert analysis in the media on issues relating to tropical health and medicine. This has resulted in more than 1076 commentaries across radio, television, print and online worldwide.

For example, Dr Emily Callander's work on the impact of healthcare costs generated more than 139 hits across online, TV, radio and print media, while Professor Alex Loukas and Dr Severine Navarro's work on hookworm proteins suppressing asthma generated more than 95 media mentions, including interviews with a number of radio and television stations. With intense international focus on the Zika virus in 2016, AITHM Director Professor Louis Schofield and senior researcher Professor Scott Ritchie were repeatedly approached for expert comment on the issue. This included an interview with the international news network, SKY News. Associate Professor Andreas Lopata was interviewed for a story on treatments for severe food allergies by Channel 7 news.



CONSTRUCTION

Townsville

In a significant new capacity for research in the Tropics, the \$31M three-level Townsville Facility was completed 'on time and on budget' in September 2016 and was opened in October by the Queensland Premier, the Hon. Anastacia Palaszczuk MP. The State Government provided the main construction costs (\$21.5M), the Federal Government (ARC SRI) contributed \$8M, with the remaining funds provided by JCU.

The building includes PC3 and PC2 certified laboratories, animal holding spaces, offices, a Biobank for clinical and epidemiological samples and meeting rooms. It accommodates both laboratory-based and clinical researchers, as well as staff and students in key supporting disciplines including biostatistics, epidemiology, bioinformatics, and health economics. It is located in an existing health research precinct adjacent to The Townsville Hospital to foster collaborative interaction and support translational research. The Translational Research Facility on the ground level has day clinics that support testing of telehealth approaches and methodologies, and research requiring community consultation. Its laboratories support research on TB, melioidosis, Group A streptococci, malaria, vaccine development, immunology and chronic disease research.



Cairns

The construction of a new AITHM Tropical Health Research and Training facility in Cairns is well under way with completion expected late 2017. The new facility will house state-of-the-art laboratory and research facilities including a PC2 laboratory, and office space for research leaders, postdoctoral fellows and PhD students. The PC2 laboratory will focus on bio-discovery and the therapeutic potential of tropical flora and fauna.

Total construction cost is \$25M, with the ARC contributing \$18M, the Queensland State Government \$6.5M, and JCU the remainder. The facility will enhance AITHM's capacity to conduct research and training in viral and parasitic diseases, and mosquito vector biology and control. It will also allow for the expansion of highly successful existing research groups focused on drug discovery and development of new treatments and vaccines for tropical diseases. This building was originally intended to include both PC2 and PC3 laboratories, but construction cost estimates following the public tender process required that AITHM build only PC2 facilities in Cairns and concentrate PC3 capability in Townsville. This will allow the unexpectedly rapid growth in the Cairns research groups to be accommodated in a somewhat larger building than originally planned. AITHM has also refurbished part of an adjacent building to accommodate new appointees while construction is under way.



Torres Strait

In 2016, construction began on a \$6.63M Thursday Island Facility, funded by the Queensland State Government (\$6.33M) with additional support from JCU of \$300K.

The building is located on JCU-purchased land adjacent to the Thursday Island Hospital and will enable research, training and community engagement in a region which is highly vulnerable to disease incursion. Its location is critical to the investigation of health security threats on Australia's northern border. In addition, the community space will provide an ideal platform for engagement and collaboration with the Torres Strait community and the hospital service.

The facility will be delivering research and health outcomes for the Torres Strait Island community in 2017.

LEADERSHIP AND GOVERNANCE

AITHM Advisory Board

AITHM is governed by the AITHM Advisory Board; the key strategic body that drives the Institute's globally oriented research agenda. The Advisory Board provides independent and strategic advice on all aspects of the Institute, including high-level business management, research and commercialisation, and linkages with government, industry and philanthropic institutes.

The Board meets three times a year and is comprised of up to 12 members from a diverse range of external organisations as well as senior staff from James Cook University. AITHM would like to thank Ms Julie Hartley-Jones for her contribution to the Advisory Board over the past three years.

Chair

The Hon. Dr Michael Wooldridge

Independent Chair

Wooldridge Consulting

Advisory Board members

Professor Louis Schofield

Director, AITHM

Professor Chris Cocklin

Senior Deputy Vice

Chancellor, JCU

Professor Ian Wronski

Deputy Vice Chancellor, JCU

Dr Jim Thompson

Chief Biosecurity Officer

Biosecurity Queensland

Dr Peter Bristow

Chief Executive

Townsville Hospital and
Health Service

Ms Julie Hartley-Jones/ Ms Clare Douglas***

Chief Executive

Cairns and Hinterland
Hospital and Health Service

The Hon. Jan McLucas*

Independent

Dr Mark Wenitong

Medical Officer

Apunipima Cape York
Health Council

Professor Zee Upton*

Research Director

Institute of Medical
Biology Agency for Science,
Technology and Research

Mr Tony Wood*

Program Director

The Grattan Institute

* Joined the AITHM Board in 2016 ** Stepped down from the AITHM Board in 2016

Management Advisory Committee

The Management Advisory Committee provides advice to AITHM management and senior researchers regarding key issues pertaining to AITHM's activities, its operations, management and research program direction.

The Committee comprises senior JCU staff and meets quarterly.

ARC Performance Review of the Australian Institute of Tropical Health and Medicine

In the second half of 2016, AITHM was subject to a scheduled mid-term review of the Australian Research Council's investment in AITHM. AITHM is pleased with the positive outcomes, report and recommendations provided by the ARC expert panel. AITHM agrees with the spirit of the recommendations included in the report, and is proactively engaged in developing responses and plans to these suggestions.

Independent Scientific Review

AITHM undertook an Independent Scientific Review during 2016, with the focus on continuous improvement and benchmarking.

The review panel consisted of:

- Professor Marcel Tanner, Director, Swiss Tropical and Public Health Institute
- Professor Peter Hotez, Dean, National School of Tropical Medicine, Baylor College of Medicine
- Professor Jonathan Carapetis, Director, Telethon Kids Institute
- Professor Zee Upton, Dean of Research, Institute of Medical Biology | Agency for Science, Technology and Research (A*STAR)
- Professor Rhondda Jones, Director of Research Strategy, DTMH, 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 the State of Queensland through the Department of Science, Information Technology and the Arts, formerly DSITIA, now Department Science, Information Technology and Innovation (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 Year – 2013 to 2017	Target	2016 outcomes
Establish AITHM Board by 31 December 2013		Established 2013. 3 meetings held in 2016.
Establish AITHM Business Development Advisory Group by 31 December 2013		Established 2013. The AITHM Business Development Advisory Group was discontinued in 2016, with the approval of DSITI and the ARC. Business development and commercialisation activities are managed through AITHM and newly appointed business development and commercialisation staff at JCU.
Establish AITHM Management Committee by 31 December 2013		Established 2013. 4 meetings held in 2016.
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 \$3.7M in external funding for research projects in 2016.
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 2016 there were 38 research staff employed within AITHM, and 33 technical and professional staff. A total of 240 academics were affiliated with AITHM and the research centres across the Division of Tropical Health and Medicine.
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 263 HDR students enrolled in the Division of Tropical Health and Medicine in 2016.
With expectation that 25% of these students graduate each year	10 per year	27 HDR students enrolled in the Division of Tropical Health and Medicine graduated in 2016.
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	Division of Tropical Health and Medicine researchers produced a total of 458 research publications in 2016.

Key Performance Indicators for Calendar Year – 2013 to 2017	Target	2016 outcomes
Visiting national and international scientists	10 per annum	More than 23 national and international scientists visited AITHM in 2016.
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	AITHM has exceed the target of 5 new collaborations within 5 years of establishment. Several new collaborations from 2016 are detailed on pp.28–32.
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	Australasian Tropical Health and Medicine Conference held 22–23 September, Brisbane. 20 AITHM Seminars focussing on significant tropical health and medicine research. 12 workshops organised by AITHM. Refer p.41 – Special events, Communications and Community Engagement section for further information regarding conferences, seminars, forums and workshops.
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 2016, the number of AITHM invention disclosures was 5.
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 in Brisbane on 22-23 September 2016. The conference attracted a wide range of national and international speakers and delegates from a variety of sectors (refer to p.41).
1 case study per annum on research outcomes demonstrating research impact and benefit to Queensland derived from the AITHM activities	1 per annum	3 case studies have been developed by AITHM Professor Scott Ritchie, <i>Monitoring mosquitoes to prevent disease transmission</i> (refer to p.13), and Professor Robyn McDermott, Professor Alex Loukas, Dr Paul Giacomini and Dr Matt Field, <i>Intersection between chronic and infectious disease in tropical Australia</i> , (refer to p.21) and Professor Sarah Larkins, Professor Sabe Sabeson and Dr Emily Callander, <i>Health systems strengthening, capacity building and knowledge transfer</i> , (refer to p.25).
5 community events involving presentations by AITHM researchers on average per annum	5 on average per annum	In 2016, there were more than 15 community events involving presentations by AITHM researchers (refer to pp.41–43).
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 2016. In 2016 there were more than 13 public lectures promoting AITHM research and research outcomes to the research and wider community (see pp.41–43).

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. The Key Performance Indicators relating to appointments and publications account only for those appointments made under ARC SRI funding and the publications authored by those appointments.

KPIs 2015-2021	Reporting Frequency	2016 Target	2016 Outcomes
Cairns	Year of completion		Delays experienced with value management and engineering management prior to signing with principal contractor. Construction contract executed with Hutchison 8 August 2016. Practical completion is expected in November 2017.
Townsville	Year of completion	Completed and occupied	Practical completion achieved on time and on budget in September 2016, with building opened by Queensland Premier, the Hon. Annastacia Palaszczuk MP and Senator the Hon. Ian MacDonald, on 7 October 2016.
Research Outputs			
Refereed journal articles (peer reviewed in Scopus-listed publications). SRI funded positions only ¹	Annual	30	38
Publication Quality ¹	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.	Average Field Weighted Citation Impact: 1.82.
Senior Research Appointments (enabling and Research Leaders)	Year of appointment	4	<p>Professorial Research Fellow (Immunology of Infectious Disease), Professor Denise Doolan commenced on 18 Jan 2016.</p> <p>Professorial Research Fellow (Biostatistics and Population Health), Professor Adrian Esterman commenced 1 Jan 2016 (0.2FTE) [Professor Esterman was funded from DSITI in 2016 and will be funded from ARC in 2017].</p> <p>Senior Research Fellow (Bioinformatics) Dr Matthew Field commenced on 29 Feb 2016.</p> <p>Principal Research Fellow (Molecular Immunology), Associate Professor John Miles commenced on 8 Aug 2016.</p> <p><i>2017 Commencements</i></p> <p>Principal Research Fellow (Occupational Health and Safety) Associate Professor Gunther Paul (commenced on 13 Mar 2017).</p>

KPIs 2015-2021	Reporting Frequency	2016 Target	2016 Outcomes
ECR appointments (Postdoctoral Research Fellows)	Annual	4	Postdoctoral Research Fellow, Dr Michael Meehan commenced 13 Jan 2016. Postdoctoral Research Fellow, Dr Claire Loiseau commenced 18 Jun 2016.
PhD stipends through AITHM	Annual	12	6 full scholarship stipends 6 top-up scholarship stipends
PhD Completions	Annual	N/A in 2016	N/A in 2016
Mentoring programs Students supported by AITHM HDR Student Cohort Program	Annual	4	6 AITHM PhD Scholarship students were supported by the AITHM HDR Student Cohort Program in 2016.
Website describing recent outcomes from AITHM programs	Annual	Active maintenance of webpages providing regular updates of AITHMs research and outputs	AITHM continues to maintain an engaging and up to date website, featuring AITHM research, news and engagement. www.aithm.jcu.edu.au
Radio/TV interview focused on AITHM research	Annual	6	AITHM issued 23 media releases in 2016 and generated more than 1076 commentaries worldwide across radio, print, TV and online. Some key radio/TV interviews focused on AITHM research included: 24 August: Professor Louis Schofield – Managing the threat posed by the Zika virus outbreak 11 November: Dr Jamie Seymour – Funding needed for Irukandji research 21 September: Associate Professor Andreas Lopata – Novel approaches to treating allergy
Public Lectures	Annual	4	In addition to the 21 AITHM Seminars, which are open to the general public, AITHM researchers delivered many public lectures in 2016, including public lectures as part of: The Australasian Tropical Health Conference National Science Week TEDxCairns For further information about AITHM public lectures refer to p.41.
Social Media	Annual	Continuing activity and regular posts via Twitter, Facebook, You tube	AITHM continued to engage with audiences through social media channels during 2016. Facebook posts: 109 Facebook posts resulting in over 3,300 direct engagements Tweets: 222 resulting in 261,300 impressions YouTube posts: 12

KPIs 2015-2021	Reporting Frequency	2016 Target	2016 Outcomes
International leadership positions held by initiative participants	Annual	8	In 2016 AITHM senior researchers held 17 international leadership positions, including: Professor Denise Doolan – Executive Board, International Society for Vaccines Professor Maxine Whittaker – Co-Chair, WHO Research Project Review Panel of the Department of Reproductive Health and Research including the WHO Special Programme Of Research, Development And Research Training In Human Reproduction Professor Adrian Esterman – Fellow of the American College of Epidemiology
Visits in person months by international investigators	Annual	3	Visits in person months by international researchers to AITHM in 2016 total more than 4 months.
Advisory Board Meetings	Annual	3	3

1. The publications KPIs only account for the publications authored by the appointments made under ARC SRI funding.

Previously completed ARC Milestones

Management and administrative appointments in place	Director, Chief Operating Officer and administrative staff appointed
Advisory Board Membership (Breadth, balance and experience of the members of the Advisory Board)	Reported at Mid Term Review
Advisory Board Contribution (Frequency, attendance and value added by Advisory Committee meetings)	Reported at Mid Term Review

FINANCE

Statement of Operating Income and Expenses for the year ended 31 December 2016

INCOME	Notes	2015 Annual Report \$	2015 \$	2016 \$
Commonwealth Government Funding (ARC Special Research Initiative)		3,053,731	3,053,731	3,105,644
State Government Funding (DSITI)		3,300,000	3,300,000	1,700,000
Host Institution Funding (James Cook University)	1	4,933,253	4,391,718	5,019,474
External Research Grants & Consultancies	2	6,274,975	6,056,564	3,703,617
Other Income		60,938	60,938	565,998
Total Income		17,722,896	16,862,951	14,094,734
EXPENDITURE				
Operational	3			
Salaries		4,040,519	4,179,488	5,064,687
Equipment & Maintenance		1,008,770	1,122,411	1,232,932
Governance		55,283	55,283	47,760
Other Expenditures		2,116,516	1,155,306	1,077,574
Capacity Building Grants (DSITI)	4	1,500,000		
Salaries			0	459,932
Equipment & Maintenance			0	109,196
Other Expenditures			0	277,389
External Research Grants Expenditure				
Salaries		1,845,074	1,845,074	2,317,746
Equipment & Maintenance		61,221	60,869	188,762
Other Expenditures		2,463,703	2,174,946	2,130,016
Total Expenditure		13,191,086	10,593,377	12,905,993
Surplus/(Deficit)		4,531,810	6,269,573	1,188,741
CASH FLOW SUMMARY				
Balance Brought Forward			11,908,833	18,178,407
Surplus/(Deficit)			6,269,573	1,188,741
Closing Balance			18,178,407	19,367,148

The following general information is extracted from the 2016 Annual Report for James Cook University, published 2016². The principal accounting policies adopted in the preparation of these financial statements reflect the accounting policies used in the audited financial statement for James Cook University for the year ended 31 December 2016. The accounts are prepared on an accrual basis and comply with Australian Accounting Standards. It also requires management to exercise its judgement in the process of applying the University's accounting policies. The estimates and underlying assumptions are reviewed on an ongoing basis.

Audit Committee

The Audit Committee is responsible for all audit and related matters, and for monitoring the assigned performance measures on behalf of JCU Council — thereby assisting the University to fulfil its responsibilities under the Financial Accountability Act 2009. The Act requires the mandatory appointment of the Auditor-General of Queensland as the University's external auditor. The Audit Committee also reviews the Queensland Audit Office's (QAO) approved audit strategy, observes the terms of the committee charter, and has due regard to Queensland Treasury's Audit Committee Guidelines.

Internal Audit

Internal Audit is an independent, objective assurance and consulting activity designed to add value and improve the University's operations. It assists the University accomplish its objectives by bringing a systematic, disciplined approach to evaluate and improve the effectiveness of risk management, control, and governance processes. Internal Audit activity encompasses the review of all financial and non-financial policies and operations of the University, excluding controlled entities.

Notes to the AITHM 2015 and 2016 Financial Report

In preparing the AITHM 2016 financial results, restatements to 2015 have been performed to achieve consistency in disclosure. The resulting net adjustment in the statement of 2015 restated results is reflected in the cash flow summary closing fund balance, and the 2016 opening balance brought forward. Where a material adjustment or reclassification has occurred explanatory notes are provided below.

Income

1. The JCU operating contribution is shown in Host Institution Funding. The 2015 result is restated to reflect the reclassification of the internal income component of the JCU contribution against internal expenses to reflect the net value to AITHM for the use of goods and services between operational units within JCU.
JCU Research Infrastructure Block Grant (RIBG) contribution to AITHM has been reclassified as Host Institution Funding, previously classified as External Research Grant & Consultancies income.
2. Reclassification of the JCU Research Infrastructure Block Grant contribution to Host Institution Funding. Refer Note 1.

Expenditure

3. Reclassification of RIBG expenditure in 2015 from External Research Grant Expenditure to Operational Expenditure. RIBG expenditure reflects actual in year expenditure of the grant funding. The 2015 presentation showed the full funding as spent in that financial year. The result have been restated to reflect the actual expenditure of RIBG funding in both 2015 and 2016.
4. Capacity Building Grants (DSITI) expenditure reflects actual in year expenditure of the grant funding. The 2015 presentation showed the full grant as spent in that financial year, upon disbursement of funds to research projects. The results have been restated to reflect the actual expenditure of Capacity Building Grants in both 2015 and 2016.

2. *James Cook University Annual Report 2016*, ISSN 0158-7730. Produced by, and available from Quality, Planning and Analytics, James Cook University. This Annual Report is also publicly available on the JCU website at www.jcu.edu.au/about-jcu/annual-report.

2017 ACTIVITIES

Governance

- Increase commercialisation experience on Advisory Board
- Following recommendation of the Independent Scientific Review; review the function and membership of AITHM's Management Advisory Committee

Research

- Rationalise research thematic areas to prioritise infectious and chronic diseases, their intersection, health security, translation and commercialisation
- Promote funding opportunities including Advance Queensland
- Build on occupational health and safety research including black lung
- Extend collaborative engagement with Department of Defence
- Extend collaborations in the Asia-Pacific including Singapore

Research Training and Professional Development

- Improve training opportunities for PhD and ECRs in areas such as; media, entrepreneurship, grant and fellowship applications
- Continue to support and enhance the PhD Cohort program

Business Development, Commercialisation and Translation

- Secure AITHM operational sustainability
- Increase activity and resourcing of business development
- Seek increased contracted research opportunities
- Embed Research Services' business development teams in AITHM locations

- Revise AITHM's business plan for the next five years
- Continue to build on the commercialisation projects of drug discovery and vaccines
- Leverage commercialisation developments with JCU commercialisation staff
- Promote and support entrepreneurship training opportunities
- Build clinical trials capacity and experience

Communications and Engagement

- Conduct Australian Tropical Health Conference
- Continue engagement with tropical populations, funding partners, business and industry
- Officially open AITHM Torres Strait
- Plan opening event for AITHM Cairns
- Continue to showcase AITHM researchers' world-leading research

National and International Linkages

- Continue to build collaborative opportunities afforded by the Tropical Australian Academic Health Centre (TAAHC), research collaboration between the five northern Queensland Hospital and Health Services, the North Queensland Primary Health Network, AITHM and JCU.
- Link with Singaporean institutions to promote research into health security and commercialisation of research outcomes
- Link with Pacific Island institutions to promote research and build capacity in health security

PUBLICATIONS

458 publications were published by researchers in the Division of Tropical Health and Medicine in 2016.

The full details of these publications can be viewed via the AITHM website:
<http://bit.ly/2qKOn1z>

ACRONYMS

AAA	Abdominal Aortic Aneurysm
ABRC	Anton Breinl Research Centre for Health System Strengthening
AIDS	Acquired immune deficiency syndrome
AITHM	Australian Institute of Tropical Health and Medicine
ALPA	Arnhem Land Progress Association
APEC	Asia-Pacific Economic Cooperation
ARC	Australian Research Council
ARDS	Aboriginal Resource and Development Services
AuTuMN	Australian Tuberculosis Modelling Network
B	Billion
BCG	Bacille Calmette–Guérin
BMDT	Biodiscovery & Molecular Development of Therapeutics
CBTID	Centre for Biosecurity and Tropical Infectious Diseases
CCDP	Centre for Chronic Disease Prevention
COPD	Chronic obstructive pulmonary disease
CRE	Centre of Research Excellence
DFAT	Department of Foreign Affairs and Trade
Dr	Doctor
DSITI	Department of Science, Information Technology and Innovation
DSITIA	Department of Science, Information Technology, Innovation and the Arts
DTHM	Division of Tropical Health and Medicine

HDR	Higher Degree Research
Hon.	Honourable
HIV	Human immunodeficiency virus
IBD	Inflammatory Bowel Disease
ICAN	Indigenous Counselling and Nicotine
IHR	International Health Regulation
IMR	Institute of Medical Research
JCU	James Cook University
K	Thousand
LIEF	Linkage Infrastructure, Equipment and Facilities
M	Million
MDR TB	Multi-drug resistant tuberculosis
Mets	Metabolic Syndrome
MRR	Mark, release, recapture
NCIG	National Centre for Indigenous Genomics
NHMRC	National Health and Medical Research Council
NMR	Nuclear magnetic resonance
NQHF	North Queensland Health Foundation
OHS	Occupational Health and Safety
PAD	Peripheral arterial disease
PC	Physical containment

PhD	Doctor of Philosophy
PNG	Papua New Guinea
QAO	Queensland Audit Office
RIBG	Research Infrastructure Block Grant
ROV	Remote operated vehicle
QRCPVD	Queensland Research Centre for Peripheral Vascular Disease
SAHMRI	South Australian Health and Medical Research Institute
SIT	Sterile Insect Technology
SRI	Special Research Initiative
SSA	Site Specific Approval
T2DM	Type 2 diabetes Mellitus
TAAHC	Tropical Australia Academic Health Centre
TB	Tuberculosis
UC	Ulcerative Colitis
US	United States
USA	United States of America
WEHI	Walter and Eliza Hall Institute of Medical Research
WHO	World Health Organization



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