INFLUENZA: A GLOBAL EFFORT FOR VACCINATION

PRACTICAL ACTION IN PNG
UNDERSTANDING CROHN’S
DENDRITIC CELLS: NEW HOPE FOR CANCER
MICROBICIDES
Welcome to the autumn issue of IMPACT. The breadth of our research and public health programs continues to grow, and in this issue we address some areas of our work that you may not be aware of. A large proportion of our research is focused on the immune system and looks at ways by which our knowledge can be exploited to find new ways of preventing and treating diseases.

A relatively new area of research that is expanding significantly at Burnet, and showing very exciting possibilities in the prevention and treatment of disease, is dendritic cell research. Dendritic cells are at the very centre of the body’s immune response. To a very large extent they are the ‘conductors’ in the orchestra of cells and molecules that combine to fight infections and cancers. Being able to manipulate these cells and give them a memory against specific proteins found on cancer cells or viruses provides us with new ways to develop vaccines that could be used to treat or prevent diseases. In just one example, Professor Geoff Pietersz discusses progress on cancer vaccines, which use dendritic cells to evoke an immune response against cancer.

With the colder months approaching, we are also very mindful that we’re likely to see increased cases of influenza. Over the past few years we have seen outbreaks of swine flu and bird flu, both of which had the potential to result in significant global pandemics and cause millions of deaths. So far we have been fortunate that the numbers of people affected has been relatively small in comparison to earlier global pandemics, but the potential for another major pandemic remains with us. Influenza researcher Emeritus Professor Greg Tannock discusses some of the basics of influenza and reminds us just how complex it is to find a solution to this common viral infection.

We also update you on some of our activities in Papua New Guinea, which provides great challenges across a spectrum of areas including HIV prevention, women’s and children’s health, and sexual and reproductive health. Two of Burnet’s researchers who are now working in PNG discuss their work and our close relationship with an amazing organisation, the Papua New Guinea Institute of Medical Research (PNGIMR).

Finally, if you haven’t already visited our new website I would encourage you to log on and take a wander through the various pages. The site is easier to navigate and I think you will be impressed by the easy-to-find information and the regularly updated news of our research and public health activities. The address remains the same as previously www.burnet.edu.au.

Best wishes

Professor Brendan Crabb,
Director and CEO
NEW EQUIPMENT WILL FAST-TRACK CANCER RESEARCH.

The Bill and Janina Amiet Foundation is a long-term supporter of the Burnet Institute’s cancer research and has over the past five years provided funding to purchase a number of major pieces of equipment.

Recently the Institute received a further substantial donation to part-fund the purchase of an automated liquid handling system. The new system will enable the Institute to process large numbers of samples much more efficiently, increasing the progress and scale of our cancer research.

Burnet Institute’s Centre for Immunology Head, Professor James Beeson, said using the new system will enable staff to perform major experiments with large sample sizes in just a few days as opposed to weeks, and with better results.

Foundation Trustee Mr Bill Amiet said he was pleased to support Burnet’s research programs ensuring the Institute had access to the most up-to-date technology.

“Technology has moved quickly over the past decade and the ability to provide new state-of-the-art equipment that enables research to be fast tracked is important,” Bill said.

The donation provided by the Amiet Foundation also helped to encourage a major gift from the Kel and Rosie Day Foundation, enabling the automated liquid handling system to be purchased outright.

Burnet Institute’s Head of Advancement, Ms Ruth Rosh said these major gifts were great examples of how one donor’s support could impact and encourage the support of others with the end result being the ability to develop research outcomes more quickly.

If you would like to know more about making a donation like this, please contact Ms Ruth Rosh on (03) 8506 2332 or email ruth.rosh@burnet.edu.au

GENEROUSITY, GRATITUDE AND HOPE FOR THE FUTURE.

I have come to the Burnet Institute from the environment sector, where I worked initially as an editor and publisher, and then as a bequest fundraiser. I’m excited to have joined the Institute, and I am inspired by the visionary work of our medical researchers, social scientists and health workers to improve the health of disadvantaged and vulnerable people, both in Australia and around the world.

Now, in my current role as Planned Giving Manager I work with those wonderful members of the community who support Burnet’s work through a gift in their Will – with a bequest, or other more structured form of giving such as a testamentary trust.

People often ask me why I love this work. “Isn’t it all about death and dying?” they ask. But for me a charitable bequest is about life, and living – with generosity, gratitude, and hope for the future.

Burnet is fortunate in having received legacies and notifications of future bequests from many people in all walks of life, who share a common humanity and hope for a future freed from the suffering caused by infectious disease, poverty and social inequity. It’s their generosity and foresight that allows Burnet to plan for our long-term future with confidence.

In Australia we are privileged to have access to good primary health and medical care and good nutrition, housing and sanitation – the foundations of good health. Almost all of us have the capacity to enhance the life opportunities of others through a gift in our Will. Every bequest, however small or large, is gratefully received and makes a difference to Burnet’s capacity to meet the health and social justice challenges of the day.

For further information about including Burnet in your Will, please call me for a confidential discussion on (03) 8506 2338 or email mjulian@burnet.edu.au

BRIGHTER FUTURES BECAUSE OF YOU.

“I would like to extend my sincere thanks to those who donated to our Healthy Mothers, Healthy Futures Appeal, launched by Board Member Natasha Stott Despoja AM in November last year.

“Funds raised through this Appeal are increasing access to basic health services for women and children.”

Professor Brendan Crabb, Director and CEO

To find out more about Burnet’s maternal and child health programs, please visit www.burnet.edu.au/health_themes/6_MCH

Maternal and Child Health:
Why Care this holiday season?

Women in the world’s least developed countries are 100–300 times more likely to die during childbirth or because of their pregnancy than those in Australia.

Eight million children a year die before their fifth birthday, almost all from preventable causes such as birth asphyxia, pneumonia, diarrhoea and malnutrition.

Less than half of women in developing countries have their babies delivered by a skilled attendant.
Burnet is fortunate to have the support of many Trusts and Foundations. One of our long-standing supporters, The CASS Foundation recently gave Professor Geoff Pietersz a grant to conduct innovative proof-of-concept work on developing novel anti-arthritis drugs. Rheumatoid Arthritis is an incurable autoimmune disease that causes great pain and loss of joint function. Existing drug therapies have a number of limitations relating to safety, cost, efficacy or method of delivery; there is an urgent need for treatments with novel mechanisms of action that have more convenient dosing or treatment methodologies.

Professor Pietersz and his team have identified a novel target on the surface of immune cells (FcγRIIa) that is involved in the tissue destruction associated with rheumatoid arthritis. Data gained from this work will be used to conduct ‘virtual screens’ whereby new drugs are designed computationally to fit into the known groove of the target. These new generation drugs will then be tested in well-established in-vitro assays to determine whether they are indeed specifically targeting FcγRIIa.

Two invaluable grants were received from the William Buckland Foundation (managed by ANZ Trustees). Dr Paul Gilson from our Centre for Immunology was awarded a grant to purchase an Ettan IPGphor 3 IEF System to support his malaria research. This machine sifts through and separates cellular proteins to determine how drugs affect the on/off switch state of malaria parasite invasion proteins. Associate Professor Anthony Jaworowski and Dr Anna Hearps from the Centre for Virology were also awarded a grant to conduct a study into the role of human bone marrow monocytes and their role in controlling inflammation in the elderly. Little is known about the changes in innate immune cells in blood during ageing or chronic viral diseases and this project hopes to inform new treatments.

Dr Rebecca Jenkinson, research officer with the Centre for Population Health, will be attending the 38th Annual Alcohol Epidemiology Symposium of the Kettil Bruun Society (KBS) in Norway in June, thanks to a travel grant from The Ian Potter Foundation. She will present a paper on young people’s health behaviours conducted at a music festival in Melbourne in 2011. Dr Jenkinson’s paper examines the increase in high-risk alcohol and other drug use and sexual risk behaviours among young Australians, and how harm reduction campaigns should consider targeting this population with specific health promotion messages.

The Kel and Rosie Day Foundation has been an enthusiastic supporter of Burnet for many years and in 2011 they supported the purchase of a benchtop flow cytometer, which will assist in the development of novel vaccines and will support many of Burnet’s scientists. Representatives from the family visited our labs and have seen for themselves the programs they support, and we are grateful for their commitment to Burnet.

“Kel and Rosie Day’s previous donations have purchased state-of-the-art equipment which has significantly improved the efficiency and outcomes of our research. This new flow cytometer will allow us to take some of our exciting research into clinical trials, speeding the development of vaccines for HIV, hepatitis C and malaria as well as therapies for autoimmune diseases,” said Associate Professor Rose Ffrench, Head of the Viral Immunology Group, Centre for Immunology.
Super Resolution Microscopy, the Way of the Future

This is why I am seeking your support so we can acquire Burnet’s first super resolution microscope.

Super resolution microscopy is a powerful technology new to Australia that will enable Burnet scientists to capture images of microbes, cancerous cells and immune cells in unprecedented detail.

It is indeed the way of the future and will ensure we are at the forefront of good science.

It will significantly accelerate the development of new therapies and vaccines against infectious diseases such as malaria and HIV as well as a range of cancers such as ovarian and breast cancer, lymphoma and autoimmune diseases. This new microscope will be used by a vast array of Burnet scientists working across infectious diseases, autoimmune diseases and cancer immunology. It will also be made available to our partners on the Alfred Medical Research and Education Precinct (AMREP).

I INVITE YOU TO JOIN US IN OUR QUEST TO RAISE A TOTAL OF $360,000 TO PURCHASE THIS NEW MICROSCOPE.

One of Burnet’s committed donors has contributed a very generous $100,000 foundation funding for the new microscope. He has done so in the hope that you too will be encouraged to make a gift and help us close the funding gap by raising a further $260,000.

Please consider making a gift today by visiting www.burnet.edu.au/support_our_work or by completing the donation coupon in this magazine.

Professor Brendan Crabb, Director and CEO, Burnet Institute

Thousands participated in the Romp on Sunday 25 March.

Thousands Romp for Burnet!

With beaming smiles and a Romping spirit, people from all walks of life turned up on Sunday 25 March for a fabulous day of fun, adventure and laughs – all in the name of a great cause – raising money for Burnet’s fight against The Big Three.

Burnet’s Director and CEO, Professor Brendan Crabb said the money raised will go directly to towards the Institute’s malaria, TB and HIV programs.

“We would especially like to thank those teams who worked so hard in the lead up to the Romp by fundraising for us,” Professor Crabb said.

“It’s events like this that provide a great opportunity for Burnet to reach new supporters and also spread the message about the work we do.”
The PNGIMR is the oldest national research institute in PNG, conducting research and public health intervention programs to target respiratory diseases, malaria, malnutrition, enteric diseases, sexual health and women’s health.

Dr Claire Ryan has been working and studying with Burnet since her honours year in 2003, involved with projects investigating HIV transmission among Vietnamese injecting drug users in Melbourne and characterising the types of HIV circulating in PNG, Fiji and Indonesia. In 2006 Claire moved to Cambodia with the Australia Youth Ambassador for Development Program, in partnership with Burnet, to establish HIV viral load testing within the National Institute of Public Health. She returned to complete her PhD in Burnet’s Centre for Virology with Professor Suzanne Crowe AM in 2009, before being seconded as the HIV and STI laboratory head at the PNGIMR.

Claire’s development of the HIV and STI laboratory has enabled testing for a variety of sexually transmitted infections, including chlamydia, gonorrhoea and trichomoniasis. These techniques are utilised in ongoing STI epidemiology studies, including the largest survey among antenatal clinic attendees in PNG. The laboratory also conducts serological based tests for syphilis, herpes simplex virus type 2 and HIV, and is working with Burnet’s Centre for Virology to conduct the first investigation into the prevalence and development of HIV drug resistance in PNG.

Collaborating with the Kirby Institute, the HIV and STI laboratory is also principally involved in the first study of human papillomavirus prevalence among the general population in PNG. This virus is the pre-curser to cervical cancer, which is a leading cause of death among PNG women.

“This information will be used to improve the screening and treatment for pre-cancerous lesions, and also to provide information that the National Department of Health require for the introduction of vaccination,” Claire explained.

Another priority for Claire’s team is to improve the diagnosis and treatment of syphilis, and they are currently working with the Kirby Institute (University of NSW) and Burnet’s Associate Professor David Anderson to identify the...
Claire’s laboratory also conducts work on a basic-science level; the team are working with Burnet’s Associate Professor Gilda Tachedjian at Burnet on the HIV-1 enzyme reverse transcriptase. She also worked with Dr Alyssa Barry on population genetics of malaria parasites, particularly focused on epidemiology in PNG. After a short-term contract working with PNGIMR in 2011, Jo began a full-time secondment in 2012.

Jo works at IMR to assist in the implementation and development of molecular techniques to test for pathogens, working closely with Claire’s HIV and STI laboratory on several projects. Her other major projects include providing technical support to IMR’s Malaria Laboratory (led by Dr Barnadas from the Walter and Eliza Hall Institute) and establishing molecular techniques to investigate the role of two common causes of pneumonia in child hospitalisation, with Dr Andrew Greenhill’s Bacteriology Laboratory in collaboration with the University of Western Australia.

“The majority of these tests utilise a technique known as real-time PCR to detect and quantify a particular pathogen’s genomic material,” Jo said.

“Currently IMR is the only facility in PNG that has the equipment, staff and knowledge to use these molecular biology techniques.”

Training and capacity building of the staff involved in each project is one of Jo’s primary objectives and she enjoys being able to assist staff working on any project with almost any question they might have.

“I think I have the best job at the IMR. I get to work with many different people across a broad range of the research, and I learn a lot in the process,” she said.

Working in a development setting such as PNG poses many challenges, particularly when trying to conduct quality research. The timely and safe delivery of reagents, inconsistent power and water supply, and intermittent phone and internet connections result in plenty of interruptions. But Jo explains the rewards of the job far outweigh the difficulties.

“We get to work with a lot of amazing people in a beautiful place and perform basic research that directly impacts on people’s lives. For a lot of the staff working at IMR, this is one of their major motivations – to contribute to the health of the people of their nation. We count ourselves lucky to work here.”

Claire and Jo acknowledge the support of their collaborators: the PNG National Department of Health, the Burnet Institute, the Kirby Institute and the Royal Women’s Hospital, Melbourne. They also acknowledge the PNG National AIDS Council Secretariat, Exxon Mobil, through the Partnerships in Health Initiative, AusAID, the PNGIMR Internal Competitive Research Awards Scheme, the Australian Centre for HIV and Hepatitis Virology, and the National Health and Medical Research Council for funding this vital work.
In healthy individuals, the immune system does not react against food, ‘good’ bacteria or other normal bowel components. In patients with Crohn’s Disease however, the immune system seems to overreact to substances and bacteria in the intestine; white blood cells invade the intestinal lining and produce inflammatory toxins causing chronic tissue swelling, injury and ulceration. Burnet’s Dr Amanda Gavin and her laboratory are trying to understand how responses in our immune system can lead to the development of autoimmune diseases, like Crohn’s Disease.

Our immune system has the important job of protecting our bodies from unwanted microbial infections. The white blood cells that make up our immune network include B-cells that make antibody, T-cells that fight viruses and assist B-cells, and innate cells that eat and destroy bacteria.

In some people, an immune response develops against our own cells and tissues; this is known as an autoimmune disease. There are many types of autoimmune diseases, including type 1 diabetes, rheumatoid arthritis, and systemic lupus erythematosus. Inflammatory bowel diseases such as Crohn’s Disease are also thought to be a type of autoimmune disease, where the intestine is wrongly targeted by the immune system.

AN INCREASING CONCERN
Dr Amanda Gavin, head of Burnet’s Gavin Laboratory, says almost 30,000 Australian’s are living with Crohn’s Disease. “What is particularly concerning is the growing incidence; it has been predicted that this figure will rise by 20 per cent over the next decade,” she said.

Crohn’s seems to occur equally in men and women, and usually appears for the first time in patients under 30 years of age. It usually affects the lower small intestine (ileum) and the large intestine (colon),
but can also target other parts of the digestive tract. The inflammation causes abdominal pain, diarrhoea and a range of other symptoms including fever and weight loss. In severe cases, intestinal surgery may be required.

The precise cause of this abnormal immune response is unknown.

Research indicates that there is a genetic or inherited predisposition to develop Crohn’s Disease. First-degree relatives (brother, sister, parent or child) of patients with Crohn’s are more likely to develop the disease, although genetic studies using identical twins have shown that not everyone who has genetic predisposition will go on to develop it.

Environmental factors and gut bacteria have also been shown to contribute to a patient’s likelihood of developing Crohn’s, and there are certain chromosomal markers that have also been found in the DNA of patients with the disease.

There is currently no cure for Crohn’s; patients may need medical care for a long time with regular doctor visits to monitor their condition.

“It is hard to find a solution for something if you don’t know every detail about how it works,” Dr Gavin explained.

“Although immune suppression drugs can help the symptoms of Crohn’s Disease, we really need to understand the cause and effect between the immune system, intestinal tissue, and good bacteria.”

While there are many groups in Australia, and internationally, trying to understand what “goes wrong” in people who develop Crohn’s, most of the work is focused on understanding how macrophages and other innate immune type cells handle and respond to bacteria in the gut.

“We are approaching the problem from another angle however, asking instead if Crohn’s patients have altered tolerance signaling that may allow self-attacking T-cells to escape from the thymus, rather than being detained as they should be,” Dr Gavin said.

The thymus is the organ in our body where T-cells undergo quality testing, in a process called ‘tolerance’. T-cells that show they will not attack self-antigens are released from the thymus go out to defend our bodies from microbial invaders; conversely T-cells which do attack self-antigens are normally detained in the thymus and eventually die.

Recent advances by other research groups have identified genes that are linked to Crohn’s Disease, including NOD2, a bacterial sensor protein, and IL23R, a gene that importantly keeps some T-cells alive.

Dr Gavin and her team are testing if mutations in these and other genes influence how T-cells receive self-tolerance signals in the thymus. Researchers in Burnet’s Gavin Laboratory are also using animal models to discover if the body’s self-tolerance signals are impaired when gut bacterial load is altered.

“Gut bacteria differs from person to person, and we are only now beginning to learn the effect that this bacteria can have on our entire wellbeing and immune system,” Dr Gavin said.

“Ultimately, by looking at the problem from different angles, the information gained by us and others will help provide the larger picture.”

Outcomes from these studies will hopefully provide a much better understanding of the basic mechanisms behind autoimmune reactions, and the ability to develop better therapies and prevention strategies.

“Our ideal outcome would be to gain insight of how and why these tolerance mechanisms breakdown, so that Crohn’s Disease and other autoimmune reactions could be prevented in the future.”

Dr Amanda Gavin has always been interested in understanding how the immune system receives signals that stop it from attacking our own bodies.

These signals lead to immune self-tolerance in healthy people, and presumably breakdowns in these signals lead to autoimmune disease in others.

After studying the control of B-cells by self-tolerance signals in the USA with David Nemazee at The Scripps Research Institute, Dr Gavin joined the Burnet Institute in 2010. Her laboratory investigates the molecular interplay between the innate and adaptive arms of the immune system.

Her current work focuses on Crohn’s Disease, an autoimmune disease of the gut that is driven by both an abnormal immune system and gut bacteria.
INFLUENZA:
A GLOBAL EFFORT FOR VACCINATION
Influenza outbreaks are a significant public health problem and are responsible for severe illness and death in high-risk populations (the elderly and young children) as well as high levels of absenteeism.

Influenza pandemics involving the introduction of ‘new’ influenza A viruses (most relevant in humans) occur infrequently but have the capacity to cause illness, death and economic loss that dwarf all other human infectious diseases.

Vaccination is the most effective way to prevent illness by influenza viruses. Effective and safe vaccines have been available for many years but their uptake, especially in at-risk individuals, has been less than optimal. In the recent swine flu pandemic millions of vaccine doses were unused.

Burnet Senior Fellow and virologist, Emeritus Professor Greg Tannock, believes that we may be at risk of undervaluing the importance of seasonal vaccination. Professor Tannock has spent more than 30 years researching influenza, one of the most familiar, and still most perplexing, viruses known to man.

WHAT IS INFLUENZA?
Influenza, or ‘the flu’, is an infectious disease caused by RNA viruses that can infect birds and mammals.

Every year, seasonal epidemics of the flu spread around the world, causing the death of between 250,000 and 500,000 people. Pandemics of influenza can cause much higher levels of mortality, with the Spanish influenza outbreak (1918) estimated as being responsible for the deaths of more than 50 million people. There have been three influenza pandemics over the past century, with the most recent being the 2009 swine flu pandemic.

Seasonal influenza spreads easily. When an infected person coughs, infected droplets get into the air and can be inhaled by another person. Epidemics occur usually during autumn and winter, and result globally in three to five million cases of severe illness. Most deaths associated with the virus occur among people age 65 or older, although young children and the chronically ill are also considered high-risk.

“EVERY YEAR, A GLOBAL PROCESS OF SURVEILLANCE FORECASTING PREDICTS WHICH INFLUENZA VIRUSES ARE LIKELY TO CAUSE THE MOST ILLNESS IN THE COMING SEASONS.”

UNDERSTANDING THE VIRUS
Influenza A and B are common causes of acute respiratory illnesses, with Influenza A being considered the most relevant to humans. Influenza A has great capacity to change, and can be transmitted from animals, notably aquatic birds, which can cause major pandemics of influenza.

Among the 16 influenza A virus subtypes, influenza A(H1N1) and A(H3N2) subtypes are currently circulating between humans. ‘H’ and ‘N’ refer to different combinations of surface glycoproteins, haemagglutinin and neuraminidase, which exist on the outer shell of the virus. These different combinations play key roles in determining the susceptibility of humans to infections by ‘new’ viruses and are important factors in determining virus virulence.

A COMPLEX PROBLEM
Influenza is a remarkably complex virus, both in the way it behaves and the way it is structured. While most viruses have one gene which carries out all the virus’s functions, the influenza virus is made up of eight genes, which all act independently of each other.

In an article published in The Monthly in April 2010, Professor Tannock explained that one of the key characteristics distinguishing influenza virus is its complicated method of replication.

“Carbon copies of genes are produced, rather than the genes themselves being reproduced. Because this copying process is imperfect, the consequent errors produce mutants of the virus, which may not be recognised by immunity obtained by previous infection or vaccination,” he said.

Both the high mutation rate and the random unpredictable nature of genetic reassortment of the virus enables it to evade immune recognition, and poses significant problems in the development of strategies to prevent infection.

VACCINATION: A GLOBAL EFFORT
Unfortunately, with a complicated virus like influenza, the solution isn’t as simple as with other highly successful viral vaccines – such as those for the prevention of polio viruses, measles, mumps, rubella and hepatitis B, which remain effective from one year to the next. To be effective against influenza, a new vaccine is required before the onset of each new flu season.

Every year, a global process of surveillance forecasting predicts which influenza viruses are likely to cause the most illness in the coming seasons.

The process relies on the surveillance and study of disease trends in more than 100 countries, which supply information to the five World Health Organization (WHO) Collaborating Centres for Reference and Research on Influenza, one of which is located in Melbourne.
WHO consults with the directors of these Collaborating Centres twice yearly, and recommendations are made on the composition of the next influenza vaccine. From these recommendations, each individual country makes their own decision as to which strains should be included in influenza vaccines licensed in their country.

The vaccines are then manufactured by a small number of private companies, including CSL Ltd in Melbourne. Influenza vaccines are developed using ‘inactivated’ or killed virus, and each season will be effective against one influenza A (H3N2) virus, one seasonal influenza A (H1N1) virus, and one influenza B virus. Because of the necessity for quick turn-around, manufacturers will often start growing one or more virus strains for the vaccine even before a recommendation is made, based on their own predictions. This allows more time to make vaccine before the arrival of flu season. It usually takes at least six months to produce large quantities of influenza vaccine.

This process involves a tremendous amount of work and vaccines are only specific for viruses that have recently been isolated from humans; it is simply not possible to predict the nature of change in a forthcoming flu season, particularly given the capacity of influenza viruses to mutate. Despite these difficulties, in a normal flu season – for instance, one where there has not been a pandemic virus – a reasonable match is obtained between the protective ingredients of the vaccine and the viruses responsible for seasonal influenza.

Professor Tannock assures us that vaccination is a success story, and that its cost as the major public health measure for the prevention of influenza is more than justified.

“Many people don’t realise just how effective these vaccines are. Among healthy adults the seasonal vaccination can prevent up to 90 per cent of influenza-specific illness,” Professor Tannock said.

“We are also particularly fortunate in Australia to have an influenza vaccine manufacturer (CSL); the only one the Southern Hemisphere and one of very few in the world.”

Professor Tannock reminds us that there is still much we don’t know about influenza, and many improvements still to be made in the development of vaccinations.

“Ideally, we need to develop a vaccine which is effective against both pandemic and non-pandemic viruses, which could eliminate most of the ‘bottlenecks’ around vaccine manufacture,” he said.

“Essentially many of the methods developed by virologists more than 60 years ago are still important and relevant to us today; unfortunately, despite all our increased knowledge, we are still unable to predict when the next influenza pandemic will occur.”

IMPROVING THE YIELD OF INFLuenza B VIRE

Most vaccines, including the seasonal influenza vaccine, are prepared by growing viruses in fertilized chicken eggs.

While the process for growing influenza A viruses is relatively straightforward, for reasons not entirely understood the same method is not as effective when trying to grow strains of Influenza B virus.

Influenza B comprises one-third of each seasonal influenza vaccination and as such it is important for manufacturers that they can grow predictable amounts of the virus.

Ms Hyunsuh Kim, from the International Vaccine Institute in Seoul, is undertaking a PhD project at the Burnet Institute with Professor Tannock to address problems associated with the influenza B component of vaccines caused by low-yields. Ms Kim’s research is being supported by a grant from CSL Ltd.

The results have been encouraging. Although the preliminary hypothesis was shown to be incorrect, other studies to enhance yields of influenza B viruses have been highly encouraging.

A paper outlining causes of variability has been submitted for publication, and was recently presented by Ms Hyunsuh Kim at the European Scientific Working Group on Influenza (ESWI) in Malta.
More than 35 years ago, Professor Ralph Steinman (Rockefeller University, New York) discovered a new type of cell, which he called ‘Dendritic Cells’. Steinman hypothesised that these cells might hold the key to activating T-cells, an immune cell that helps our bodies develop an immunological memory in what is known as ‘adaptive immunity’. After decades of research, and a Nobel Prize for Steinman’s work in 2011, dendritic cells provide new hope for vaccines and therapies against cancer and a myriad of pathogens.

Dendritic Cells (DCs) are often described as the ‘sentinel guards’ of our immune system. They recognise pathogens by special sensors called Toll-like receptors and activate a defence, interacting with T-cells and B-cells to initiate and shape our adaptive immunity.

DCs are rare and difficult to isolate, and our understanding of their subsets has been limited until quite recently. Now many researchers, including several groups at Burnet, have begun looking for ways to exploit the unique capability of DCs to prime an adaptive immune response.

Head of Burnet’s Bio-Organic and Medicinal Chemistry Laboratory, Professor Geoff Pietersz and his team are finding ways to use DCs to evoke an immune response against cancer.

“The key strategy involves using a ‘carrier’ to deliver tumour-associated proteins to DCs, so they activate an immune response to target and destroy the cancer cells,” he said.

“We use expertise in organic chemistry to design these ‘carriers’. To mimic DCs natural function we link a tumour-associated protein (mucin 1) to a sugar (mannan), which the DC recognises and engulfs.”

A vaccine (CVac™) based on mannan developed by Professor Pietersz and colleagues at the Austin Research Institute (which merged with Burnet in 2006) has shown promising results in clinical trials, and is now in development by Prima Biomed Ltd as a vaccine for ovarian cancer. The vaccine uses cells harvested from the patient, which are converted to DC, mixed with the vaccine and reintroduced into the patient’s body. Recently, the Pietersz Laboratory has developed a more potent mannan formulation, from which 4G Vaccines Ltd are developing an improved vaccine.

Professor Pietersz believes that while historically there has been much pessimism towards cancer vaccines, the growing knowledge of DC subsets, their function and how cancers and our immune system overcome vaccines, allow for new optimism.

“Greater understanding is helping us identify the ‘right type of DCs’ to target, and to avoid DCs that counteract the generation of effective immunity,” he said.

“In 2010 the first cancer vaccine, Provenge®, was approved by the FDA for use against a type of prostate cancer. This vaccine uses the patient’s own blood cells, including DCs, and demonstrates the significant step forward DC research provides for cancer vaccines.”
Women account for 50 per cent of HIV infection, with more than 60 per cent of those infected living in Sub-Saharan Africa. In these environments, negotiating use of male condoms can be difficult for women, and abstaining from intercourse is not an option for women who want to have children, or who are at risk of sexual violence.

Head of Burnet’s Retroviral Biology and Antiviral Laboratory, Associate Professor Gilda Tachedjian and her team are investigating methods of protection that women can initiate themselves.

“It is precisely in these most affected environments where the development of female-initiated strategies, such as microbicides, is desperately needed. We need to offer women a chance to protect themselves,” she said.

Microbicides are chemical entities that can block infection by HIV and other STIs that enter via the female genital tract. They can work in many different ways: by killing pathogens; strengthening the body’s natural defences; creating a barrier between the pathogen and target cells; and by preventing the infection from spreading between cells. Microbicides can be formulated into various products such as gels, films, tablets or rings for application to the vagina, and are also being developed for use

IMAGES:
1: SPL7013 is a dendrimer which has been shown as potent in blocking HIV and genital herpes in cell culture tests.
2: Polyvalent dendrimers. (Images courtesy of Starpharma Pty Ltd).
in the rectum by women and men. Globally, more than 60 products have been evaluated as potential microbicide candidates. The majority of these products have undergone preclinical evaluation and some have even advanced into human studies. But the challenge lies in the myriad of criteria that a microbicide must meet in order to be successful; most importantly that it is safe for use and does not cause any irritation or discomfort to the user. The importance of this was highlighted when researchers investigated using the spermicide Nonoxynol-9 as an HIV microbicide: they discovered that vaginal lesions and inflammation caused by the spermicide made it easier for HIV to establish an infection, and the rate of transmission actually increased.

For a microbicide to become successful it must also be socially acceptable to women and their partners, affordable for use in low-income settings, and easy to apply. Ideally, it would provide protection for several days or even weeks at a time, and must be available in both contraceptive and non-contraceptive formulations. Microbicides must remain stable at high temperatures, preferably be odourless, colourless, tasteless, compatible for use with latex, and able to be used without partner knowledge.

LEADING AUSTRALIAN MICROBICIDE EFFORTS
In collaboration with the Australian biotechnology company Starpharma Pty Ltd, Burnet’s Associate Professor Tachedjian and her team have been undertaking the preclinical evaluation of dendrimer microbicides for the inhibition of HIV and genital herpes. The laboratory is also studying how dendrimers interact with the virus and host cells to block infection. These studies have identified a fourth-generation dendrimer, SPL7013, as the most potent in blocking HIV and genital herpes in cell culture tests, achieving a broad-spectrum activity against different HIV strains and herpes virus (HSV) by inhibiting viral attachment and entry.

“THIS IS AN EXCITING TIME IN THE HIV PREVENTION FIELD, WITH MANY CHALLENGES AHEAD.”

The Tachedjian Laboratory has also discovered that SPL7013 directly kills some HIV strains. Computer modeling studies predict that HIV particles with exposed, highly charged knobs on their surface are more likely to bind to SPL7013 and be killed by this dendrimer.

In 2011, Starpharma and the Tachedjian laboratory published results for a study investigating VivaGel®, a topical gel containing SPL7013, in healthy women. This study found that VivaGel®’s antiviral activity against HIV and HSV was sustained in cervico-vaginal samples for at least three hours post application in all women, and up to 24 hours in 50 per cent of participants. This prolonged high-level efficacy suggests that VivaGel® does not need to be used immediately prior to intercourse.

“While these results are encouraging, further studies will need to evaluate VivaGel®’s effect in the body, and determine the products effectiveness in real-life settings,” Associate Professor Tachedjian said.

“There are also exciting results indicating that daily application of VivaGel® for seven days clears bacterial vaginosis (BV), which is a relatively common imbalance in the vaginal microflora. Curing this condition is critical because BV can increase the risk of acquiring HIV and other STIs. If confirmed in phase III clinical trials, this property of VivaGel® will make it highly attractive for use in combination with specific antiretroviral agents, such as tenofovir, forming a multi-prevention microbicide with potential efficacy against HIV, other STIs and BV.”

WHERE TO FROM HERE?
Microbicides show considerable promise as a strategy for HIV prevention, particularly in empowering women to protect themselves. But there is still a fair way to go.

“While it is important that new agents are identified and progressed, there is a need for improved selection criteria for microbicides to enter the clinical pathway,” Associate Professor Tachedjian said.

“Different delivery strategies and formulations, particularly those that enable women to use the microbicide well before intercourse itself, are critical to give women options for microbicide application and for addressing issues with microbicide adherence.”

While antiretroviral agents show promise, the development of combination microbicides would potentially be more potent, and would also prevent infection with drug-resistant HIV compared to a microbicide comprising only a single agent.

“Acceptability studies with different microbicides need to be performed as a first-step in making these strategies available to women in the Asia and Pacific Regions, such as Papua New Guinea, where male to female HIV transmission is predominant,” Associate Professor Tachedjian said.

“This is an exciting time in the HIV prevention field, with many challenges ahead.”

LACTIC ACID: Another approach
The Tachedjian Laboratory in collaboration with Professor Richard Cone (Johns Hopkins University, Baltimore, USA) and Dr Thomas Moench (ReProtect, Baltimore, USA) are determining the potential for lactic acid as a topical vaginal microbicide.

“We are studying the ability of lactic acid to inactivate microbes associated with BV, HIV and HSV, and assessing its potential to be combined with specific antiretrovirals.” Associate Professor Tachedjian said. Lactic acid is produced by bacteria that are normally present in the healthy vaginal tract and has been found to be potent in inactivation of HIV.
Burnet has a unique blend of skills and expertise, which are utilised across a diverse range of activities including basic research, clinical management, and public health responses. Our programs cover a range of infectious diseases including HIV, malaria, tuberculosis, hepatitis viruses and influenza.

HIV
Almost 50 per cent of our research and public health programs are focused on various aspects of HIV such as vaccines, drug targets, microbicides and development of rapid diagnostic tests. By linking our existing activities and skills across the Institute’s four centres, and expanding our programs through the Infectious Diseases Theme we will create a more comprehensive approach to infectious diseases prevention and management.

ONE HEALTH CONCEPT
We are also addressing our approach to infectious diseases through the One Health concept, which recognises the interplay of common factors between animal and human health and the environment. It has been shown that significant health gains that can be achieved through improved coordination and collaboration between these sectors, especially in preventing and identifying emerging infectious diseases, 60 per cent of which are spread from animals to humans.

MALARIA
Malaria continues to be a strong focus for Burnet and covers a broad spectrum of activities. This includes scientific research, which is advancing our understanding of the parasite itself and how it invades and survives inside human red blood cells. Studying the immune responses that provide natural protection from malaria has also enabled further insights into potential malaria vaccine development. Burnet’s malaria vaccine development programs are focusing on several proteins required for parasite invasion or survival.

“HCV TRANSMISSION IS AN ON-GOING PROBLEM WITHIN MARGINALISED POPULATION GROUPS...”

Burnet’s Centre for International Health also completed the redesign of the next phase of one of AusAIDS’s priority projects, the Pacific Malaria Initiative, in both the Solomon Islands and Vanuatu. Burnet’s activities on malaria also extend to the community level with a new program to start in 2012 to increase access to malaria diagnostics and treatment for remote and rural communities in East New Britain, Papua New Guinea.

HEPATITIS C VIRUS (HCV)
HCV transmission is an on-going problem within marginalised population groups and Burnet continues to work with people who inject drugs. An important component of our work is a project which examines how the social and injecting networks of people who inject drugs can affect transmission of the virus. This project modeled different transmission scenarios and highlighted the importance of social network factors in studies of HCV transmission, and raise their importance in public health interventions aimed at reducing HCV transmission.

It is estimated around 11 million people, mostly young children, die every year from infectious diseases.
Unfortunately, progress towards reducing maternal deaths has been slow, and stillbirths and deaths of newborns in the first week or two of life represent a large proportion of deaths of children under five.

The reason for this slower progress is because most complications of labour are unpredictable – but they can be managed well if women deliver in a health facility that can provide good emergency care. Burnet has a broad approach to improving maternal and child health across the life-course.

We work to strengthen health service systems; to tackle underlying causes such as poverty, inequalities in service access, and the low status of women; and to develop new technologies such as low-cost easy-to-use diagnostic tests, new ways to deliver medicines, and interventions to prevent malaria.

**COMPASS, THE WOMEN AND CHILDREN’S HEALTH KNOWLEDGE HUB**

AusAID’s Health Knowledge Hub initiative aims to increase aid effectiveness by ensuring that evidence is reviewed, synthesized and taken up by policy makers. Within this initiative, the Burnet Institute’s Centre for International Health has responsibility for maternal and newborn health.

A comprehensive analysis was recently completed of what could be done to reduce deaths due to infections in mothers immediately after childbirth. This is especially significant in settings where many births take place at home and many mothers die in childbirth.

A detailed study of which community-based interventions would have the greatest impact in Papua New Guinea was also completed. Other programs include exploring the challenges faced by rapidly growing smaller cities in the Philippines in delivering maternal and child health services to the poor, and learning lessons about how to meet the reproductive health needs of adolescents in Vanuatu.

**RESEARCHING MALARIA**

Malaria is a leading cause of childhood death and illness and a major health problem among pregnant women. Burnet’s malaria program integrates laboratory-based research with clinical and population studies in collaboration with partners in malaria-endemic countries. The programs aim to understand the biological mechanisms that cause malaria disease and immune responses that clear and prevent infection.

“**BURNET RESEARCH HAS LED TO THE DEVELOPMENT OF A NEW, NON-LABORATORY TEST FOR CONGENITAL SYPHILIS.**”

This knowledge is applied to the development of vaccines and other interventions to prevent malaria and also to new treatments. In studies of Karen women on the Thai-Burma border and PNG women, we have recently made major gains in understanding how pregnant women develop and maintain immunity to malaria. Our studies in children in PNG and Kenya are helping us to understand how the immune system responds to malaria and to identify new targets for a malaria vaccine. These studies have identified new compounds that block malaria infection and revealed essential biological processes that could be targeted by new drugs.

**PREVENTING CONGENITAL SYPHILIS**

Many babies are still born with syphilis, an easy problem to prevent and treat if a low-cost clinic test was available. Burnet research has led to the development of a new, non-laboratory test for congenital syphilis. Clinical studies are now underway in Australia and PNG in collaboration with the National Centre for HIV Epidemiology and Clinical Research.
Burnet’s work in this area is broad, ranging from basic (laboratory) science projects, clinical trials and epidemiologic studies through to capacity building projects, education, training, policy development and more.

IV and other sexually transmitted infections (STIs) are a focus of several Burnet laboratories. Research to identify new therapeutic targets in the structural proteins of HIV and validating low-cost tests for monitoring HIV patients in resource-limited settings are major programs currently in progress.

Clinical trials relevant to sexual health are also important areas of work and key projects include a Phase I trial of VivaGel®, a candidate microbicide for HIV prevention; and a trial to see whether Vorinostat (a drug used to treat cancer) can activate latent HIV in patients on therapy. Finding strategies to eliminate latent HIV infection could be an important step towards a cure.

INTERNATIONAL SEXUAL HEALTH PROJECTS

Centre for International Health (CIH) staff are involved with many sexual health related projects. One example of this is Compass, the Women’s and Children’s Health Knowledge Hub, a partnership between Burnet, Menzies School of Health Research and the Centre for International Child Health.

“A BURNET WORKED WITH PROVINCIAL AIDS AUTHORITIES TO ENHANCE LOCAL HIV PREVENTION CAPACITY...”

A key aspect of Compass’ work has been identifying regional needs and barriers to achieving the Millennium Development Goal of ‘ensuring universal access to reproductive health’.

Burnet Laos completed the Expanded HIV Prevention Program on Lao Northern Economic Corridor (Route 3). This program is supported by AusAID and the Asian Development Bank (ADB), and aims to reduce HIV/STI transmission in communities near major road construction projects. Burnet worked with provincial AIDS authorities to enhance local HIV prevention capacity and provide education to at-risk communities (including ethnic groups, truck drivers, miners, casino workers and female sex workers). Increased HIV knowledge and condom use was reported among target groups, with no increase in men purchasing sex – despite increased opportunity through new venues opening. Burnet is building on this success to implement an HIV/STI prevention program along another major road construction project in Northern Laos.

In Timor-Leste, CIH has been working with Marie-Stopes International on a pilot project to develop a youth friendly sexual and reproductive health counselling manual (funded by World Bank, UNFPA and AusAID). Burnet has designed the manual and provided training to 39 counsellors in Dili and Bobonaro.

SEXUAL HEALTH PROJECTS IN VICTORIA

The increasing success and popularity of Queer as F**k, originally developed by researchers in the Centre for Population Health, is now a core part of the Victorian AIDS Council (VAC)’s sexual health promotion work. Queer as F**k centres on an online video series hosted through facebook, which describes a share house of gay men living in Melbourne and has sexual health topics embedded within the narrative. It is one of the first attempts internationally to harness the reach and interactive potential of social networking for sexual health promotion. The latest Season 5 attracted increased interest with the appearance of Academy Award winner Geoffrey Rush, and the Victorian Department of Health has committed to further funding of the project.
The Drugs and Public Health Interest Group (DPHG) promotes cross-Centre collaboration by sharing information on opportunities for Burnet both in Australia and the Asia and Pacific Regions.

While continuing a focus on drug use, injecting and HIV prevention in Asia, other international highlights include our work in PNG as well as the ongoing expansion of the Pacific Drug and Alcohol Research Network.

**STUDIES AND FOLLOW-UP**
Our work continues to focus on prospective studies of drug use and related harms, with high follow-up rates of participants across all studies. For example, in a recent study of treatment engagement by people who use methamphetamine, more than 80 per cent of participants recruited in 2010 were followed up in 2011. Similarly high rates of follow-up across all of our studies highlights how effectively our fieldwork teams are able to engage with participants who are often from marginalised and vulnerable populations.

**HARM REDUCTION**
Harm reduction continues as a strong theme in our domestic and international programs. A good example of our domestic work is the evaluation of the viability of Medically Supervised Injecting Facilities, which has been used to assess the feasibility of this innovative harm reduction intervention in Victoria.

“In the Pacific, including Papua New Guinea, the main concern for harm reduction is the impact of excessive alcohol use on individual, family and societal well-being.”

In Asia, drug injecting and the risk of transmitting blood-borne viruses is at the core of our HIV prevention activities. In Myanmar we continue to build the capacity of the Myanmar Anti-Narcotics Association (MANA) and other civil society partners to effectively respond to drug use and related harms, including HIV.

In the Lao PDR we train and support peer educators who work with sexually active young people to address sexual risk behaviours associated with alcohol and amphetamine use. Burnet, as part of the USAID funded bilateral in Indonesia, has adapted the Resource Estimation Tool for Advocacy (RETA) to be used for estimating resource needs for countries to respond to HIV among injecting drug user populations.

In the Pacific, including Papua New Guinea, the main concern for harm reduction is the impact of excessive alcohol use on individual, family and societal well-being.

Burnet, through the Centre for International Health, is a partner on two-bilateral HIV prevention programs in Indonesia (funded by AusAID and USAID) that work within a harm reduction paradigm with people who inject drugs and commercial sex workers, and the community organisations that support them. These programs, working through the Government of Indonesia structures, aim to address the harmful consequences of drug use and to strengthen the in-country agencies that target high-risk populations.
These cross-centre activities focus on urgent needs to protect the world’s most vulnerable populations from diseases such as malaria, polio, TB, hepatitis C, hepatitis B and HIV. Burnet is also at the forefront of state-of-the-art technologies to manipulate the immune system for the production of vaccines against non-infectious diseases such as cancer and arthritis.

**HEPATITIS C VIRUS (HCV)**
Creating an HCV vaccine is challenging because the virus is able to alter its appearance to the immune system. The Centre for Virology has made exciting progress in developing a vaccine that has protection against highly divergent HCV strains. Through collaboration with CSL Limited, these studies have identified the optimal form of the major surface protein of HCV that gives protection. The work has also been supported by NHMRC funding to further define the lead vaccine candidate and understand how the virus evades the immune system. Interferon lambda is a soluble factor known to be important in patient’s immunity to HCV; researchers from the Centre for Immunology and the Centre for Population Health have studied HCV infected patients who produce this factor to determine what specific cell types are involved. This will allow for analysis of whether there are defects in the cells important for HCV immunity.

**HEPATITIS B**
The Centre for International Health is studying new approaches to vaccination delivery. Vaccination against hepatitis B within 24 hours of birth is challenging for many countries, but is critical to global efforts to prevent liver cancer (the fifth most common cause of cancer death) or liver failure. Burnet is supporting a new global hepatitis program, led by the World Health Organization, and is demonstrating innovative means to vaccinate newborns in Papua New Guinea (PNG).

**HIV**
One of the biggest obstacles for producing a vaccine against HIV is knowing exactly what type of immunogen will generate a broad neutralising antibody response. The Centre for Virology and Centre for Immunology are investigating the 3-dimensional structure of the HIV gp120 protein when bound to its CCR5 co-receptor. Understanding these structures provides a critical ‘missing link’ in HIV research and will accelerate the development of better vaccines. Studies are also determining how the immune system ‘ages’ in the setting of infection with HIV and other chronic diseases. Research has shown that the immune system of young HIV-positive individuals ages prematurely, which is predisposing these people to illnesses normally associated with older people, such as cardiovascular disease and metabolic syndrome.

**“BURNET IS SUPPORTING A NEW GLOBAL HEPATITIS PROGRAM, LED BY THE WORLD HEALTH ORGANIZATION...”**

**MALARIA**
Burnet’s researchers are investigating the function of parasite proteins that may be potential vaccine targets and analysing the immune responses in infected individuals from endemic areas. A particular focus is on the anti-malarial immune responses in pregnant women, where research is shedding new light on the course of disease in this highly susceptible group.
almost 25 per cent of the ill-health related to pregnancy and childbirth; maternal conditions are their leading cause of death. Unsafe sex and lack of contraception are leading risk factors for poor health among young people.

Compass has demonstrated that young people do not automatically benefit from strategies aimed at improving the sexual and reproductive health of the general population: they have unique health needs, face particular barriers to accessing information and services, and require targeted responses.

ALCOHOL, ILLEGAL DRUGS AND YOUNG PEOPLE

Burnet researchers recently conducted several unique studies of young people’s engagement in alcohol and other drug use. CPH’s research into psychostimulant use revealed that large quantities of alcohol and psychostimulants were often consumed during the same ‘session’, and that this heavy, simultaneous use was associated with an increased risk of arguments and fights, accidents and injuries, driving while drug-affected, uncharacteristic sexual behaviour, and overdose. The study participants also regularly engaged in other risky behaviours, such as selling drugs for profit (drug ‘dealing’) and young women using psychostimulants to lose or maintain their weight. Other research into alcohol and other drug use among night-life patrons commenced in late 2011, and will inform harm reduction approaches in Melbourne’s entertainment precincts.

To reduce risky behaviour and its harmful consequences in young people, it is important to understand the interaction between the contexts of their alcohol and other drug use, and their engagement in risky behaviours.
Combination treatment can cut malaria by 30 per cent

A new malaria drug regime tested in Papua New Guinea can cut malaria infections in infants by up to 30 per cent. Burnet’s Head of Immunology Professor James Beeson and Professor John Reeder, formally of Burnet, now the Director of the Special Programme for Research and Training in Tropical Diseases at the World Health Organization, collaborated with the Walter and Eliza Hall Institute (WEHI) on the project.

The three-year trial showed this new regime was effective against both *plasmodium falciparum* and *plasmodium vivax*. This is the first time a drug treatment has shown to prevent infections by both strains of malaria.

Called Intermittent Preventative Treatment (IPT), the regime protected infants tested against malaria for at least six weeks, showing that it provided ongoing protection and did not stop the development of natural immunity.

RTI visits Burnet

Liz Hill, the Global Health Collaborative Leader for Research Triangle Institute (RTI) International, spent two weeks at Burnet to explore collaborations between RTI International and Burnet to increase the breadth and scope of what the two organisations want to achieve.

“We think we can do great things together that we can’t do separately, let’s look at what needs to be done and if we can do something working together we should,” Ms Hill said.

Burnet international health specialist awarded OAM

A long and dedicated career in the field of international health has seen Beverley Snell recognised in the 2012 Australia Day Honours with a Medal of the Order of Australia.

A qualified pharmacist, Mrs Snell, who has worked with Burnet since 1994, has made a huge contribution to international health, especially in the areas of drug policy and as a consultant to the World Health Organization (WHO). She said receiving the OAM was recognition that her work is important and necessary. “I’m really passionate about my job and Burnet has given me a good base to explore things which weren’t necessarily on ‘the program’,“ Mrs Snell said. “There probably aren’t too many public health research institutes that allow you to do that.”

Chief Patron of Burnet Institute, The Governor of Victoria, the Hon Alex Chernov, AC, QC was also recognised in the Australia Day Honours.

Gates grant for TB Biomarkers:

Associate Professor David Anderson’s project ‘Novel reagents for the serological diagnosis of tuberculosis’ is one of ten projects to be awarded a grant through the Bill & Melinda Gates Foundation’s Grand Challenges in Global Health program, an initiative which seeks to overcome persistent bottlenecks in creating new tools that can radically improve health in the developing world.

Within the Gates Grand Challenges program, the Grand Challenges TB Biomarkers program provides funding specifically for groundbreaking research into TB Biomarkers for the development of a low-cost, simple to use tool that can quickly and accurately diagnose TB in developing countries. Using just a drop of blood, David and his team have developed an innovative diagnostic test which may be able to detect if a patient has TB.

“Our approach for TB diagnosis is novel, and we look forward to working with the Gates Foundation and the other grant recipients to identify the best approach for TB diagnosis in the developing world,” David said.

“If this project is successful it could have a big impact because we are developing a relatively simple biomarker that could form the basis of an inexpensive test, suitable for low-resourced countries.”
**Staff Spotlight**

**Harry Fong**

Logistics Officer – Burnet’s Port Moresby Office, PNG

I began work for Burnet in September 2008 as a driver, after finishing a role as storeman with the National AIDS Council Secretariat. Initially my role was to look after the distribution of Informational Educational Communicational (IEC) materials and condoms throughout PNG.

I now work as a Logistics Officer, arranging travel for local staff and visiting staff from Melbourne. I am also the security point person, which involves providing updates on security issues to ensure safety for all staff across Burnet’s PNG offices.

We are a small team in the Port Moresby office, which means I get to assist people in a range of tasks such as administrative support, driving, doing the banking, escorting Melbourne-based staff when they are in-country, and even making coffee sometimes!

I like my job because it provides an opportunity to do new things, but more importantly because of the work environment that has interesting challenges, a lot of very kind, friendly and professional people that I get to meet, and my colleagues who are very supportive.

Outside of work, my family has quite a reputation in snooker. My younger brother, Djorne, is ranked as PNG number one player for five years, my uncle Peter and my dad (Harry Snr), are considered ‘veterans’ of the game, and there are many other ‘Fongs’ highly seeded in the ranks. I have played competitive snooker, and also have represented New Ireland in national basketball tournaments. Music is really important to me too; last year, while training at Lamana Hotel for the ‘Media Pool Comp’, a team member suggested I audition for PNG Idol, which was being held at the same hotel. This evolved into the experience of a lifetime; I never expected to get past the first round but ended up making it through to the Grand Final! This has really motivated me to take music more seriously, and I have been writing music, collaborating with other musicians, and am working on an exciting project with KB Stone Studios.

My ultimate goal is to learn as much as I can from experience life presents, and to achieve success in opportunities that arise. One day hopefully all my experiences will lead the way to further success in one of the areas I am most passionate about, sports or music.

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**Talking Heads**

**Professor Irina Caminisch**

Laboratory Head – Dendritic Cells in Innate and Adaptive Immunity

For some people a single event shapes their lives. Mine happened when I was three years old and I watched my seven year old sister slip into a coma and pass away from an undetected brain tumour. From that moment on I wanted to understand ‘why?’ and ‘how?’ – medical research is a natural extension of that quest.

I received my PhD from the University of Western Australia where I studied ways of evoking anti-tumour immunity. It was during this time that I fully realised how powerful our immune system is: on the one hand it can achieve miracles such as spontaneous rejection of cancers; on the other hand, when the immune system gets it wrong, it can literally destroy the body as with autoimmune diseases.

At the centre of all this are dendritic cells, the ‘sentinel guards’ of our immune system which control the armies of immune cells. I joined Professor Shortman’s group at the Walter and Eliza Hall Institute 13 years ago to learn more about dendritic cells, and how we can utilise them to control immune responses. Moving to Burnet this year gave me the opportunity to start my own laboratory in an environment that recognises the importance of basic research, and fosters the translation of that research into practical outcomes.

Contributing to medical research as a way of supporting the welfare of children remains a driving force of my work. While my day-to-day experimental work can seem abstract and esoteric, the benefit is finding new ways of making better vaccines. My collaborator, Dr Mireille Lahoud, and I are testing new ways of vaccinating against cancer, malaria, influenza, and HIV. Burnet is committed to better health for vulnerable communities; better vaccines are one way to achieve this.

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**Burnet Intern:**

**Lavinia Magir**

Drug and Alcohol Harm Reduction Project Port Moresby, PNG

I chose to do this internship with Burnet because I want to play a part in addressing the drug and alcohol issues in my country. Training is a big part of my day-to-day job. Recently I was in the Pomio District of East New Britain Province, delivering training in two different villages. My colleagues and I lived in the village with the peer educators, and we conducted training every day from 8am–4pm, followed by community activities at night. I really enjoy working in villages with our peer educators – they are fun to hang out with!

I really like it that my role gives me the opportunity to educate people about their drug use, and its also great that I get to travel a lot and meet different people, and learn about their culture and experiences.
Cutting edge research demands state-of-the-art technology; the equipment we need is specialised and expensive.

We urgently need a further $260,000 to purchase Burnet’s first Super-Resolution Microscope.

Every extra dollar gets us closer to our target.

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