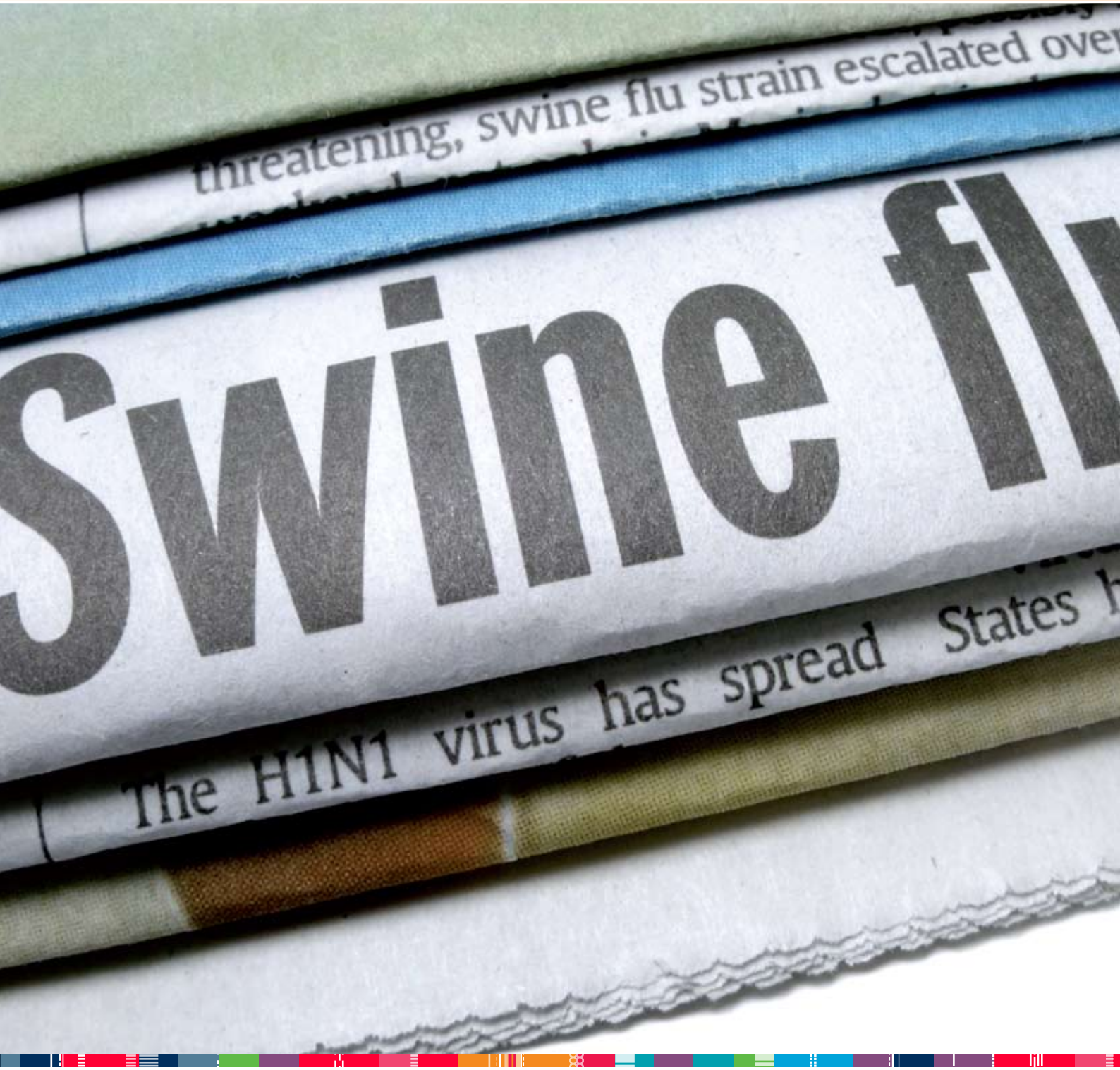
IMPACT

THE NEWSLETTER OF THE BURNET INSTITUTE | SPRING 2009



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Burnet Institute
Medical Research. Practical Action.

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DIRECTOR'S REPORT

Welcome to the spring issue of *IMPACT*. This issue is especially significant for the staff at Burnet because it's the first to bear our new and recently launched logo.

Since the Austin Research Institute merged with Burnet in 2006, we have been working with an interim logo, which appropriately reflected the coming together of the two Institutes. But of course in time, it was important for the Institute to develop an image that reflected the core mission and unique characteristics of the new Burnet. Working with branding and communications consultants Oxygène, the new logo has been designed to express and position the Institute as an organisation that focuses on addressing major health needs of disadvantaged groups and of the developing world.

The new symbol is a simple, strong and iconic mark that represents a red globe, designed to be recognisable and to highlight our emphasis on global health.

Our new tag line '*Medical Research. Practical Action.*' highlights the Institute's unique approach, combining world-class laboratory and field research with translational activities that include a major emphasis on the practical delivery of public health programs in many regions of the world.

We're very proud of our new look and excited about increasing our profile within the communities in which we work.

The onset of the swine flu pandemic has again highlighted how quickly infectious diseases can spread within communities and cause significant concern. At the time of writing this report, more than 10,000 Australians have been infected with pandemic (H1N1) 2009. The need for a rapid response to new and emerging infectious diseases is only possible with a high level of scientific expertise and the associated infrastructure to support this work.

Burnet has developed significant capacity in infectious disease research and public health over many years and as a result will make a considerable contribution to the prevention and control of the H1N1 pandemic. We have recently received NHMRC funding for three research programs which are focused on the immunology, monitoring of the immune response, and the epidemiology, transmission and impact of swine flu on the community. Given the high degree of community focus on this disease and the potential for it to impact further in the future, we thought it was most appropriate to enclose a special feature on swine flu in this issue of *IMPACT*.

Again, I would like to thank all our donors for supporting the work of the Burnet Institute. Your contribution does help us to continue to be at the forefront of medical research into infectious diseases and cancers, and to undertake practical programs which together, will help millions of people around the world to have a healthier future.

Professor Brendan Crabb, Director and CEO

Burnet Institute
Working towards a healthy world

Austin Research Institute

Burnet Institute
Incorporating Austin Research Institute
Joining together for a healthier world

Burnet Institute
Medical Research. Practical Action.

All donations over $2 are tax deductible. Where possible people who appear in images included in this newsletter were photographed with their permission. There is no implication that these people have any infectious diseases.
Photo credits: Andrew Connolly, Liquid Creations, Clare Murphy, Les O'Rourke, Lisa Renkin, Tracy Routledge

Victoria The Place To Be

ACFID CODE

Australian Government AusAID

Women for Women:
getting together, making a difference. A new fundraiser for Burnet

On Mother's Day, our Board Member Ms Natasha Stott Despoja, launched *Women for Women* a new fundraising campaign for Burnet. This internet-based campaign aims to raise funds for our international health projects that help vulnerable women and girls.

From our work in many poor countries it's clear that women have very different experiences of poverty due to the different physiological, cultural, social and economic factors that surround and shape their lives. Many of our projects help women, often in dire situations, to reduce their vulnerability and disadvantage.

Donations to *Women for Women* will support current programs such as: our work in Mozambique with organisations that look after AIDS orphans and women with HIV; a maternal and child health program in Papua New Guinea; supporting older people on Sri Lankan tea plantations; and various projects working with young women in Laos.

» To find out more about Burnet's work with vulnerable women and girls or to support our fundraising or to purchase this great 'Mozi' t-shirt go to www.womenforwomen.org.au.

IMAGE GENEROUSLY SUPPLIED BY THE SUNDAY HERALD SUN, PHOTOGRAPHER, SIMON CROSS.

'Cycle for a Cure' and support Burnet on the Rainforest Ride, 21 November

The Rainforest Ride is a new road cycling event to be held on Saturday 21 November. The Ride is set amidst the stunning Great Otway National Park, around Apollo Bay and along the beautifully scenic Great Ocean Road.

Cyclists riding through the Great Otway National Park.

This ride features four different rides to suit all levels of cyclist; a challenging 140km Rainforest Circuit, a 70km Lighthouse Discovery Ride, a tranquil 23km Waterfall Explorer and a unique and magical 23km Glow Worm Twilight Ride.

The Rainforest Ride is being held in support of Burnet's fight against The 'Big Three': HIV, TB and malaria – some of the world's worst infectious diseases.

» For more information about this exciting new event go to www.rainforestride.com

A big thank you to our donors – Zeiss Microscope Appeal

We would like to thank everyone who has so generously supported our Appeal to purchase a new Zeiss microscope. To date we have received $90,000 towards the $200,000 cost of this state-of-the-art piece of equipment. The microscope is vital to our research as we are currently without a dedicated live-cell imaging system for our staff. All donations to the Burnet Institute of $2 and above are fully tax deductible.

Inaugural Gust-McKenzie Medal awarded

The inaugural Gust-McKenzie Medal was presented to Dr Heidi Drummer, Head of the Viral Fusion Laboratory at the Burnet Institute's Annual General Meeting in May.

The Medal is awarded in recognition of excellence in research and/or public health by a mid-career Burnet Institute staff member. It is named in honour of the founding Directors of both the Burnet and Austin Research Institutes, Professor Ian Gust AO, and Emeritus Professor Ian McKenzie AM.

Dr Drummer said, "I am very honoured to receive the inaugural Gust-McKenzie Medal. Over the past five years, I have been extremely fortunate to work with a dedicated and talented group of scientists without whom this work would not have been possible. I would also like to thank the Burnet Institute for the support and facilities offered to me for my studies in hepatitis C virus entry and vaccine development."

Dr Heidi Drummer holding the inaugural Gust-McKenzie Medal with Chairman of the Board Alastair Lucas (left) and Professor Brendan Crabb.

SWINE FLU

– first global influenza pandemic for the new millennium

The Burnet Institute has three swine flu research projects underway. Read on to find out more about influenza, the recent pandemic and how Burnet's new research projects will inform public knowledge and government policy around influenza.

SEASONAL INFLUENZA: IMAGE GENEROUSLY SUPPLIED BY WHO COLLABORATING CENTRE FOR INFLUENZA AND ROSS HAMILTON AT CSL LIMITED.

On 17 March 2009 health authorities in Mexico and the USA reported that people were infected with an influenza virus not previously detected in humans. The virus appeared to be unrelated to known seasonal influenza viruses, and contained gene segments from North American and Eurasian swine influenza viruses. It also included gene segments from an avian and a seasonal human influenza virus. This new A (H1N1) virus, now known as 'swine flu', spread rapidly around the globe and was declared to be a pandemic virus by the World Health Organization (WHO) on 11 June 2009.

Swine flu – the facts

Viruses that infect pigs do not normally infect humans. Sporadic human infections that have occurred have mainly been in those directly exposed to pigs, such as workers in the pig industry. The pandemic (H1N1) 2009, as WHO refers to this swine influenza, is a 'new' virus, derived from pigs, that changed genetically, allowing it to be efficiently transmitted to humans.

We know that pigs can be infected by avian, human and swine influenza viruses. So when influenza viruses from different species infect pigs, the genes of those viruses can re-assort and new strains emerge that contain mixtures of swine, human and/or avian influenza. It's considered that pigs act as a 'mixing vessel' for different animal and human influenza viruses and seem to play an important role in the emergence of potential new human influenza viruses.

Human to human transmission varies between influenza strains

Avian influenza virus H5N1, also known as 'bird flu', is relatively inefficient at infecting humans unless they have been exposed intensively to birds or contaminated poultry products. The reasons for the lack of human-to-human transmission are now well understood by scientists – transmission is dependent on the molecular properties of several of the virus' genes.

While avian flu outbreaks have been reported in birds, it's uncertain whether pandemic (H1N1) 2009 virus is capable of producing disease in pigs. The swine flu virus has genes derived from both pigs and birds, but the big difference between it and avian influenza is that pandemic (H1N1) virus can be transmitted readily between humans.

Swine flu is infecting different population groups compared to seasonal influenza

Seasonal influenza viruses are distinct viruses that infect the entire population, regardless of age, but tend to cause higher rates of mortality in the very young, the very old, pregnant women and those with underlying illnesses, such as respiratory illnesses and diabetes. The 2009 swine flu virus appears to predominantly infect young to middle-aged people and to cause severe illness mainly in those with underlying medical conditions or pregnant women. At this point people aged over 45 are thought to have immunity to the virus. For reasons that are currently not well understood, the pandemic (H1N1) 2009

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> "INFLUENZA IS AN UNVARYING DISEASE CAUSED BY A VARYING VIRUS."
>
> Dr E D Kilbourne, influenza research specialist.

virus appears to have a greater capacity than seasonal influenza virus to spread in the lower respiratory tract and cause pneumonia. Despite this, the new pandemic virus has caused only relatively mild infections in most people. By contrast, the mortality rate of those infected with avian influenza is 60–70%.

Unlike seasonal influenza which largely causes infections during winter in temperate climates and is largely absent during the summer, pandemic (H1N1) 2009 is currently a major cause of illness in Europe and North America during the summer.

Declaring pandemic status

The term 'pandemic' (from the Greek language 'pan' meaning all and 'demos' meaning people) is used to describe an epidemic that has the capacity to infect whole populations in every continent within a relatively small time frame. An influenza pandemic occurs when:
1) a new subtype of influenza virus emerges in humans that most people have not been previously exposed to and are, therefore, highly susceptible
2) the virus causes serious disease in humans, and
3) it is rapidly spread between humans, infecting large numbers of people worldwide and causing many deaths. Past pandemics, caused by influenza viruses, have occurred at least six months after the initial identification of a new type of virus. The 2009 swine flu spread in less than six weeks.

The WHO is the directing and coordinating authority for health within the United Nations system and is responsible for declaring the official phases of pandemic alert.

STATS AND FACTS ABOUT PANDEMIC (H1N1) 2009

8 May Queensland: First confirmed case of a new A (H1N1) influenza in Australia

20 May Victoria: First four cases confirmed, first state to report human-to-human and community transmission of the virus

19 August 2009 – Victoria
2924: Laboratory confirmed cases
22 (9 cases in intensive care):
Current pandemic (H1N1) 2009 inpatients
22: Total number of Australian deaths associated with human swine flu

* Statistics correct as at 20 August, 2009.
Source: The WHO, Centres for Disease Control and prevention, Department of Health and Ageing, Canberra, ACT, Australia.

Swine flu research at Burnet

On 8 July 2009, the Federal Government's National Health and Medical Research Council (NHMRC) awarded AUD$7million to medical research projects into swine flu, in response to international data showing the virus could continue to spread through the summer. The Burnet Institute gratefully received funding for three projects valued at AUD$521,442.

This research will help ensure the Australian Government's response to the evolving threat of pandemic (H1N1) 2009 is based on the most up-to-date information available. The research will help the Government tailor its response to the spread and nature of the disease and better equip it to help those most at risk.

Associate Professor Margaret Hellard, Head of the Centre for Population Health, and her colleagues will describe, map and model the epidemiology, transmission and impact of the new H1N1 virus on the Victorian community in 2009. This project is important because it will present the data collected by the Department of Human Services during the early phase of the outbreak starting in May 2009. Access to the data will enable the epidemiological and clinical characteristics of this strain of swine flu to be studied. Additionally, it will allow mathematical modelling of the transmission of the virus and will evaluate the impact on virus transmission of the control measures that were introduced, such as quarantine for families exposed to the virus and school-closures.

Professor Suzanne Crowe, Head of the Centre for Virology, in collaboration with investigators at the Burnet Institute, The Alfred hospital, and Duke University North Carolina, received a grant to research immune responses to pandemic (H1N1) 2009. This will involve detailed analysis of the antibody response to the virus with rapid development of potentially therapeutic monoclonal antibodies and a genetic analysis of the host's response that may be used in rapid diagnostic tests. The research will facilitate the development of a broadly cross-reactive vaccine, new serotherapies, as well as new diagnostics.

Associate Professor Rosemary Ffrench received a grant for monitoring human H1N1 immunity post-infection or vaccination through the Centre for Immunology's new Immunological Monitoring Facility (IMF) *(see page 13 for more information)*. The aim of this research is to set up a centralised and independent facility at Burnet that provides assays (tests) to assess swine flu immunity, including antibodies and cellular immune responses, validated to the highest industry-standard, known as Good Laboratory Practice. At the end of the project the IMF will have all the reagents and assays available to quickly assess vaccine responses and respond to the next influenza season, allowing the community to be further prepared for the arrival of future pandemic strains of influenza.

The principal investigators of the latter two projects are currently recruiting individuals with swine flu, seasonal influenza and those receiving influenza vaccination via collaboration with The Alfred hospital Emergency and Infectious Diseases departments.

Pandemic (H1N1) 2009

Emeritus Professor Greg Tannock, a virologist who has researched influenza for more than 30 years, joined Burnet's Centre for Virology in 2008. Since April, Greg has regularly appeared in the media, commenting on the swine flu pandemic. In September he will go to Oxford University on a Royal Society International Travel Fellowship. His work will look at the short-term responses against different influenza viruses, including pandemic (H1N1) 2009, from intranasally administered live vaccines.

Emeritus Professor Greg Tannock.

The current (H1N1) swine influenza pandemic is yet another reminder of the unpredictability of influenza A viruses to cause morbidity and death. Despite great increases in our knowledge of influenza viruses and the disease in recent years, we're still unable to predict when a pandemic will actually occur. Major outbreaks of illness usually follow changes to the influenza A surface antigens, involving the substitution of one or more surface antigen genes (the phenomenon of 'antigenic shift'). When these changes occur, entire populations are potentially susceptible to infection and the spread of viral illness is termed a pandemic. Four pandemics of influenza A have occurred over the past 100 years, in 1919, 1957, 1968 and 2009. The 1919 pandemic was caused by the emergence of an earlier (H1N1) virus and is commonly believed to have been responsible for 40–50 million deaths. The 1957 and 1968 pandemics were caused by (H2N2) and (H3N2)-like viruses, respectively, and produced far fewer deaths although their economic impact was substantial.

In other years, influenza A viruses undergo relatively minor changes, resulting from few changes to their surface antigen genes, and probable selection in the presence of pre-existing antibody. Largely because of these changes (known as antigenic 'drift'), vaccine manufacturers in most non-pandemic years are required to update their product. In most years, congruity is achieved between the antigens present in the vaccine (including those of influenza B viruses that are not discussed here) and the prevailing epidemic strains – a tribute to the efficiency of the World Health Organization's (WHO) laboratories engaged in epidemiological surveillance.

Swine flu appears more infectious than other influenza strains

Early reports suggest that the present pandemic virus appears, if anything, to be more transmissible than early isolates from previous pandemics although, overall, the disease it produces has been relatively mild and not that dissimilar to that produced by seasonal influenza viruses. Most instances of death and hospitalisation in Australia following infection appear to have occurred in individuals with underlying illnesses or risk factors that are well recognised for seasonal influenza infections. These include respiratory problems, obesity, diabetes and pregnancy.

Scientists and health strategists are better armed than in previous pandemics

We have:

- Wide-spread public awareness of the problems we face and the potential consequences of an influenza pandemic and, largely because of perceived threats from the SARS coronavirus and H5N1 avian influenza viruses, a well developed national pandemic plan.
- Greatly improved mechanisms for surveillance and reagent exchange, and a range of rapid molecular tests that allow us to rapidly identify new influenza strains and track changes that could be expected throughout a new pandemic. One of the singular achievements of the WHO has been the establishment of networks of reference centres throughout the world that freely and rapidly exchange data that is relevant to all human influenza activity.
- Two of the best antiviral drugs for the treatment of influenza (Tamiflu and Relenza) have been developed, both of which at present are active against (H1N1) 2009 viruses.
- Mechanisms in place for the expedited development of specific vaccines against new pandemic viruses. Indeed, Australia is extremely fortunate to be the only country in the Southern hemisphere and one of relatively few countries with a capacity to manufacture human influenza vaccines.

Two major deficiencies in our armamentarium: are our inability to predict when new pandemic viruses will emerge, and the time-lag between identification of the new virus and the availability of a preventive vaccine. In 2009, great credit must be given to all manufacturers who have performed wonders to have vaccines available – barely six months after the identification of the pandemic virus! There are no 'universal' vaccines available against human influenza and, although the subject of much research activity, it's a matter of conjecture whether such an approach is possible. Conventional subunit vaccines seem likely to be mostly used for the foreseeable future. However, intranasally administered live attenuated vaccines that have been registered for use in the US and provide broader relevant immune responses, are promising alternatives.

Young males have low rates of testing for sexually transmitted infection (STI) in Australia, particularly in regional areas. As *Chlamydia trachomatis* is now the most common notifiable disease in Australia, mainly affecting those aged 15 to 29 years, it is vital to find ways to encourage young people to be tested.

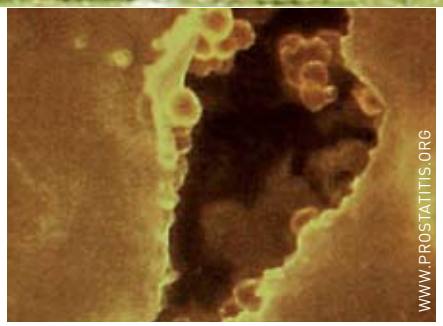
Sex & Sport

– successful STI screening in rural sporting clubs

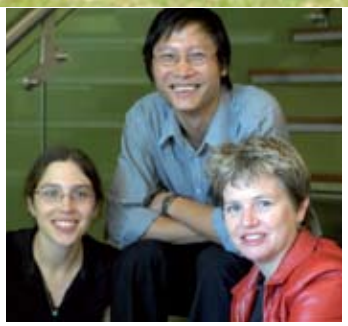
Associate Professor Margaret Hellard, Head of Burnet's Centre for Population Health had a 'lightbulb' moment watching her son play sport. Wondering about the most effective way to 'get to young blokes' in relation to STI testing and education, she realised the answer was right in front of her – sporting clubs.

Access to and confidentiality of sexual health services are seen as the major barriers to testing in rural and regional areas. The 'Sex and Sport' study undertaken by Associate Professor Hellard and Fabian Kong from the Burnet Institute, in collaboration with colleagues from rural and regional Victoria, aimed to determine the feasibility and acceptability of establishing a chlamydia testing outreach program in rural Victorian sporting clubs whilst monitoring prevalence of the disease.

Between May and September 2007, young people from the Loddon Mallee region were recruited into the study. After a night of sporting practice, participants provided a urine sample to a nurse on-site, completed a questionnaire regarding risk-taking behaviour and were then provided



Scanning electron microscopy appearance of *Chlamydia trachomatis* attacking epithelial cells.



Burnet's 'Sex and Sport' researchers, from left , PhD Student Judy Gold, Fabian Kong, Associate Professor Margaret Hellard.

with condoms and health promotion materials about STIs. Participants who tested negative for chlamydia were advised via an SMS message and those who tested positive were managed by a telephone consultation with a practitioner from the Melbourne Sexual Health Centre.

A total of 709 young people participated, 77% male and 23% female, 77% of those reported being sexually active. Every participant provided a urine sample and completed the questionnaire with the participation rate on recruitment nights over 95%. Overall, chlamydia prevalence in those sexually active was 5.1%, a rate of 7.4% in females and 4.5% in males.

Associate Professor Margaret Hellard said that the program was successful because it removed many of the traditional barriers to testing.

"The tests and treatment were free, it required no organisation on behalf of the participants and above all, results were confidential. In regional areas, especially small towns, many young people find it difficult to make a confidential visit to their local GP. They or their family may know the surgery's administrative staff personally or they may be uncomfortable discussing STI's with a GP who has treated them since they were a child.

"This is not a reflection on regional GP's but on the way the community thinks about sexual health. We need to normalise annual STI testing in the same way that Pap tests are now a standard feature of women's health management. Sporting clubs are highly-regarded in local communities, particularly in regional areas, so conducting STI testing under their auspices is a great way of reinforcing the importance of STI checks and removing any stigma of having a test. If 'everyone is getting tested' then it becomes less of an issue and also might make it easier in the future to have an STI test as part of a routine visit to the local GP," Associate Professor Hellard said.

More than 58,000 Australians were infected with chlamydia in 2008 and if left untreated it is a cause of pelvic inflammatory disease and tubal infertility in women. Modeling suggests that for the annual number of chlamydia infections to decrease, annual chlamydia testing in the 16–25 year old age range needs to be 30% or above. This model of outreach testing program works and offers an excellent way of connecting with young people, but increased testing at GPs is needed.

The 'Sex and Sport' study was funded through the Department of Health and Ageing via the Chlamydia Targeted Grants Program and the Myer Foundation.

CHLAMYDIA TRACHOMATIS

- Is now the most common notifiable disease in Australia
- Mainly affects young people aged 15 to 29 years
- Can infect you, without presenting any symptoms
- Is serious for women – causing pelvic inflammatory disease and tubal infertility
- Is easily treatable with antibiotics

Aceh Partnerships in Health – the final word

A three-year working partnership to address health issues in the wake of the 2004 Boxing Day tsunami in Aceh has been successfully completed. The Aceh Partnerships in Health (APiH) was funded by World Vision Australia for $5 million over a period of three years from early 2006. The Burnet Institute partnered with World Vision Australia and Melbourne's Nossal Institute for Global Health to build the capacity of the local health sector to respond to the disaster.

Based on an assessment of needs some months after the tsunami, APiH focused on five neglected areas of health identified as 'gaps' in the initial response: adolescent health; mental health; disability; HIV; and health finance. APiH was not intended to directly implement activities itself, rather to support existing systems and governance structures by partnering with local government, non-government and educational institutions, providing grants and quality technical support.

Substantial achievements credited to the APiH partnerships included: the establishment of the first, dedicated youth friendly clinic in Aceh and 'youth friendly corners' within seven health centres; creation of the first HIV-focused organisation; and the introduction of voluntary HIV counselling and testing services in the province. As a result of the program, mental health training was provided for 69 general practitioners, 126 community mental health nurses and 1358 village-level volunteers. The draft of the first mental health legislation for Aceh province is now under consideration by the Provincial Government.

Another excellent result was the development of a model for costing the minimum package of primary health care services at the district level, to inform rational budget allocations by government.

Ongoing health gains continue in Aceh through strengthened local non-government organisations and government departments nurtured under the APiH partnerships.

PROJECT NAME:
The Aceh Partnerships in Health (APiH)
FUNDING BODY:
World Vision Australia
LENGTH OF PROJECT:
Three Years

> "APiH FOCUSED ON FIVE NEGLECTED AREAS OF HEALTH IDENTIFIED AS 'GAPS' IN THE INITIAL RESPONSE: ADOLESCENT HEALTH; MENTAL HEALTH; DISABILITY; HIV; AND HEALTH FINANCE."

Thanks to our generous supporters

Without the support of our generous donors Burnet could not continue its vital work. We would like to acknowledge recent support for the following projects:

The Invergowrie Foundation: Training of young peer outreach workers from marginalised communities

Helen Macpherson Smith Trust: Victorian Immunological Monitoring Facility for Vaccine Development

Perpetual Trustees: A study of injecting drug users and early therapy intervention in relation to hepatitis C immunity (Percy Baxter Charitable Trust) and research into Lupus (Pendergast Charitable Trust Fund)

Joe White Bequest: Electron Multiplying Charge-Coupled (EMCCD) camera

Staff Spotlight

Lisa Renkin

Senior Fellow, HIV and Development, Centre for International Health

In 2005 I was living and working in China when I received an email that Burnet was recruiting. I was considering returning to Australia after many years working overseas so this was perfect timing – and I haven't sat still since!

I'm currently the Technical Director of the Tibet Health Sector Support Program, and I support several health systems and HIV projects across Burnet's China and Indonesia country programs. My role involves a lot of travel – this past year, for example has taken me to China, Indonesia, Cambodia, PNG, Mexico and South Africa.

I'm involved in business development, policy contribution, consultancies and technical leadership of Burnet's health and development staff in our overseas offices. I'm also on various committees and working groups within the Institute. I teach several postgraduate subjects offered by Monash University (where I'm an Adjunct Senior Lecturer), and also design and deliver tailored courses on specific topics.

Coming from a background of social justice, with a humanities degree from the University of Queensland, I've progressively specialised in international health and development, with an emphasis on HIV. I have a Masters of Public Health from the University of NSW and have lived and worked in many countries including Eritrea, South Africa, UK, Ghana, Togo, Ethiopia, Democratic Republic of the Congo (DRC), China, PNG and Indonesia. As a result, I can bargain in some fairly esoteric languages!

I first became involved with HIV via the Queensland AIDS Council, as a hotline volunteer counsellor in the early 1990s, before moving into the international development sector. I've worked for various agencies such as AusAID, Medecins sans Frontieres (MSF) and the Red Cross, and while I've loved the experiences in remote field placements I'm now loving living in Melbourne (go the Saints!).

Earlier this year I was fortunate to receive an Ian Potter scholarship that supports my involvement in the Asialink Leaders Program for 2009. This, along with my studies to upgrade my counselling qualification to a full professional diploma is keeping me quite busy – I hope to start my PhD next year, am I mad to even consider it...?

Talking Heads

Dr Paul Gilson

Joint Laboratory Head, Gilson/Crabb Laboratory (Malaria), Centre for Population Health

The aim of the Malaria Research Group is to perform laboratory-based research on the parasite *Plasmodium falciparum*, which causes the most deadly type of human malaria. The malaria parasite is transmitted by mosquito bite and remains one of the most devastating diseases of resource-poor tropical countries causing approximately one million deaths and 400 million infections annually. Unfortunately, many of the cheapest drugs available to treat malaria are losing their effectiveness due to parasite resistance and new drug targets urgently need to be identified. There is also huge demand for an effective malaria vaccine.

Our group's focus is to investigate how parasites invade human red blood cells where they grow and multiply, and how the parasite-infected red blood cells avoid the immune system. We are specifically trying to discover how the malaria parasite reads the red blood cell surface and then makes the decision to invade it. Once inside, the malaria parasite synthesizes sticky, velcro-like proteins and sends them out to the surface of the red blood cell causing the cell to bind to the walls of blood vessels. This keeps the infected blood cells away from the spleen, a blood-filtering organ that can destroy the infected cells.

Over the next five years we hope to develop treatments that could reduce the severity of the malaria disease or even eliminate the parasite altogether.

Student Focus

Anna Bellamy-McIntyre

Laboratory you work in: Drummer/Poumbourios Laboratory (Viral Fusion)

Supervisors: Dr Andy Poumbourios, Dr Heidi Drummer, Dr Melissa Hill

Currently studying: PhD Microbiology, Monash University.

Previous degrees: I did a BSc Auckland University, then Honours at Monash University in 2004, which is when I started at Burnet.

What is your average day? Ninety per-cent of my time is in the lab, conducting molecular virology experiments. Then it's back to the desk writing up results, working on papers and conference abstracts.

What attracted you to Burnet? I wanted to work on HIV and Burnet was offering fantastic opportunities in that.

Best thing about being here? Everyone is very social and friendly and I get a lot of opportunities to attend international conferences and interact with leaders in my field of interest.

Where to from here? I have to submit my thesis on HIV-1 viral entry, and then I'll head overseas and do a Post Doctoral position, hopefully somewhere in Europe.

Centre Heads:
Professor Sharon Lewin and
Professor Suzanne Crowe

Centre for Virology

A new low-cost, point-of-care HIV monitoring test

In an Australian first, scientists from Burnet's Centre for Virology have revealed a prototype low-cost HIV monitoring test designed for field use in remote settings. The new test enables patients at the point-of-care to find out within 30 minutes if they should begin antiretroviral treatment, without any laboratory equipment being required.

The CD4 rapid test, similar in design to a home pregnancy test, works with a finger-prick blood sample to measure the numbers of CD4+ T-cells in a person's blood. These cells are critical for a healthy functioning immune system and are slowly destroyed during the course of HIV infection. When the numbers of CD4+ T-cells in a person's blood decrease to a critical level, the individual is increasingly vulnerable to illness. Healthcare workers rely on a CD4 count to help them decide when HIV-positive patients should begin antiretroviral therapy.

The majority of patients in developing countries start antiretroviral therapy based on symptoms alone. Research shows that if HIV patients wait until they are sick to start treatment, they have a much poorer outcome than if treatment is commenced based on a falling CD4 count.

The majority of patients in the developing world do not have access to CD4 testing because it is expensive, and relies on sophisticated laboratory testing requiring specially trained operators. Where testing facilities exist, they are often too far away for people in rural areas to access and obtaining results can take weeks. Currently 33 million people globally have been diagnosed with HIV, many of them in resource-poor countries.

A prototype of the CD4 rapid test developed by Burnet scientists.

Having completed the first phase of trials, the prototype test developed by Burnet's scientists, in collaboration with colleagues at Chicago's Rush University Medical Centre, and Duke University in North Carolina, will undergo further validation and clinical studies to ensure it offers reliable and reproducible results.

The Burnet Institute was awarded a grant from The CD4 Initiative at Imperial College London, for the development of the low-cost, rapid point-of-care CD4+ T-cell test, specifically designed for field use in remote settings. Professor Suzanne Crowe, Associate Professor David Anderson and senior scientist Mary Garcia lead a team at Burnet with expertise in diagnostic test development.

> "CURRENTLY 33 MILLION PEOPLE GLOBALLY HAVE BEEN DIAGNOSED WITH HIV, MANY OF THEM IN RESOURCE-POOR COUNTRIES."

New research into the impact of HIV on cardiovascular health

The Centre for Virology is undertaking an exciting new research project into the cardiovascular health of people living with HIV. With the success of current antiretroviral drugs for the control of HIV, people with HIV infection are living longer, healthier lives. However, there is now a large body of evidence to suggest that despite this, people with HIV infection have higher rates of cardiovascular disease, including atherosclerosis and heart attacks. This is especially important as many HIV-positive people in Australia and other developed countries are already in a higher-risk category, due to older age and other risk factors such as smoking.

Together with The Alfred Heart Centre, and Baker IDI, Burnet scientists are studying whether there are residual effects of chronic HIV infection on the immune system that exacerbate cardiovascular disease. The researchers hope to develop better markers of cardiovascular disease in HIV-positive individuals, as well as better understand how cardiovascular disease may occur in a unique setting such as chronic HIV infection.

Centre Head:
Professor Mark Hogarth

Centre for Immunology

Burnet establishes a central IMF

In a major initiative, a central Immunological Monitoring Facility (IMF) has been established in the Centre for Immunology, that will support Burnet's research into the immune responses to vaccines and immunotherapies.

Under the guidance of Associate Professor Rosemary Ffrench and Associate Professor Bruce Loveland, the Facility has been carefully developed during the past year, with highly-skilled staff, validated immunoassay protocols and dedicated equipment to undertake tests which assess immune responses in small animal studies and early-phase human clinical trials.

The Facility is available to the broader research and development community via collaborative partnerships and the first Phase I clinical trial has been successfully conducted in association with clinical trial organisation, Nucleus Network Ltd. A second vaccine trial is now underway.

IMF staff at work in the new Facility.

IMF staff are in the process of expanding the range of assays that can be performed in the Facility to the highest industry standard, Good Laboratory Practice, and the Facility is also being evaluated for National Association of Testing Authorities (NATA) accreditation.

The development of the IMF has been supported via a grant from the Helen Macpherson Smith Trust. In addition to Ms Kylie Goy (IMF Co-ordinator), Dr Harini de Silva (Project Manager), Dr Amanda Brass (Clinical Laboratory Scientist) and Ms Devy Santoso (Laboratory Assistant) have recently joined the IMF.

> "IMF STAFF ARE IN THE PROCESS OF EXPANDING THE RANGE OF ASSAYS THAT CAN BE PERFORMED IN THE FACILITY TO THE HIGHEST INDUSTRY STANDARD."

The Burnet Institute has a long track-record of achievement in the translation of research into potential therapeutics – a number of vaccines, antibodies and immunotherapies for cancer or infectious diseases are in different phases of development. *(Read more about the IMF's contribution to swine flu research on page six.)*

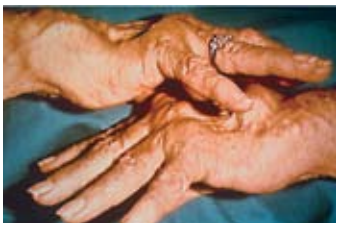
For more information please contact Associate Professor Rosemary Ffrench on ffrench@burnet.edu.au or phone **(03) 9282 2285.**

Advances in lupus and arthritis research

Researchers in our Centre for Immunology have made several exciting discoveries in their ongoing research in two related diseases: systemic lupus erythematosus (lupus) and rheumatoid arthritis. Although different diseases, they are related and are both autoimmune diseases where the immune system which normally protects against foreign invaders e.g. bacteria and viruses, breaks down and attacks the kidneys and skin in lupus, and the joints in arthritis. The research has the ultimate goal of producing treatments to cure these diseases and possibly intervene before disease develops. To achieve these aims it's necessary to understand the processes that lead to the immune system breakdown and the attack on the body's tissues.

In this research, the scientists and their medical colleagues are studying both human disease tissue and the immune system of mice, which has been engineered to develop disease. These new discoveries link the development of disease to changes in the regulation of white blood cells that normally respond to infection. In these studies, scientists have discovered several genes that become 'switched on' to regulate white blood cells. Also, other genes that in the past have had no known function, are now, for the first time, found in immune tissues. The future research will attempt to unravel the function of these genes and will explore their role in human disease which we hope will lead to the development of new treatments or interventions.

This collaborative research is being conducted with groups around Australia and also internationally at Stanford



The hands of a rheumatoid arthritis sufferer.

University. We are grateful for the support from the Harold and Cora Brennen Trust and Pendergast Charitable Trust Fund together with the NHMRC that fund this work in the Hogarth Laboratory (Helen Macpherson Smith Trust Inflammatory Diseases Laboratory).

Centre Heads:
Associate Professor Margaret Hellard,
Professor John Reeder

Centre for Population Health

An Achilles' heel in malaria offers new therapy hope

Members of Burnet's Gilson/Crabb Laboratory (Malaria) were delighted to have a major malaria discovery recently published in *Nature*, the leading international journal of science. This research group has identified a chink in the life cycle of malaria that offers hope for the development of new treatment options for this devastating disease.

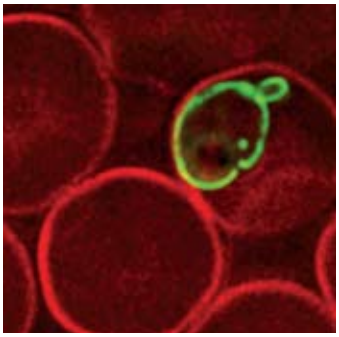
The malaria parasite grows inside red blood cells but to survive and cause illness it must transport hundreds of different proteins to the outside of the cell. While these proteins have many different functions that are crucial to parasite growth and survival, a common feature is that they must all pass through the same pore in the surrounding membrane. The discovery of this protein pore has major implications for a new anti-malarial therapy.

The research was undertaken in a collaboration including Burnet, The Walter and Eliza Hall Institute for Medical Research, and Deakin University's new Medical School.

Dr Tania de Koning-Ward, the lead author of the study, said the discovery opened up a new way to combat this disease. "The next step is to identify drugs that block this protein channel. Since the channel is completely unique to malaria parasites this is a realistic possibility", she said.

Director and CEO of the Burnet Institute, Professor Brendan Crabb, coordinator of the project, described the discovery as a breakthrough. "Protein export mechanisms are of great interest in biology, but because of the enormous scale of the malaria problem, discovery of this protein pore also has practical health value. Therapies that block this pore interfere with many different crucial processes in the one hit and in that sense it is the malaria parasite's Achilles' heel."

Malaria is spread via mosquitoes and its most lethal form is caused by the parasite *Plasmodium falciparum*. There are more than 400 million cases of malaria recorded each year with more than one million people, mainly children, dying from the disease. New therapies are urgently needed to combat ever-increasing resistance to the available drugs.



A live *Plasmodium falciparum* parasite (green), the cause of human malaria, inside a human red blood cell.

IMAGE TAKEN AT THE 2008 BURNET INSTITUTE DELTAVISION RT HIGH RESOLUTION MICROSCOPE WORKSHOP WITH THANKS TO DR TOM HOPE, DR CANDIDA DA FONSECA PEREIRA, DR JENNY ANDERSON AND DR GILDA TACHEDJIAN. PARASITES PROVIDED BY DR PAUL GILSON AND TANA TAECHALERTPAISARN.

'Suck it and See' – results revealed

The Centre for Population Health has just released the results of its 'Suck it and See' study. The study aimed to estimate the percentage of gay men who have HIV in Victoria and to better understand the spread of HIV. 'Suck it and See' is the first study of its kind in Australia to collect saliva samples to estimate HIV prevalence in a community setting, including gay bars/clubs, gay sex-on-premises venues and gay men's health clinics.

Of the 745 men recruited into the study, 100 were found to be HIV positive. Based on participants' survey responses, one in five of the HIV positive men in this study did not know that they were HIV positive.

These results underline the importance of regular HIV and other STI testing among sexually active gay men in Melbourne to reduce further transmissions and increase timely access to treatment.

Data from this study will be used to guide local and national HIV and AIDS prevention initiatives, health promotion and education strategies.

The full report is available at: www.burnet.edu.au.

The study was conducted by the Burnet Institute in collaboration with National Serology Reference Laboratory, researchers from the Melbourne Gay Community Periodic Survey and the Victorian AIDS Council/ Gay Men's Health Centre.

PROJECT NAME: 'Suck it and See'
FUNDING BODY: Department of Human Services
LENGTH OF PROJECT: One year
CHIEF INVESTIGATOR: Dr Mark Stoovè Head, HIV/STI Research Group, Centre for Population Health, Burnet Institute
PROJECT CO-ORDINATOR: Alisa Pedrana (PhD) Student, Centre for Population Health, Burnet Institute

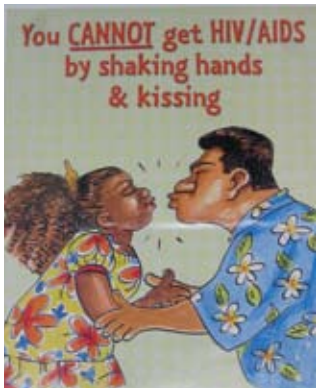
WE'D LIKE TO SAY THANKS TO ANSELL FOR THEIR KIND DONATION OF CONDOMS TO OUR CENTRE.

Centre Head:
Professor Mike Toole

Centre for International Health

Burnet's work is a sign of the times in the Pacific

Over the last five years, Burnet's Centre for International Health has worked with governments and communities in 14 Pacific countries to prevent the spread of HIV and Sexually Transmitted Infections (STIs) through the AusAID-funded Pacific Regional HIV Project. The project team helped government and community groups to develop their own national plans to respond to the spread of HIV. They built the capacity of people living with HIV to develop and deliver their own support and prevention activities. The project also provided funds to support community HIV activities and helped to improve the quality, reach and range of HIV and STI programs across the region.



Billboards promote reducing risky behaviours.

In late 2008, the program was transferred to the Secretariat of the Pacific Community, one of the project partners.

In 2009, Burnet decided to extend its program in the Pacific. The extensive networks and strong reputation generated through earlier work, such as the HIV project, has placed Burnet in a strong position to provide further capacity-building, technical advice and support in the region.

The Centre for International Health has already obtained two grants to continue its HIV and STI work with Pacific countries. Burnet staff will continue its support to implement national HIV strategies, and undertake research to improve the diagnosis and management of STIs. Opportunities to build a broader public health program to respond to 'lifestyle' diseases, including drug and alcohol use, are also being explored.

If you would like to know more about our Pacific program please contact either **Dr Tamara Kwarteng**, in Suva, kwarteng@burnet.edu.au or **Suzanne O'Neill**, in Melbourne, suzanneo@burnet.edu.au.

PROJECT NAME: Pacific Regional HIV Project
FUNDING BODY: AusAID
LENGTH OF PROJECT: Five years

What do roads and bridges have to do with HIV?

The Greater Mekong Subregion is one of the world's fastest-growing areas of economic development, it comprises Cambodia, the People's Republic of China, the Lao People's Democratic Republic, Myanmar, Thailand, and Vietnam. Investment in infrastructure, especially transport corridors, is creating greater opportunities for trade and regional communication. New cross-border agreements between governments in the region are facilitating an increase in the movement of people as well as goods.

In the Lao PDR, the Asian Development Bank (ADB) recently upgraded 220 kms of road running through the northern provinces of Bokeo and Luang Namtha, effectively linking Thailand, Lao and China. This improved connectivity and regional integration can come at a cost, a major one being the potential increase in vulnerability to the spread of HIV, especially for communities along these transport corridors.

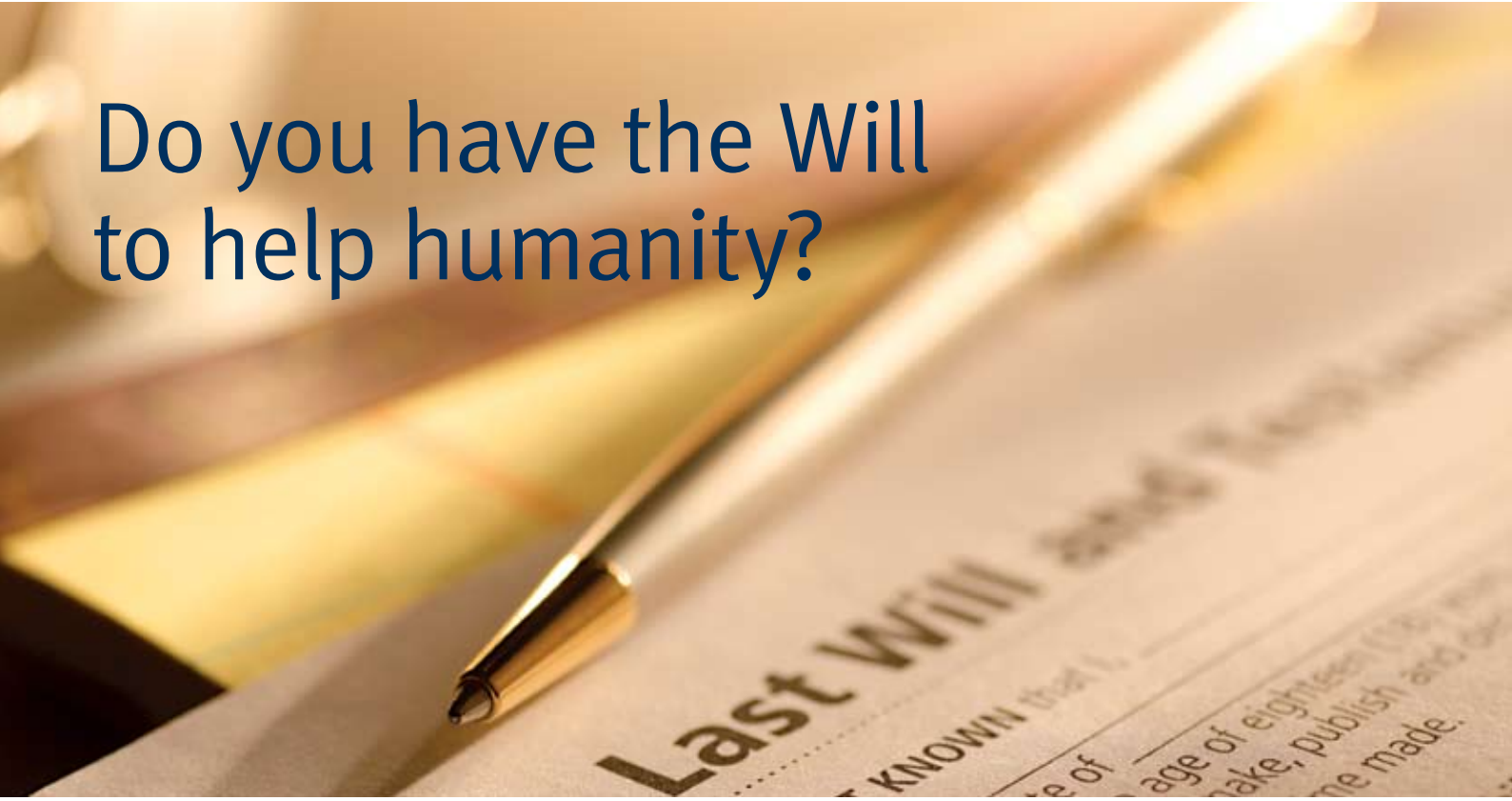
In March this year the Burnet Institute was awarded a contract by ADB to undertake an expanded HIV prevention project along the newly reconstructed Road 3 roadway in northern Laos. In projects similar to this, Burnet has demonstrated expertise in successfully assisting local authorities to address the impact of infrastructure development and its relationship to the spread of HIV and sexually transmitted infections (STIs).

Burnet's approach is to initially establish a multi-sectoral team of key local stakeholders including government bodies, media outlets, military, transport associations and/or the private sector. The design of the HIV and STI program capitalises on input from all stakeholders, their interests and concerns. This team is integral to the analysis of the current situation.

This 'settings approach' offers several potentially positive outcomes. In particular it provides for the development of more effective prevention programs that minimise the risk of stigmatising any specific groups in the community by taking a 'whole community' approach.

If you would like more, contact **Bridget Gardner** at bridget.gardner@burnet.edu.au or call (03) 8506 2343.

PROJECT NAME: HIV Prevention and Infrastructure: Mitigating Risk in the Greater Mekong - Northern Economic Corridor
FUNDING BODY: Asian Development Bank
LENGTH OF PROJECT: Two years



Do you have the Will to help humanity?

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