IMPACT

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ENDING THE TUBERCULOSIS EPIDEMIC BY 2030

HEALTHY MOTHERS, HEALTHY BABIES: RESEARCH TO SAVE LIVES IN PNG

SPECIAL FEATURE

EVE-M: TRANSFORMING WOMEN'S SEXUAL AND REPRODUCTIVE HEALTH

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Equity Through Better Health

Welcome to the SPRING issue of *IMPACT*.

In this edition, we highlight a number of key programs including overviews of our work on tuberculosis (TB) and HIV, provide an update on the Healthy Mothers, Healthy Babies program, and look at the role of the microbiome in sexual and reproductive health.

The issue of multidrug-resistant tuberculosis in Daru, Western Province of Papua New Guinea, is one of the most concerning health problems to emerge in our region for many years. Burnet is playing a significant leadership role in helping to contain its spread and strengthening local health system capacity. The team led by our Deputy Program Director, Health Security, Dr Suman Majumdar has been working closely with the PNG Department of Health, Western Province Health Administration, affected communities, and other partners such as World Vision, the World Health Organization, and the Australian Government to bring this epidemic under control. It is estimated that since 2014, Australian supported initiatives in Daru have averted at least 255 TB-related deaths and 5376 infections, and saved AUD$3,089 per life year gained. This has been a tremendous effort by all those involved, requiring significant collaboration across all teams.

We have also included an overview of Burnet's HIV research and public health programs. As many of you would know, Burnet was founded at the peak of the HIV epidemic in Australia in the mid '80s and continues to play a major role in HIV research and public health in Australia and internationally. The Institute has 15 working groups and more than 25 projects focused on HIV across prevention, treatment, diagnosis and care. These include issues such as new drug discovery, vaccine research and rapid diagnostic test development, and working with communities to reduce the spread of the virus through PrEP and home-based testing. It's a phenomenal program which has had major global impact and one that the Institute is extremely proud of.

We highlight the work of Professor Gilda Tachedjian and her team, who were recently awarded a highly competitive Medical Research Future Fund Frontier Grant – one of only 10 awarded from hundreds of applicants. Professor Tachedjian's research will provide major insights on how the microbiome can impact on sexual and reproductive health, and provide practical solutions to reduce the spread of sexually transmissible infections, bacterial vaginosis and HIV.

I also want to take this opportunity to farewell our former Chair, Rob Milne who has retired after 19 years as a member of the Institute's Board, the last four of which were as Chair of the Institute, and to welcome our new Chair, Mary Padbury. Rob has made a huge contribution to the Institute during his time on the Board and as Chair, and we are grateful for his leadership during this time. Mary is no stranger to Burnet, having joined the Board in 2011 and brings a wealth of legal and corporate governance expertise to the Institute.

I look forward to sharing more with you in the coming months.

Professor Brendan Crabb AC
Director and CEO

INSIDE FEATURES

Cover image: Discovering how the microbiome impacts women's sexual and reproductive health.

Burnet Institute is a leading Australian medical research and public health organisation focused on achieving better health for vulnerable communities in Australia and internationally by accelerating the translation of research, discovery and evidence into sustainable health solutions.

All donations over $2 are fully tax-deductible. Where possible people who appear in images included in this publication were photographed with their permission. There is no implication that these people have any infectious diseases. If you would like to discuss any issue from this edition please call Tracy Parish on +61 3 9282 2111. **Managing Editor:** Tracy Parish. **Editorial contributors:** Angus Morgan, Arnis Stonis. **Photo credits:** Angus Morgan, Corey Wright Photography, Gillian Chamberlain, Jefferson Krua Creative Commons, Jen Clark, Martin Maden, Nick Dalziel, Photovoice participants, Ric Piscioneri, Shutterstock, Tess Keam. **Design:** Francis Maurice Design.

Robert Milne retires, Mary Padbury new Burnet Chair

After almost two decades as a Burnet Director, including four years as Chair, Mr Robert Milne retired from the Board, leaving a proud legacy of sustained growth for the Institute, accomplished with exceptional leadership.

Mr Milne is succeeded by Ms Mary Padbury, a corporate lawyer with international expertise in the field of intellectual property, and Burnet board member since 2011.

As CEO and later Chairman of international construction contractors, Hooker Cockram Limited, Mr Milne brought invaluable corporate experience to the Board, and played a key role in the construction and development of Burnet's Alfred Centre laboratories and facilities.

"This created an asset that has grown in value and provided Burnet with underlying profitability that has supported our research activities to improve the lives of people for whom life is difficult," Mr Milne said.

"It's this ethos and spirit that makes Burnet so special for me."

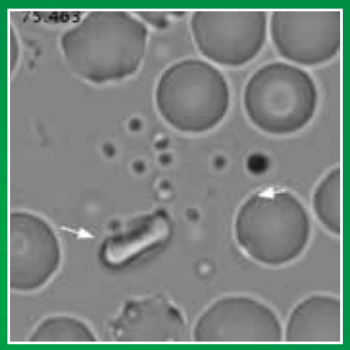
Burnet Director and CEO Professor Brendan Crabb AC said Burnet would not be as it is now without Mr Milne's contribution.

"He's done something profound for our community and the wider world, and he goes with our very best wishes and sincere and heartfelt thanks," Professor Crabb said.

A former partner and Global Vice-Chairman of international law firm Ashurst, Ms Padbury is a board member of the Commonwealth Bank of Australia, the Victorian Legal Admissions Committee and Chair of the Trans-Tasman IP Attorneys Board.

"It's a huge privilege and I'm extremely committed to Burnet and what it stands for," Ms Padbury said.

Exciting new study identifies antibodies to fight malaria



Above: *Video still image of malaria parasites invading red blood cells.*

Burnet Institute scientists have played a key role in an Oxford-led study that has identified the human antibodies that prevent the malaria parasite from entering blood cells.

Professor Brendan Crabb AC said the work, published in the prestigious journal, *Cell*, is a potential step towards the creation of a world-first highly effective malaria vaccine.

The researchers were able to demonstrate which human antibodies effectively block a protein called RH5 produced by the parasite to bind to red blood cells, thus preventing malaria from spreading through the blood.

They also identified a new antibody that slows down the speed with which RH5 binds to red blood cells, giving blocking antibodies more time to act and become more effective.

Using state-of-the-art imaging technologies, Burnet's Dr Paul Gilson, Dr Rasika Kumarasingha, and Professor Crabb helped identify this antibody and explain its enhancing effect.

> The team has a bold vision of transforming the antiquated current sexual and reproductive health toolkit, and it provides an opportunity for a paradigm shift in women's sexual and reproductive health."
>
> – BURNET DIRECTOR AND CEO, PROFESSOR BRENDAN CRABB AC

Ambitious new concept to revolutionise women's sexual and reproductive health

The transformation of the sexual and reproductive health of women worldwide, and helping to prevent the one million new sexually transmitted infections (STIs) that occur globally every day, are among the goals of a bold and innovative new collaborative research project.

Led by Burnet Institute's Head of Life Sciences, Professor Gilda Tachedjian, the EVE-M (Enhancing the Vaginal Environment and Microbiome) initiative aims to develop a number of novel technologies, including an intravaginal ring loaded with active pharmaceutical ingredients designed to address bacterial vaginosis (BV), and

- Regulate a woman's vaginal microbiota over her lifetime
- Prevent the transmission of STIs and HIV
- Provide contraception to reduce the incidence of unplanned pregnancies.

"Contraception for women hasn't really improved in 50 years and women's health is often not prioritised," Professor Tachedjian said.

"If we can create a device that can optimise the vaginal microbiome and enhance the mucosal environment, help prevent STIs, and reduce unplanned pregnancies, it will have a dramatic impact on women's health and the global economy.

"Every day there's one million new STI infections globally, not including herpes and HIV, and the economic cost of STIs, BV, and unplanned pregnancies is estimated at over USD$70 billion a year, so there's a huge burden."

EVE-M was made possible by stage-one funding from the Medical Research Future Fund (MRFF) Frontier Health and Medical Research Program, which will facilitate planning for further research. It was one of only 10 projects from almost 1200 applicants reviewed by an international panel of experts to attract funding, and the only one of these projects focused on women's health.

"This is a tremendous opportunity to advance our concept of improving women's sexual reproductive health through the development of a multipurpose prevention technology (MPT) that targets the vaginal microbiota," Professor Tachedjian said.

"What this funding support does is take our high-impact ideas and gives us the resources to progress these as part of a multidisciplinary team."

That team comprises Burnet, Swinburne University of Technology, Melbourne Sexual Health Centre (The Alfred and Monash University), Deakin University, Family Planning NSW, Institute for Genome Sciences at the University of Maryland (Baltimore), and spinoff company, Eudaemon Technologies Pty Ltd.

"The multidisciplinary and multinational approach, and the scale of this endeavour is really exciting and challenging," Professor Tachedjian said.

"We've got biologists working with material engineers, who are working with clinicians and researchers, with spinoff companies and industry, and with business development and commercialisation."

An important aspect of EVE-M is the commitment to end user-driven design. Feedback from women recruited to take part in qualitative studies as part of stage one will help to inform the design of the interventions because, as Professor Tachedjian explains: "If you don't have input from the end users and their partners, they're not going to use the device."

Research and business synergy breaks new ground

Burnet Executive General Manager of Commercial Strategy and Industry Partnerships, Ms Serina Cucuzza said: "A market-led approach not only allows us to tailor make our interventions to end users, but will lead to a greater chance of commercial success."

"By adopting Burnet's qDOS Lab accelerator principles from the beginning with focused milestone driven plans, we hope to reach patients and the market sooner," she said.

"We are extremely fortunate to be bringing together some of the world's foremost thought leaders in this evolving field, all with a shared vision and common goal focused on generating innovative solutions for women's health."

It's not just a research project, but it's focused on product development, so we want an outcome, we want to be internationally competitive, and we want to have an impact on health at home and globally."

– PROFESSOR GILDA TACHEDJIAN, BURNET INSTITUTE HEAD OF LIFE SCIENCES

What is BV?

Bacterial vaginosis is a common condition caused by an imbalance in the bacteria that occur naturally in the vagina. Associated adverse sexual and reproductive health outcomes include:

- Preterm delivery and miscarriage
- Low birth weight in infants
- A higher risk of acquiring STIs including HIV.

BV is hard to treat, often requiring multiple courses of antibiotics and has a very high (50+ per cent) recurrence rate.

In Australia BV affects

1 in 3
indigenous women

1 in 8
non-indigenous women

In PNG BV affects

almost 1 in 2
women

In sub-Saharan Africa BV affects

more than 1 in 2
women

Ending tuberculosis:
A neglected global health challenge

How do we end the global tuberculosis (TB) epidemic by 2030? By Dr Suman Majumdar.

Responding to drug-resistant tuberculosis (DR-TB) is the critical step on the pathway to ending TB. It's a complex global health challenge that affects the most vulnerable. It requires innovative solutions, including high quality science, public health action and community-driven solutions.

Resurgence of the leading infectious killer

The airborne epidemic spread of TB, in particular DR-TB, is a major threat to global health security carrying catastrophic costs in terms of human lives and health systems. Despite being preventable and curable, TB is the world's leading infectious disease, and the numbers around it are telling:

- 1.6 million lives lost in 2017
- 1.7 billion people, one quarter of the world's population, infected with latent TB (LTBI)
- One-third of all deaths from antimicrobial resistance attributed to DR-TB
- Future GDP costs to the global economy of AUD$26 billion from DR-TB deaths in one year.

Since the World Health Organization (WHO) declared TB a global health emergency in 1993, we have seen better outcomes and reductions in mortality with the expansion of simplified treatment programs for drug-susceptible TB. But these gains have been offset by the emergence of DR-TB and the co-epidemics of TB and HIV. At the current trajectory, we are not going to eliminate TB within the next 200 years. The number of people estimated with DR-TB – 558,000 in 2017 – is increasing each year, but only 14 per cent of them are being successfully treated, the majority either dying and/or transmitting to others in their community.

Recent neglect and lack of funding in TB research and development has been a major contributor to this situation. From the 1950s to the 1980s, TB research was thriving. High-income countries including Australia conducted mass screening and treatment programs. These successes resulted in declining TB rates, but also the de-funding of TB research.

The global burden is especially heavy in the Asia-Pacific region, which accounts for 62 per cent of the 10 million new TB cases each year and 55 per cent of DR-TB cases. Facing a major epidemic, the situation in Papua New Guinea (PNG) is compounded by alarming rates of multidrug-resistant TB in several hotspots.

What can be done?

Despite the complexities, the solutions are simple – political will, empower affected communities and mobilise resources, and invest in research. What's needed is a science-based and person-centred approach to TB care and addressing the epidemic. Detection, effective treatment and care, prevention and management of exposure are standard in high-income countries, but in low-resource settings these measures are contingent on available resources and functioning health systems, with DR-TB adding new complexities, challenges and costs.

Innovation and research play a key role and should be embedded into programs.

Novel strategies include molecular diagnostic tests, shorter regimens and scaling up preventive treatment of LTBI, particularly for those at high-risk. As well, it's critical that people and communities affected by TB be at the centre of the response and at the decision-making table.

| ***Above:*** *TB physician Dr Stenard Hiasihri consulting at Daru General Hospital, Papua New Guinea.*

Burnet's work in TB has two broad aims:

- Improve the efficiency and effectiveness of the response to DR-TB with a major focus on PNG
- Generate knowledge and develop solutions to end TB in high-burden settings in the Asia-Pacific region.

Elimination involves ending TB over the longer term so it's not a major public health challenge, and that's defined as an incidence of less than 10 per 100,000 population. The elimination of MDR-TB in specific locations is a goal in its own right and arguably one of the most important steps towards TB elimination. TB elimination cannot be achieved without a strategy to address LTBI, and this also applies for MDR-TB. This is a key focus of implementation research for Burnet.

The importance of partnerships

Burnet works collaboratively with communities, governments, and partners such as laboratories, implementers and research agencies. Currently, we are working with Gadjah Mada University and local partners to launch a TB elimination initiative, 'Zero TB Yogyakarta'. With Australian government support, Burnet has had a leading role to improve patient treatment outcomes on Daru Island in PNG's Western Province, which is the centre of an unprecedented outbreak of MDR-TB. Our current focus is to expand community-based household screening and preventive treatment to eliminate the outbreak. The response in Daru has been a successful example of a large partnership where Burnet has had a leading role working with the national and provincial governments, World Vision and WHO.

Another innovative initiative in PNG is our TB peer-counselling project that trains TB and MDR-TB survivors to support patients. It has helped to empower the affected community and establish patient representatives at a local level. Working with advocacy partners such as RESULTS and the Australasian TB Forum, we have been engaging with parliamentarians and supporting TB survivors and experts to speak at national and regional forums.

Whilst there is a long way to go to end TB, there is considerable cause for optimism. A range of new diagnostic tests and MDR-TB treatment regimens is expected to be available over the next few years, and TB vaccine candidates are undergoing field trials. A regional research collaboration with the Menzies School of Health Research has been highly productive in building capacity in PNG and Indonesia, and Burnet is a key part of the NHMRC Centre of Excellence in TB Research, which is spearheading Australian and regional research.

Dr Suman Majumdar is Burnet Institute's Deputy Program Director, Health Security.

TB FACT SHEET

TB is the leading infectious disease killer globally with **1.6 million deaths** in 2017

62 per cent of all TB cases globally, and **55 per cent** of DR-TB occur in the **Asia-Pacific region**

Globally, DR-TB is estimated to cause one-third of all deaths from **antimicrobial resistance**

Deaths in one year from DR-TB will **cost the global economy** an estimated **AUD$26 billion** in future losses each year

The United Nations Sustainable Development Goals aim to **end the TB epidemic by 2030**

Left: *Dr Rina Triasih (right) with staff at the launch of a mobile TB screening service in Yogyakarta, Indonesia.*

PHOTOVOICE:
A voice for young at-risk tuberculosis patients

Armed with a basic digital camera and some photography skills training, a resilient group of young Papua New Guinean patients in Daru, Western Province, are finding a voice amidst the upheaval of a challenging treatment regimen for tuberculosis (TB) or drug-resistant TB (DR-TB).

Two groups of TB patients, aged 18-28 years, who were considered possibly at-risk of stopping treatment, were encouraged through the PHOTOVOICE program to visually document their lived experience, and share insights into what is important to them.

PHOTOVOICE empowered the young people to use visual expression to tell their story. It also aimed to increase self-esteem and a sense of pride, community awareness about the many challenges these young people face in dealing with strong stigma and discrimination, and the effects of poverty, relocation to Daru to access treatment and disruption of education. Thanks to a generous anonymous donor, support of The South Fly District TB counselling team through the Australian NGO Cooperation Program (ANCP) RID-TB Education and Counselling (PEC) project, PHOTOVOICE has had a remarkable impact on the Daru community.

A special PHOTOVOICE exhibition held earlier this year in a compound in Daru where one of the TB clinics is based attracted more than 80 visitors, and enabled the participants to proudly share their photos with family, friends and the community.

Burnet Social Worker, Ms Tess Keam and a photography facilitator helped coordinate the project.

"Adherence to treatment tends to be harder for this group (18-25-year-olds) as they are affected by disruption to education and peer pressure," Ms Keam said.

"The difficult treatment regimen, existence of strong stigma and discrimination in the community, and pre-existing factors of poverty make daily life extremely difficult for people living with TB in Daru.

"It was also important that PHOTOVOICE trained and involved local Peer Counsellors who encouraged the patients to talk about their photos and will be able to lead this project in another area of the province in the future."

Above: *Robin Tom shows his daughter her photo.*

Below: *PHOTOVOICE: Giving a voice to people living with TB in Daru, PNG.*

Daru, the capital of PNG's Western Province is dealing with a large-scale TB epidemic, and is known as a hotspot of intense transmission of DR-TB. Faced with up to 24 months of treatment using strong drugs with a high prevalence of serious side effects for DR-TB, many young patients struggle to finish the course.

Augie Lala: *My big brother is working inside the hospital. He is helping sick people in their beds with tubes and getting different medicine to cure them. He cleans their sores. Sometimes he helps me when I'm sick to drink some medicines.*

Anu Danu: *When I started my treatment, I was a bit weak. Day two I felt better. I finished my three months and then continued another three months. I'm feeling happy. I took photos of the DART site house and my treatment supporters. (These) other patients recently started one week of treatment and asked me to take their photo.*

Bani Jugu: *My mother is the one supporting me with my treatment. Like food, and whatever I need, she buys and brings to the house. When she harvests, she takes them (vegetables) to the market and gets money.*

Timothy Moiba: *My story is about a house, my auntie's house ... I've been staying there for three weeks. It's important to me because the house is close to where I get my treatment. I'm excited to finish treatment and go back to my parents and continue my happy life with my parents.*

Nobby Nou Koiti: *After I take my treatment I go down and sweat out at the basketball court. Every afternoon I go with other boys. We play four on four. At high school I wanted to captain a basketball team. (If) you're a good player you are like a role model for other people.*

Eka Steven: *My photos are about my family and another one of my treatment supporter. He helps me get better so I can finish my medicines. He is like a father or mother to us.*

AUGIE

TIMOTHY

ANU

NOBBY

BANI

EKA

25 ways we are working to eliminate HIV

DISCOVERY RESEARCH. EVIDENCE. COMMUNITIES.

The AIDS epidemic of the 1980s was frightening and devastating for communities across the globe.

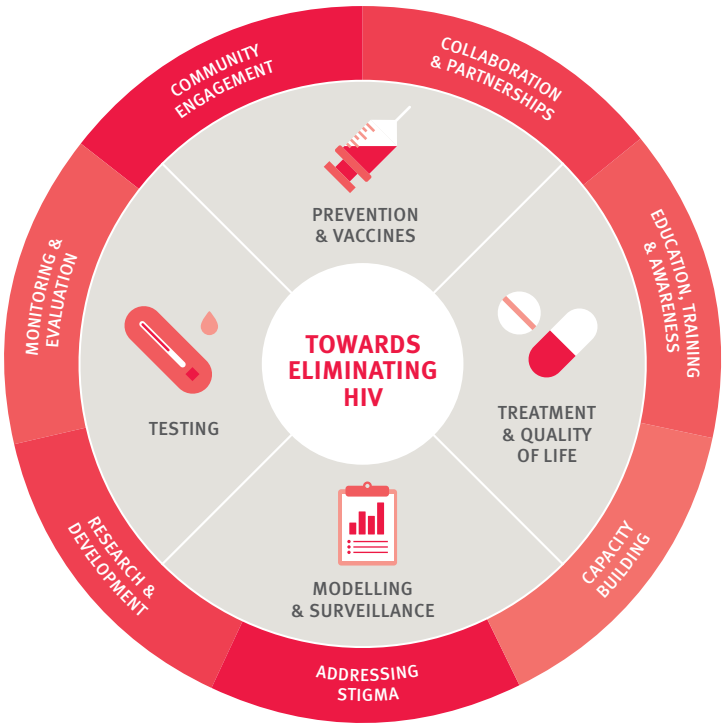
Burnet Institute has been at the forefront of the challenges of HIV since the early days of the epidemic. In this time, the global medical research community has come together to understand and mitigate the effects of this deadly virus.

Burnet's research focuses on the four pillars towards eliminating HIV: prevention and vaccines, testing, modelling and surveillance, and treatment and quality of life. We have 15 working groups and 25 projects under way across these four pillars, each focused on a different aspect of eliminating HIV.

"The multidisciplinary aspect of our research and public health projects makes us unique. The commitment, skill and talent of our people makes us unique," Burnet Director and CEO, Professor Brendan Crabb AC said.

There is still a lot of work to be done in Australia and globally, with 36.9 million people living with HIV. There are 1.8 million new HIV infections each year, and according to the World Health Organization more than 940,000 people died from HIV-related causes in 2017.

There are more than 27,500 people living with HIV in Australia, and at least 10 per cent of these people don't know they are infected. Elimination is achievable, but it will require a scientific and public health response on a number of fronts.

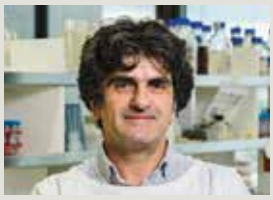


THE WAY FORWARD

PREVENTION

1. Development of a novel HIV vaccine candidate.

Dr Andy Poumbourios and his team have developed a vaccine candidate that produces the right kind of antibodies to create an effective immune response to HIV. This is progressing to further trials.



2. Monitoring HIV prevention knowledge and practice in Victoria.

3. Using Optima modelling to maximise life-saving health initiatives.

4. Pilot and phase 1 trial of a new condom technology.

5. Understanding the vaginal microbiome's role in HIV prevention.

The vaginal microbiome has a crucial role to play in preventing HIV transmission in women. Professor Gilda Tachedjian and her team are working to better understand this, to work out the best way to keep women safe from HIV infection.

6. Preclinical safety studies of an anti-inflammatory microbiome metabolite.

7. Development of an intravaginal ring to prevent HIV transmission.

DIAGNOSIS

8. Development of a plasma separator device to test HIV viral load.

9. Implementation of the VISITECT® CD4 and VISITECT® Advanced Disease point-of-care tests.

Burnet is supporting the manufacturing and rollout of the innovative CD4 tests developed at the Institute. Now licensed to Omega Diagnostics for manufacture and sale worldwide, the tests have achieved the CE Mark for products sold in Europe. They are being rolled out in key countries this year, allowing people at risk of HIV infection to test themselves regularly.

10. Testing the Burnet-developed VISITECT® CD4 point-of-care test.

11. Testing and evaluating the diagnostic test: Xpert® HIV-1 QUAL.

12. Development of a point-of-care HIV test for infants.

CARE

13. Treatment with Antiretrovirals and their Impact on Positive and Negative men (TAIPAN).

14. Supporting people to age well with HIV.

15. Monitoring of the PrEPX project.

16. Development of an ACCESS surveillance system for Myanmar.

17. A toolkit for living with HIV in Papua New Guinea.

Working with international partners, Burnet is providing peer counsellors in PNG with a toolkit and extensive training, enabling them to give people living with HIV information that supports and improves their health literacy.

TREATMENT

18. Development of new potent killing mAbs.

19. Predicting quality and potency of antibodies.

20. Targeting novel sites on reverse transcriptase for HIV treatment and prevention.

21. Working towards the elimination of hepatitis C / HIV co-infection – DARE-C project.

22. Working towards the elimination of hepatitis C / HIV co-infection – Co-EC Study.

Hepatitis C virus infection is a significant health issue among people living with HIV and has been associated with more rapid progression to liver disease. Burnet is working across clinics in Melbourne to offer hepatitis C treatment to gay and bisexual men who are co-infected with HIV and hepatitis C.

23. Investigating drug-resistant HIV strains in Victoria.

24. Starving the HIV reservoir.

25. Developing new ways to treat inflammation and prevent early onset of ageing diseases in people living with HIV.

Healthy Mothers Healthy Babies

Research to save lives: What's next?

Burnet's innovative research program Healthy Mothers, Healthy Babies (HMHB) comprises a suite of studies that aim to save lives and improve health and well-being in Papua New Guinea (PNG).

HMHB is based in Kokopo, East New Britain (ENB) and is a partnership with the East New Britain Provincial Health Authority, PNG Institute of Medical Research (PNGIMR), National Department of Health, University of PNG, Kirby Institute, and local health facilities.

HMHB has made significant progress in understanding the causes of poor maternal and child health, and identifying potential areas for improvement. The first major HMHB Study, a longitudinal study of 700 mothers and their babies, completed follow-up in 2018, and early results have been provided back to local communities, health facilities and provincial government.

Above: *A personal story from a mum told to Professor Caroline Homer AO and Ms Primrose Homiehombo.*

ACCELERATING ACCESS TO POSTNATAL CARE AND CHLORHEXIDINE IN PNG

Severe infections in young babies account for one-third of newborn deaths in low- and middle-income countries like PNG. The newly cut umbilical cord is an important entry point for infections. In partnership with the ENB Provincial Health Authority and GSK, we began a trial of a low-cost, non-profit formulation of chlorhexidine, a sterilising antiseptic, for umbilical cord care straight after birth; this has been demonstrated to significantly reduce newborn mortality in many countries in Asia and Africa.

Research conducted by Burnet in ENB also suggested that routine postnatal care service coverage in the first week after birth was low, reaching only 17 per cent of mothers. In response we developed PNG's first set of targeted postnatal community education materials to help families understand more about how to care for mothers and babies in the first crucial weeks after childbirth.

Outcomes and Impact:

1. Nurses are educating new parents in postnatal wards before they go home with their new baby, including detailed information on routine care, information about the use of the new GSK chlorhexidine gel for the umbilical cord, as well as danger signs to watch for in themselves and their baby.
2. Burnet-trained volunteers are visiting new mothers in the home, checking their understanding of postnatal health, use of chlorhexidine, and encouraging them to visit clinics.

PRINCIPAL SUPPORTER: BSP

PARTNERS: Papua New Guinea Institute of Medical Research; East New Britain Provincial Government; National Department of Health; The University of Papua New Guinea; Kirby Institute

A HIGHLY SENSITIVE RAPID DIAGNOSTIC TEST FOR MALARIA AMONG PREGNANT WOMEN: AN EVALUATION

A new rapid, point-of-care, *Plasmodium falciparum* diagnostic test for malaria has been developed that has a 10-fold greater sensitivity than existing tests. But how does it compare with conventional rapid diagnostic tests in the field for detecting malaria in pregnant women in PNG?

"Malaria during pregnancy is really a major public health problem because the malaria parasite can hide in the placenta and so they are often hard to detect," Burnet's Associate Professor Leanne Robinson said.

"The mother might not necessarily feel sick but they can have really serious consequences, both for the mother and the baby. These can include maternal anaemia, fetal growth restriction, premature labour, and even death of the mother or the fetus.

"We are screening mothers who attend antenatal clinics in ENB province using this new rapid test, the standard malaria test, as well as several very sensitive laboratory-based assays (analysing a substance to determine its composition or quality), one of which could be conducted in the clinics."

Preliminary data suggests a moderate burden of malaria (18 per cent) and a substantial burden of anaemia (82 per cent) in pregnant women in the study. This evaluation project is being led by Associate Professor Robinson, in partnership with Dr Moses Laman at the PNGIMR, the ENB provincial government, and Kirby Institute, through funding from the Foundation for Innovative and New Diagnostics (FIND).

LOW CHILDHOOD IMMUNISATIONS – STEPS TO CHANGE THIS

HMHB research into health care services during the first six months after childbirth revealed two significant gaps:

1. Very low uptake of routine checks after childbirth (postnatal care)
2. Strengths and weaknesses in the running of childhood immunisation clinics.

Below: *Field testing of the highly sensitive rapid diagnostic test for malaria by HMHB's Ms Kerryanne Tokmun (front) with Ms Dorah Edwards and Ms Primrose Homiehombo and a study participant.*

We responded to the first issue in the postnatal care and chlorhexidine study. We also found that while staff are providing safe and effective vaccinations, service planning can be improved to reach all children, and some vaccinations (such as those in the second year of life) are not being prioritised.

The 2018 resurgence of polio (now under control) elsewhere in PNG, and the looming threat of more measles outbreaks, shows just how urgent it is to find ways to improve immunisation nationally. Stronger routine programs are the key; but their coverage has been stagnant at sub-standard levels for more than 15 years.

Our findings point to new ways to document where unvaccinated children are, new options for organising outreach clinics, and mechanisms by which polio campaigns can do a better job of strengthening routine immunisation services, even as they respond to the emergency. These findings have been circulated within ENB, presented nationally, and are being published internationally. We are also using these research findings in our development work to strengthen immunisation in other parts of PNG.

THE QUALITY OF PREGNANCY, CHILDBIRTH AND NEWBORN HEALTH SERVICES STUDY

Earlier HMHB studies have identified a critical need to evaluate the quality of health care provided to women and babies in PNG, and to identify and implement strategies to improve maternal and newborn health outcomes. Internationally, it is recognised that:

- Saving mothers' and babies' lives requires quality care that is 'safe, effective, timely, efficient, equitable and people-centred'
- If the level of care is not considered to be of quality by a community, women are more likely to avoid accessing health services.

"This study will highlight immediate opportunities for improved provision of good-quality maternal and newborn care in partnership with local health managers and health care workers," a study principal investigator, Burnet's Dr Alyce Wilson said.

The collaborative study involves principal investigators from Burnet Institute, PNGIMR, Nonga Hospital and St Mary's Hospital, ENB. Key partners include the ENB Provincial Health Authority, PNGIMR, National Department of Health, and University of PNG. Funding support has come from Steamships PNG Community Grant, June Canavan Foundation, and the Alastair Lucas Prize for Medical Research.

Below: *Dr Alyce Wilson (second from left) with Provincial Health Authority staff Ms Claire Pidik (left), Ms Elsie Buka (second from right) and Burnet's Mr Hadlee Supsup and Ms Pele Melepia.*

Maternal and child health is a family affair

> "I think we're interested in the same questions and problems; we're just approaching it from different angles."
>
> **– BURNET PHD STUDENT, ELIZA DAVIDSON**

Born in Australia and raised in Namibia, Eliza Davidson took a keen interest in her parents', Lisa and Andee's work in international development for Australian Volunteers International. The experience helped to shape Eliza's view of the world, and ways to help others.

With a keen interest in science as a student, Eliza envisaged a career path very different from her parents. But fate, or perhaps that shared interest in helping others, has brought mother and daughter together at Burnet, in a unique way.

Now a third-year PhD candidate investigating anaemia during pregnancy and postpartum in a cohort of women from Papua New Guinea (PNG), Eliza's work interconnects directly with Lisa's in her role as Deputy Program Director, Behaviours and Health Risks, and Sexual and Reproductive Health Specialist.

"One of my projects involves working with pregnant women to improve their knowledge and skills about how they can better protect themselves and their children from malaria," Lisa said.

"Eliza is doing research on those same mothers to look at the impact malaria has on pregnancy outcomes for both mothers and babies, so there's quite a strong interconnect.

"I think even within Burnet it's quite a unique situation."

Eliza added: "I think we're interested in the same questions and problems; we're just approaching it from different angles."

According to Eliza, it was the science, rather than her mum, that attracted her to Burnet in the first place.

"I knew mum worked at Burnet and initially I didn't have my heart set on working at Burnet," she said. "But I came to the student open night to see what was happening, and the project that Associate Professor Freya Fowkes offered really spoke to me.

"I really enjoy the laboratory aspect, and I chose Burnet because it does offer the translational research that I was interested in."

Last year, the pair had the opportunity to travel together to Kokopo in East New Britain, PNG to work on their respective projects. It was Eliza's first chance to see Lisa at work, and her first experience in the field.

She gained a new respect for the commitment of staff on the Healthy Mothers, Healthy Babies (HMHB) study, who might typically travel for several hours to remote villages to conduct interviews and collect samples, only to find the road blocked by fallen trees and be forced to turn back.

"It was eye-opening, and it made me appreciate the value of every single sample that comes into the lab," Eliza said.

"As for mum, because we're in different disciplines at Burnet, I don't generally get to see what she does, so it was interesting to see her in a different setting, coordinating workshops and planning for new projects. The staff there call her 'Mama Lisa', so that was nice, we have that in common."

Not surprisingly, mother and daughter like to 'talk shop', compare notes, and occasionally reflect upon the unconventional path that brought them both to Burnet.

"I think that we have to play to our strengths and that's definitely what Eliza is doing, but I'm also proud that she sees research as part of that bigger picture and is looking for ways that research connects with improving the lives of other people," Lisa said.

"And that's part of the attraction of Burnet, that our research is translated into action. That's what makes it really interesting to work here, and it's the same for students like Eliza."

For her part, Eliza is looking forward to completing her PhD. After that, she's keeping her options open.

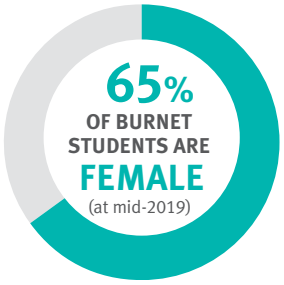
"Maybe by studying science I was trying to separate myself from my parents and what they did, but Burnet offers lots of opportunities to move from the lab into international development or public health," she said.

Above: *Eliza Davidson on a field trip in Kokopo, East New Britain, to collect samples for the HMHB study.*

WOMEN IN STEM AT BURNET

Above: *Burnet postdoctoral scientist, Dr Jo-Anne Chan.*

Burnet Institute is committed to furthering the positions of women in Science, Technology, Engineering and Mathematics (STEM). The Institute has created a Gender Equity, Diversity and Inclusion (GEDI) Committee to step up its commitment to gender equity in science.



Chaired by Professor Caroline Homer AO, the GEDI Committee is developing a number of gender equity-related objectives and initiatives that will assist the Institute in achieving its Burnet 2020 strategic goals.

"Burnet is thoroughly committed to gender equity both in our externally-facing work and internally," Professor Homer said.

"We have joined the Science in Australia Gender Equity Initiative (SAGE) and we have recently submitted our application to achieve Bronze Status – the entry level assessment for Australian health and medical institutions.

"In reviewing data collated for our SAGE application, we identified by-level gender pay gaps and the underrepresentation of women at senior levels across the Institute, including in the Executive Committee.

"We have developed new initiatives to address these, and have already enacted policies around flexible work, parental leave, meeting times and working hours."

A community-first approach to malaria control

Above: *Dr Win Han Oo (right) conducts training for a malaria volunteer in Hpruso Township, Kayah State, Myanmar.*

Making best use of community resources in a changing environment is the task of an exciting Burnet project underway focused on malaria elimination in the Greater Mekong Sub-region (GMS).

Led by Burnet's Head, Malaria and Infectious Disease Epidemiology, Associate Professor Freya Fowkes, the brief is to develop a model for malaria elimination that is acceptable, pragmatic, effective and cost-effective, to be delivered by and for local communities in the GMS.

Funded by the Global Fund to Fight AIDS, Tuberculosis and Malaria, and conducted in collaboration with the Myanmar National Malaria Control Programme and Lao Tropical and Public Health Institute, the project builds on work undertaken by Burnet Institute Myanmar Program Manager, Dr Win Han Oo, for his PhD.

Dr Win Han Oo's research included qualitative consultations with a broad range of stakeholders, from rural Myanmar's grass-roots network of malaria village health volunteers who provide prevention and treatment services for village communities, to the head of the National Malaria Control Programme.

"As we transition from malaria control to malaria elimination activities, the question I wanted to address was, how do we develop an integrated program the community wants, making best use of the community as a resource, that's able to be implemented, and that meets the needs of all stakeholders," Dr Win Han Oo said.

"We've now designed what we think would be a good integrated model the village health volunteers can implement, as well as ensuring they are sufficiently trained and supported, in order to maximise testing and treatment for malaria as Myanmar works towards the end goal of malaria elimination, which it hopes to achieve by 2030."

Associate Professor Fowkes said in order to achieve malaria elimination in the region, it's important to redefine and modify the capacity of communities to meet the needs.

"Community-delivered models are crucial in eliminating malaria in rural settings in Myanmar and more broadly in the GMS," Associate Professor Fowkes said.

"The burden of malaria has decreased significantly in the GMS but there are still pockets of malaria transmission.

"These pockets are often geographically and socially isolated, making the challenge of reaching these communities harder. But if you want to eliminate malaria you have to detect and treat every last malaria infection.

"In hard-to-reach areas, you need to integrate treatment or referral services for other diseases in order to maintain high testing rates for malaria, and hopefully we will also have impact on these diseases too."

Associate Professor Fowkes said the next step is to investigate the generalisability of the community-delivered integrated malaria elimination model to other GMS countries, starting with Lao PDR.

Above: *Malaria testing in Hpruso Township, Kayah State, Myanmar.*

The world's adolescents – unmet needs, growing inequality

Above: *Boys playing football in Monrovia, Liberia.*

Today's adolescents make up the largest generation in history, but a landmark study reveals these young people are encountering greater health challenges than those faced 25 years ago, and investments in their well-being have not kept pace with population growth.

Published in *The Lancet*, the global study provides the first comprehensive and integrated snapshot of the health and well-being of the 1.8 billion adolescents aged 10-24 years who make up one-third of the world's population.

The study tracked the progress of adolescent health in 195 countries between 1990 and 2016 against 12 indicators including tobacco use, obesity, anaemia, secondary school education, child marriage, nutrition and non-communicable diseases.

Lead author, Burnet's Co-Head of Adolescent Health, Associate Professor Peter Azzopardi, who also holds positions with the Murdoch Children's Research Institute and University of Melbourne, said the study exposes the failure of health, education and legal systems to keep up with shifting adolescent needs and demographic change.

"While there have been great improvements in adolescent health in some countries, the greatest population growth has been in countries where adolescents experience the largest disease burden. There are now an extra 250 million adolescents living in these settings compared to 25 years ago," Associate Professor Azzopardi said.

"Investments in adolescent health have also not kept pace with needs. For example, compared to 1990, there are now 180 million more adolescents overweight and obese, and 75 million more living with anaemia.

"The absolute number of young people not completing secondary education, 300 million, has changed little since 1990, and there remains substantial gender inequality in post-education opportunities, with young women three times more likely to not be in employment or training compared to young men," he said.

Associate Professor Azzopardi said investing in adolescent health provided a "triple dividend" by ensuring the health of adolescents now, in the future, and for their children.

The findings of this paper are helping to improve adolescent health globally. In particular, this work provides an important foundation for the World Health Organization's Global Action for Measurement of Adolescent Health initiative, an advisory group chaired by Associate Professor Azzopardi. The country level estimates also enable more precise policy and adolescent health programming, including countries in our region where Burnet leads a number of programs.

A SNAPSHOT OF THE WORLD'S 1.8 BILLION ADOLESCENTS

More than half the disease burden among adolescents was due to non-communicable diseases, including mental disorders

Tobacco smoking prevalence declined overall, but 136 million adolescents smoked daily in 2016, and 71 million reported binge drinking

One in five (324 million) was overweight or obese, and one in four (430 million) anaemic

There were 12 million live births to adolescent mothers, and an estimated 66 million girls were married as children

73 million young women aged 15-24 years could not access contraception

Despite gender parity in secondary school completion, young women in low- and middle-income countries were five times less likely than boys to be in employment and further training

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– PROFESSOR BRENDAN CRABB AC

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I find the more I give, the more I receive in return. My efforts to help others give me great enjoyment."

LONG-TIME BURNET SUPPORTER AND BEQUESTOR, TRISH RICHARDS

ENTHUSIASM AND COMPASSION

Trish Richards, 80, is one of those friendly, enthusiastic and very interested people who easily engage in conversation. She also has a serious side governed by her deep compassion for those less fortunate.

Trish greatly appreciates her life in Australia. Her many travels overseas have reinforced her view that it is a privilege to live in Australia. Consequently, Trish has always looked for ways of giving to others, such as her work as a mothercraft nurse; her support of charities, particularly Burnet Institute; and her volunteering. Currently, Trish volunteers at four charities, covering mental illness, the aged, the disabled, and disadvantaged children.

Trish loves children and in her mid-40s became a mothercraft nurse after two years of full time study. She then worked in various roles looking after children until her retirement at age 69.

A supporter of Burnet for many years, Trish frequently attends our supporter presentations.

"I have had many meaningful conversations with research scientists and have frequently heard the CEO, Brendan Crabb, present and answer questions about the Institute's work. Brendan and his scientific team have great expertise, huge enthusiasm and a deep dedication for their work, together with liberal doses of optimism and compassion. They are inspirational and I have every confidence in their ongoing ability to continue their vital work," Trish said.

"I am fascinated by the different types of research and social programs undertaken by Burnet.

"I love the Institute's focus on helping vulnerable communities in Australia and overseas – particularly improving the health of children and young people in disadvantaged or 'at risk' circumstances. It is so important to help children and young people as they are the future.

"I support Burnet Institute through regular monthly donations which are modest because I am on a limited income age pension," she explained.

"However, I have also left a gift in my Will for the Institute. Through Burnet and its wonderful, far-reaching work, I know that I am making a much larger contribution to the welfare of others than I could ever do by directly supporting one community with a particular need."

Trish plays pennant lawn bowls, has a very active social life and is always interested in trying new things.

"Everyone should take an interest in what is happening around them and undertake new challenges to remain healthy, active and alert," Trish said.

"My enjoyment of life is greatly enhanced through my giving."

If, like Trish Richards, you would like to support Burnet Institute through a gift in your Will, please contact Mr Arnis Stonis on +61 3 9282 2111 or arnis.stonis@burnet.edu.au

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AUSTRALIA
Head Office
85 Commercial Road,
Melbourne, Victoria 3004
T: +61 3 9282 2111
F: +61 3 9282 2100
E: info@burnet.edu.au

A.B.N. 49 007 349 984

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