MARIE BASHIR INSTITUTE
Tackling infections, locally and globally
The Marie Bashir Institute for Infectious Diseases and Biosecurity at the University of Sydney brings together world-leading research and expertise across a wide spectrum of disciplines to increase our capacity to detect and respond to infectious disease outbreaks in humans and animals.

Within the field of infectious diseases and biosecurity, no other Australian institute can deliver such breadth across both the social and biological sciences.

The creation of this institute has greatly enhanced the University of Sydney’s capacity to act as a national, Asia-Pacific and global leader in the field.
Fifty years ago, people believed that humans had won the fight against infectious diseases. However, as new diseases such as AIDS, SARS and Hendra have emerged, and traditional diseases such as tuberculosis are increasingly resistant to treatment, it is clear that there is still much to do before we win this battle.

Controlling infectious diseases is one of the major health challenges of the 21st century, a challenge not only for countries where the burden of disease is highest, but worldwide – because infectious diseases have no respect for international borders.

If we are to safeguard people in Australia and across the world from emerging and re-emerging infectious diseases, we need the exciting cross-disciplinary research being undertaken by this new institute at the University of Sydney.

It is indeed a deeply felt privilege to have my name associated with an institute whose fine professionals will be meeting the challenges of these diseases with considerable commitment, innovation and scientific skill.

“We need the exciting cross-disciplinary research being undertaken by this new institute at the University of Sydney.”
THE RISK WE FACE
Infectious diseases in humans and animals are major causes of illness and death worldwide. They cause substantial social disruption and economic hardship, especially in developing countries, and cost the global economy billions of dollars each year.

Multiple factors contribute such as increased population density, habitat disturbance, global trade and travel, and climate change, but newly implicated are the interactions between microbial ecosystems and the rapid rise in resistance to antimicrobial drugs.

WHY WE NEED TO ACT
Anticipating and controlling epidemics, combatting antimicrobial resistance and maintaining biosecurity poses a challenge that crosses geographic, social and discipline boundaries.

Expert knowledge and input are essential for governments to effectively anticipate, control and reduce the impact of future epidemics.

OUR MISSION
To reduce the health and socio-economic impacts of infectious diseases in Australia and the Asia-Pacific region, through our commitment to:

- world-leading research that translates into better infectious disease management and control
- partnerships that build regional capacity in research, clinical care and public health
- advocacy with governments, professional and international bodies to improve policies and systems
- communication and discourse with the public.

The institute’s strategy of linking together research, education and advocacy with a particular focus on priority populations will improve the health and wellbeing of all.
OUR COMMITMENT

WORLD-LEADING RESEARCH

RESEARCH ACTIVITY DOMAINS
Our research will focus on three interlinked domains: emerging threats, critical infections and biosecurity. Several research themes run as threads throughout all three domains, and offer a means of tying together the entire research network within the institute as well as linking to external research.

OUR RESEARCH TEAMS
Research activity domains bring together complementary expertise across the biological, natural and social sciences.

Health, Medical and Veterinary Sciences
- Sydney Medical School (Faculty of Medicine)
  - Clinical schools and affiliated hospitals and Institutes on the Camperdown, Westmead, Concord, Northern, Nepean and rural campuses
  - School of Public Health (including the Centre for Values, Ethics and the Law in Medicine)
  - School of Medical Sciences
- Faculty of Veterinary Science
  - Food security, animal infectious diseases, zoonoses, public health
- Faculty of Nursing and Midwifery
- Faculty of Pharmacy
- Faculty of Dentistry

Humanities and Social Sciences
- Faculty of Arts and Social Sciences
  - Biosecurity, anthropology, history, media and communications
- University of Sydney Business School
- Sydney Law School (Faculty of Law)
  - Health and ethics law
- Sydney College of the Arts
  - Art and science/health interface

Natural and Biological Sciences
- Faculty of Agriculture and Environment
  - Food safety and security, soil microbiology
- Faculty of Science
  - Biological Sciences
  - School of Molecular Bioscience
- Faculty of Engineering and Information Technologies.
DEVELOPING CAPACITY IN AUSTRALIA AND ABROAD

The institute is working with partners in countries in Southeast Asia to build research capacity and train future leaders in research-based practice and policy development. Our programs in laboratory diagnostics and surveillance, infection control and infectious diseases prevention and management offer two key benefits. They bring laboratory leaders and students to Sydney for training in methods and techniques to be implemented in country, and facilitate long-term partnerships.

We will continue to strengthen and extend existing national, regional and international research networks and provide a major resource for training, strategic research and translation into policy.

COMMUNICATION AND ADVOCACY

We provide an independent, expert resource in infectious disease and biosecurity for government and relevant professional bodies and assist in the development of policy and practice documents.

Members of the institute collaborate with and sit on advisory committees of bodies such as the World Health Organization (WHO), the World Organisation for Animal Health (OIE) and other international aid/funding agencies.

EDUCATION

A principal aim of the institute is to educate future public health leaders in the control of infectious diseases in humans and animals. We also equip them to practise independently in program implementation and policy positions across the world.

We are committed to the sharing of knowledge through education and partnerships, and development of academic training programs to improve service delivery. We regularly assist national and international bodies with supervisory and capacity-building activities, and the development of expert guidelines.

The institute contributed to the development of public health leaders via the Australian Awards Fellowship program. Fellows from Cambodia, Timor-Leste, Myanmar, Papua New Guinea, Indonesia, Nigeria, Tanzania and Zambia completed an intensive HIV training course.

On return to their countries of origin, trainees became trainers themselves and received ongoing guidance from institute mentors in the implementation of new programs and policies. Veterinary fellows from Indonesia were taught how to coordinate rapid and effective responses to limit incursions of trans-boundary livestock and zoonotic diseases, using a similar train-the-trainer model.
CORE EXECUTIVE TEAM
The institute’s director, Professor Tania Sorrell, guides our strategic thinking, key partnerships and outputs. She is a Professor of Clinical Infectious Diseases at the University of Sydney, and a Senior Physician in Infectious Diseases at Westmead Hospital, Sydney.

Our other lead researchers and academics are drawn from the various faculties and schools and act as liaisons between the institute and the broader research teams within the University.

Associate Professor Ben Marais
Institute Deputy Director
Children’s Hospital, Westmead

Professor Eddie Holmes
Leader, Sciences Precinct, School of Biological Sciences, Camperdown

Dr Adam Kamradt-Scott
Leader, Humanities and Social Sciences Precinct, Centre for International Security Studies, Camperdown

Professor Michael Ward
Leader, Veterinary Science Precinct, Veterinary Science, Camden

Professor Cheryl Jones
Leader, Maternal and Child Health, Children’s Hospital, Westmead

Professor Alison Kesson
Leader, Laboratory Capacity Building Committee
Children’s Hospital, Westmead

Dr Siobhan Mor
Leader, Education Committee, Veterinary Science and Public Health

Dr Grant Hill-Cawthorne
Lecturer, Communicable Disease Epidemiology, Microbiology Westmead and Public Health

Additional executive team members include various discipline and interest group leaders, as well as committee co-leaders. Find all our people at sydney.edu.au/mbi
OUR AFFILIATIONS

Our team of researchers is enhanced and broadened by collaboration with other faculties of the University, as well as other academic institutions.

CHARLES PERKINS CENTRE
The centre aims to reduce the impact of obesity, diabetes and cardiovascular disease. It undertakes basic biological research and promotes improved understanding of factors such as our psychological makeup, the cultural norms we grow up with, the economic pressures that shape our lives, our built environment, and the agricultural and food industries we depend on for food.

Areas of overlap with the institute include an interest in the microbes that colonise our gut, how this is influenced by diet and environmental exposures, and also to understand and model complex systems that drive the emergence and spread of infectious diseases.

sydney.edu.au/perkins

KIDS RESEARCH INSTITUTE
The institute conducts research into diseases that adversely affect the health and development of children. Focus areas include population health, diseases affecting Aboriginal children, renal disease, metabolic disorders and infectious diseases.

kidsresearch.org.au

NATIONAL CENTRE FOR IMMUNISATION RESEARCH AND SURVEILLANCE
The centre aims to inform policy and planning for immunisation services in Australia, and support national surveillance of vaccine-preventable diseases, vaccine coverage and immunisation-related adverse events. It coordinates an extensive epidemiological research program aimed at reducing the incidence of vaccine-preventable diseases and improving vaccine uptake in children and adults.

ncirs.edu.au

WESTMEAD MILLENIUM INSTITUTE
The institute conducts research into a wide range of important human disorders affecting both adults and children. Research spans infectious and immune diseases; cancer and leukaemia; liver and metabolic diseases; eye and brain-related disorders; and heart and respiratory disorders.

wmi.org.au/ourresearch

For information on other affiliated institutions and partnerships please visit sydney.edu.au/mbi
OUR CURRENT PROGRAMS
EMERGING THREATS

MICROBIOME DISTURBANCE
GUT MICROBIOME RESEARCH
The gut houses an enormous population of microorganisms that profoundly influence many aspects of our health. These include infectious diseases and lifestyle diseases. Our research focuses on how interactions between diet, environment and physiology impact on the microbiome and the effect this has on its host. To this end we collaborate broadly with researchers concerned with many aspects of the biology and ecology of gut microorganisms.

Each individual has a characteristic ‘personal microbiome’ that can influence their metabolic, and immune phenotype. Community profiling is being undertaken to develop strategies for managing the spread of antibiotic resistance and diet-based interventions in microbiome-related diseases.

ANTIMICROBIAL RESISTANCE
CRITICAL INFECTIONS
Led by Professor Jon Iredell, the NHMRC Centre of Research Excellence for Critical Infections concentrates on improved detection and management of infectious diseases in Australia and Southeast Asia.

Our main research activities are focused on infections that threaten the critically ill or are likely to cause life-threatening illness such as septic shock, severe pneumonia or encephalitis.

The centre also studies the ecology of major infections, including antibiotic resistant infections and the ethical and legal issues associated with diseases affecting the very ill. International collaborations are particularly well developed in the area of severe respiratory infections and encephalitis.

IMPROVING HOSPITAL INFECTION CONTROL
MRSA (methicillin-resistant Staphylococcus aureus) is a term used to describe strains of the bacterium, Staphylococcus aureus, that are resistant to a number of antibiotics, including methicillin. This group of bacteria lives on the surface of people’s skins and inside the nose and, while normally harmless, can spread quite easily through person-to-person contact. They can cause serious disease if they enter the body through a cut or wound.

Healthcare-associated MRSA bloodstream infections are reported to be in decline in several countries, including Australia. But there is still a high number of infections among hospital patients, resulting in major impacts on patients, as well as hospital practices and staff workload.

We have a major focus on MRSA epidemiology and aim to improve healthcare worker awareness of infection prevention and control, particularly in regard to preventable risk factors.
PANDEMIC INFECTIONS

EVOLUTION AND EMERGENCE OF VIRUSES
Research in this area is devoted to understanding the evolution, emergence and treatment of a wide range of human diseases caused by viruses, most notably influenza, HIV, SARS, hepatitis C, West Nile fever, dengue fever, rabies, polio and measles.

Much of our focus is on the evolutionary mechanisms by which viruses cross species boundaries and emerge in new hosts, as well as determining how a new virus will evolve after it has successfully emerged.

We are helping to predict, prevent, and control future major disease epidemics and are particularly interested in viruses that pose a threat to the Australian human population, such as dengue fever virus, or our animal species.

In collaboration with researchers at CSIRO in Canberra, we are studying two viruses used to control European rabbit populations in Australia: myxoma virus and rabbit haemorrhagic disease virus.

ZOONOSES

AUSTRALIAN REGISTRY OF WILDLIFE HEALTH
Diseases in wildlife can have significant impacts on human health, the agricultural industry, and may threaten species survival. Human health and economic viability rely on functioning ecosystems, which themselves rely on the health of their constituent wildlife, domestic animals and humans.

The Australian Registry of Wildlife Health is a conservation and research program of the Taronga Conservation Society Australia and an affiliate of the institute. Research programs focus on increasing Australia’s capacity to better understand and detect wildlife diseases that could have negative impacts on Australia’s biodiversity, trade, economy, tourism and human health.

VETERINARY PUBLIC HEALTH
We conduct research and training in veterinary microbiology, epidemiology and pathology with relevance to animal welfare, food production and disease control.

Studies include traditional farm animals such as sheep, cattle, pigs and chickens, but also aquatic species, wildlife and companion animals. Projects in countries such as Cambodia, Laos, Bhutan and Indonesia include best practice models in the beef industry; limiting infection risk during milk production; reducing antibiotic use in pig farming and limiting the spread of rabies.
MAJOR HUMAN DISEASES

INFLUENZA VIRUS
A particular research focus is influenza, one of the deadliest viruses in human history.

Faced with an increasing number of circulating influenza virus strains that are drug-resistant, it is imperative that we search for new antiviral drugs, including those from natural sources.

The institute will be conducting a study of preparedness for pandemic influenza in Australia and selected Asian countries with diverse sociocultural backgrounds, ethical, legal and governance structures. This study will assess these countries’ national plans, conformity to World Health Organization guidelines and the robustness of planning to deal with the many consequences of an influenza pandemic.

TUBERCULOSIS
Tuberculosis (TB) has plagued humanity for millennia and it remains problematic today. Although rates in Australia are low, TB flourishes in areas affected by poverty and social disruption. The rising tide of drug-resistant TB is one of the most daunting health challenges facing the Asia-Pacific region and raises the spectre of virtually untreatable disease, from which Australia is also at risk.

Under the leadership of the University’s Professor Warwick Britton, the Centre of Research Excellence for Tuberculosis Control supports world-leading research. Work aims to limit TB transmission within Australia, address relevant legal and ethical issues, understand and reduce the emergence of drug-resistant strains, enhance early patient identification in Vietnam and improve the management of childhood TB globally.

The ultimate goal of research in this field is to eliminate transmission of TB within Australia, and make substantial contributions to the World Health Organization (WHO) goal of global elimination of TB by 2050.

LYMPHATIC FILARIASIS
Lymphatic filariasis is a mosquito-borne disease caused by a parasitic worm. It is one of several debilitating and disfiguring illnesses that include leprosy and yaws, a tropical infection of the skin. It is considered a Neglected Tropical Disease (NTD) because it has not been given sufficient priority as a global health issue and control programs remain stagnant.

In Timor-Leste, where lymphatic filariasis is endemic, the institute is providing capacity-building and technical support to the National Plan for Integrated NTD Control Program.

We are helping to provide strategic direction towards achieving two key goals:
- eliminating lymphatic filariasis as a public health concern in Timor-Leste by 2020
- controlling soil transmitted parasites and eliminating yaws by 2016.
FUNGAL INFECTIONS
We are committed to understanding the origin, development, and effects of invasive fungal infections in humans and animals, and to developing new treatment options.

Extensive cross-disciplinary collaboration resulted in better understanding of cryptococcosis, a potentially fatal fungal infection of the nervous system, especially in immunosuppressed individuals. Our work has yielded new insights into the risk determinants and management of infection in humans and how cryptococcal organisms cause disease.

We established partnerships with colleagues in Indonesia, Thailand, Chile, Colombia and Brazil to broaden our epidemiological research.

Animal studies identified Cryptococcus gattii infection in the koala. Its natural habitat is a key environmental niche of C. gattii, which is found in woody debris of certain species of eucalyptus trees.

Additional research is focused on reducing deaths from Candida bloodstream infection in the critically ill, with plans to collaborate with colleagues in agriculture on the unintentional effects of biocide use on cereal crops.

MAJOR ANIMAL DISEASES
AUSTRALASIAN WILDLIFE
The University’s Australasian Wildlife Genomics Group from the Faculty of Veterinary Science studies the molecular genetics and evolution of genes and genomes of our native wildlife. They are particularly interested in the immune system.

The best-known work of this research team is on the contagious cancer affecting Tasmanian devils: Devil Facial Tumour Disease (DFTD). This disease is passed from animal to animal when they bite each other. Research has shown that DFTD is spread due to low genetic diversity in Tasmanian devil populations, combined with the tumor’s ability to hide from the immune system.
FOOD SAFETY
Fresh fruit and vegetables are healthy and nutritious. However, as many products are eaten raw, there can be a risk of contaminated produce causing illness. Prevention of food-borne illness relies on local evidence-based research to underpin the quality assurance programs that make our fresh produce safe.

A Fresh Produce Safety Centre (FPSC) will be established in 2014 at the University of Sydney to identify research needs and provide appropriate solutions for the Australian and New Zealand fresh produce industry. This transformational approach to food safety will provide a single industry-driven entity that represents the whole fresh produce supply chain. It covers policy, outreach, research and crisis management, and will provide food safety guidelines for all horticultural industries.

FOOD SECURITY
One major aspect of food security is making sure that food is safe and free from infectious and toxic agents. But also of major concern is the link between our food systems and emerging infectious diseases.

Globally, infectious diseases have a significant impact on plants, animals, farmers, traders and consumers in terms of food production, health and welfare. By focusing on livestock research we hope to directly contribute to ecologically sustainable development and improved livelihoods for rural communities in Australia and internationally.

Our research in this area is currently focused on strengthening food security through small-scale, family farming that includes poultry, pigs and a variety of crops.

MOSQUITOES
Mosquito-borne disease management in Australia faces challenges on many fronts. An increase in coastal urbanisation is bringing the community closer to habitats where mosquitoes breed. Meanwhile, water conservation strategies and wetland rehabilitation projects are creating new mosquito habitats, with the potential to significantly increase the abundance of local mosquitoes.

Mosquitoes may be an integral part of Australia’s wetland ecosystems, but they also facilitate the spread of dangerous viruses such as Ross River, Barmah Forest, Murray Valley encephalitis and Kunjin. It is vital that we improve our understanding of the environmental risk factors that drive the seasonal activity of these viruses. This deeper understanding in turn may help with the development of more ecologically sustainable mosquito control programs.

Programs featured here are a snapshot of the breadth of work being undertaken by the institute. For more information about these and other research work please visit sydney.edu.au/mbi
JOIN OUR COMMUNITY OF RESEARCHERS, EDUCATORS AND EXPERT PROFESSIONALS
If you are interested in collaborating with institute-sponsored multidisciplinary research and activities, please get in touch with us. We welcome your involvement, whether you are an academic or student of the University of Sydney, or an external party interested in our work.

SUPPORT US
You can help our dedicated community of researchers and clinicians to win the fight against emerging and re-emerging infectious diseases and improve the health and wellbeing of people in Australia, the Asia Pacific and elsewhere.

Donations over $2 are tax deductible. Funds are used to support our research, education, and capacity building to promote biosecurity and prevent, detect and control infectious diseases of global and national importance.