

CONTACT US

t 1300 363 400
+61 3 9545 2176
e enquiries@csiro.au
w www.csiro.au

YOUR CSIRO

Australia is founding its future on science and innovation. Its national science agency, CSIRO, is a powerhouse of ideas, technologies and skills for building prosperity, growth, health and sustainability. It serves governments, industries, business and communities across the nation.

FOR FURTHER INFORMATION

Biosecurity Flagship
Dr Gary Fitt
Director
t +61 7 3833 5665
e Gary.Fitt@csiro.au
w www.csiro.au/biosecurityflagship

Cameron Begley
Commercial Director
Biosecurity Flagship
t +61 2 6246 4033
e Cameron.Begley@csiro.au

Emma Pyers
Communication Manager
t +61 3 5227 5123
e Emma.Pyers@csiro.au

Biosecurity Flagship

Protecting Australia from biological threats



Biosecurity challenges

Biosecurity is about the management of risks to our health, economy, industries and environment, from pests and diseases entering, spreading or establishing on Australian soil.

Diseases, weeds, invasive animals and insects devastate our crops, livestock and farm profits, our unique environment and occasionally human health.

Historically, with our geographic isolation and history of strong quarantine measures, backed by world-class science and research, we have been spared from some of the serious impacts of exotic pests and diseases that circulate around the world.

Australia's favourable biosecurity status contributes to the sustainability of our agricultural production systems and underpins access to export markets on which we depend. Maintaining this status supports Australia's contribution to a secure global food supply, and protects our environmental assets, way of life and community.

However, with increasing global trade and interconnectedness, we are facing a greater challenge.

The movement of animals, plants and people, a changing climate, together with declining levels of expertise and resources in the biosecurity system, are placing pressure on Australia's future ability to protect itself from exotic pest and disease threats.

This increasingly complex environment requires new and integrated approaches and to address these challenges CSIRO has established the Biosecurity Flagship.



CSIRO has assembled strong multidisciplinary research teams focused on tackling major national and international biosecurity challenges to help protect the health of our farming sector, environment and people. We will contribute to Australia's social, environmental and economic wellbeing by reducing the risk of pests and diseases entering Australia and improving the effectiveness of mitigation and eradication responses.

Dr Gary Fitt, Director, Biosecurity Flagship

Biosecurity Flagship – helping to protect Australia

The CSIRO Biosecurity Flagship brings a national perspective and focus on the science needed to tackle biological threats that don't respect borders.

Protecting Australia is our primary concern and the Biosecurity Flagship offers great opportunities for Australia to further strengthen its biosecurity system by:

- ♦ minimising the risk of entry, establishment or spread of pests and diseases
- ♦ effectively dealing with exotic incursions and endemic outbreaks in a timely manner
- ♦ controlling and eradicating post-incursion and mitigating the impact of established pests and diseases.

Our research involves the detailed study of invasive organisms, pests and diseases, risk analysis, predictive modelling and new strategies for treatment and response.

We provide a vehicle to work closely with a wide range of external partners across the national and global biosecurity system to respond to Australia's long-term biosecurity needs in a more coordinated and focused research effort.

Our research achievements enhance policy development, decision-making, threat characterisation and risk management, together with more cost-effective and resilient surveillance, prevention and emergency response strategies.

We collaborate with industry to provide deployable technologies that reduce the financial, environmental and social impacts of emerging and

established diseases and pests. In addition, we provide specialist training for professionals working within the biosecurity sector.

The Biosecurity Flagship provides new technologies in the form of sensors, sensor networks and autonomous platforms for more cost-effective surveillance systems for our borders. New genetic technologies and precision genome engineering will be deployed to develop disease resistant livestock, while diagnostics, vaccines and new therapeutics add to the range of options to protect animal and human health. Additionally, the Flagship provides highly effective options to manage invasive species through biological control.



Autonomous platforms, such as this unmanned aerial vehicle (donated to CSIRO by Ericsson Australia), provide cost-effective surveillance systems for our borders.





Research areas and capabilities

We are focusing our biosecurity research and strengths across animal, plant and environmental sciences to more rapidly develop solutions to Australia's major biosecurity challenges.

Our objective is to reduce the risk of pests and diseases entering our borders or, where necessary, manage the consequences by improving the effectiveness of our strategies to respond.

Our researchers are international leaders across many fields, including genomics, virology (including zoonoses), immunology, robotics, sensor technology, advanced mathematics, social sciences, economics, computer modelling, genetics, ecology, biology and epidemiology.

Preparedness – reducing likelihood of adverse events

Our research focuses on transforming Australia's ability to rapidly predict, detect and control incursions of economically and ecologically important exotic and newly emerging infectious diseases of livestock. Including diseases that spread from animals to people (zoonoses). Research outcomes will directly ease the social, economic and environmental costs of such events, and encourage further investment and growth in the livestock sector through a measurable reduction in the risk of doing business.

Response – managing consequences of adverse events

Our research focuses on reducing the economic, environmental and social threats and impacts of national priority invasive pests (plants, vertebrates, invertebrates and plant pathogens) of the terrestrial and marine environments and plant-based agriculture. We achieve this through world-leading research on preparedness, surveillance and response and combining this with advanced mathematics, robotics and sensors, social, economic, genetic, biological and ecological research.

One Health approach to emerging infectious diseases

The risk of a pandemic that could affect the lives of millions of people world-wide is very real. For example, more than 70 per cent of emerging infectious diseases affecting people have been found to have originated in animals, including influenza viruses, coronaviruses and Hendra virus.

To address this threat, the Biosecurity Flagship adopts a multidisciplinary, One Health approach – a combined approach to animal, human and environmental health.

One Health recognises that human, animal and ecosystem health are inextricably linked. We are strengthening Australia's engagement with significant global research networks built on the One Health model.

Improving knowledge, prevention and treatment of zoonoses is the focus of One Health research based at the Australian Animal Health Laboratory (AAHL) – the world's most sophisticated high containment facility.



Australia is one of the only countries free of the mite *Varroa Destructor* which has decimated bee populations overseas, impacting global beekeeping production.



We build on existing collaborations and develop new partnerships to support an enhanced national ability to protect public health, the environment and the economy into the future.

Working with us

We are continuing to build our collaborations with governments, industry, universities, cooperative research centres and other national and international research agencies.

In partnership, we believe the Flagship can significantly contribute to meeting future biosecurity challenges on both a national and global level.

Our researchers are supported by the internationally recognised AAHL in Geelong, Victoria and the Tropical Plant Quarantine Facility in Brisbane, Queensland.

We believe innovation is the product of vibrant, focused collaboration seeking to address local and global challenges.

We welcome partnerships with leading organisations with similar interests and complementary skills.

We are striving for a biosecurity system that is pre-emptive, responsive, resilient, and based on cutting edge surveillance, informatics and technologies. For our goal to become a reality, we will continue to rely on the strong partnerships we have formed, and those we will continue to seek out and grow into the future.



New One Health partnership

CSIRO's world-leading bat virology research, which has already been instrumental in the identification and understanding of viruses such as Hendra virus and the Severe Acute Respiratory Syndrome (SARS), will form an important basis for a new international collaboration.

The Biosecurity Flagship and AAHL in collaboration with Duke-NUS (an alliance between Duke University in North Carolina, USA and the National University of Singapore) have formed the International Collaborative Centre for One Health. This new partnership is headed by Dr Linfa Wang who leads CSIRO's bat virology team, world leaders in understanding bat-virus-host interactions. Together this partnership will develop:

- ♦ a better understanding of how zoonotic viruses develop and interact with their hosts and the environment
- ♦ epidemiology and predictive biomodelling of diseases emergence and impact
- ♦ new preventative and diagnostic tools, new therapeutics and vaccines.



CSIRO's bat pack sheds light on deadly viruses

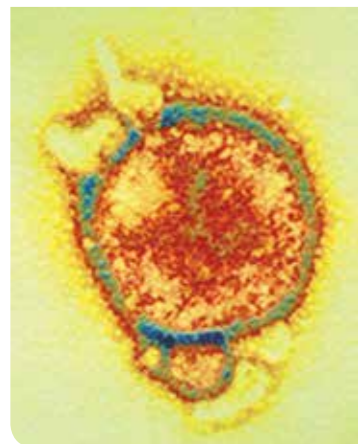
CSIRO researchers are studying the ecology and the immune system of bats to determine how they are able to host a range of viruses and how they 'spill over' into humans and other animals.

The CSIRO bat virology team, based at AAHL, is focused on gaining a better understanding of bat immunology and bat virus-host interaction, to assist in developing strategies to help control or prevent viruses which spread from bats to other animals and people.

The team has been instrumental in the detection and characterisation of many bat-borne viruses including Hendra, Nipah, Melaka, Australian bat lyssavirus and Cedar virus.

The team has also worked with international partners to identify bat genes with roles in both immunity and flight, providing more clues to the future treatment and prevention of infectious diseases.

Ongoing research will help enhance Australia's biosecurity and limit the wide ranging impacts that a new disease can have in our closely interconnected and highly mobile world.



World first – Hendra virus vaccine

CSIRO scientists have been working with Australian and international colleagues to develop effective prevention and treatment strategies for the deadly Hendra virus since it was first identified in 1994.

In November 2012 CSIRO, along with Zoetis Australia and US partners, launched a horse vaccine for Hendra virus – Equivac® HeV – the world's first commercial vaccine for a Bio-Safety Level-4 disease agent.

By vaccinating horses against Hendra virus, we are now able to stop the spread of this deadly virus from horses to people. This is not only a global scientific achievement; it is an achievement for our nation.

AAHL played a critical role in developing the vaccine, providing technical knowhow and the safe handling of Hendra virus and testing of the Equivac HeV at its high containment facility in Geelong, Victoria – the only laboratory in the world capable of such high-risk work involving infected livestock.



Mite bee a problem

The European honeybee, *Apis mellifera*, is the foundation for commercial honey production and also provides a global pollination benefit worth up to \$100 billion.

In 2008, CSIRO scientists discovered that Asian honeybee populations in Papua New Guinea are carrying a new strain of varroa mite which is lethal to managed European honey bees. This poses a very real threat to wild and managed European honey bees as future honey bee

incursions in Australia could transmit this new mite. Scientists are working on understanding what type of viruses could be transmitted by this new strain of varroa mite and thereby readying our defences if an outbreak should occur.



A solution to the control of silverleaf whitefly

The silverleaf whitefly is a pest in vegetable, cotton and grain legume production areas. It is considered one of the world's most invasive pests.

Soon after it first arrived in Australia in 1994, CSIRO started looking for a biocontrol solution. After much specificity testing, the tiny wasp, *Eretmocerus hayati*, from Texas, was first released in Queensland in 2004. This release offered CSIRO the opportunity to evaluate the performance of a biological control agent released to manage an exotic invasion such as the silverleaf whitefly.

From 2004 until 2008, *E. hayati* became successfully established throughout Australia and growers reported a reduced need to treat for silverleaf whitefly. The biocontrol agent is now part of an integrated management package. The introduction of *E. hayati* has been so effective in providing a control for the effects of silverleaf whitefly that a biological control company called *Bugs for Bugs* has made the beneficial insect commercially available.



World class facilities Australian Animal Health Laboratory Geelong, Victoria

AAHL is Australia's high containment facility for animal health and is one of the most sophisticated laboratories in the world for the safe handling and containment of animal diseases. Our scientists develop new diagnostic tests, vaccines and treatments for both exotic and endemic animal diseases of national importance. We research major diseases of livestock, aquaculture animals and wildlife. The laboratory's capacity to rapidly diagnose disease, combined with high quality research, makes it a global leader in a wide range of animal and zoonotic diseases.



Working with us The Tropical Plant Quarantine Facility Brisbane, Queensland

The Tropical Plant Quarantine Facility, a joint CSIRO/Queensland Department of Agriculture and Fisheries initiative, provides QC3 level infrastructure to support plant health and quarantine based sciences through the Ecosciences Precinct in Brisbane. This state-of-the-art facility allows researchers to conduct secure and controlled studies to provide innovative options for management of insects and microorganisms that threaten Australia's agricultural sector and broader environment. The 400 m² secure facility enables researchers to work with exotic agents to better understand the threat they pose or to evaluate their potential as biological control agents. These specialised labs are supported by conventional laboratories, controlled environment rooms, and approximately 3000 m² of non-quarantine on-site plant growth facilities.

