RECENT RESEARCH BREAKTHROUGHS
Who we are

QIMR Berghofer is a world-leading medical research institute, renowned for our efforts in both discovery and translational (real patient setting) research. We research **cancer, mental health, infectious diseases** and **chronic disorders**.

We are a passionate and dedicated team of almost 900 researchers, scientists, students and support staff based in Brisbane. We have more than 65 research groups who work in state-of-the-art laboratories and collaborate closely with doctors, hospitals, universities and other research institutes in Australia and around the world. Our scientists are creating The Future of Health by discovering more effective ways to diagnose and treat diseases.

We hope you enjoy reading about some of our recent research achievements in disease prevention, diagnosis, treatment and survivorship.
Discovered a new pathway linked to seizures and epilepsy

OUR RESEARCH
We led an international study that uncovered a new pathway linked to brain activation. When unsettled, this pathway resulted in excessive and uncontrolled seizures. We also found significant evidence that this pathway is associated with epilepsy patients.

OUR IMPACT
Our study not only discovered new aspects of brain activation, but also, for the first time, showed how brain cells become resistant to switching off this activity. These results will be important for designing treatments for patients who become resistant to standard therapies, which result in intractable seizures.
Discovered a new way in which cancer evades natural killer cells

OUR RESEARCH

Using specialised high-throughput gene and protein detection technologies, we have shown that white blood natural killer cells that normally protect us from cancer development can be converted into a related immune cell that may actually promote the cancer’s growth and spread. This conversion is driven by a factor called transforming growth factor beta which is made by the cancer and its supporting tissue. Preventing this conversion suppresses tumour growth and spread.

OUR IMPACT

Discoveries like these facilitate the development of exciting new cancer immunotherapies, which could increase survival rates of advanced-stage cancer patients.
Progressed toward new blood test for oesophageal cancer

OUR RESEARCH
We performed the first large-scale study that proved we can detect early-stage oesophageal cancer through a blood test.

OUR IMPACT
Our goal is to develop a blood test for surveillance of the high-risk population (overweight/obese, older males with chronic heartburn), which would operate similarly to the National Bowel Cancer Screening program. Those with positive tests would be diagnosed by endoscopy, with early oesophageal lesions directly treated during the endoscopy.
Proved reduced risk of cross-infection in cystic fibrosis patients

**OUR RESEARCH**

Our study demonstrates that two different types of masks are effective in reducing cough aerosols containing bacteria that cause difficult-to-treat lung infections in people with cystic fibrosis (CF). The masks controlled the spread of bacteria two metres from the source during coughing in patients with CF. Covering the mouth with the hand was also found to be effective, to a lesser extent.

**OUR IMPACT**

We will test the effectiveness of longer facemask wearing time in people with CF, including children, and adapt the test to understand the best ways to apply masks, both in the hospital and workplace, to reduce infection transmission in the real world.
Large-scale genomic analysis identified genes that predict survival in leukaemia

OUR RESEARCH

We have collected one of the largest and most comprehensive datasets from patients with leukaemia. We have used these findings to identify the key genes that predict survival after chemotherapy. We found that there is an interaction between tumour genetics and patient characteristics such as age.

OUR IMPACT

This will have a significant impact on the way patients with leukaemia are treated and selected for more intensive treatment, such as bone marrow transplantation.
Developed a patient-specific procedure to screen drugs for treatment of neuroinflammation in dementia

OUR RESEARCH

We have developed a procedure that uses a dementia patient’s own blood cells to test for drugs that could improve immune function in the brain for that patient. It provides a rapid, cost-effective means to determine if a drug can potentially improve the function of the brain’s immune cells (microglia) for each patient.

OUR IMPACT

There are currently no effective treatments for dementia. Our research will allow effective testing of drugs specific for each patient, and provide real-time monitoring of patients in clinical trials of immune drugs.
Found more than a third of cancer deaths are preventable

OUR RESEARCH

We led a large study that used multiple sources of data to estimate how many people die from preventable cancers each year. We found that 38 per cent of cancer deaths in Australia each year are potentially preventable. The findings mean about 16 700 cancer deaths each year could potentially be avoided, mostly through lifestyle changes.

OUR IMPACT

By educating the public to make changes to their lifestyles, we hope that the burden of fatal cancers will be reduced.
Discovered cooperation between different cells is required for melanoma to spread

OUR RESEARCH

We have identified that different sub-populations of melanoma cells within the same tumour are important in the cancer’s growth and spread. We believe that these different cell types cooperate and communicate with each other to enable this to happen.

OUR IMPACT

This finding opens the opportunity to study the way the tumour cells communicate and cooperate with each other and to then find a treatment to stop the melanoma cells growing and spreading. We hope that this will lead to better treatments to prevent melanoma from developing and spreading around the body, and result in better outcomes for patients with the disease.
Developed new vaccine to protect against both Zika and chikungunya

OUR RESEARCH
We have helped to develop a vaccine that protects against both Zika and chikungunya viruses (termed SCV-ZIKA/CHIK). Pre-clinical evaluation of this vaccine illustrated it was able to completely protect against Zika and chikungunya infection and disease after a single immunisation. Zika and chikungunya are both mosquito-borne viruses. Chikungunya virus causes rheumatic disease, and in pregnant women, Zika infection can result in brain defects in newborns.

OUR IMPACT
SCV-ZIKA/CHIK is currently being evaluated by the National Institute of Allergy and Infectious Diseases (USA) in pre-clinical studies. Phase I human studies are planned for 2019 at Q-Pharm. A single immunisation with SCV-ZIKA/CHIK will hopefully protect people against both diseases and have global implications.
Discovered 136 genetic risk factors for allergic disease

OUR RESEARCH

We led the world’s largest genetic study of allergic disease and discovered 136 genetic variants that influence the risk of developing asthma, hay fever and eczema. We also pinpointed specific genes that are affected by these risk variants. Our results help understand why these three common diseases often co-exist in the same individuals.

OUR IMPACT

We hope that our results will help develop new drugs to treat asthma, hay fever and eczema. It is estimated that 2.5 million people suffer from asthma and nearly one in five Australians, or almost 4.5 million people, suffer from hay fever.
Identified new treatments to reduce the suffering from scabies

OUR RESEARCH

Currently available drugs for fighting scabies parasites frequently fail, because mite eggs are not susceptible to treatment. We have identified new candidate drug treatments that kill both the egg and the mite and have progressed the research to pre-clinical trials.

OUR IMPACT

Scabies and associated co-infections cause substantial illness and burden affecting the world’s poorest people. In Australia, an alarming prevalence persists in remote Aboriginal communities. This project combines cutting-edge research and unique pre-clinical studies to deliver new drug treatments that kill mites and eggs and to compare their efficacy to currently recommended treatments for scabies.
Identified variability in care of patients with pancreatic cancer

OUR RESEARCH

We conducted Australia’s largest population-based study of pancreatic cancer and found that across all treatment types (surgery, chemotherapy, stenting, supportive care), patients who lived in rural and remote areas received less optimal care (on average) than those in major centres.

OUR IMPACT

This has implications for health service delivery and we hope that in the future we can implement new strategies to ensure all patients have equal opportunity to receive optimal pancreatic cancer care.
Showed how cystic fibrosis damages children’s livers

OUR RESEARCH

We identified the existence of a type of pre-liver damage, called the ductular reaction, in liver biopsies from children with cystic fibrosis (CF). We demonstrated that increased levels of a toxic bile acid cause liver stem cells to differentiate into this ductular reaction, causing specialised liver cells to produce excess scar tissue (fibrosis), leading to cirrhosis and liver failure.

OUR IMPACT

This is the first demonstration of a mechanism of this type of liver damage in children with CF. We hope this insight will allow us to identify new therapies for this disease. Future therapies can be targeted at inhibiting liver stem cell differentiation, and therefore provide greater quality of life for children with this devastating disease. Life expectancy for CF patients has doubled within a generation, but at 36 is still unacceptably low.
Discovering brain imaging marker of risk for future bipolar disorder

**OUR RESEARCH**

We conducted scans of 200 young people (aged 15-30) who either had bipolar disorder, were at high future risk of bipolar disorder (due to familial risk), or were healthy at the start of the study. At the end of the two-year study, we scanned them again and discovered brain network changes indicating future risk of bipolar disorder, as well as markers of reliance.

**OUR IMPACT**

Young people with a parent, sibling or child with bipolar disorder are at 10 times increased risk of developing bipolar disorder. We are moving toward a combination of genetic and brain imaging markers that can customise the individual risk. Those at the very highest risk could be eligible for new preventative interventions, including those of a psychological and pharmacological nature.
Developed nanorobots that can help stop tumour growth

OUR RESEARCH
We have successfully developed microscopic nanorobots – made of DNA and protein – that directly target tumours and stop them from growing. The nanorobots have shown early signs of success in pre-clinical trials.

OUR IMPACT
This technology is potentially applicable to treating a broad range of cancers with minimal side effects. As with most cancer treatments, it is likely to be most effective when used in conjunction with other forms of treatment. It is still very experimental at this stage, but the use of nanorobots could provide a new, cutting-edge therapeutic strategy to fight cancer.
Studied how young infants absorb essential iron

OUR RESEARCH

The cells lining the intestine of nursing infants take up iron quite differently to adults. They deliver this iron to the blood using the same pathway as adults, but this pathway can only be regulated after weaning, and not in infancy.

OUR IMPACT

Understanding how infants take up iron and how the process is regulated has important implications for the effective design of infant formulae and other iron supplementation strategies.
Identified factors affecting new onset chronic kidney disease (CKD) after surgery for kidney cancer

OUR RESEARCH

Using data from a large study of kidney cancer, we found that age, lower preoperative kidney function, larger tumour size, total (rather than partial) removal of the kidney, the presence of additional disease, rural place of residence, and smaller treatment centre capacity were associated with a higher likelihood of new onset CKD.

OUR IMPACT

Our results can be used to identify those at most risk of developing CKD after treatment for small kidney cancer, allowing for closer monitoring and earlier intervention to help stop CKD progression. Our findings also help develop surgical service delivery models, particularly in smaller and regional/rural hospitals.
Determined endometrial cancer risk for individuals reporting family history of cancer in close relatives

OUR RESEARCH

We conducted the first study to systematically assess endometrial cancer risk associated with reported cases of cancer in first-degree relatives (parents, siblings and children) and second-degree relatives (aunts, uncles, nephews, nieces, grandparents and grandchildren). We showed that the strongest predictor of endometrial cancer risk was endometrial cancer diagnosis under 50 years of age in a close relative, but risk was also increased if a second-degree relative reported endometrial cancer.

OUR IMPACT

We have shown that it is important to collect information on endometrial cancer and age at diagnosis in both first-degree and second-degree relatives when assessing the family cancer history for genetic counselling and risk prediction.
Conducted a clinical trial to make bone marrow transplantation safer

OUR RESEARCH

This is the first clinical trial in Queensland, and one of only a handful in Australia, to use gene-modified cells in patients. We genetically engineered a type of immune cell, known as a T cell, to make them delete-able. This improves the safety of bone marrow transplantation, which is used in the treatment of blood cancers.

OUR IMPACT

We are now expanding our expertise in genetic engineering into other forms of immunotherapy. We are working on using regulatory T cells to treat graft-versus-host disease, which is a life-threatening complication of bone marrow transplantation. We are also expanding into chimeric antigen receptor technology, where immune cells are re-targeted to kill cancer cells.
Identified genomic differences between patient matched primary and metastatic bowel cancer samples

OUR RESEARCH

We found that there are a number of genetic profile differences that could affect the choice of treatment for bowel cancer patients. These findings indicate that clinical testing needs to include a sample from the patient’s metastatic disease to be able to identify all potential treatments.

OUR IMPACT

We are now extending this work using whole genome sequencing for these and more patient samples. In the future we hope this work will help to identify the best clinical testing strategy for patients with colorectal cancer to ensure each patient receives the best treatment.
Mapped the genetic mutations that drive pancreatic cancer

OUR RESEARCH

Pancreatic cancer is one of the most difficult-to-treat cancers and outcomes are almost always poor. Even though a number of people may develop pancreatic cancer, the actual tumour cells may be quite different in each person’s cancer. Our researchers investigated the specific genetic mutations that were present in over 100 pancreatic tumours and found patterns of change which showed how the cancer arose.

OUR IMPACT

This kind of detailed information about the characteristics of pancreatic cancer cells helps us progress further towards better targeting of treatments and the development of new treatment strategies.
Completed clinical trial of a new immunotherapy to treat multiple sclerosis

OUR RESEARCH

There is increasing evidence that infection with a particular virus, called the Epstein-Barr virus (EBV), has a major role in the way multiple sclerosis (MS) develops. The way our immune system eventually eliminates the virus might cause MS by allowing EBV-infected cells to accumulate in the brain. Our researchers have successfully completed a world-first immunotherapy clinical trial to treat progressive MS.

OUR IMPACT

The outcomes of this trial will help to develop an effective immunotherapy in treating those suffering from the debilitating effects of MS.
Found a healthy diet may improve survival for women with ovarian cancer

**OUR RESEARCH**

We looked at whether a woman’s diet before she was diagnosed with ovarian cancer was associated with survival and found evidence that components of a healthy diet (dietary fibre, green leafy vegetables, fish, low glycaemic index and a high ratio of polyunsaturated to monounsaturated fats) were associated with longer survival.

**OUR IMPACT**

If confirmed, this would give women with ovarian cancer greater motivation to follow a healthy diet in order to increase their chances of survival.
Discovered new therapeutic target in brain tumours

OUR RESEARCH

We led the discovery of the receptor EphA3 as a therapeutic target in adult brain cancer tumours. The EphA3 receptor is not normally expressed on healthy adult tissue but is re-expressed in a number of cancers, especially brain cancer cells. The EphA3 receptor also appears to be present on the tumour cells that are responsible for brain cancer initiation and recurrence.

OUR IMPACT

This discovery provides an opportunity to target the tumour ‘at its roots’ while inducing minimal side effects in the normal health brain. Our hope is that further clinical testing will prove safe and effective in increasing not only the survival, but also the quality of life of patients suffering from these aggressive diseases.
Support the Institute

Medical research is a major reason Australians now live longer, healthier lives. However, our life-saving research wouldn’t be possible without support from the community. There are many ways you can support QIMR Berghofer’s research.

- Make a donation
- Sign up for our newsletter
- Host a fundraiser
- Join a tour or request a speaker at your next event
- Participate in our High School Education Program
- Join a study or clinical trial
Make a donation

Unlike other not-for-profits, at QIMR Berghofer 100% of your donations go directly to research, and nothing else, so you can be assured your gift has maximum impact.

**Appeal Giving:** Twice a year we run an appeal focussed on raising much-needed funds for a particular area of our research. If you provide your postal or email address, we will send you information about these appeals and a donation card.

**Monthly Giving:** Maximise the impact of your donation by committing to a monthly, or weekly donation. This can be set up as a direct deposit from your bank account or credit card.

**Impact Giving:** Contact our philanthropy team to discuss an area of interest or passion, and we can help direct your generous support to create the greatest impact. Contact Philanthropy Manager Joanne Lovett at joanne.lovett@qimrberghofer.edu.au or phone 1800 993 000.
Sign up for our newsletter

You can read about how our research breakthroughs are having a real impact on the lives of patients in LIFELAB, our quarterly research magazine.

You can then also receive other news about the Institute, including our appeal letters, which are filled with the very latest research from our laboratories, and invitations to special events.

Sign up today:

🌐 qimrberghofer.edu.au/newsletter
📞 Free call 1800 993 000
✉️ enquiries@qimrberghofer.edu.au
Host a fundraiser

Are you a member of a community group or just interested in becoming a fundraiser for QIMR Berghofer?

Here are some ideas to get you inspired:

- Host a high tea, lunch or night in with friends
- Organise a bake off at your workplace or community group
- Arrange a sporting event, such a golf or bowls day
- Hold a sausage sizzle
- Set up a workplace giving program

Contact us at:

enquiries@qimrberghofer.edu.au

or call 1800 993 000 to discuss ideas and opportunities.
Join a tour or request a speaker

QIMR Berghofer is proud to offer a free tour program for community groups. If you belong to a community group, why not take the opportunity to put our research under the microscope in 2018? Tours include a formal presentation, morning tea and the opportunity to take a tour inside one of our laboratories.

If you are a member of a community group or organisation and would like to hear more about our research on a particular topic, you can request a speaker to make a presentation at your next event. Contact us at:

enquiries@qimrberghofer.edu.au

or call 1800 993 000 to discuss ideas and opportunities.
Participate in the High School Education Program

QIMR Berghofer is inspiring the next generation of medical researchers through our high school education programs. These programs give students from across the entire state the chance not only to engage with QIMR Berghofer scientists about the vital work they do, but to gain hands-on, practical experience of what it’s like to work in a medical research laboratory.

If you know any high school students or teachers who would like to learn about the outstanding science at QIMR Berghofer, direct them to the student section of our website and we can work through the best program to suit their needs.

Visit: qimrberghofer.edu.au/students
Volunteer for studies or trials

**Studies**
QIMR Berghofer is always looking for volunteers to participate in various research studies. For example, QIMR Berghofer is a principal research institute investigating clinical depression, leading the Australian Genetics of Depression Study (AGDS). We are currently recruiting for this study. To participate or find out more, visit geneticsofdepression.org.au or qimrberghofer.edu.au/our-research/participate-in-our-research.

**Clinical Trials**
Q-Pharm is wholly owned by the QIMR Berghofer, and specialises in the conduct of early phase (Phases 1 and 2) clinical trials and vaccine studies. These studies are conducted in a state-of-the-art facility within the QIMR Berghofer precinct at the Royal Brisbane and Women’s Hospital in Brisbane. By participating in a clinical trial you can help in the development of new, safer and more effective medicines. To find out more about current trials at the Institute, visit qpharm.com.au or email participate@qpharm.com.au
We are the Future of Health

Thank you for your support