New face of medicine

Personal approach to treat illness

BY DAMON CRONSHAW

University of Newcastle researcher Professor Murray Cairns. Picture by Max Mason-Hubers

PRECISION medicine is being increasingly used in Newcastle-based research to advance treatments for mental and physical disorders and the links between various conditions.

Professor Murray Cairns, of the University of Newcastle, believes this form of medicine will become much more common in future.

"The genetic information we need to achieve this is cheap and extremely cost effective," Professor Cairns said.

"The applications are growing constantly, particularly in oncology. There is almost limitless potential to use this approach for thousands of drugs and a myriad of disease conditions."

Precision medicine considers variability in genes, environment and lifestyle for each person, enabling more accurate treatment and prevention strategies for disease.

"A major focus of my research is to use genetics to inform the treatment of chronic disease through precision medicine."

The approach in the medical sector and pharmaceutical industry is often to treat disease with "one size fits all" medicine.

But the causes of disease need to be pinpointed in each person, so they can be targeted more specifically.

Professor Cairns was last month awarded $1 million in NSW government funding to research "genetically-informed precision medicine for schizophrenia".

The University of Newcastle and HMRI project aims to help those with the disorder to live better lives.

Schizophrenia affects about 81,000 people in NSW.

Treatment of the disorder has not been significantly improved for 60 years.

Professor Cairns and his team aim to change this by matching patients with treatments, using their genetic information.

The project will involve the use of "cerebral organoids" - artificially grown miniature organs resembling the brain.

He is also part of a team conducting a $1 million research project into cardiovascular disease and cancer.

The research aims to pinpoint "shared disease pathways and pharmacological management".

"This project is exploring the link between cancer treatment and cardiovascular health," he said.

Cardiovascular disease is the leading cause of long-term morbidity and mortality among cancer survivors.

"Cancer treatment often leads to life-threatening heart problems and failure."

The team is seeking to determine how cancer treatments contribute to cardiovascular damage and ways to prevent this damage.

Professor Cairns' lab will help with "molecular and bioinformatic analyses" of patient samples with cardiovascular disease associated with cancer treatment.

So-called "cardioprotective compounds" thought to ease heart damage in such cases will be examined.

Professor Cairns also completed a large genomic study of pneumonia this year, which identified factors that could lead to new treatments with precision medicine.

"We were looking to identify the genetic risk factors for pneumonia, so we could identify treatments and preventative strategies for the disorder. So far, we have identified several compounds that could specifically mitigate the symptoms of pneumonia."

These could prevent the onset of "life-threatening acute respiratory syndrome", which can occur from all causes of pneumonia including COVID-19 and influenza.

"We are trying to raise funds to support a clinical investigation of this approach," he said.

The pneumonia study also found "a genetic correlation between risk of pneumonia and risk of psychiatric disease, such as schizophrenia, bipolar disorder and major depression".

Close links were also found between pneumonia and post-traumatic stress disorder and attention deficit hyperactivity disorder.

"This was a quite unexpected finding, but also very interesting," he said.

"I think it's surprising, but in some ways it's not. There are thought to be inflammatory risks for mental illness.

"We know that serious maternal infections that expose the fetus to pro-inflammatory molecules pose a risk of psychiatric conditions later in life. Similarly, neonatal and early childhood exposure to infection increase the risk of mental health problems later in life.

"The shared heritable risk of these conditions may be related to alterations in immune function, which are also known to be associated with psychiatric conditions."

The Western medical establishment has historically paid little attention to links between mind and body, but the two have long been considered connected in the East.

Professor Cairns said "I don't see there being a clear separation between mind and body".

"The brain is another part of our body, whereas the mind is an abstract construction formed by the activity and circuitry in our brain. Mental and physical health are bi-directionally linked."

This concept relates to the issue of repurposing drugs because drugs for the mind can work for the body and vice versa.

"Many of the drugs relevant for psychiatric conditions also have a function in the body directly, or they modulate circuits in the brain that control the physiology of the body."

The reverse is also true.

For example, drugs designed for cardiovascular disease that target the heart, blood vessels or liver can have direct and indirect effects in the brain.

Links between mental and physical health are obvious to most people in ordinary life.

"It is well known that exercise can have significant benefits for mental health," Professor Cairns said.

"Poor mental health can also have a significant impact on physical health."

Problems in the body can come out in the mind and vice versa.

As such, it is important to consider "all the causes and sites" of disease and disorders and how they interact.

Professor Cairns and his team are also examining ways to repurpose drugs, using genetically-informed precision medicine, to treat conditions like obesity, type 2 diabetes and other complex disorders. The team has identified various drugs and is looking to raise funding for a clinical trial.