UKRI Medical Research Council

# Changing Lives

An introduction to the Medical Research Council

# Improving human health with research

Our mission is to improve human health through world-class medical research.

Since 1913 we've funded the science behind some of medicine's biggest breakthroughs. From deciphering DNA's structure to identifying the flu virus and inventing the MRI scanner, our scientists have made an enormous contribution to modern medicine.

We have over 50 research units, institutes and centres across the UK, as well as several resource centres, and two research units in Africa.

# Funding the best science

Every year we invest over £800 million, on behalf of the UK taxpayer, into research tackling the health problems of the 21st century.

We support a wide range of research across different areas of medicine. From looking at the smallest parts of cells to studying diseases in millions of people, our researchers use science and technology to make life-changing discoveries.

# Why choose a career in research?

"The best thing about being a scientist is that you could be the first person to discover something no one else knows."

PhD student Tash Clarke is teaching machines to detect language changes due to Alzheimer's disease

"Scientists are treasure hunters. After a long time of searching, you discover nuggets of gold - usually not what, or where, you expected."

Professor John McLauchlan studies hepatitis C virus, a major cause of liver disease

"I wake up and I'm excited to go to the office and do research. Apparently, I even talk about my research in my sleep!"

Matt Lee is a PhD student researching the links between body fat and disease

Hear more of our scientists share their thoughts and career highlights in our podcast: **mrc.ukri.org/podcast-CL**

"I love meeting the multinational and multicultural people I work with, and being a key part of their amazing research."

Technology specialist Kevin Clark uses lasers to help scientists study specific cells in detail

"Medical research is stimulating, enabling me to improve our understanding of what gives us good health and to make a difference to people's lives."

Nutrition scientist Professor Nita Forouhi studies how food affects our health

In 2018, **Sir Greg Winter** from the MRC Laboratory of Molecular Biology won a share of the Nobel Prize in Chemistry. Thanks to Greg's pioneering work, scientists can alter antibodies - parts of our immune system that fight infection - in the lab to make new medicines for treating cancer, arthritis and multiple sclerosis. These treatments have changed the lives of millions of people, including Eilean. Read her story on **the next page**.

# Happier futures for children with arthritis

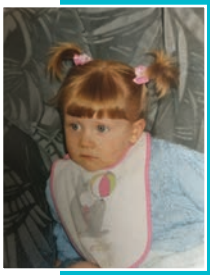
## Patient lead Eilean MacDonald

I was 18 months old when doctors discovered my juvenile idiopathic arthritis (JIA). At first I was lucky, but over time the arthritis got worse.

I began treatment on a drug called methotrexate, but the side effects were terrible. After two years I changed to a different medication - adalimumab - which was life changing. Still, I've needed several painful surgeries through the years. Managing pain and fatigue is hard, especially as a teenager.

But it hasn't all been bad. I'm currently the patient lead on the CLUSTER study, a five-year MRC-funded project following 5,000 children with JIA to create a simple test that will lead to personalised treatment.

Being involved in CLUSTER is so important. I'm not 'just a patient', I'm part of something much bigger. In the future, children with JIA could have the right treatment handpicked for them, saving them from years of unnecessary pain and suffering.



**What is juvenile idiopathic arthritis (JIA)?**
The immune system attacks the body's own tissues, especially the joints, causing pain and swelling. This condition affects children and scientists don't yet know the cause.

# Giving back the gift of sight

## Stem cell scientist Pete Coffey

We were over the moon to help two patients see again.

I study the leading cause of sight loss in the UK: age-related macular degeneration (AMD). The condition damages the 'seeing' cells at the back of the eye, either gradually (the 'dry' form) or suddenly over weeks or months (so-called 'wet' AMD).

For 11 years, I've tried to use stem cells to repair this damage. Unlike other cells, stem cells can develop into any cell in the body.

In 2015, we tested a new treatment in two patients with severe wet AMD - a woman in her 60s and a man in his 80s. Both had severe sight loss and were only weeks away from blindness.

To fix the damage, we grew stem cells from human embryos into a 'patch' of new eye cells in the lab. Then, in a short operation, we placed the patch over the damaged area of the eye.

Today, both patients can see - a very exciting result.


Professor Pete Coffey (right) with eye surgeon Professor Lyndon de Cruz.

# Treating mental health disorders

## Psychologist Daniel Freeman

Virtual reality (VR) has enormous potential to help people with mental health conditions.

Approximately one in four people in the UK will experience a mental health problem each year. The availability of psychological therapy in the NHS has increased but there are still many people who aren't receiving the support they need.

We've trialled using VR to help patients who experience severe paranoia. By coaching patients through difficult 'virtual' situations, we found they experienced much less paranoia.

We're now testing VR with in-built psychological therapy. Patients meet a virtual coach before they enter a virtual shopping centre. The coach advises them on how to cope with progressively more challenging virtual environments.

It's still early days and more research is needed,but the technology is there to create mental health treatments of the future.

# A step closer to ending HIV

## HIV researcher Sheena McCormack

To end HIV, we must protect people from it.

Testing has increased awareness, but thousands of HIV-positive men live unaware and risk infecting sexual partners.

We did the PROUD study to see if a daily pill, called PrEP, could prevent HIV-negative men from being infected. It included two groups of people, those who received PrEP and those who didn't.

Promisingly, we saw that PrEP provided protection and it worked far better than we'd expected.

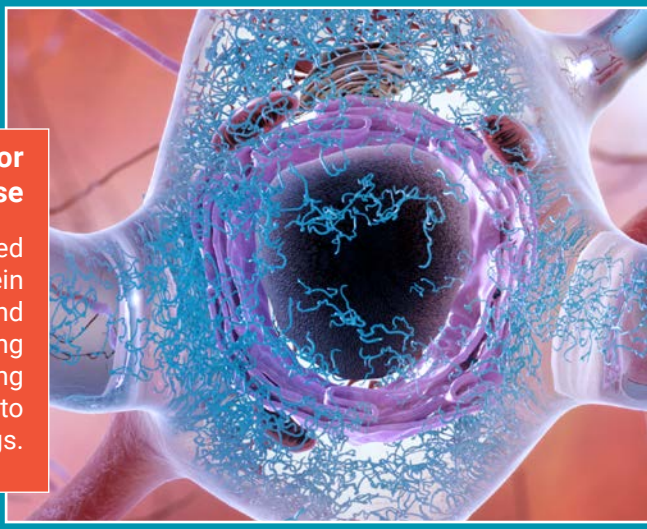
As men in the PrEP group knew they were taking the pill there was a concern they would change their behaviour, increasing their risk of getting HIV and other sexually transmitted infections.But this didn't happen.

Once we knew it worked, we offered the drug to all participants in the study.

Our findings have sparked further trials, bringing us a step closer to the ultimate goal of ending HIV.

**What is HIV?**
HIV (human immunodeficiency virus) is a virus that attacks and weakens the immune system. It can lead to severe infection and illness, called acquired immune deficiency syndrome (AIDS).

# Looking to the future

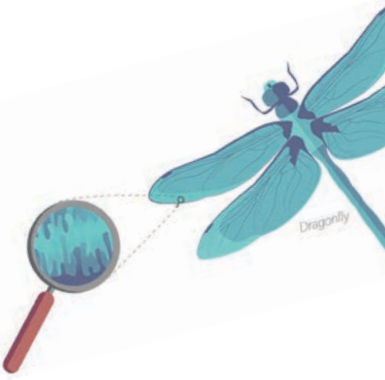


## New treatments for Alzheimer's disease

Researchers have revealed the structure of a protein called tau which builds up and damages the brain, causing Alzheimer's disease. Knowing tau's structure will be essential to developing new drugs.

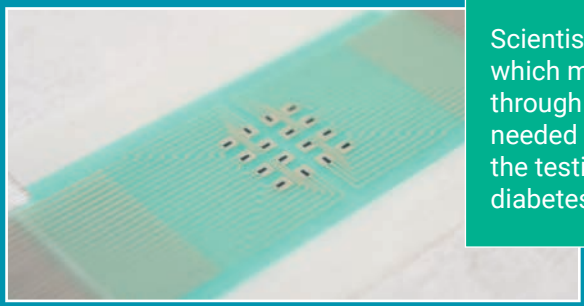
## Developing drugs to lower blood pressure

A global genetic study has identified over 500 new gene regions linked with high blood pressure. The findings help explain why some people develop high blood pressure and could lead to new treatments.



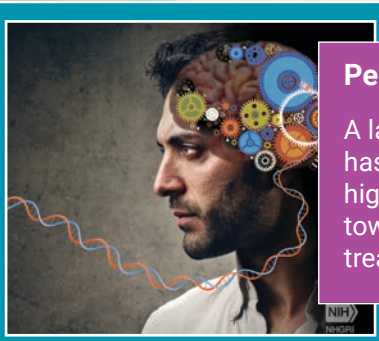

## Tackling drug-resistant bacteria

Inspired by the microscopic bacteria-killing spikes found on dragonfly wings, scientists hope to prevent infection by adding tiny spikes on to medical implants.



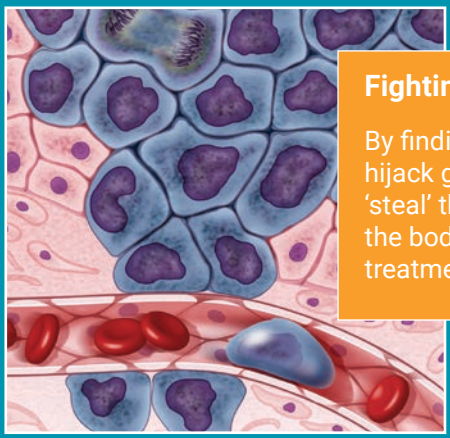
## Bloodless diabetes test

Scientists have created a patch which measures blood sugar levels through the skin. Further testing is needed but the device could improve the testing and management of diabetes.



## Personalising care for schizophrenia

A large genetic study of 100,000 people has revealed 50 gene regions linked to a higher risk of schizophrenia, a key step towards developing personalised treatments for the condition.



## Fighting kidney cancer

By finding out how kidney cancers hijack genes from other cell types and 'steal' their functions to spread around the body, scientists hope to find new treatment options.

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