2023 at LifeArc

Making life science life changing

LifeArc

Contents

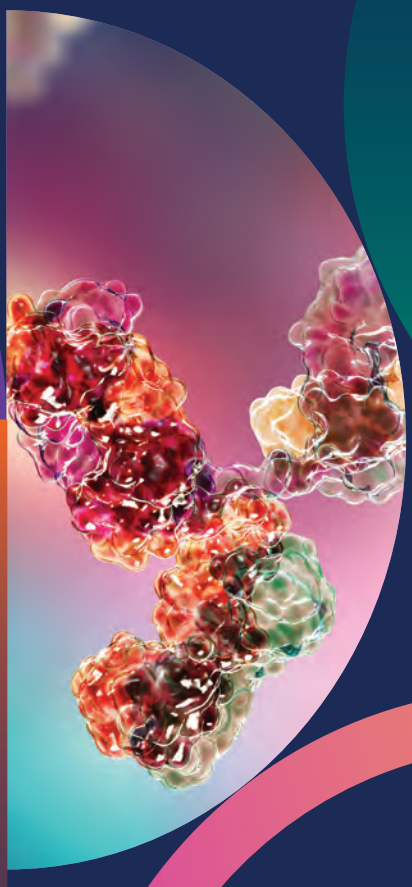

APPROXIMATE VOLUMES

About LifeArc

For over 30 years, we've provided translation advice, scientific support and funding to progress promising science that we believe could save and improve lives.

We're doing this for some of the most under-served health conditions and areas – motor neuron disease, chronic respiratory infection, global health, rare disease and childhood cancer – alongside our partners.

In this report, you can read about the progress we've made together this year.



Foreword

A note from Stéphane Maikovsky, Interim CEO of LifeArc, and Ian Gilham, Chair of the LifeArc Board of Trustees

Stéphane Maikovsky, Interim Chief Executive Officer and Chief Financial Officer

Dr Ian Gilham, Chair of LifeArc Board of Trustees

We've made great strides toward our mission to bring promising science to improve the lives of patients with unmet clinical needs. In this report, we're pleased to share a selection of highlights.

An important milestone was the completion of a refreshed strategy, providing a clear definition of our vision, mission and purpose.

This strategy refines our focus to specific health conditions with high unmet patient needs – our 'Translational Challenges' – where our translational expertise can truly make a difference. They include motor neuron disease, chronic respiratory infection, 3 global health challenges (antimicrobial resistance, neglected tropical disease, and emerging viral threats), rare disease and childhood cancer.

We also did a great deal of work to secure the long-term sustainability of our organisation through clear plans for people and governance, infrastructure and financial resources.

These resources, partially derived from Keytruda royalties (read the story of Keytruda on pg 44), enable us to make meaningful commitments and drive important collaborations with our partners. This financial stability also allows us to take calculated risks on projects in areas which have been historically overlooked due to high project risk and low patient numbers.

The LifeArc Ventures team has been instrumental in driving innovation and helping us secure long-term sustainability, making 6 new direct investments and several follow-on investments.

Our organisation has also grown significantly, welcoming over 60 talented individuals who share our passion for making a difference in patients' lives.

We'd like to express our thanks to Dr Melanie Lee – who stepped down this year after 5 years as CEO – for securing LifeArc's strong foundations and for her inspiring leadership during significant change. We wish her all the very best for the future.

Looking forward, we'll continue to make a difference for under-served patients. We remain increasingly well placed to deliver on our ambitious goals and the impact the outcomes will have on patients with unmet medical needs.

None of our achievements would be possible without the extraordinary commitment and dedication of the LifeArc team and our many partners and collaborators, for which we are very grateful.

We've certainly set the bar very high for 2024.

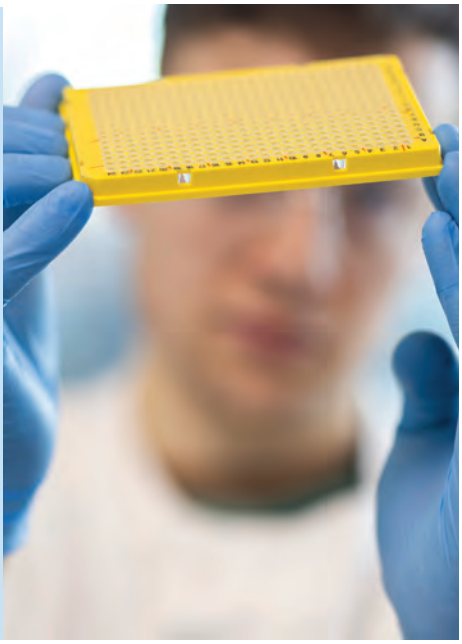
The highlights of our year

The early Alzheimer's disease drug **Leqembi**® (lecanemab) was approved by the US FDA and in Japan, and named by TIME magazine as one of 2023's top inventions. We humanised the antibody for this drug.
(see page 18)

Keytruda® (pembrolizumab) – Merck's antibody-based cancer drug, which we humanised and has treated over one million patients – became the top-selling drug in the world[1].
(see page 44)

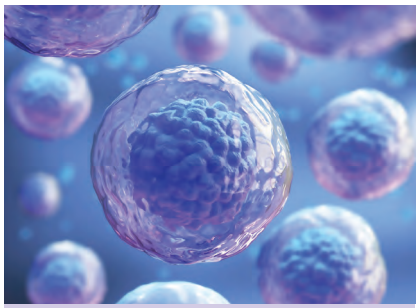
We launched our **Translational Challenge** in Rare Disease and our 3 Global Health challenges: Antimicrobial Resistance, Emerging Viral Threats and Neglected Tropical Diseases.

They join our existing Motor Neuron Disease and Chronic Respiratory Infection challenges.
(see page 15)



Over 60 new, **talented people** joined our team this year.

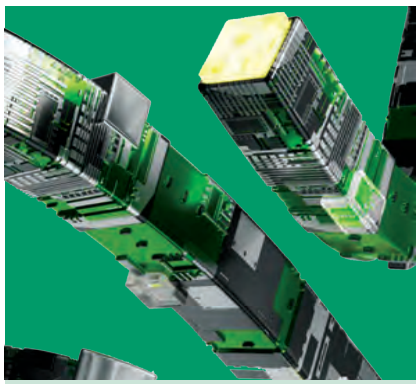
1 Merck & Co, Feb 2024



Sustainability remains a focus and our Edinburgh lab was awarded platinum 'My Green Lab' certification.
(see page 39)

We put out our single biggest grant funding call ever, dedicating £40 million to new **Translational Centres for Rare Disease**.
(see page 34)

We solidified our **new strategy** and began in-depth work to track the impact we're making.
(see page 12)



Our **leadership teams** grew this year, including 3 new trustees, 2 new executive officers and a new interim CEO.

Our **LifeArc Ventures** arm invested in 6 new early-stage science companies with promising therapeutics, technologies or medical devices.
(see page 52)

In the spotlight

New Alzheimer's disease drug, Leqembi® (lecanemab), approved for use in the USA

Every time we collaborate on promising research, we aim to give it the best chance to become a market-ready treatment or diagnostic later down the line. This year, we celebrated as one of the projects in our science portfolio did just that.

In January 2023, the incredible news broke that the therapeutic antibody for treating Alzheimer's disease, Leqembi® (lecanemab), received full market approval by the US Food and Drug Administration (FDA). We were extremely proud, due to the instrumental role we played in the drug's development through our antibody humanisation work.

To top it off, Leqembi® was also named one of TIME's 'Best Inventions of 2023' – a testament to the drug's significance as an innovative treatment for Alzheimer's disease and its potential to slow cognitive and functional decline.

Alzheimer's disease: A leading cause of death

Alzheimer's disease – the most common type of dementia – is a progressive brain disorder that slowly and irreversibly destroys memory, thinking and language skills. Until now, there were no effective treatments to prevent, slow down or reverse the disease.

Alzheimer's disease affects more than half a million people in the UK and this number is expected to increase because of the ageing population. In 2022, there were 74,261 deaths due to Alzheimer's disease and other dementias in the UK, making it a leading cause of death in the country for that year.

One of the main causes of Alzheimer's disease lies in the toxic form of a protein called amyloid beta, which builds up in the brains of people affected by the disease in deposits known as amyloid plaques. For many years, a great deal of research has focused on the amyloid hypothesis, which assumes that these plaques have a role in damaging brain cells and causing cognitive decline. But several other drug candidates that break down these toxic plaques in the brain have failed in late-stage clinical trials.

Leqembi® is the first drug to both successfully lower beta-amyloid in the brain and reduce cognitive and functional decline in people living with early Alzheimer's disease.

What is antibody humanisation

Antibody humanisation is the process of modifying non-human (typically mouse) antibodies to more closely resemble human antibodies. This alteration significantly reduces the immune response in humans when these antibodies are used as therapeutic agents, enhancing their safety and effectiveness.

Leqembi® emerges as the first drug able to slow the progression of Alzheimer's disease

2006

LifeArc scientists partnered with the biotechnology company BioArctic Neuroscience to humanise mAb158, a monoclonal antibody derived from mice which targets a specific form of the amyloid beta protein.

Through our antibody humanisation work, we helped generate a new, humanised antibody for clinical use – lecanemab (later branded as Leqembi®).

2022

Results were published from a phase III clinical trial involving around 1,800 patients with early-stage Alzheimer's disease. They revealed that cognitive capabilities of people who received treatment with Leqembi® declined by 27% less than those on the placebo after 18 months.

This was the first time that any treatment has shown a clinical benefit for people affected by this devastating condition.

2023

The success of the trial led to the US FDA granting accelerated safety and regulatory approval for the use of Leqembi® to treat Alzheimer's disease in the USA.

Continuing our quest to improve patients' lives

We put patients at the heart of all that we do. The success of Leqembi® is a clear example of how our experience and hard work can pay off in the most impactful of ways. Through our efforts, an effective treatment option can at long last be provided for people with early-stage dementia.

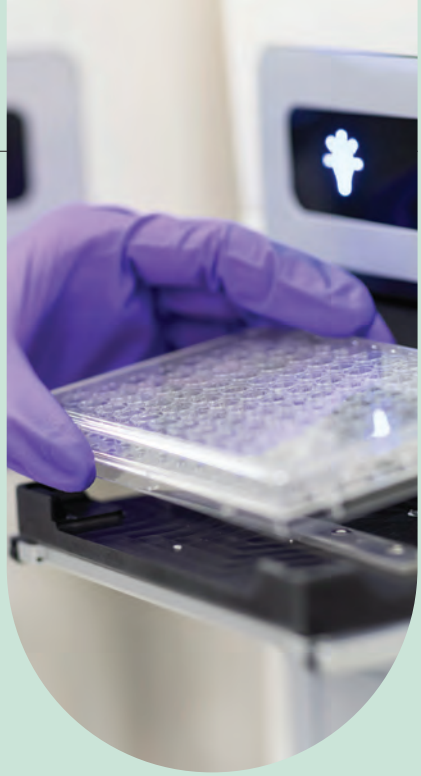
This year, we hope the UK's medicines regulator will make a quick decision on the drug, so eligible people in the UK can also benefit from this new medicine, if the benefits for people with Alzheimer's disease are clear and they are not outweighed by safety concerns.

Looking forward, we will continue our antibody humanisation work (see more about this on pg 42) and are always looking for promising new projects to collaborate on. By applying our extensive experience and collaborative approach, we ensure antibody candidates have the best chance of successfully reaching clinical trials.

What we do

We’re experts in translational science.

We remove barriers that keep promising scientific breakthroughs from reaching the next phase of development on their journey toward patients.



We're focused on delivering what patients tell us they most need, whether that's a transformative new drug, diagnostic, device or digital solution.

We partner with organisations and researchers already doing incredible work to provide:

Investment

Grant funding, partnerships and early ventures investment

Expert scientific support

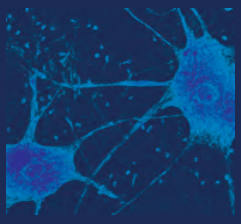
Drug discovery, diagnostic development, and antibody discovery and humanisation

Commercialisation advice

Technology transfer, intellectual property protection and research portfolio assessment

Our Translational Challenges

This year, we solidified our Translational Challenges: the specific areas of under-served healthcare needs where all of our activity – investment, science and advice – will happen.



Motor Neuron Disease

Chronic Respiratory Infection

Global Health: Antimicrobial Resistance, Neglected Tropical Disease, and Emerging Viral Threats

Rare Disease

Childhood Cancer

A strategic refresh in 2023

This year, our Executive Management team and Board of Trustees sharpened our strategy.

Everything we do revolves around **patient impact** – getting life-changing discoveries to patients faster.

The work within our **Translational Challenges** supports that mission.

Long-term, we want to continue creating this change for patients and building partnerships. Plans for our **financial sustainability** are in place, and we're now looking ahead to how we track **our impact as an organisation** and build our reputation as a leader in translational science.

How we do this?

We bridge the gap between academic research and clinical development, by translating early scientific discoveries into the next generation of diagnostics, devices, treatments and cures. We are led by patient need and committed to transparency, excellence and integrity.

Our vision

To enhance human health and wellbeing across the globe, by identifying innovative discoveries and driving delivery of new therapies to patients.

Our mission

To improve the lives of patients with unmet medical need.

Our purpose

To bridge the gap between academic research and unmet patient need.

Measuring our impact

Measuring how we create impact is multi-layered and complex. Our contributions are often focused on early-stage research – these discoveries can take a decade or more to reach patients; some of them don't make it past later phases of development at all.

We're trying to understand how we contribute to change. In turn, we hope this will allow us to better track, evaluate and maximise our future impact. You can read more on our website.

Discovery

Early research

- Strong scientific rationale
- Novel target, mechanism
- Biomarkers

Translation

- Designing molecules/assays
- Navigating development
- Protecting innovation

Development

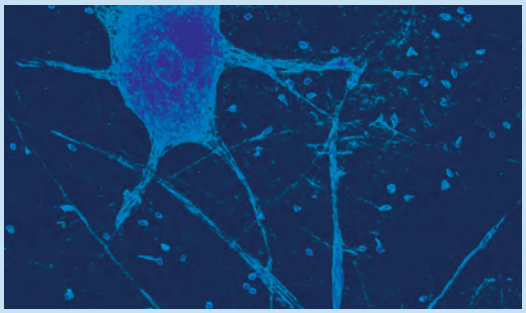
- Therapeutics suitable for further development
- Diagnostics ready for clinical trials

Market approval

Our Translational Challenges

We're taking on some of the most under-served health conditions to accelerate preventions, diagnostics and treatments using our expertise in early-stage science.

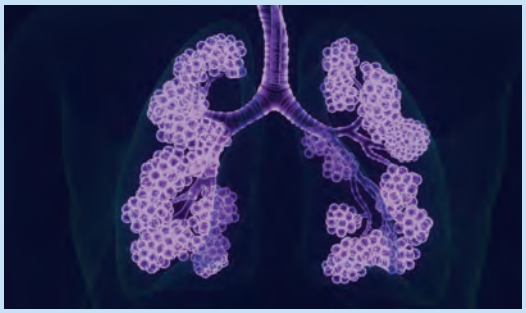
Much of this work is already underway. We simply seek to unlock the potential of promising science by funding it, forming partnerships and providing scientific expertise.



Motor Neuron Disease

A world where motor neuron disease (MND) is preventable and treatable.

We also do work in neurodegeneration beyond MND. Read more about this on pg 19.



Chronic Respiratory Infection

Earlier intervention and improved quality of life for those living with cystic fibrosis and bronchiectasis.

Global Health

(3 Translational Challenges)

Within the umbrella of global health, we seek affordable and accessible treatments and preventions through our:

- Antimicrobial Resistance Translational Challenge
- Emerging Viral Threats Translational Challenge
- Neglected Tropical Diseases Translational Challenge

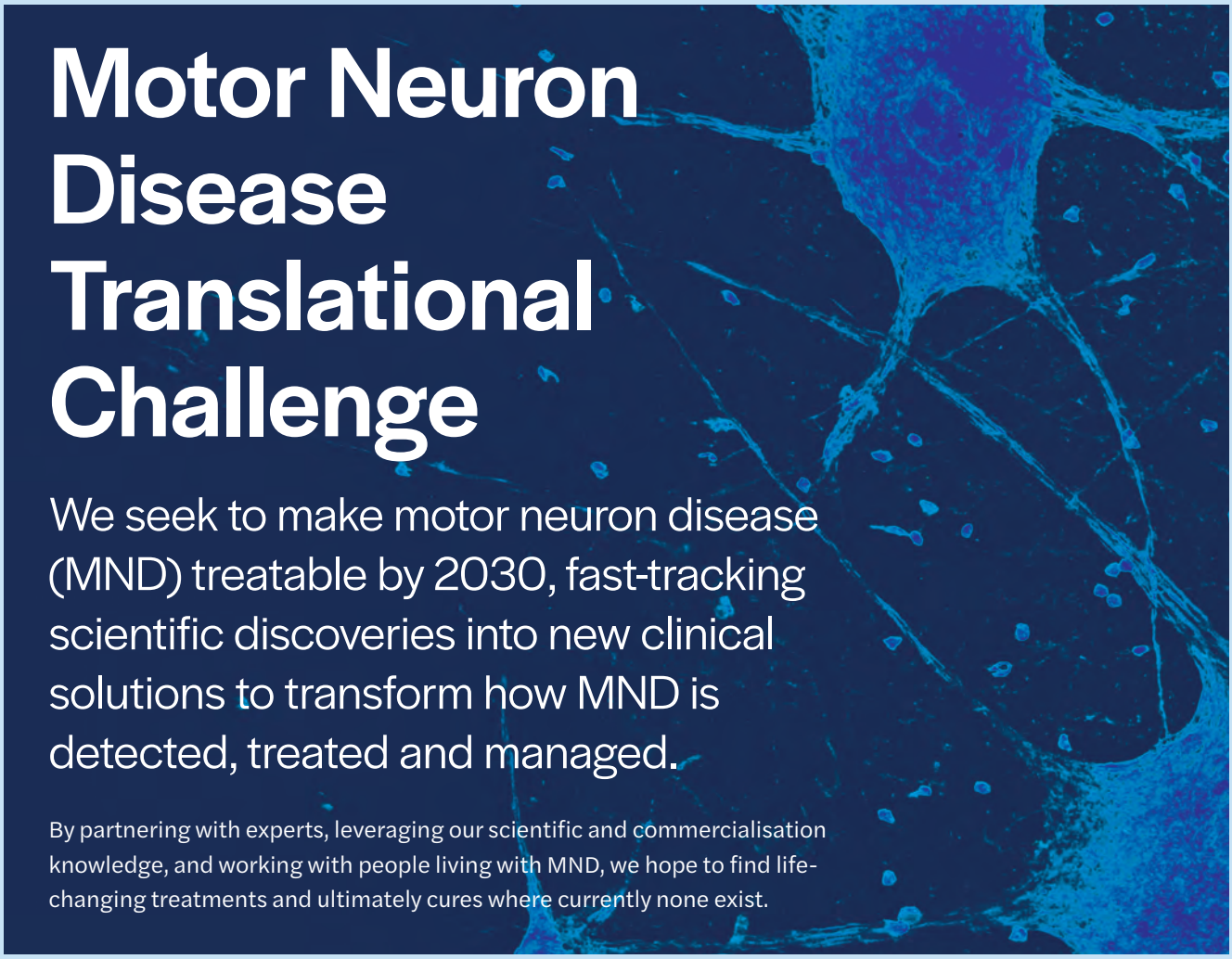
Rare Disease

Filling gaps to help get discoveries and treatments to rare disease patients faster.

Childhood Cancer

Driving life-changing innovations for children with cancer.

Motor Neuron Disease Translational Challenge



We seek to make motor neuron disease (MND) treatable by 2030, fast-tracking scientific discoveries into new clinical solutions to transform how MND is detected, treated and managed.

By partnering with experts, leveraging our scientific and commercialisation knowledge, and working with people living with MND, we hope to find life-changing treatments and ultimately cures where currently none exist.

What do we want to achieve?

Listening to those with lived experiences of MND, we seek to:

- improve patient quality of life
- improve prediction and diagnosis of MND
- connect experts across neurodegeneration research
- contribute to making medicines and diagnostics
- unblock barriers that keep scientific discoveries from reaching patients

1/3

of people in the UK with MND die within a year of being diagnosed and there is no cure[1]

6

people are diagnosed with MND everyday in the UK[2]

1 Motor Neurone Disease Association, **2** Brain Research UK

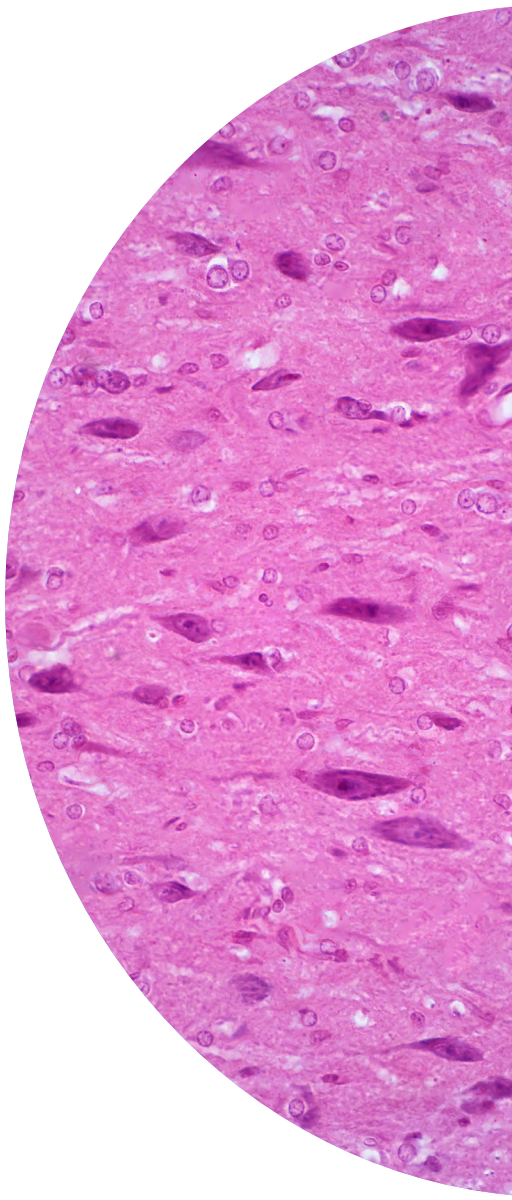
Paul Wright,
Head of Motor Neuron Disease

Listening to those living with MND

In 2024, we will create an MND Insights Group made up of people with lived experience of MND, to help us understand their most pressing needs. Through collaboration, we aim to identify key questions and prioritise research that can make a significant impact on the lives of people living with MND.

"In the field of motor neuron disease, we aspire to be catalysts for change. By creating strategic partnerships with research institutions, we are uncovering and funding promising research and helping bridge the gap between the lab and the clinic.

Our commitment to finding new treatments, diagnostics and other technologies for people living with MND involves more than simply providing funding. It's about ensuring we're immersed in the community, harnessing our scientific expertise and resources to encourage and support early career researchers in their pursuit of new treatments."



Our progress in motor neuron disease

Funded a partnership to bring together experts to speed up drug discovery and development

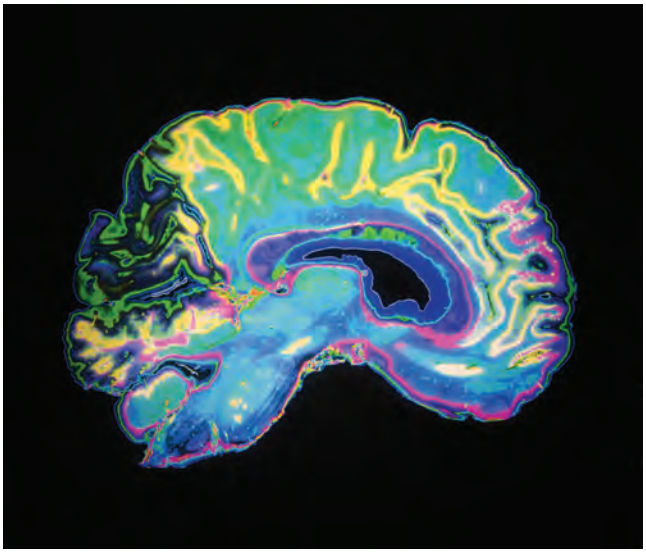
Doctors, clinicians, scientists and people with MND, together with charities and other funders will work together to speed up drug discovery and development for MND as part of the new UK Motor Neuron Disease Research Institute. We helped to fund the MND Collaborative Partnership behind the institute.

Launched an international MND drug repurposing call

Our £5 million MND drug repurposing call seeks to help advance and validate promising research which we hope will lead to the discovery of a new treatment for MND.

Invested in the development of new cell and gene therapies for MND

Together with MNDA and My Name'5 Doddie Foundation, we jointly awarded £1 million to progress development of 2 pioneering new gene and cell therapy projects that could transform the lives of those living with MND.



Launched a fund to develop solutions for faster MND diagnosis

Our £1 million primer fund will support projects seeking to develop MND solutions that enable earlier diagnosis for people with MND, allowing more timely treatment and potentially saving lives. Funding for the first projects has been agreed and will be announced in 2024.

Joined forces with PrecisionLife to progress MND research

PrecisionLife, a tech-bio company, specialises in identifying new drug targets through data analysis. Our partnership aims to develop and commercialise a portfolio of precision MND therapeutics for patients most likely to respond to improve outcomes and potentially save lives.

Used our in-house laboratories to find new treatments for MND

Our drug discovery laboratories are building a portfolio of novel MND projects, using our in-house expertise and building new capabilities including using human stem cells to create motor neurons.

Neurodegeneration

Beyond our focused work around MND, we also work to tackle neurodegeneration more broadly.

A prime example is our 5-year, £30 million partnership with the UK Dementia Research Institute, which will fund research into new diagnostic tests, treatments and devices for people with dementia.

This year, the partnership awarded £14.5 million to support the first 7 projects – all exciting innovations with the potential to become medical breakthroughs.

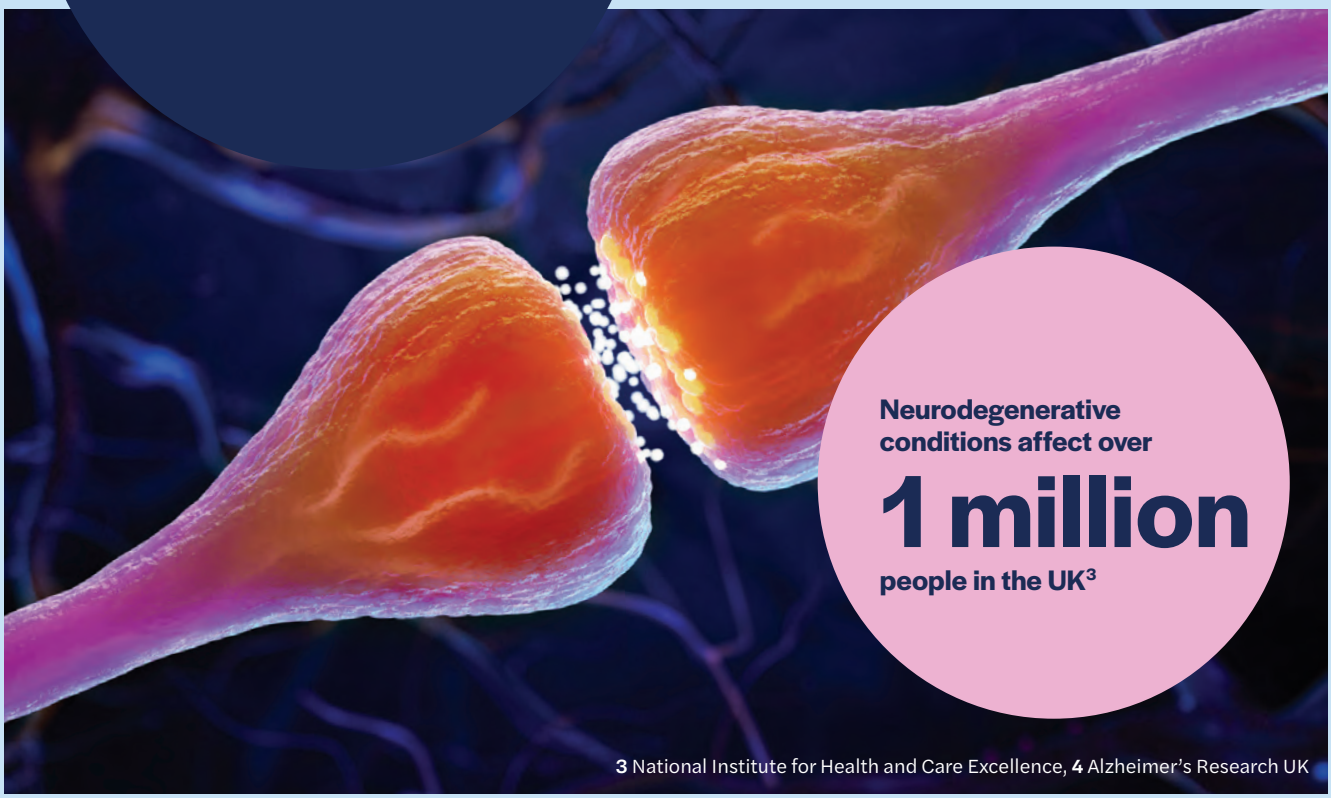
Read about another of our neurodegeneration initiatives – NEURii – in the spotlight on the next page.

This year, Professor Roger Barker joined us as chair of our neurodegeneration efforts.

Global dementia cases are expected to triple to

153 million

by 2050[4]



Neurodegenerative conditions affect over

1 million

people in the UK[3]

3 National Institute for Health and Care Excellence, **4** Alzheimer's Research UK

In the spotlight

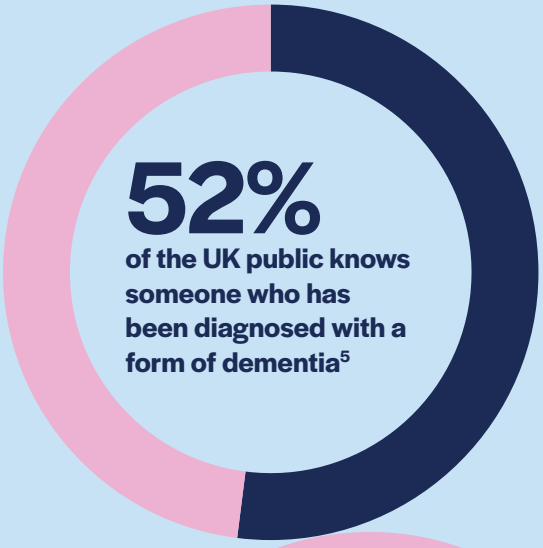
The NEURii research collaboration: transforming dementia care with digital innovations

Despite dementia cases predicted to rise dramatically in the coming decades, there are still a very limited number of approved treatments to slow or cure the disease.

We've launched a new 2-year collaborative research agreement, NEURii, to fast-track the development of scalable digital solutions into prototypes that can transform care for people living with dementia.

In partnership with:

Gates Ventures · The University of Edinburgh · HDRUK Health Data Research UK · Eisai



More than
55 million
people are currently living with dementia around the world[6]

The landscape of healthcare is evolving, increasingly focusing on monitoring, lifestyle influence and early intervention before resorting to medication. Digital innovation plays a critical role in enabling this proactive approach, which can improve health outcomes and enhance quality of life.

NEURii will explore the use of data and digital solutions to complement approved treatment options for dementia and improve:

Earlier detection and diagnosis

Evidence-based treatment decision-making

Monitoring of disease progression

Dementia encompasses a range of medical conditions and diseases such as Alzheimer's disease, Parkinson's disease, vascular dementia and lewy body dementia.

As well as having a significant impact on the lives of patients and those who care for them, these conditions place significant pressure on health and social care systems.

5 UCL, **6** World Health Organisation

> “Currently, expertise in this area is scarce and the path forward is largely uncharted. NEURii presents an opportunity for us and our partners to develop experience in this field while investing in worthwhile translational science. The initiative will act as a pilot to assess how using patient data and digital apps can be beneficial, and what the route to commercialisation might look like for new products.”

Derek Sheader, Senior Business Development Manager at LifeArc

NEURii will test the waters with 3 projects – all utilising pre-existing population level data unique to NHS Scotland – during an initial 2-year pilot phase.

These projects will explore innovative digital tools that integrate a range of digital biomarkers – gathered non-invasively from both clinical and everyday environments – with existing health data, which is then processed through specially designed AI algorithms.

New projects include:

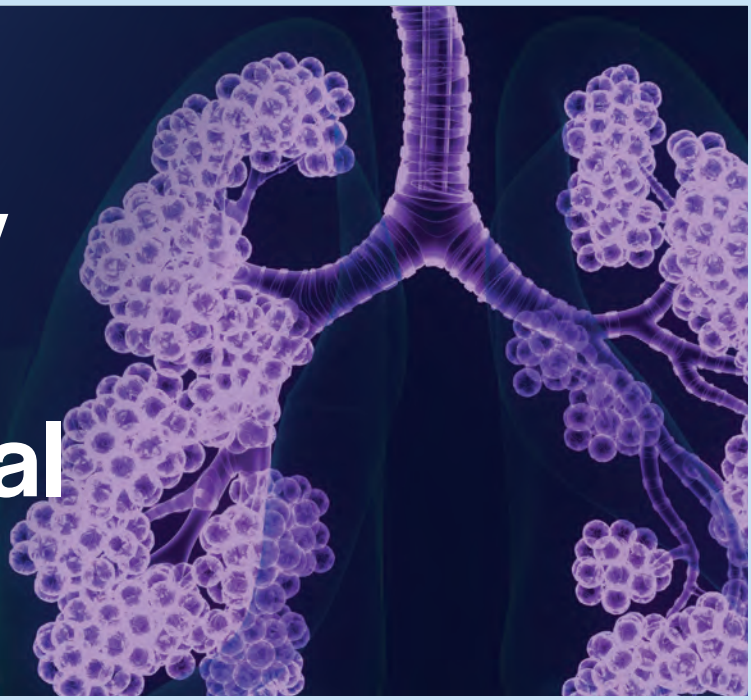
- a digital speech bank and speech-based real-time digital assessment tool to detect neurodegeneration
- development of a diagnostic tool for predicting future risk of and diagnosing neurodegenerative diseases using hospital and community eye scan data
- development of digital biomarkers of healthy ageing and neurodegenerative disease using nationally collected MRI scan image data

We are committing **up to £1.5 million** to support the initial pilot phase, with matched funding from NEURii partners to **a total of £4.8 million**. Alongside funding, we will be closely involved in both the operations and active management of the projects. Using real-world data, we will measure the impact of potential new solutions and evaluate their effectiveness.

Looking ahead, the vision is for NEURii to expand into a larger follow-on phase that aims to discover over 50 new translational projects, aiming to commercialise 10 projects and potentially launch new companies.

By leading the way in digital therapeutics, we hope to inspire a broader industry-wide shift and scale up digital health efforts across the UK and beyond.

Chronic Respiratory Infection Translational Challenge



We aim to progress discoveries that can intervene early and improve the quality of life for those living with cystic fibrosis and bronchiectasis.

We are investing in projects that lead toward early detection, right diagnosis and better treatments by establishing partnerships with patients, researchers, clinicians, charities and industry.

Crucially, our work is shaped by patients. People living with cystic fibrosis and bronchiectasis have shared their experiences to influence our activities via workshops, project plan reviews and roundtable discussions.

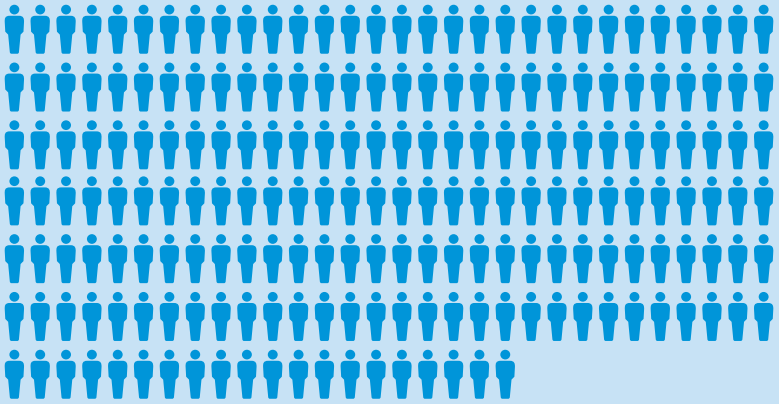
Shaped by patients

With Asthma + Lung UK, we've brought together people living with bronchiectasis, who provide insights into their condition and its needs.

We also continue to consult people living with cystic fibrosis through our charity partner, Cystic Fibrosis Trust. Guidance from people who will ultimately use the solutions is powerful, and these groups have already had an impact on our and others' work.

Over

300,000 people in the UK are living with bronchiectasis



Over

11,000 people in the UK are living with cystic fibrosis[1]

1,500 deaths are estimated to be caused by bronchiectasis in the UK each year[2]

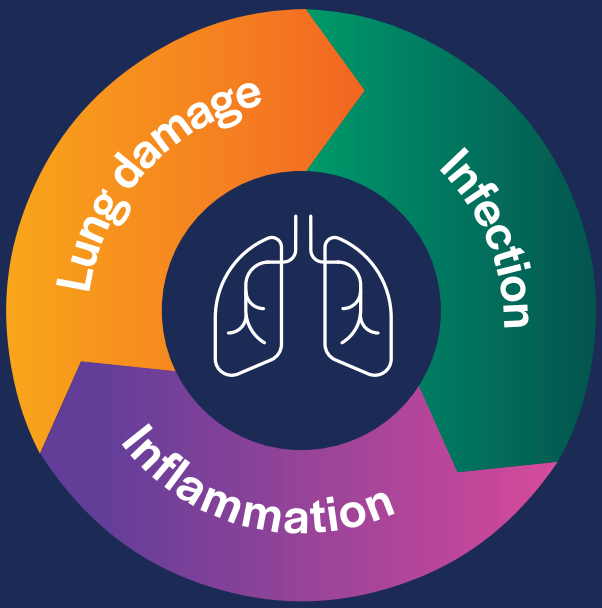
1 Cystic Fibrosis Trust, **2** NHS England

What do we want to achieve?

We're focused on early detection, right diagnosis and better treatments to break the vicious cycle of infection, inflammation and lung damage associated with these conditions.

Ultimately, we want people with cystic fibrosis and bronchiectasis to:

- live longer with improved quality of life
- have the tools to understand their condition and more easily manage their health
- have a wider range of treatment options and reduced side effects
- receive the right treatment sooner and stay out of hospital

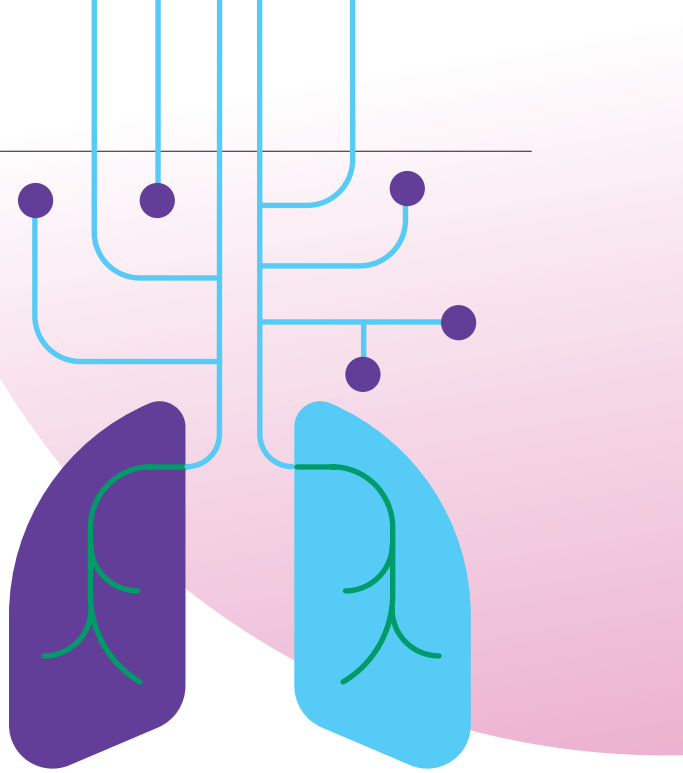


"Collaboration and partnership are critical for us to succeed.

Collaborating with those who live with bronchiectasis and cystic fibrosis and the challenge of a chronic infection. Partnering with organisations who have deep knowledge of these conditions and the underpinning biology.

Together we can drive towards finding new interventions so that people living with these conditions live longer, with improved quality and more certainty."

Katy Kettleborough,
Head of Chronic Respiratory Infection



Our progress in chronic respiratory infection

£3.4 million jointly invested in trial testing home monitoring app for cystic fibrosis and bronchiectasis patients

Alongside £1.5 million from the National Institute for Health and Care Research (NIHR), we are committing £1.9 million to the NHS ACE-CF trial. Read more about this trial and how an AI-powered app could help empower people living with chronic lung conditions like cystic fibrosis and bronchiectasis to manage their condition at home – and potentially receive the right treatment sooner – on page 25.

Defined the diagnostics that are most needed for cystic fibrosis lung infections

As treatment evolves for people living with cystic fibrosis, new diagnostics are needed. We've worked with people living with cystic fibrosis and the wider community to understand the gaps in current diagnostics for cystic fibrosis lung infections and develop a suite of target product profiles (TPPs) that could address them. We did this as part of the CF AMR Syndicate – our partnership with Cystic Fibrosis Trust and Medicines Discovery Catapult – and in partnership with the NIHR Newcastle In Vitro Diagnostics Co-operative.

Hosted a joint workshop with Asthma + Lung UK on transforming diagnostics

People living with lung conditions came together with clinicians, researchers, SMEs, industry and diagnostic providers. Over 100 people spent the day exploring the challenges to develop much needed new and better diagnostic tests for respiratory diseases. We will use these insights to shape our strategy moving forward.

Closed our drug repurposing call for treatments for chronic respiratory infections

Repurposing existing drugs can potentially speed up development of new treatments by reducing the time and costs associated with bringing new drugs to market – and to patients. We closed our £10 million drug repurposing call and decided on which programs to fund – the first of which will start spring 2024. It will test 3 widely available generic drugs as potential treatment for bronchiectasis.

Provided £3 million in collaborative funding to accelerate the development of new antimicrobials for treating infections in people living with cystic fibrosis

While CFTR modulators have transformed the lives of many people living with cystic fibrosis, infections still occur, and for some, modulator therapy is not an option. Antimicrobial resistance (AMR) is frequently seen and there is an urgent need for new antimicrobials. As part of the CF AMR Syndicate, we will fund and support a portfolio of 6 projects at different stages of development to help nurture the early drug discovery pipeline.

Co-funded £15 million to establish Translational Innovation Hubs to address lung health and infection in cystic fibrosis

Collaboration is critical to finding and developing new diagnostic tests, drug treatments, medical devices and other digital solutions for people living with cystic fibrosis. This network of hubs – co-funded with the Cystic Fibrosis Trust – will work together to speed up the process, with the first hub set to open in late 2024.

In the spotlight

ACE-CF clinical trial

AI-driven home monitoring to help people living with cystic fibrosis predict the onset of symptoms and reduce hospital stays

For many people, an infection usually means a trip to the GP and a course of antibiotics. For someone living with cystic fibrosis, it can mean more than 10 days in hospital, potentially serious lung damage and severe side effects from the potent antibiotics used to fight infections.

If cystic fibrosis patients could predict early signs of an infection, they could begin treatment sooner and potentially reduce hospital admissions, significant lung damage and side effects that can come with treating an established infection.

Can this early prediction be achieved? The Royal Papworth NHS Foundation Trust believes so – with the right data and technology. And we have joined forces with them and the National Institute for Health and Care Research (NIHR) in the latest iteration of their project to make this happen.

About cystic fibrosis

Cystic fibrosis is a chronic condition caused by genetic mutations in the CFTR gene. This results in a build-up of thick mucus in the lungs and digestive system, among other effects.

People with cystic fibrosis often experience exacerbations – a worsening of symptoms – that can result in chest infections and further complications. Despite new drugs slowing the decline of lung function and improving wellbeing, exacerbations remain a serious issue, often requiring lengthy hospital stays and causing significant lung damage.

Clinical care for cystic fibrosis patients is almost exclusively managed by specialised cystic fibrosis centres.

3 Cystic Fibrosis Trust

Royal Papworth Hospital has been looking at how home monitoring and AI can help detect exacerbations earlier since 2011.

In partnership with many organisations, they've conducted a pilot study, a national feasibility study, the training of machine learning algorithms, the development of home monitoring software, and a clinical implementation trial. Partners along the way included the Cystic Fibrosis Trust, Cystic Fibrosis Foundation and Innovate UK.

Now, we have joined forces with Royal Papworth Hospital as the project enters its next phase: ACE-CF, a clinical trial which seeks to get the software platform and algorithm registered as class II medical devices.

During the ACE-CF trial, participants will use special equipment to measure key indicators such as blood oxygen levels, lung function, weight and heart rate every day. Results are then uploaded via the software platform, Breathe RM, and specially-trained AI algorithms use this data to identify early signs of infection.

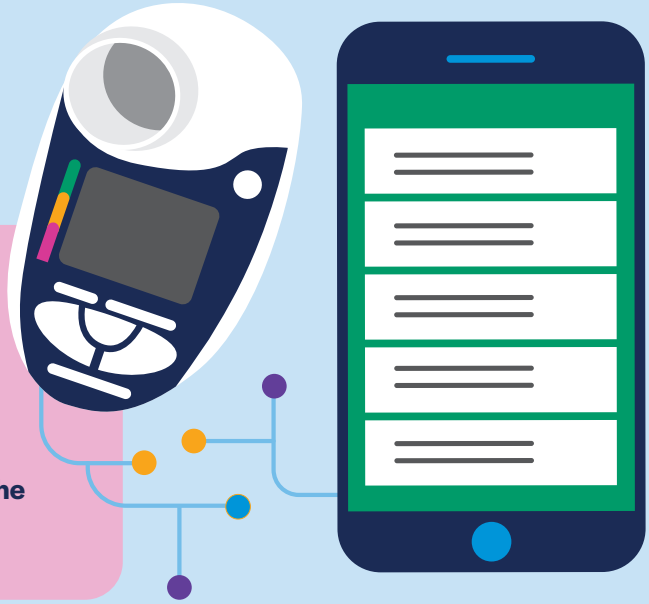
Alongside our funding commitment of £1.9 million and the £1.5 million from NIHR, we will provide advice and support to commercialise the technology. This includes looking at the technology that's currently available and helping the team identify gaps, as well as sharing our expertise around the complex regulatory processes involved in running a trial of this scale.

Timeline

- **2011** – Pilot launched
- **2015** – Feasibility study, SmartCareCF
- **2016** – Algorithm based on study is built
- **2017** – Worked with Microsoft Research to develop an app
- **2019** – Project Breathe started
- **2021** – NIHR committed £1.5m to ACE-CF trial, and study begins
- **2022** – LifeArc committed £1.9m to ACE-CF trial
- **2023** – ACE-CF trial began recruiting patients

10 days earlier

Algorithms (trained in an earlier phase of the project) can predict deterioration up to 10 days earlier than previously possible.



What's next?

In the short term, the ACE-CF trial hopes to prove that the software and algorithm are effective at detecting deterioration early.

If it is, the technology could become more widely available to people with cystic fibrosis. Not only could it improve their quality of life, it could also save time and money for the NHS.

We are also helping to expand use of the technology to other respiratory conditions, starting with bronchiectasis.

In the medium term, the team hopes to make inputting data into the software a seamless part of people's daily lives.

While it currently requires special equipment and extra time spent by participants to log measurements for the app, the team is scoping how to make gathering the data as easy as possible.

We are helping to scope what's out there already, so the team can make informed decisions about new devices or technologies to try. Some of these could include passive breath measurements using a bedside radar tool, analysis of a person's voice or new ways to measure how well the lungs are working.

If successful, this software could change many lives, including those of the...

Estimated

1 in 200

people affected by bronchiectasis in the UK[4]

More than

1.3 million

people living with diagnosed COPD in the UK[4]

Approximately

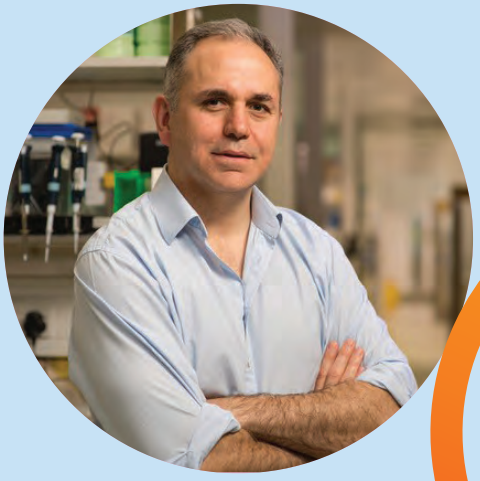
5.4 million

people living with asthma in the UK[4]

And finally, in the long term the software and algorithms could benefit others alongside cystic fibrosis patients.

We're proud to be part of this work and to partner with Royal Papworth Hospital on such an important project that could lead to big changes for respiratory health conditions.

"With LifeArc, we worked together to better understand the landscape of sensors. They also provided enormous expertise on how to navigate the regulatory landscape, alongside supporting us in running this project. Eventually, we hope to also have their invaluable input in commercialising this work and bringing this new technology to as many patients with chronic respiratory conditions as we possibly can."



Andres Floto, Professor of Respiratory Biology at the University of Cambridge and Research Director of the Cambridge Centre for Lung Infection at Royal Papworth Hospital

4 Asthma + Lung UK

Global Health Translational Challenges

We officially launched our 3 Global Health Translational Challenges in 2023. Our aim is to help progress the development of treatments and diagnostics to tackle infectious diseases around the world.

To support our mission, we are collaborating with academic institutions, charities and industry partners. Together, we hope to accelerate the development of affordable and accessible solutions and increase the likelihood of them reaching patients.

Our Translational Challenges in global health:

Antimicrobial Resistance Translational Challenge
Reduce the number of deaths and health problems from drug-resistant infections.

Neglected Tropical Diseases Translational Challenge
Support the control and elimination of tropical diseases and help reduce their impact on people's health.

Emerging Viral Threats Translational Challenge
Improve lives by collaborating to address the threat from emerging and re-emerging viruses with outbreak or epidemic potential.

By 2050, it is predicted that more than

10 million

people per year could lose their lives to antimicrobial resistance[1]

An estimated

1 billion+

are impacted by neglected tropical diseases[2]

1 AMR Review. (2016). Tackling drug-resistant infections globally: Final report and recommendations, **2** World Health Organization

What do we want to achieve?

Focusing our efforts where patient need is greatest and listening to those with lived experiences of these diseases, we seek to:

- improve understanding of infectious diseases
- connect experts across global health research
- share expertise and plug gaps in translational research
- support sustainable growth and share expertise to enhance the research ecosystem in sub-Saharan Africa
- contribute to making medicines and diagnostics affordable and accessible
- unblock barriers that keep solutions from reaching patients

With our partners and our combination of scientific services, funding and strategic translational expertise, we are already making steps that could help reduce the global impact of infectious diseases.

"LifeArc is new to the global health field and over the past year we've been dedicated to forging partnerships and understanding how our expertise and investment can make the biggest difference.

We've made a great start with partnerships with globally recognised experts and we are making even more ambitious plans for the future. I can't wait to share more of our impact as our work continues to grow and evolve."

Mike Strange,
Head of Global Health

Our progress in global health

Launched a £2.7 million research fund to advance innovations for emerging viral threats and neglected tropical diseases

We established this fund with the Liverpool School of Tropical Medicine (LSTM) to help address the urgent need for new approaches to infectious diseases by supporting the progression of new technologies and treatments. We also joined the LSTM's Infection Innovation Consortium (iiCON) to make our antibody humanisation platform available to the iiCON community and its collaborators to get new treatments to patients faster.

Invested £7.5 million to help African scientists tackle infectious diseases

We partnered with the Francis Crick Institute and 5 institutions across Africa to support African scientists in their research careers and establish themselves as science leaders. This funding will also help grow scientific and training capacity in Africa while contributing to global biomedical research that addresses unmet medical needs.

Started a £30 million initiative to support research in antimicrobial resistance (AMR)

It's estimated that AMR could kill more than 10 million people a year by 2050, and only 2 new classes of antibiotics have been discovered since the 1980s. We joined forces with Innovate UK and Medicines Discovery Catapult to create PACE, a £30 million initiative supporting early-stage innovation against AMR.
Read more about this initiative in the spotlight on pg 31.

Invested £300,000 in the DOSA Project to tackle antimicrobial resistance

This project will field test the DOSA Urinary Tract Infection (UTI) Strip, an affordable (10p) paper strip can determine in minutes if an infection is present, and if further action is required. This research is part of a broader effort to tackle drug resistant infections, as UTIs are the second leading cause of antibiotic consumption worldwide. The project also aims to overcome the stigma of UTIs in rural communities in India, which can prevent people from seeking necessary medical treatment.

In the spotlight

PACE: a £30 million initiative to combat drug-resistant infections

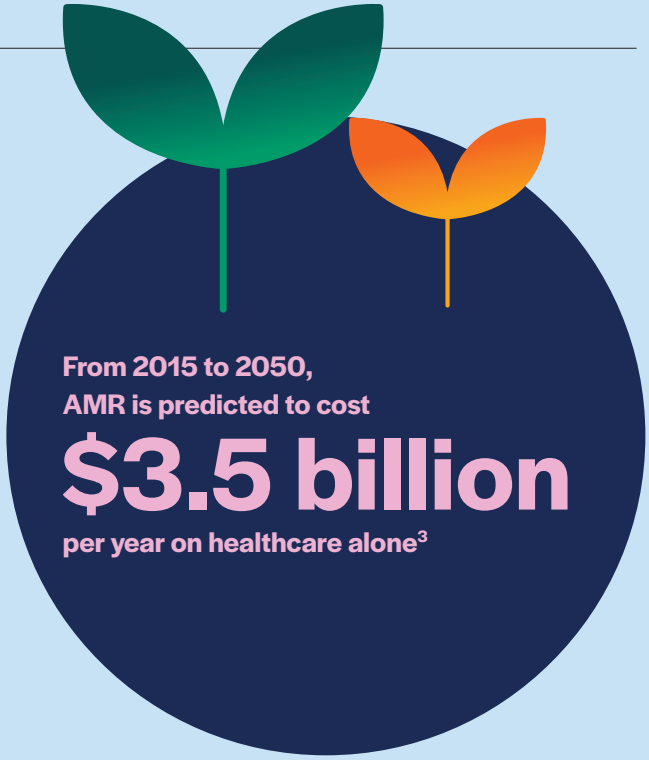
Antimicrobial resistance (AMR) is a serious global health threat estimated to kill more than 10 million people each year by 2050. In partnership with Innovate UK and Medicines Discovery Catapult, we have launched a £30 million initiative to drive development of new tests and treatments to tackle drug-resistant infections.

AMR arises when bacteria and other microbes evolve to become resistant to treatments – largely driven by our overuse and misuse of antibiotics.

According to the World Health Organization, AMR is one of the top 10 global health threats. The economic impact could also be significant – the World Bank predicts that from 2015 to 2050, the cost of AMR will be $3.5 billion USD per year on healthcare alone.

Dr Clive Mason, AMR Programme Director at LifeArc says, "currently, there are not enough drugs in development to stay ahead of resistant infections. Half of the antibiotics prescribed today were discovered in the 1950s. This means there is an urgent need to do everything we can to grow the number of high-quality antimicrobial drugs in development."

As part of our global health strategy, we're committed to reducing the number of lives lost to treatment-resistant infections across the world and have joined forces with Innovate UK and Medicines Discovery Catapult to create PACE – the UK's largest AMR initiative of this kind. We and Innovate UK have each invested £15 million into PACE, with Medicines Discovery Catapult helping to deliver the initiative.



PACE isn't just about money. An important part of the programme is wrap-around support to remove the barriers impacting the speed and success of new treatments, including financial, regulatory and technical challenges. The advice, funding and expertise delivered through PACE will help innovators move their projects forward with greater speed and confidence, giving the very best AMR innovations the greatest chance of succeeding.

A new £10 million funding call

PACE announced its first global funding call in October 2023, with up to £10 million available to support projects focused on early-stage treatments for bacterial infections with a high unmet need.

Dr Mike Strange, LifeArc's Head of Global Health says, "We really seemed to strike a chord with the community when it came to PACE. Our work to identify the urgent needs in early translational research in AMR and our desire to offer the right combination of financial support, expertise and advice has really paid off. We received the most applications LifeArc has ever received for a call we've been involved with. It shows that if you get it right you can have a real impact on the research community. I can't wait to see what the funded projects can achieve."

The PACE team is currently reviewing applications and we expect to have selected the first projects to be funded by June 2024. A second call should be announced by autumn 2024.

3 The World Bank

Rare Disease Translational Challenge

We want to accelerate research and remove barriers, helping get treatments to people with rare diseases more quickly.

We've been funding rare disease research for more than 5 years, committing more than £30 million in that time. Now, our commitment is not only continuing, but growing.

What do we want to achieve?

We want to maximise how we help bridge the gap between scientific discoveries and benefits for people living with rare diseases through investment and expertise.

We seek to:

- support promising initiatives that will benefit from our skills in translation and investment
- foster interdisciplinary collaboration, knowledge sharing and community building in rare disease research
- explore the best ways to ensure innovations get to market and stay there, including novel business models
- listen to the needs of patients and families and understand the challenges they face to ensure our work helps meet their needs

“Since LifeArc began funding rare disease research, our work with the community and our investment have continued to grow. We're now beginning to see the difference we can make when we apply our skills, expertise and investment in the right way. We'll continue to listen to the community and explore the ways we can help continue to bring changes to the research ecosystem and therefore to people living with rare diseases.”

Catriona Crombie, Head of Rare Disease

Our progress in rare disease

Launched a £40 million Translational Centres for Rare Disease call

This funding call was launched to establish 4 new centres of excellence to bridge the gap between lab-based ideas and the development of diagnostics and therapeutics for people living with rare diseases.
Read more about them in the spotlight on pg 34.

Launched a £2.5 million funding call for epidermolysis bullosa with DEBRA Austria

In collaboration with DEBRA Austria, we are providing funds to explore the repurposing of treatments for epidermolysis bullosa, an incurable rare skin disease. This funding aims to help accelerate the creation and distribution of treatments targeting the most challenging aspects of the disease, ensuring patients receive these critical treatments more rapidly.

Invested £3 million to advance promising early rare disease research from the lab to the patient

Through the LifeArc Pathfinder Award, we funded around 30 innovative early research projects at 6 UK universities to investigate the diagnosis and treatment of a wide range of rare diseases. This enables researchers to obtain the data and evidence to get future funding and helps progress research from the lab to the patient.

Funded a clinical trial to treat an ultra-rare genetic disease

We’ve invested £750,000 in a trial to look at repurposing the UK-licensed medicine deferiprone for treating neuroferritinopathy, an incurable disorder characterised by iron accumulation in the brain. Deferiprone, an affordable oral medication already used to lower blood iron levels, shows promise in halting the progression of this condition. Success in this trial could lead to deferiprone being considered for other neurodegenerative diseases.

Funded trial for new aplastic anaemia treatment

New treatments for aplastic anaemia – a rare and severe blood disorder – are urgently needed as current treatments aren’t safe or are ineffective for most people. In collaboration with The Aplastic Anaemia Trust, we’re funding the TIARA trial to investigate the safety and efficacy of using expanded autologous regulatory T cells to treat aplastic anaemia.

In the spotlight

£40 million to create new collaborative Translational Centres for Rare Disease

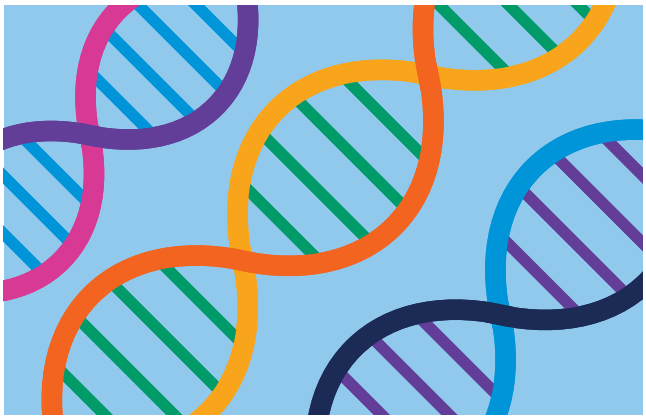
To address the challenges in translating rare disease research and get more tests and treatments to patients, in 2023, we launched a £40 million funding call to create 4 translational rare disease centres in the UK.

Globally, more than 300 million people are living with rare diseases and there are no approved therapies for over 90% of these conditions. There is a need for better diagnostic tests and new treatments to improve the lives of patients living with these conditions.

However, several challenges can prevent promising innovations progressing to them.

Limited access to funding and challenges in securing downstream investment are common hurdles in rare disease research because the prevalence of these conditions is low and investing in early-stage research is risky.

Plus, without the right support, navigating the complexity of processes such as intellectual property, regulation, manufacturing and commercialisation can prove difficult, particularly for academics who may lack prior experience in these areas.



By combining resources, the rare disease community can progress research and overcome challenges more effectively than as individuals. We hope to help tackle some of these challenges through our work in the area, including through our Translational Centres for Rare Disease.

Our biggest funding call to date

In April 2023, we launched a £40 million funding call (our largest call to date) to create several virtual centres to further enhance collaboration in the rare disease community. The aim is to pool knowledge and resources between experts located in different geographical sites to accelerate the progression of lab-based ideas into new solutions for patients with rare diseases. The centres will be focused on specific disease themes or on areas of research that cut across all rare diseases.

By moving existing research further down the pipeline through translation, we can build a stronger research

base. We hope these centres will bring new groups together and increase the volume and depth of research. We believe they will help foster new collaborative approaches and provide an ideal setting to engage with the patient community to understand their needs better.

By strengthening this kind of rare disease infrastructure, we hope we are underpinning a future with great expertise, skills and resources to carry out more advanced and effective rare disease research. This can be shared with the wider rare disease research community to ultimately find answers for those living with rare diseases.

Providing more than financial support

Apart from providing the funds to set up the centres, we will help facilitate important connections within the rare disease community, offer expertise on IP management and tech transfer and provide access to our 3 Innovation Hubs for Gene Therapy. These hubs, funded in 2021 with the Medical Research Council and the Biotechnology and Biological Sciences Research Council, provide academics with access to good manufacturing practice-compliant facilities for clinical trials, as well as vital translational support and regulatory advice.

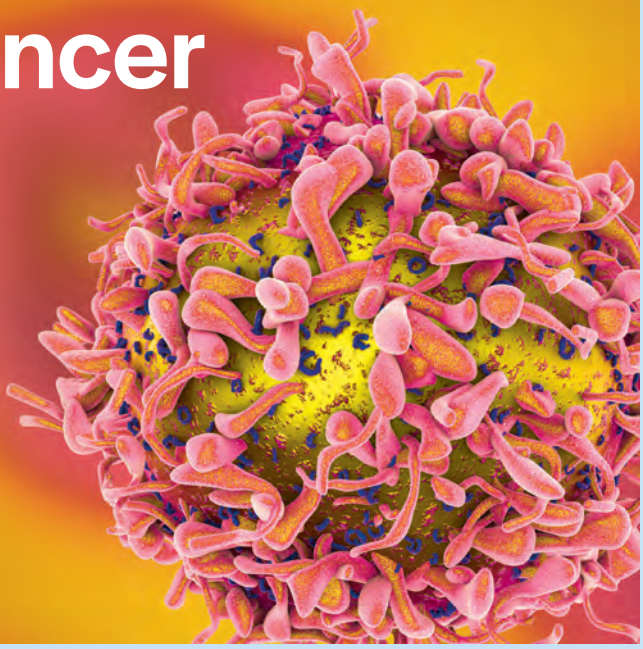
We hosted a workshop in July that brought together shortlisted applicants to understand overlapping areas of interest, potential collaborative partnerships and help determine what aspect of rare disease research each centre will focus on.

Many of the teams that attended had not worked together before and it was clear that everyone is ready for a more collaborative approach. When the centres are formed, they will serve as an ideal platform to nurture this collaborative spirit.

The details of the focus of these rare disease centres will be revealed in 2024. By bringing together the right skill sets at the right time, we hope to accelerate medical breakthroughs and improve the lives of patients.

1 National Institutes of Health

Childhood Cancer Translational Challenge



In 2023, we announced our final Translational Challenge: Childhood Cancer. Officially launching in 2024, our work in this area will involve using our expertise to progress promising science into better outcomes for children with cancer.

Research and investment into childhood cancer is faced with many barriers. For instance, the number of children who develop cancer is relatively low, leading to a scarcity of samples, difficulty in recruiting sufficient numbers to trial and a challenging commercial landscape.

On top of that, the cancers that affect children are often different to those that affect adults, requiring tailored treatments, not just repurposed ones from adult cancers.

These factors make getting drugs to market more difficult. This gap needs to be addressed, in order to get more innovations to the children that need them.

We are currently working on our strategy in childhood cancer, and are looking to partner with others also working in this space.

Our Childhood Cancer Translational Challenge is chaired by Professor Andy Pearson

“There are many challenges facing the development of tests and treatments for childhood cancer. Diagnosis can be slow, many treatments are not designed specifically for children and there are regulatory and financial hurdles to overcome.

LifeArc has real potential to bring our expertise in translation to the field, and make a difference to the research ecosystem. Our hope is that this will ultimately lead to better outcomes for children.

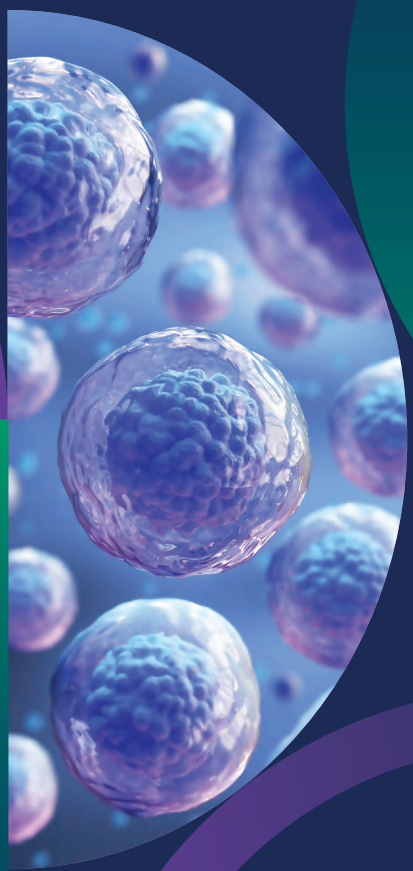
We’re looking forward to sharing our strategy later this year.”

David Jenkinson,
Head of Childhood Cancer

Our science

We specialise in great translational science.

Our labs advance early-stage antibodies, drugs and diagnostics to a point where they can become the next generation of diagnostics, treatments and cures.



Our approach has evolved with us, and we continuously seek out the best science and methods to move exciting discoveries to the next phase of development, with the ultimate hope of reaching the patients who need them most.

24 science colleagues

joined our teams in Edinburgh, Stevenage and the Francis Crick Institute in 2023.

Our Edinburgh location achieved a platinum 'My Green Lab' certification, with a

73%

overall sustainability score.

Expanding our use of big data and machine learning

Data, informatics and computation are driving the world forward. We've been applying techniques in these areas for several years.

In 2022, we formalised our efforts and created a dedicated team in data sciences.

That team now looks at how digital approaches can broaden the questions we might be able to answer for patients.

Sometimes we work in conjunction with our traditional wet lab capabilities. In others, we're exploring new areas where we feel data science can make an impact for patients in one of our Translational Challenges.

Our capabilities

At our labs in Edinburgh and Stevenage, our in-house experts work closely with our partners to transform promising discoveries into new treatments and diagnostics that are ready to be clinically developed into marketed products.

We also offer personalised strategic advice on potential target product profiles and development routes to market, and can facilitate connections with commercial partners, patient groups and other non-for-profit organisations.

Therapeutics

Our technology platforms support several drug modalities, including successful and established biological approaches and a newly emerging modality in the small molecule space.

Antibody discovery

We use innovative single B-cell selection technologies and the clinically validated Intellisect transgenic animal platform to generate fully human, affinity-matured therapeutic antibodies.

Antibody humanisation

We have a long-standing, highly successful track record in this technology, offering a no upfront-cost service that humanises monoclonal antibodies from a range of species and produces therapeutic candidate molecules of various modalities, including VHH, IgG, Fab and VH-Fc. Find out more on pg 42.

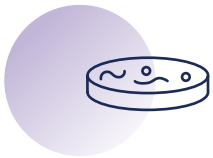
Targeted protein degradation**

We're building our capacity in this exciting, newly emerging therapeutic modality, with a focus on PROTACs and alternative E3 ligases to degrade target proteins that aren't classically targetable by small molecule inhibitors.

**Capability currently in development

Supporting technology

We develop and provide technologies and methodologies that support ongoing projects within LifeArc and with our collaborators across different disease areas.



Induced pluripotent stem cell (iPSC) technology

We offer gold-standard iPSC models for studying neurodegeneration, which are essential for effective mode of action (MOA), target validation and drug discovery projects but can be difficult to access externally. We're expanding our range of cell types to include astrocytes and microglia and are improving reliability and throughput.

Microbiology

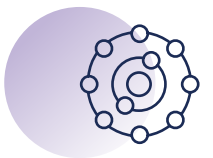
We have established the facilities and fundamental technology to support the study of mechanisms of action (MOA), drug screening, and the susceptibility to and mechanisms behind resistance of novel antibiotics.

Data science**

As the role of data, informatics and computation in translational science grows, we're continuing to evolve our services in this space. This builds on our long-established technologies – such as computational methods to understand structure-activity relationships or design new molecules using protein structures – while capitalising on new areas and advances in artificial intelligence and machine learning.

Diagnostics

We support all stages of diagnostic product development at our labs in Edinburgh, from early proof of concept to validation and clinical development, underpinned by a deep understanding of clinical need. Our development environment is certified to ISO 13485.



Diagnostic development

Supplemented by our suppliers and partners, we can support the development of any diagnostic technology platform. A robust design history file is provided to support regulatory submission.

Clinical development

We can coordinate clinical samples as well as design and manage clinical studies to evaluate novel diagnostics and biomarkers.

Molecular diagnostics

We use a range of PCR and NGS approaches to develop, evaluate and optimise molecular diagnostics, with assay development at the core of our activity. We have experience of design transfer to ensure a smooth transition into manufacture and production.

**Capability currently in development

Antibody discovery and humanisation

We have a rich heritage in humanising antibodies and have contributed to 5 leading, licensed drugs.

Antibodies as a treatment

Monoclonal antibodies, which target specific antigens to affect biological processes, have transformed the treatment of many conditions. The majority are discovered in non-human species, making humanisation an essential part of their translation towards safe, effective use in patients.

Over the past 30 years, we've helped to humanise nearly 100 therapeutic monoclonal antibodies – including 5 of the world's top drugs. This includes the cancer drug Keytruda®, the royalties of which fund much of our work (read more on pg 44). We're continuing to evolve our antibody pipeline, including growing our capabilities in antibody discovery.

With a success rate of more than 98%, our antibody humanisation process gives partners the best chance of their antibody successfully reaching clinical trials.

30
years' experience

94
antibodies humanised

51
companies worldwide

98%
success rate

5
drugs on the market:

- **Keytruda®** for several types of cancer
- **Tysabri®** for multiple sclerosis
- **Entyvio®** for ulcerative colitis
- **Actemra®** for rheumatoid arthritis
- **Leqembi®** for Alzheimer's disease

No upfront payment

We ask for no upfront fee – instead, we receive a small royalty on sales. This means we take on the developmental risk, so our partners don't have to.

Driven by patient impact, not profit

As a self-funded charity, we're driven by projects with the greatest potential for patient impact. We choose projects that have strong scientific rationale and validation and clear routes to commercialisation.

A unique partnership model: humanisation then hand back

We work closely with our partners throughout the project, with open dialogue and regular sharing of samples for evaluation. Partners retain IP ownership and commercialisation control after the project ends.

A 98% success rate

We have experience with a diverse range of target classes and produce as many candidates as we need – we don't limit ourselves to a fixed number of variants. We can help humanise antibodies from a wide range of species and produce therapeutic candidate molecules of various modalities.

Exceptionally high-quality antibodies

The top 4 or 5 candidates undergo extensive analysis, ensuring they have optimal expression levels, and excellent binding, stability and biophysical characteristics. Most of our humanised antibodies display a binding level at least 95% that of the chimeric antibody.

Swift delivery and valuable support

Partners can expect humanised antibodies, expression vectors and a comprehensive report in around 6 months. We can also provide post-delivery translational guidance, including publication assistance and patent support.

We take on up to

6 antibody

humanisation projects each year

Our antibody discovery capabilities

Our antibody discovery platform is based on single B-cell selection technologies and transgenic animals that produce human V-regions.

This relatively nascent approach offers great translational promise by producing affinity-matured human antibodies, bypassing the need for humanisation or other optimisation.

We're continuing to grow our discovery capabilities, including optimising our workflow for very challenging therapeutic targets. We're exploring how we could collaborate with external partners through our discovery platform to achieve greater impact for patients.

In the spotlight

Humanising antibodies for the world's top-selling cancer treatment

Our antibody humanisation team were instrumental in the development of Keytruda® (pembrolizumab), a groundbreaking new cancer drug. Years on, Keytruda® continues to transform lives and remains a focus for many ongoing cancer research efforts.

Keytruda® represents a significant breakthrough in cancer research and one of LifeArc's biggest success stories, having played a vital role in the antibody humanisation of the drug. With FDA approval for more than 19 different cancer indications to date, Keytruda® has emerged as the world's top-selling drug in 2023[1] and been used to treat over one million patients.

We are thrilled to witness the continually expanding impact of Keytruda® in cancer treatment over the past 2 years and this trajectory of success is only likely to continue – there are currently over 700 ongoing studies and clinical trials exploring the use of Keytruda® across different cancer types and in combination with various other drugs.

The power of immunotherapy

The success of Keytruda® is mostly attributed to its action as an immunotherapy drug. Traditional treatments, such as chemotherapy or radiotherapy, target rapidly multiplying cells but are not selective, so affect both cancerous and healthy cells. This lack of specificity often results in numerous side effects, including hair loss.

In contrast, immunotherapy, a more recent approach, harnesses the body's immune system to fight cancer. Some cancer cells can evade detection by the immune system and avoid getting destroyed by the body's natural defense mechanisms. Keytruda® effectively counters this by targeting the PD-1 pathway, which is critical in this evasion strategy, exposing cancer cells so that they are visible to the immune system for destruction.

This targeted approach has proven to be incredibly effective for people with some types of cancer.

Where did it all begin?

Back in 1986, Sir Greg Winter, a British biochemist, developed and patented a groundbreaking technique called antibody humanisation at the MRC Laboratory of Molecular Biology in Cambridge. At this time, LifeArc was not yet formed and we were working within the MRC as MRC Technology.

The humanisation process changes portions of animal-derived (usually mouse) antibodies into sequences that more closely resemble those of a human antibody. This is a vital step in developing a therapeutic antibody as it reduces the chance that the antibody will be recognised as 'foreign' when it is administered to the patient, and attacked by the patient's own immune system. This humanisation process was crucial for the later development of Keytruda®.

1 Merck & Co, Feb 2024

Here's how Keytruda® was born:

2003

Working for a pharmaceutical company called Organon, Dr Gregory Carven and a team of scientists started work on developing antibodies that target the PD-1 immune pathway to prevent cancer cells from evading the immune system's natural response.

2007

Collaborating with Organon to humanise their antibody PD109.A (later branded as pembrolizumab). We already had a proven track record in antibody humanisation at this time, encompassing around 30 successfully humanised antibodies, and had the necessary CDR grafting technology to generate a humanised clinical candidate from a mouse antibody from Organon's research.

2010

Organon was acquired by Merck. Pembrolizumab was approved for clinical trials by the FDA.

2014

The FDA granted approval for pembrolizumab for the treatment of melanoma in patients who have not responded to other drugs. This approval marks pembrolizumab's first entrance into the market as a therapeutic drug, Keytruda®, and sets the stage for its future successes.

2020

After MRC Technology rebranded to become LifeArc, we received £1bn from the monetisation of a portion of our Keytruda® royalty rights. This gave us financial independence and our status as a self-funded medical research charity, enabling our ambitious plans to make life science life changing.

2023

A testament to its efficacy, Keytruda® stands as the highest-selling drug ($12 billion USD) of 2023, treating over a million cancer patients. The drug's continued expansion is predicted to push this number to 2 million patients by the end of 2024.

Our commitment to progressing promising science

The triumph of Keytruda® is testament to the hard work and skills of everyone involved and exemplifies how our expertise and unique support can help bridge the gap between scientific discoveries and patient benefit.

Through collaborative efforts like this, we strive to continue progressing more life-changing treatments and diagnostics out of the lab towards patients.

Our antibody humanisation process at our labs in Stevenage

Project scope

Scientific rational

Route to commercialisation

Our projects begin once we've confirmed their scientific rationale, antibody quality and commercialisation potential.

Feasibility

Binding validation assays

Production of chimeric antibodies

We analyse properties of the parent antibody, which could be from a mouse, hamster, rat, rabbit, chicken or camelid. We produce a chimeric version of the antibody and confirm its target binding.

Design and humanisation

Molecular modelling

Sequence analysis

Choose modality

Variant expression

Binding assessment

Functional analysis

Our proprietary design method includes molecular modelling and sequence analysis. We design as many variants as needed to find the optimal candidate while maximising human content. These are produced in the chosen modality, such as IgG, VHH, Fab or VH-Fc.

We assess variant expression, binding and stability. Alongside partner-led functional analysis, this determines a shortlist of lead variants.

Lead candidate selection

Purification and quality control

Binding affinity determination

Functional potency

We test the most promising variants for factors including binding affinity, developability as a drug and potency in functional assays to identify the best candidates for further development.

Antibody delivery

Delivery of purified lead candidate (10mg)

Ongoing translational advice

Humanised antibodies are delivered ready for pre-clinical testing. This includes 10mg of the lead antibody and backup candidates, expression vectors and a comprehensive report, containing the data from a range of industry-accepted assays. We can also provide ongoing translational advice.

Examples of great LifeArc science

A selection of highlights that came out of our labs and science team

Project

Using data science to inform decisions about treatment centres for rare pain condition

Trigeminal neuralgia is a rare condition that causes intense nerve pain – similar to an electric shock – on one side of the face.

The condition is treatable once it's been correctly diagnosed. But currently, that process takes 4 to 5 years, leaving patients in immense pain as they search for answers.

With Professor Joanna Zakrzewska at University College London, we're developing an evidence package on trigeminal neuralgia's prevalence and incidence across England, using electronic health records.

The hope is that this evidence will help to inform where an institute could be set up to aid treatment and diagnosis of trigeminal neuralgia.

We'll use data science to plot patient journeys, identifying bottlenecks and delays. A prototype machine-learning algorithm will also be developed to help shorten time to diagnosis, by identifying symptoms and patterns in a person's electronic health records that suggest trigeminal neuralgia is a possible diagnosis.

In 2023, we established the platforms to safely work with patient data from Clinical Practice Research Datalink. We hope to begin analysis in 2024.

This is our first project using electronic health records, and we've now established the capabilities, and data and legal processes for working with sensitive patient data. We've already begun to build subsequent projects aligned with our 5 health focus areas.

Project

A new drug to tackle antibiotic resistance in people with cystic fibrosis

People with cystic fibrosis, a chronic condition characterised by a build-up of sticky mucus in the lungs, often experience recurrent lung infections.

This can cause permanent lung damage if not treated effectively – but bacteria are becoming increasingly resistant to the antibiotics used to treat these infections.

We're tackling this growing problem through our work in chronic respiratory infection (pg 22), with the development of a new, multifaceted antibiotic drug.

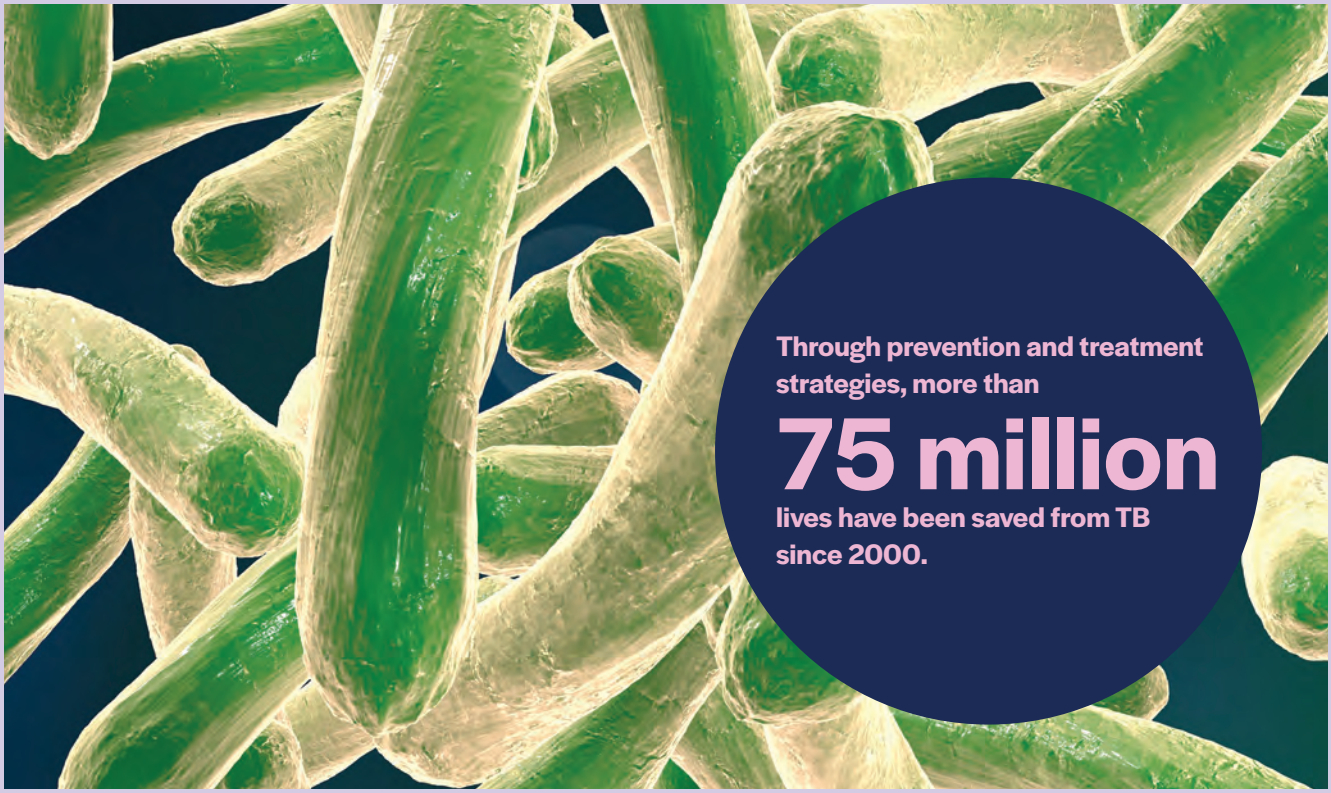
Some bacteria have evolved mechanisms of resistance that prevent current antibiotics from working. These include changes to cell structures to stop antibiotics getting in, pumping antibiotics back out and releasing enzymes that can neutralise antibiotics before they have an effect. On top of this, most of the bacteria responsible for cystic fibrosis infections have a protective outer membrane which further shields them from antibiotics.

With our exciting new approach, we aim to target

multiple different mechanisms at the same time. By combining this with a built-in delivery system, we should increase the range of bacterial species our antibiotics can be used to treat and reduce the chance of resistance developing.

The escalating challenge of antibiotic resistance means we must develop increasingly sophisticated drugs like this, with a spectrum of activity that reduces the chance of further resistance developing.

Having proved our concept, we're now moving onto developing compounds that work effectively in vivo. If successful, our approach could offer a much-needed option for people who suffer from chronic lung infections associated with cystic fibrosis.



Project

Joining the global fight against drug-resistant tuberculosis

Reducing the global burden of tuberculosis (TB) demands a multipronged approach – a combination of effective treatments, vaccines and diagnostic tests.

The ability to monitor infection is particularly important, helping to guide treatment for people at risk of severe illness and inform preventative strategies. It can also help detect treatment-resistant infections – which are on the rise and pose a significant threat to global health.

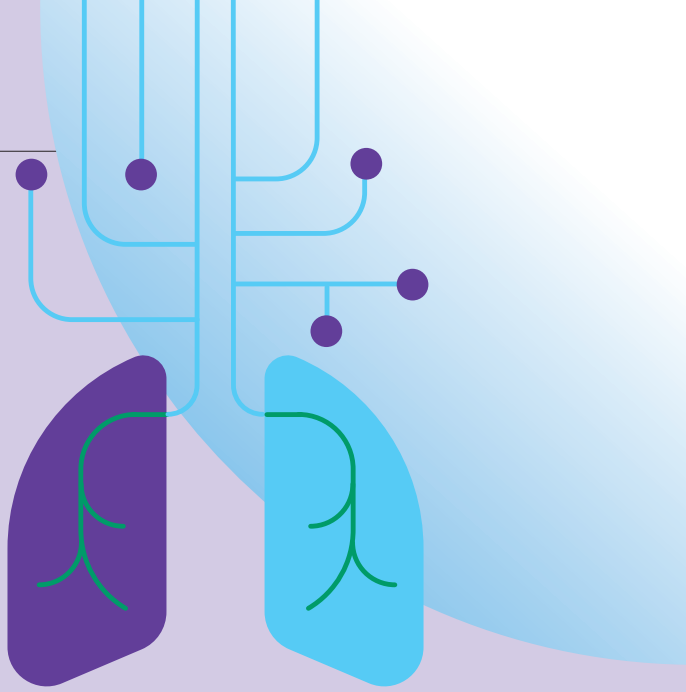
The main way to monitor infection is by growing and analysing sputum samples in culture. But this is slow and can be contaminated by other non-TB bacteria, leading to inaccurate results.

We're meeting this clinical gap with a quick, efficient RT-qPCR test: the TB-MBLA (tuberculosis molecular bacterial load assay), which quantifies bacterial load by amplifying 16s ribosomal RNA from *Mycobacterium tuberculosis.*

Collaborating with researchers at the University of St Andrews, who initially created the assay, we've been working to translate TB-MBLA into a robust, clinically relevant diagnostic tool. Early findings suggest accurate test results can be delivered within hours, compared to the weeks or even months of the culture test. Excitingly, some of our partners have incorporated TB-MBLA into their pre-clinical work, which will help evaluate the test further and potentially accelerate getting new TB drugs and treatments into clinical practice.

TB-MBLA entered the next phase of translation in 2023 with the launch of TIME (**T**B **DI**agnosis and **M**onitoring **E**valuation), a clinical study that aims to test its accuracy and effectiveness at monitoring bacterial load over time. We've successfully completed recruitment for the study, which includes people with and without TB from 4 sites across Uganda and Tanzania and will run until later in 2024.

If proven effective, TB-MBLA could provide a new way to navigate drug-resistant TB, supporting clinicians to prevent further spread or tailor treatment to best meet their patients' needs.



Project

Developing molecular assays to monitor bacterial infections in bronchiectasis

Bronchiectasis is a respiratory condition affecting the airways of the lungs. They become widened, leading to a build-up of excess mucus that can make the lungs more vulnerable to infection.

While damage to the lungs associated with bronchiectasis is permanent, better management of infections can help prevent the condition getting worse.

We're applying our diagnostics expertise to try and help patients get better-informed treatment decisions earlier, by developing molecular diagnostic tests to help monitor infection which can go further than current diagnostics.

Two years ago, we joined forces with the University of Dundee and the European Multicentre Bronchiectasis Audit and Research Collaboration (EMBARC). Through our EMBARC membership, we gained access to clinical samples and networks which have enabled us to begin exploring solutions.

Through discussions with EMBARC groups of both patients and clinicians, we also learned about what patients need in infection diagnostics.

Right now, it's only possible to diagnose whether certain bacteria are present. Our tests will provide information on the amount of bacteria present in a patient, allowing treatment response to be tracked. They'll also return these results more quickly than current tests.

Our hope is that these tests can be used in further research studies and eventually lead to earlier, more accurate diagnosis of infections, reduced cost of clinical trials and better treatment monitoring for patients.

This exciting science supports our work in chronic respiratory infections (see pages 22 to 27).

Project

Digital solutions that could transform dementia care

As part of our neurodegeneration efforts, this partnership seeks to transform care for people living with dementia through digital solutions. You can read more about NEURii in our 'in the spotlight' segment on pg 20.

Project

A unique melting pot of leading cancer research expertise

New immuno-oncology drugs hold immense promise for patients, offering hope for people with advanced cancer or for whom chemotherapy and radiation have failed.

It's how the world's best-selling cancer drug Keytruda® works, which we humanised and the royalties of which fund much of our work (see pg 44).

In 2016, we partnered with Cancer Research Horizons, uniting our respective drug discovery expertise and research networks. Ono Pharma joined us in 2019 – and the award-winning Immuno-Oncology (IO) Alliance was born.

Through the IO Alliance, we seek to accelerate the discovery and development of novel immuno-oncology drugs – those that leverage the immune system to treat cancer – with a focus on small molecules and biologics.

Together, we're fuelling the discovery of more drugs like Keytruda®, including strategies to overcome treatment resistance or ineffectiveness. Our unique combination of skills, expertise, people and resources mean we can overcome some of the challenges that commonly hold back translation of novel targets to the clinic.

Over the past 5 years, the alliance has identified and investigated a range of exciting opportunities. Throughout its final year, it will focus on the most promising antibody and small molecule projects, which could bring great hope for patients in the future.

Project

Important outcomes from our work on Ataxin-2 targeting for motor neuron disease (MND)

Ataxin-2 has long been a promising potential target for MND treatment. This RNA-binding protein is responsible for regulating RNA metabolism and stress granule formation.

Despite the strong evidence supporting targeting Ataxin-2, challenges persist in understanding its mechanism and developing effective treatments – most drug development programs are still in the early stages and rely on RNA-based modalities.

Over the past 2 years, our scientists have been working on the early stages of a project with an AI-based drug discovery company to develop and assess the feasibility of a novel small molecule targeting Ataxin-2. This could lead to an oral treatment that would be much easier for patients.

Our aim was to develop a modulator for Ataxin-2, potentially advancing new small molecule drug candidates toward clinical development for MND treatment.

Despite good progress on a number of fronts, the technical challenges of this approach meant that the likelihood of success of this project was low and the resources needed would be very high. Therefore, after careful assessment of our progress so far and the likelihood of success, we've taken the decision to halt work on Ataxin-2.

As a charity who knowingly takes on riskier or more challenging science to try to get novel solutions closer to patients who need them, we believe it's important to also acknowledge when learnings show us that successful progression is unlikely and timely termination is advised. This allows us to focus our resources on projects which we think are more likely to be successful in delivering impact for patients.

While this specific project may not have progressed as hoped, we remain dedicated to pushing boundaries and exploring approaches to find new treatments for MND.

LifeArc Ventures

We invest in early-stage biotech and healthtech companies with promising therapeutics, technologies and medical devices.

Through our investment and scientific and expertise, we help innovative life science companies accelerate their translational research and grow. Financial returns from our portfolio companies are returned to the LifeArc balance sheet and used to sustain us over the longer term.

6 new investments

16 companies in our portfolio

Investments in 2023

This year, LifeArc Ventures made 6 new investments and several follow-on investments in existing portfolio companies.

Maxion Therapeutics drives antibody development for previously untreatable diseases

LifeArc Ventures led a $16 million (£13 million) Series A financing for Maxion Therapeutics.

The funds will be used to support the development of novel biologics targeting ion channels and G-protein-coupled receptors (GPCRs) - which are involved in a wide range of previously untreatable diseases - via Maxion's proprietary, patent-protected KnotBody® platform.

Ozlo Sleep advances digital care for better sleep

Alongside ARTIS Ventures, LifeArc Ventures led a $10 million Series A funding round for Ozlo Sleep.

This money helped support the commercialisation of their revolutionary headphones, Ozlo Sleepbuds®, which use data to personalise and customise digital solutions that can help improve sleep and potentially alleviate sleep disorders such as insomnia.

Affect Therapeutics delivers digital solutions to help with addiction recovery

LifeArc Ventures invested in a $16 million Series A funding round for Affect Therapeutics.

This funding was used to support the development of their digital treatment platform which helps break the cycle of addiction in substance use disorders, including for alcohol, marijuana, cocaine and methamphetamine, as well as prescription stimulants such as ADHD medications.

Partnerships

We partner with other organisations to progress great science to the point where it's interesting to commercial partners.

Our skills lie in translational science: getting promising science out of the lab, and to the next phase of development in areas where patients need it most.

Who we partner with

Charities

Universities and academic institutions

Research institutes

Startups and early-stage biotechs

Pharmaceutical companies

Ways we collaborate

Investment
From joint funding calls to investing in promising projects.

Commercialisation and IP support
Includes analysis of research portfolios, negotiating licences, protecting your intellectual property and more.

Scientific services
Read about our exciting science collaborations and projects on pages 47 to 51.

Support for charities

Our charity partners can access our range of services including technology transfer and intellectual property (IP) management and expert advice on how best to progress your project towards commercial success.

We can help charities:

- unlock the potential of existing research portfolios
- identify how best to allocate their research investments
- commercialise research through our extensive network of biotech and pharma partners

Support for the Medical Research Council

We provide technology transfer services to the Medical Research Council (MRC), part of United Kingdom Research and Innovation (UKRI). If you are a researcher in an MRC Institute, we can help you translate your science into powerful new therapies, diagnostics, devices and research tools.

We support MRC researchers by:

- evaluating the translational and commercial viability of research, protect inventions, and advise on development pathways and access to funding
- providing tailored contract support
- facilitating connections with industry and investors to progress and commercialise MRC research via licensing, collaboration and spin-out formation

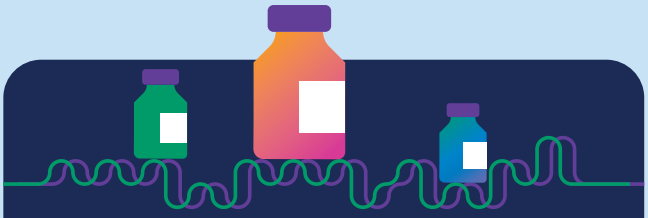
Examples of our exciting partnerships

£40 million to create new collaborative Translational Centres for Rare Disease

Read more about this in the spotlight on pg 34.

Creating and testing a clinically-relevant diagnostic tool to monitor tuberculosis bacterial loads

Read more about TB-MBLA on pg 49.



Bringing together experts to speed up drug discovery and developments for motor neuron disease through a new research institute

Read more on pg 18.

AI-driven home monitoring to help people living with cystic fibrosis predict the onset of symptoms and reduce hospital stays

Read more in the spotlight on pg 25.

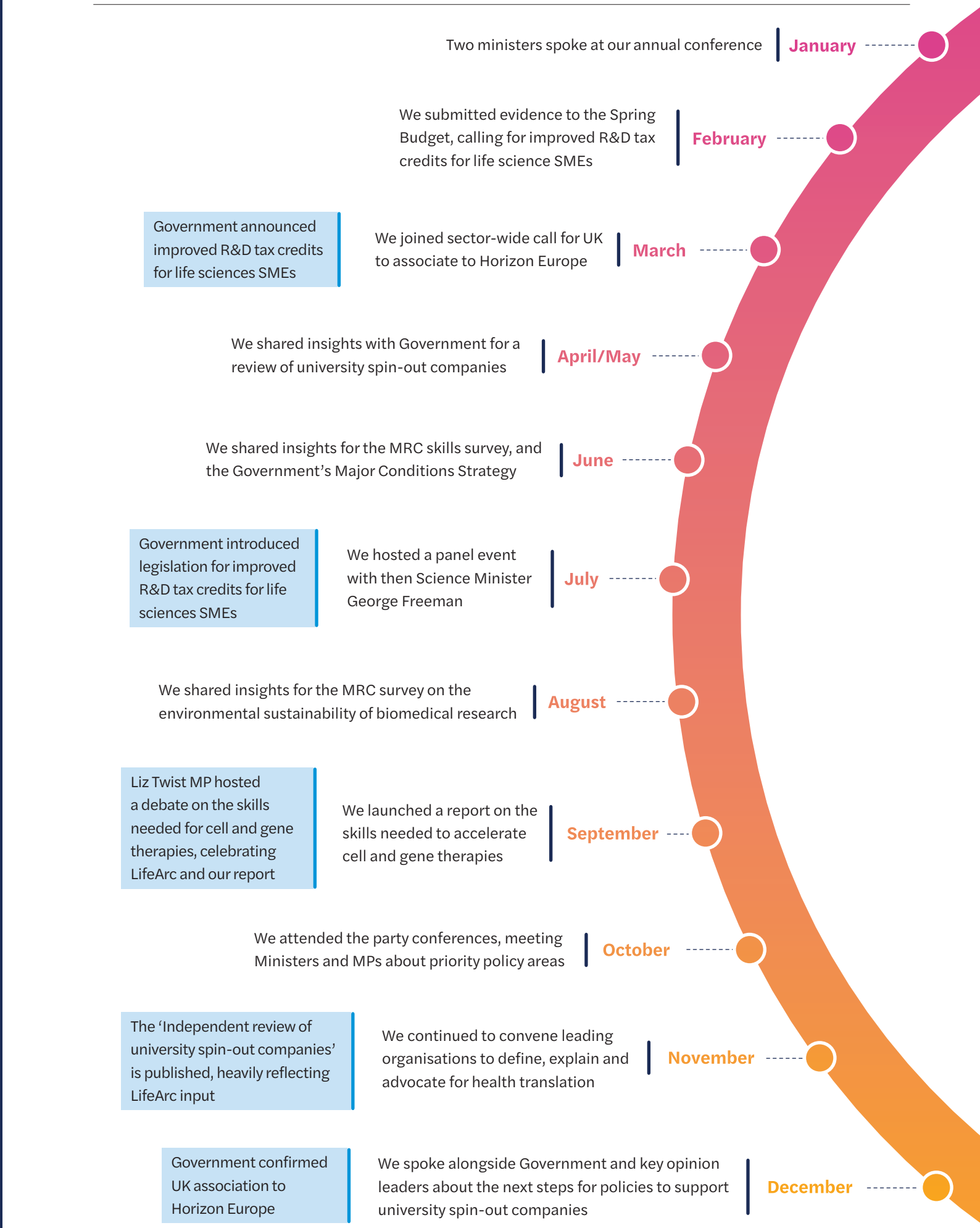
£30 million initiative to combat drug-resistant infections

Read more on pg 31.

Policy

We talk to decision-makers, across the political spectrum, who influence UK research and innovation.

By feeding in our expertise we can improve how the UK pushes good science out of the lab and into real life, closer to the people who really need it.



January

Two ministers spoke at our annual conference

February

We submitted evidence to the Spring Budget, calling for improved R&D tax credits for life science SMEs

March

We joined sector-wide call for UK to associate to Horizon Europe

Government announced improved R&D tax credits for life sciences SMEs

April/May

We shared insights with Government for a review of university spin-out companies

June

We shared insights for the MRC skills survey, and the Government's Major Conditions Strategy

July

We hosted a panel event with then Science Minister George Freeman

Government introduced legislation for improved R&D tax credits for life sciences SMEs

August

We shared insights for the MRC survey on the environmental sustainability of biomedical research

September

We launched a report on the skills needed to accelerate cell and gene therapies

Liz Twist MP hosted a debate on the skills needed for cell and gene therapies, celebrating LifeArc and our report

October

We attended the party conferences, meeting Ministers and MPs about priority policy areas

November

We continued to convene leading organisations to define, explain and advocate for health translation

The 'Independent review of university spin-out companies' is published, heavily reflecting LifeArc input

December

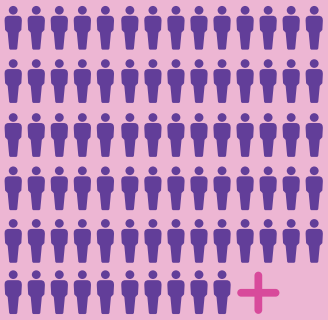
We spoke alongside Government and key opinion leaders about the next steps for policies to support university spin-out companies

Government confirmed UK association to Horizon Europe

Our people

Our people help to shape the future of translational research and enable the life-changing treatments and diagnostics of tomorrow.

We thrive on innovation, collaboration and excellence and want all our employees to flourish, be challenged and build a rewarding career with us – in an environment that supports them and prioritises their health and wellbeing.



This year, we added more than

60 people

to the LifeArc team

Our culture

Our people have a wide range of skills and backgrounds, but all come to work with the same mission: to find life-changing solutions for patients with unmet medical needs.

To allow them to do their best work, we're dedicated to creating a diverse, flexible and equitable space where everyone can thrive.

LifeArc acts as a connector, bringing the right people and organisations together to progress promising science. Collaboration is critical to what we do.

We work hard, hold ourselves and each other accountable, and aim for high quality. But we are not afraid to fail fast, learn and come back with stronger solutions.

And we're always looking for ways to make LifeArc a great place to work – our People team regularly seeks our employees' feedback and sets action plans based on what they hear.

Equity, diversity and inclusion (ED&I) at LifeArc

We strive to build our teams, organisation and partnerships to reflect the communities that we belong to and the values we hold.

We spent 2023 refining our existing ED&I policy.

Our ED&I focuses are:

- creating an inclusive culture, from recruitment through to retention
- inclusive funding and engagement practices for all our partnership and funding activities
- inclusive science and research, so that projects we work on are informed by diverse patient needs and incorporate knowledge from local communities and advisory groups

Rewarding great work

We strive for excellence in everything we do and reward outstanding performance accordingly.

This year, we introduced a new annual incentive plan. It focuses on fairly rewarding stretch performance, based on the goals set by individual employees and the organisation as a whole.

We also want our employees to have the support they need outside of work. Our total rewards package is comparable to companies like us in the private sector.

LinkedIn Learning
joined our suite of personal development tools this year

Room to grow and learn

We're always searching for the most innovative solutions, so we want our people to continue learning and to stay curious.

Every person creates a development plan with their manager, setting goals that keep their career and personal growth on track.

Recruiting the best

The future of life science research depends on attracting a diverse range of people. We look for the best of the best to join us in championing under-served patients.

That includes helping them to develop into future generations of translational scientists and specialists through programmes like fellowships and industrial placements.

Our 2023 early careers and fellowship programmes:

12
industrial placement students

4
technology transfer fellows

3
apprentices

A look to the future

Translating scientific discoveries into the next drug, diagnostic or device is a long, expensive and unpredictable process.

It requires the right expertise and resources coming together at the right time to progress promising innovations. As we look ahead, we remain dedicated to forming partnerships and providing the science, investment and expertise that will help remove barriers to this translation.

We're grateful to join forces with incredible partners who bring their knowledge and resource to tackle our Translational Challenges with us.

Together, we'll continue to turn great science into greater patient impact.

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