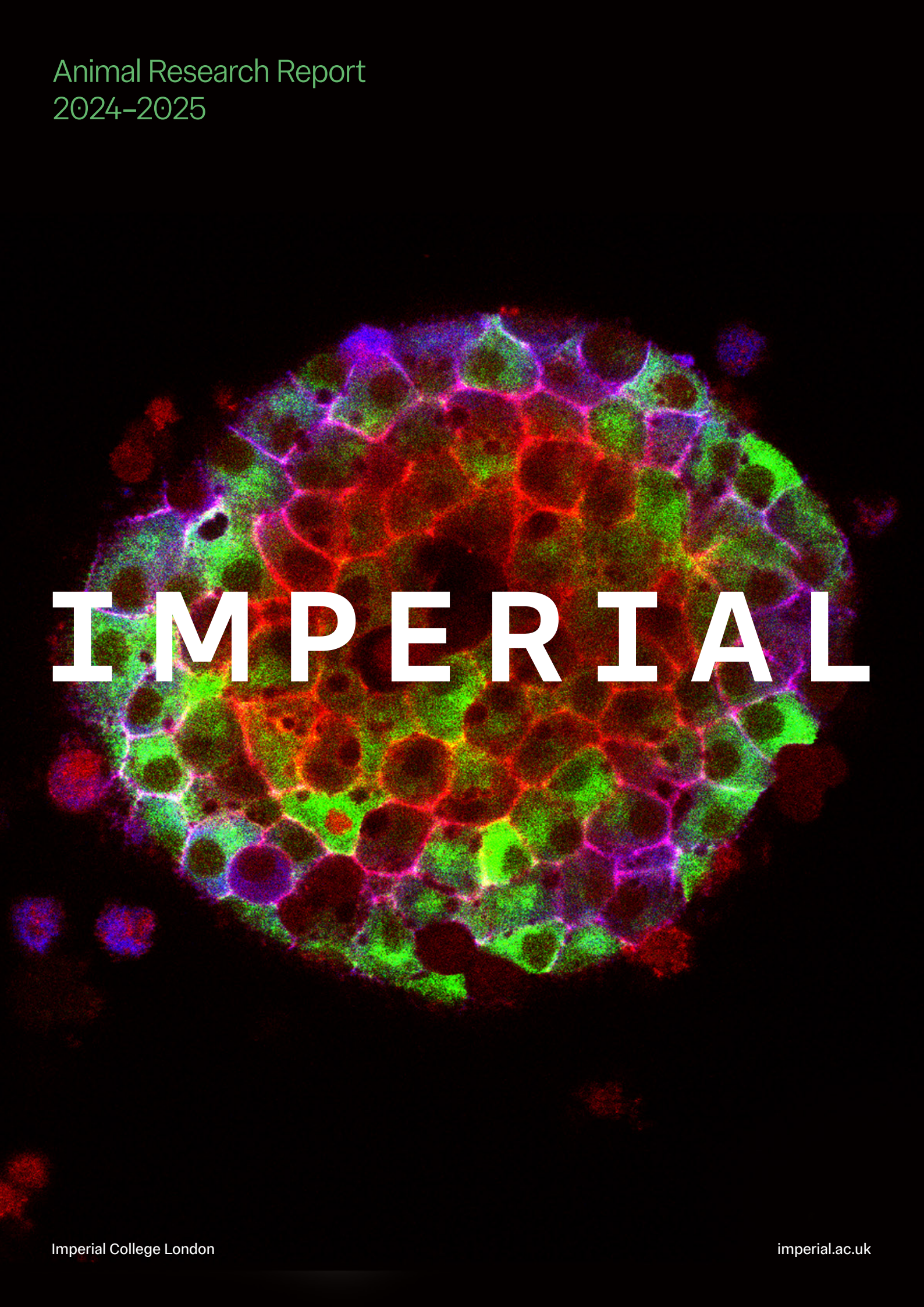
Animal Research Report 2024–2025



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Cover image:

A confocal image of a pancreatic islet of Langerhans from a mouse that's been genetically modified to express a calcium biosensor (GCamP3) controlled by the GLP-1 receptor promoter (Green). Also shown: GLP-1 receptors labelled with a fluorescent tag (Exendin9-TMR) (Red) and using a specific antibody (Blue).

Find out more about Professor Alejandra Tomas' research using these islets on page 10.

Animal Research Report 2024–2025

Foreword

Animal research at Imperial

This is my first Animal Research Report since taking over the role of Establishment License Holder. Having worked with research colleagues across life sciences and medicine in the past, I had some awareness of what was involved in running animal research facilities, but I have had a great deal to learn in this new role. It has been a fascinating journey, and I'm glad to have the opportunity to gain a deeper knowledge of this aspect of Imperial's work.

Animal research forms a small but important part of our biomedical research, with a critical role in the development of new and improved methods for diagnosing, treating and preventing diseases that affect both humans and animals. Some of this research is documented in the features on pages 10–20, exploring researchers' work on understanding diabetes and how we regulate the levels of sugar in our blood.

Whilst we continue to rely on animal models where there is currently no alternative, the number of animals used in research at Imperial is declining. Indeed, Imperial is fully committed to 'the 3Rs' of replacing animals in research, reducing the number of animals used and refining animal experiments to minimise harms. As a research community, we are united in ensuring that all animals receive the best standard of care. You can find out more about how staff in our Central Biomedical Services team share their animal care expertise on page 18. The efforts towards the 3Rs have contributed to many research successes, and our feature on organ-on-chip devices on page 14 explores a great example of this.

Our progress in animal research

Since our last report, there have been a number of developments at Imperial that demonstrate our commitment to excellence in animal care and research. Firstly, with funding from Research England's Enhancing Research Culture Framework, we developed a new 3Rs Hub website to showcase our innovations in the 3Rs. This resource is a space for promoting information, learning materials and initiatives related to the 3Rs in research at Imperial. The 3Rs Hub has also established an education and support programme for graduate scientists and beyond. We are creating a new generation of scientists who are open about their research with animals and work to reduce, replace and refine animal research. You can read more about the 3Rs Hub website in the Communication section on page 24.

Secondly, we have closed our animal facility at St Mary's Campus in Paddington and moved all animal research to our Hammersmith and South Kensington facilities. As part of the move, our South Kensington facility has been refurbished to meet containment level 3 requirements, meaning it can be used safely for research with the most dangerous viruses, bacteria and toxins. At Hammersmith, we have installed a level 3 area in our existing animal facility and created a new state-of-the-art facility within the MRC Laboratory of Medical Sciences. Together, these changes will ensure our animal research facilities meet the highest standards of animal welfare and serve as a place where world-class research can thrive.

The Association for Assessment and Accreditation of Laboratory Animal Care (AAALAC International) continues to recognise our animal research staff and facilities. In 2024, our animal care programme was AAALAC accredited for the third time, having been the first UK university to receive this award in 2018.

Finally, it's important that we help people understand how and why we use animals in research at Imperial, and this is why we are committed to openness. For a third time, we have been recognised as a Leader in Openness by Understanding Animal Research for our work in communicating about animal research. This is well-deserved recognition for the Imperial community for all our sustained efforts to raise awareness about animal research at Imperial and promote the developments we are making in the 3Rs.

Professor Mary Ryan CBE, FREng, FIMMM, FICorr, FCGI
Vice-Provost (Research and Enterprise) and Establishment License Holder

Discoveries

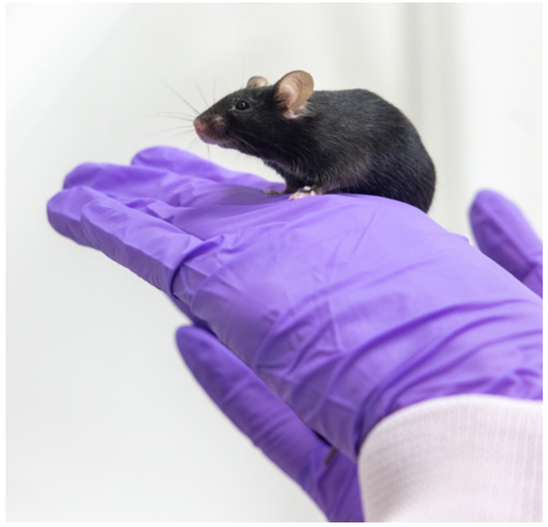
Recent findings from animal research

Turning off protein extends mice lifespan

Imperial research has shown that targeting the production of a key inflammatory protein in mice can extend their lifespan and reduce age-related disease.

A team from the Medical Research Council Laboratory of Medical Sciences at Imperial, and Duke-NUS Medical School in Singapore, explored the effects of 'turning off' a protein called interleukin 11 (IL-11). When mice had the gene producing IL-11 deleted, this extended their life by over 20% on average.

The team also treated 75-week-old mice, equivalent in age to approximately 55-year-old humans, with an injection of a drug that stops the effects of the IL-11. Mice given the anti-IL-11 drug from 75 weeks of age until death had their median lifespan extended by 22.4% in males and 25% in females. The treated mice lived for an average of 155



weeks, compared with 120 weeks in untreated mice, and the researchers observed very few side effects. The treatment largely reduced deaths from cancer, as well as reducing diseases caused by fibrosis, chronic inflammation and poor metabolism, which are hallmarks of ageing. The researchers say the work raises the possibility that the drugs could have a similar effect in elderly humans.

Gene-edited chickens help fight against bird flu

Scientists have used gene editing techniques to limit the spread of bird flu in chickens.

Bird flu is a major global threat, with a devastating impact in both farmed and wild bird populations. In the new study, researchers were able to restrict the avian influenza virus from infecting the birds by precisely altering a small section of their DNA.

The modified birds showed no signs that the change had any impact on their health or wellbeing.

The work was carried out by a team from Imperial, the University of Edinburgh and the Pirbright Institute. The researchers say that further gene edits would be needed to produce chickens which cannot be infected by bird flu.

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Drug could improve brain tumour treatment

Researchers from the Brain Tumour Research Centre of Excellence at Imperial have discovered a drug which could boost the effectiveness of chemotherapy to treat aggressive brain tumours in adults.

They used a drug called daporinad to block production of a chemical which gives cancer cells the high levels of energy they need to grow quickly. This chemical plays a key role in aggressive brain tumours called glioblastoma, where tumours grow and spread very quickly.

The team found that the drug boosted the effectiveness of the chemotherapy drug called temozolomide in both tumour cells in the lab and in mouse models, where it reduced the tumours' size.

Around 3,200 people in the UK are diagnosed with glioblastoma every year, and will have surgery, radiotherapy and chemotherapy, or a combination of these, as treatments.

People with glioblastoma live, on average, for just 12–18 months after they are diagnosed and treatments have not changed in 20 years. The discovery could lead to discoveries for new treatment plans or options for people diagnosed with glioblastomas, and the researchers hope it will pave the way for future clinical trials.

Older birds make fewer friends

Like people, birds have fewer friends as they age, but the reasons why are unclear. New research suggests they may just have no drive to cultivate new friendships.

In humans, it has often been assumed that older people have fewer friends because they're pickier about who they spend their time with. There are also fewer people of their own age around.

But it's hard to pick apart the various potential causes for humans, so researchers have turned to animals. The Imperial-led team behind the new research studied an isolated population of sparrows on the island of Lundy.

By mapping the ages and social networks of all the birds, they found that older sparrows do tend to have fewer friends. The reason could be that there is no 'evolutionary pressure' to do so: while friendliness helps younger birds survive and breed more successfully, the same isn't true for older birds. The researchers suggest that this same evolutionary mechanism could be at work in humans, with older people feeling less inclined to make new friends as they age – something that may be a factor in the loneliness crisis among older people.

Why flying insects are drawn to artificial light

Slow-motion videos collected by Imperial bioengineers have given new insights into why nocturnal insects gather around light.

Research Associate Dr Samuel Fabian researching why insects gather at artificial light.

The reasons behind the insects' apparent attraction to light have been much debated. Researchers had suggested that insects mistook the light for a gap in foliage and incorrectly used it to escape, or that the light was used as a navigational tool. Others thought insects were attracted to the heat of the light, or that they became blinded by the light, causing erratic movements and crashes.

Imperial researchers analysed stereo-videography footage from field experiments in Costa Rica, and high-resolution motion capture and computer analyses of dragonflies and moths in the lab. Their work provides evidence that flying insects are not attracted to artificial light, but rather become disorientated by it as they think it is the sky, and therefore the way 'up' – which causes them to crash.

Provost's Awards for Excellence in Animal Research

The Provost's Awards for Excellence in Animal Research acknowledge staff who have made advances in the 3Rs, shown openness in communicating about animal research, or demonstrated outstanding collaboration between research and Central Biomedical Services (CBS) staff.

3Rs

Replacing animals in research

Reducing the number of animals

Refining animal experiments

Provost's Award Winners 2025

Application of the 3Rs, researchers

Professor Cesare Terracciano; Dr Danika Hayman, Research Associate; Dr Fatemeh Kermani, Research Associate; Fani Koutentaki, PhD Student; Parisa Keshtkar, PhD Student; Lorenza Koppers, PhD Student; Sam Reitemeier, Laboratory Technician/Support Worker – National Heart and Lung Institute (NHLI)

For their efforts to reduce and then replace all animal procedures to study the electrophysiology of heart disease. This work was funded by the National Centre for the Replacement, Refinement and Reduction of Animals in Research and has led to several publications.

Amy Wathen, winner of the Application of the 3Rs, CBS staff award.

Application of the 3Rs, CBS staff

Amy Wathen, Named Training and Competency Officer, Central Biomedical Services

For her continuous professionalism and dedication, which ensures that the welfare of the animals is at the highest standards. Amy introduced a new training package, and ensures that the training records of more than 600 users are always up to date.

Team Award

Dr Yu Liu, Research Operations Manager, MRC Laboratory of Medical Sciences; Phil Rawson, Senior Animal Technologist, Central Biomedical Services

For introducing new refinements in the H3 animal facility. The panel said their work has great impact in improving animal welfare and research quality, both internally and externally.

Public Engagement Award

Katherine E Tyson, Laboratory Manager and In Vivo study coordinator, Department of Surgery and Cancer

For her efforts to effectively communicate about animal research and the principles of the 3Rs for philanthropic donors. Katherine also collaborated on an article about animal research for STEM Dorado, a free children's science magazine.

Provost's Award Winners 2024

Application of the 3Rs, researchers

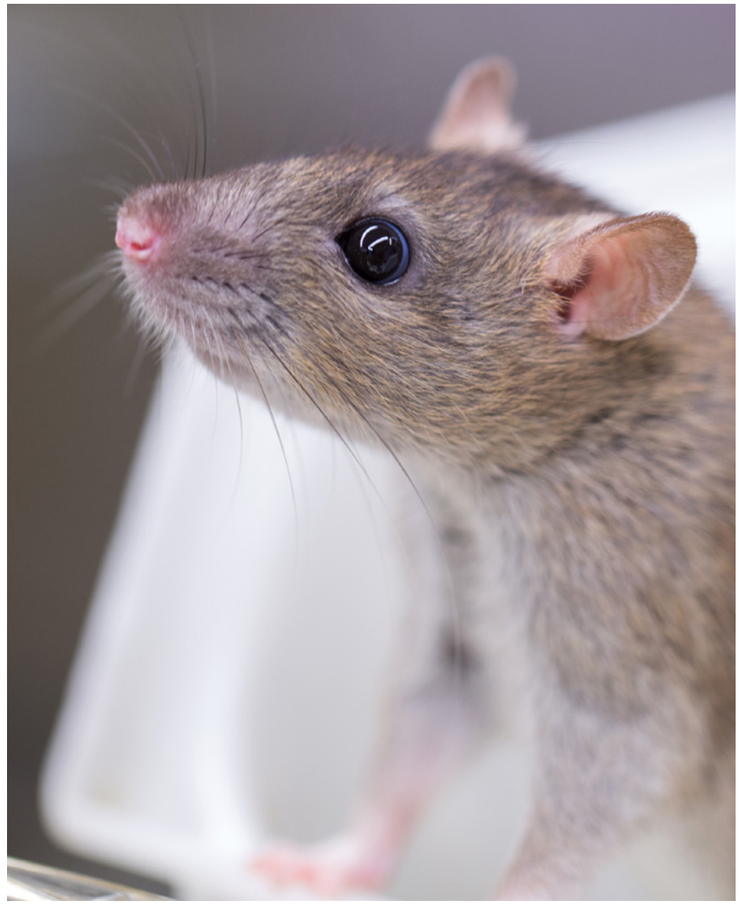
Maike Haensel, PhD Student, National Heart and Lung Institute (NHLI)

For developing an innovative 3D organ-on-chip cell culture device called REVAS.

Application of the 3Rs, CBS staff

Cheryl Brown, Animal Technologist, Central Biomedical Services

For setting up a new surplus management system for the breeding colonies.



Team Award

Dr Chengxing Lian, Research Associate, Department of Chemistry; Jun Cai, PhD Student, Department of Bioengineering; Justyna Glegola, Training and Competency Assessor, Central Biomedical Services; Dr Ginny Fisher, Veterinary Surgeon, Central Biomedical Services; Professor Mike Emerson, National Heart and Lung Institute (NHLI)

For introducing new refinements in order to develop a rat model allowing application of multiple test devices within a single animal, reducing the number of animals needed for experiments.

Public Engagement Award

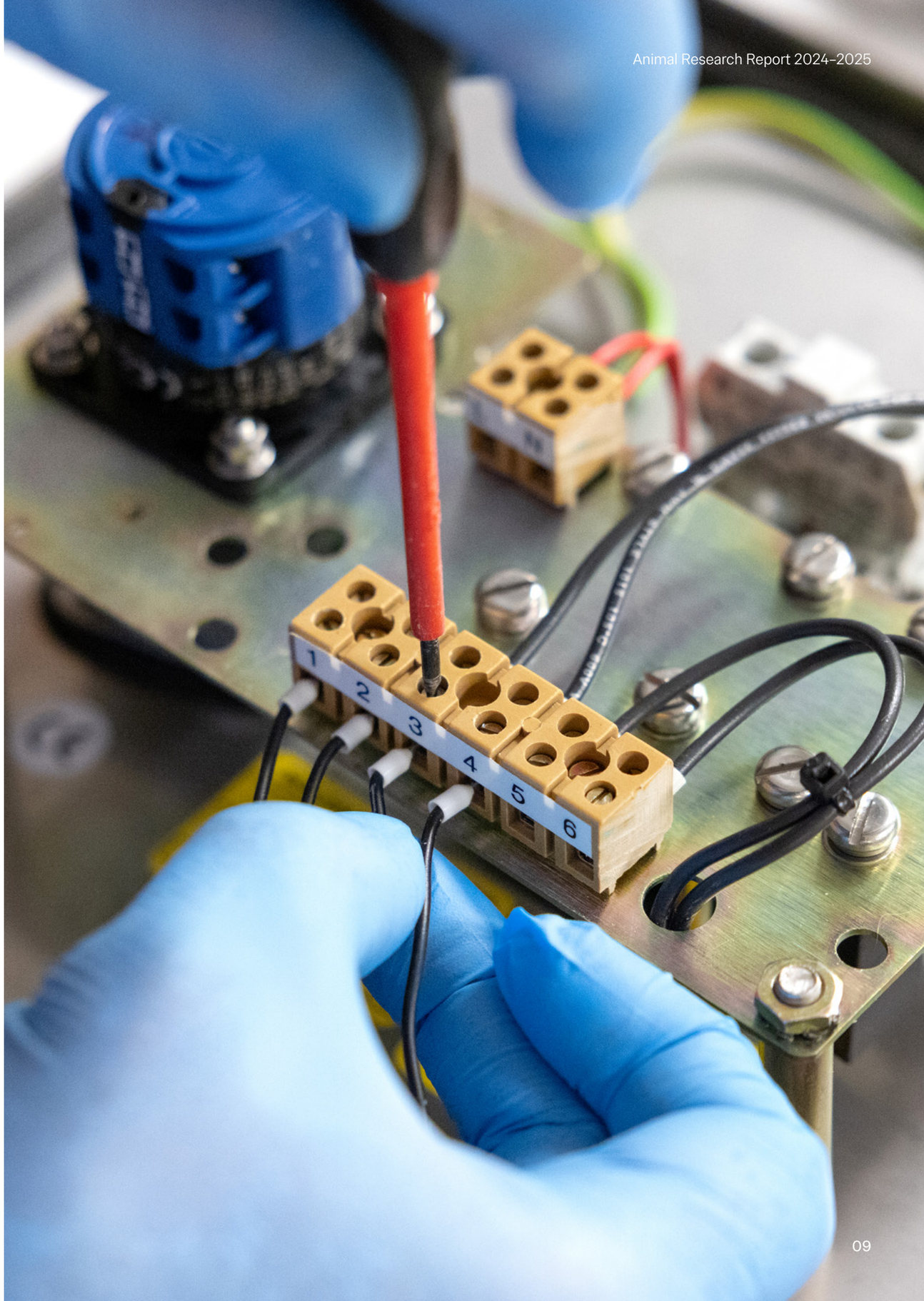
Stephanie Natario, Animal Technologist, Central Biomedical Services; Chiara Pojani, PhD Student, MRC Laboratory of Medical Sciences; Dr Elaine Irvine, Senior Investigator Scientist, MRC Laboratory of Medical Sciences; Anna Napolitano, 3Rs and Communications Programme Manager, Central Biomedical Services

For communicating with a wide audience about the use of animals in research via social media channels.

Top left: Maike Haensel, winner of the Application of the 3Rs, researchers award.

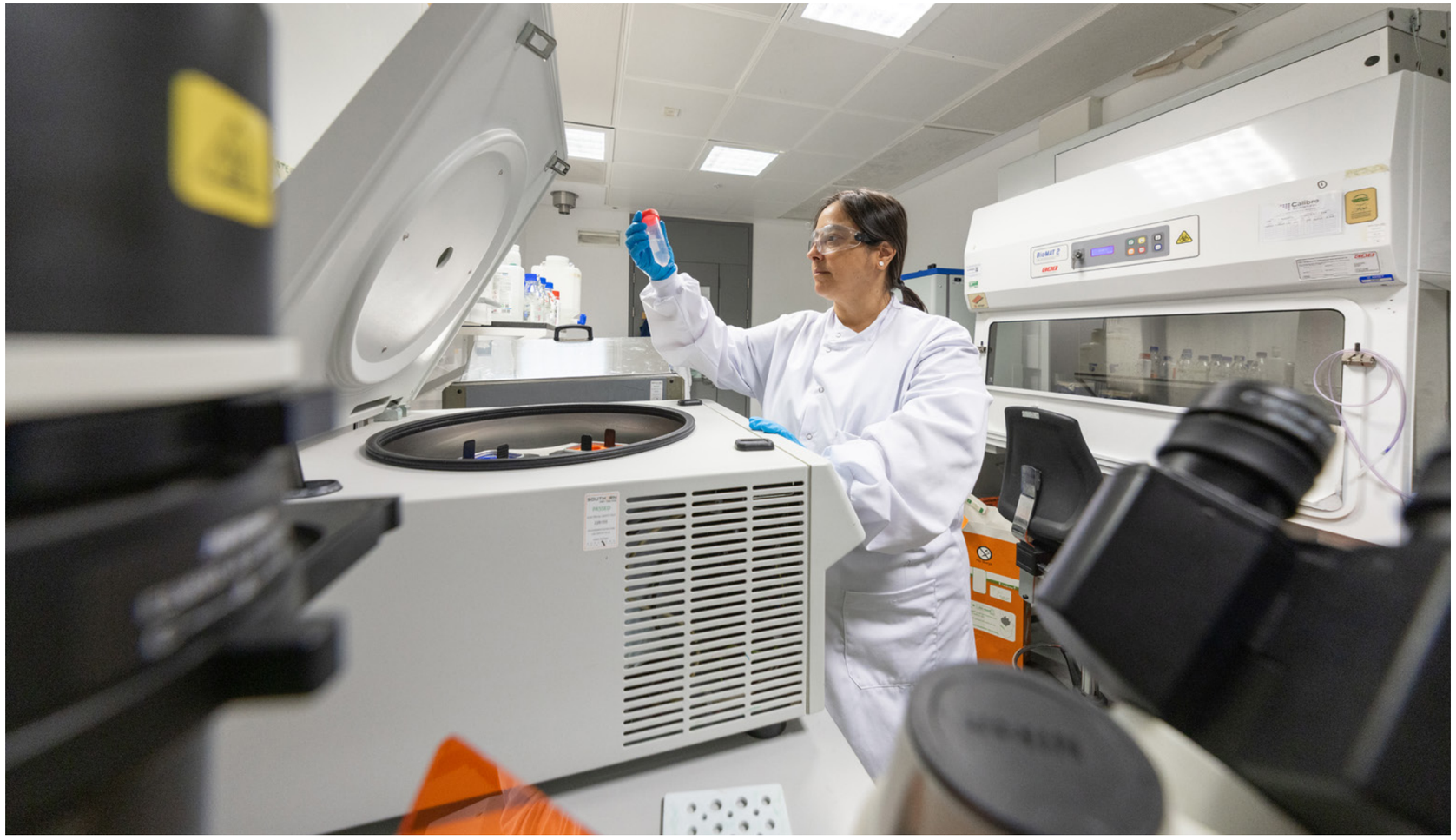
Left: A mouse in an Imperial animal research facility

Right: The robotic cage washing facility at the Hammersmith Animal Research Facilities.



Somewhere in the complex system of biochemical interactions that balance the body's blood sugar levels, there may be a key to treating conditions such as diabetes and obesity. To find that key, Professor Alejandra Tomas and her colleagues in the Department of Metabolism, Digestion and Reproduction are unpacking the system at the cellular level, while never forgetting that it is the whole body that matters.

Searching for the key to diabetes



> To control blood glucose levels you have an interplay between the brain, the pancreas, the liver and the adipose tissues, and many other organs," Professor Tomas says. "It is a homeostatic mechanism and by definition that is always complex."

Top: Professor Alejandra Tomas, Professor of Cell Biology and Head of Section of Cell Biology and Functional Genomics.

It is a complexity that brings together researchers from many different disciplines. In a recent Wellcome Trust Discovery Grant project, for example, Professor Tomas is joined by five colleagues from Imperial, each working in a different area, plus an external collaborator at the University of Oxford. The project will examine a particular class of membrane receptors known to play an important role in a range of metabolic diseases.

"We have discovered a significant interaction between these receptors and lipids, in particular, with cholesterol," Professor Tomas explains. "And we are hoping to exploit this to create new compounds that can regulate receptor function and potentially be developed into new drug therapies for obesity, type 2 diabetes and metabolic-associated fatty liver disease."

Collaborative research

Dr Tomas and her group focus on the cell biology involved. “We are looking at the cell behaviour of receptors, protein-protein interactions and the signalling pathways that are engaged,” she says.

This work is complemented by colleagues who specialise in molecular dynamics simulations. “These are computational approaches that model receptor shape and ask how other molecules fit or bind to the receptor and change its shape,” Professor Tomas says. “We also collaborate with structural biologists to resolve the structure of these receptors in different conformations, for example, with different mutations or when they interact with different molecules or lipids.”

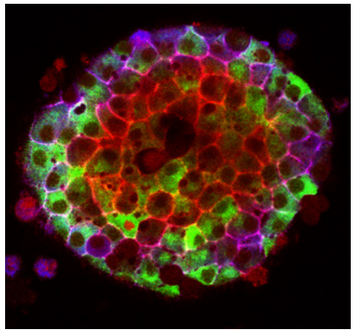
Meanwhile, work with geneticists digs into the DNA variations behind these receptors. “We have panels of variants that are present in the population, and we collaborate with geneticists who are doing population analysis or genome-wide associations to try and link these changes in the receptor with effects in population health.”

For example, are there mutations that are associated with losses or gains in metabolic function, or a predisposition to develop diabetes or obesity?

Then, together with pharmacologists, they look for new ways to direct the metabolic system. “There are drugs on the market already that target these receptors, so we are either testing modified versions or improving those drugs to modulate the way receptors act in a more beneficial way,” Professor Tomas says.

One way these collaborations emerge is through the Membrane Receptor Network of Excellence at Imperial, which Professor Tomas co-directs. “Through that network we have a lot of opportunity to interact with colleagues looking at receptors from many different angles. That can go from basic research, all the way to translation and drug discovery.”

Professor Tomas is also a director of the Diabetes Network of Excellence, which brings together a different community of researchers. “Diabetes is a very wide and complex field, and you can have different approaches, from basic cell biology or genetics to a more clinical, endocrinology approach. Then there are people working on engineering, such as new ways of monitoring diabetes patients, or delivering drugs in a more sophisticated manner.”



Light microscopy image of an animal cell

> “Diabetes is a very wide and complex field, and you can have different approaches, from basic cell biology or genetics to a more clinical, endocrinology approach.”

Right: Dr Tomas and colleagues are working to unpack the complex system of biochemical interactions that balance the body's blood sugar levels

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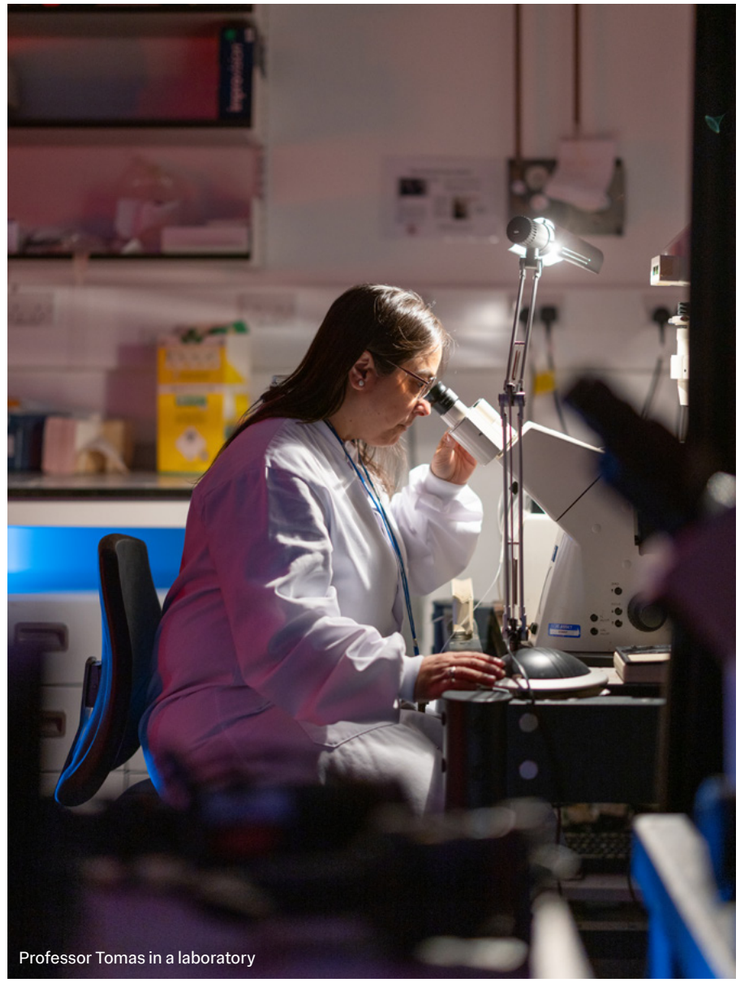
Animal models and beyond

The complexity of the system Professor Tomas is studying, and the range of organs involved, means that, at a certain point, studies involving animals are essential. “We cannot model the metabolic system completely, although we try our best,” says Professor Tomas. “We are working towards using fewer animals, but ultimately sometimes we do need them.” For example, transgenic mouse models may be created to mimic conditions such as obesity in humans, or to present specific variations in receptor structure or function.

Some of the most valuable models involve ‘humanised’ mice. “Instead of expressing the mouse receptors, these animals have been engineered so that they express the human version of the receptor,” she explains. “This is important because the drugs that we use are developed to treat humans and they don’t always engage with the mouse version of the receptor in the same way. Having a humanised background ensures the drugs will act in the same way once they are given to patients.” Working with cell cultures makes it possible to reduce the number of animals involved. “We use cell lines and primary tissue from humans where, for example, we have human donors for pancreatic islets. But mainly we are moving to research on stem cell-derived organoids,” Professor Tomas says.

Stem cells are undeveloped cells that can be grown in a controlled way so that they develop into a range of specialised cells. Combined, they can produce a cell culture that approaches the function of a specific tissue, or even an organ. And when the stem cells come from human donors, the organoids produced give results that are much more relevant than studies on animal cells.



Professor Tomas in a laboratory

Working with the MRC Laboratory of Medical Sciences, Professor Tomas and her colleagues have done this with adipocytes, cells that specialise in fat storage, and with hepatocytes, the specialised cells of the liver. The next step is to develop islet organoids, replicating the clusters of cells from the pancreas that produce insulin.

In future, she would also like to develop a more engineered, organ-on-a-chip approach. This involves combining several types of cultured cell in a structure that helps them interact as they would in a specific tissue or organ. The difficulty, again, is to capture all the other factors that apply in the body.

“It’s a very complex system of hormones and other signals, so you can imagine that it is very challenging to reconstruct something that mimics reality or approaches the real thing enough that we can test our theories.”

If successful, this approach will reduce the number of animals used but not reduce it to zero. “You need to do the research in both, and one kind of research feeds the other,” says Professor Tomas. “Maybe you have a hypothesis that was born from a mouse model, but now you can test it with human cells in vitro.” ■

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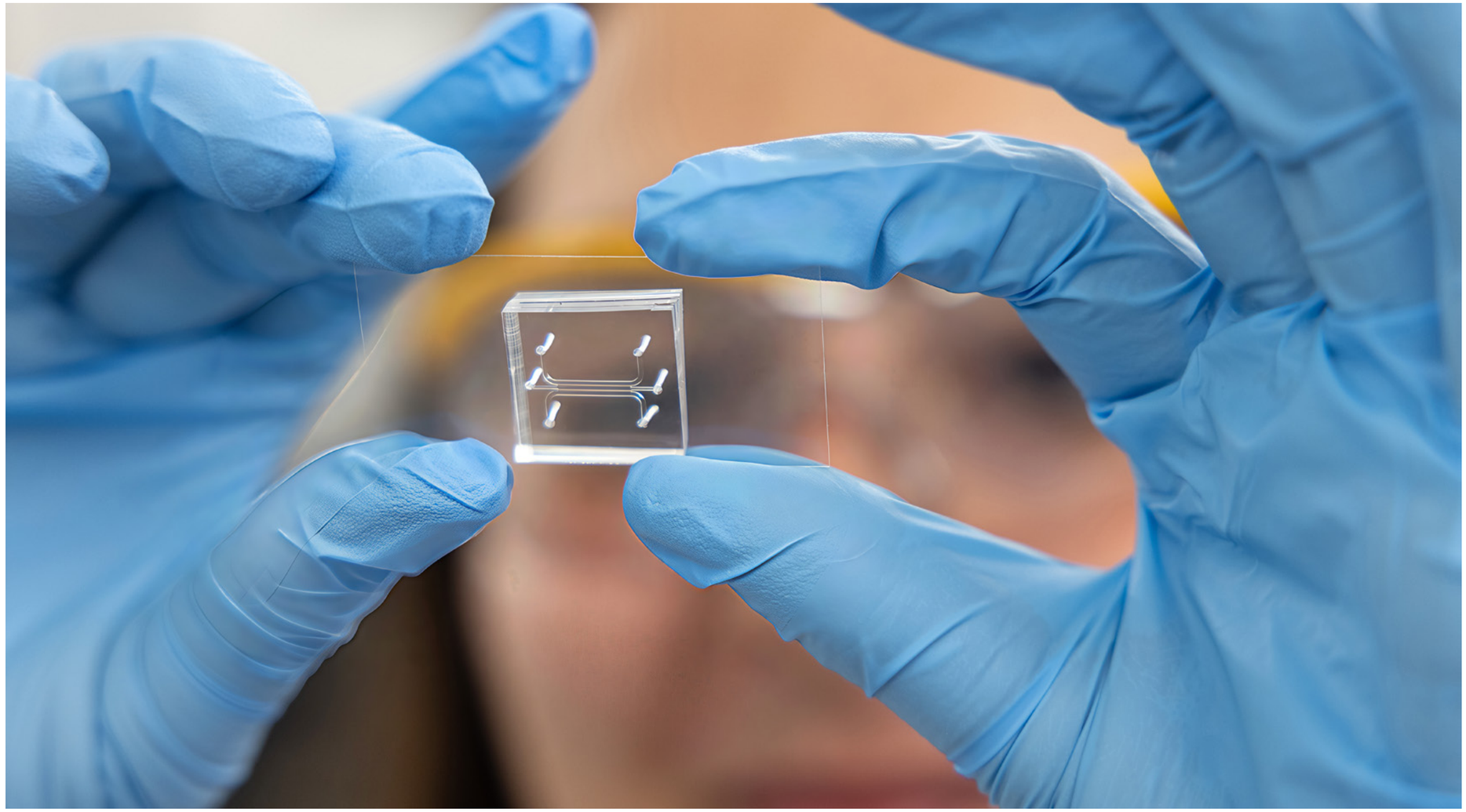


Left: Close up of an organ-on-chip device.

Below: Professor Darryl Overby, Professor of Mechanobiology and Dr Elizabeth Wheeler, Research Postgraduate.

Organ-on-chip devices reduce animal research

Experimenting on cells grown in the lab is a valuable technique in medical research, which can reduce the use of animals and, in some cases, replace them. But it also has limitations. One is that cells don't always behave the same way when grown in culture as they do in the body. Sometimes they even start to lose their identities.

Engineers and medical scientists are collaborating to address this problem, creating devices that allow cells to grow in environments that replicate some of the conditions found in living tissues and organs.

Micro-scale cell monitoring

This often involves building micro-scale channels and chambers in blocks of polymer that replicate the microarchitecture of tissues and organs. This allows different kinds of cells to be grown side by side, in such a way that they 'remember' their role in the body. These microfluidic devices, known as 'organs-on-a-chip', allow researchers to use sensors or microscopes to monitor the behaviour of cells and how they react to each other, something that is very challenging in a living animal and may be lost in conventional cell culture.

"It means you can get up close and personal with the very interactions that you care about," says Professor Darryl Overby of the Department of Bioengineering, who leads Imperial's Organ-on-Chip Network of Excellence.

This network was created to bring together engineers able to build these models, with medical scientists who have research questions they can help answer.

"The cells lining blood vessels, for example, are incredibly important in a host of diseases, such as cardiovascular disease, stroke and atherosclerosis," he explains. "And these cells are very much attuned to their physical environment, such as the shear stress caused by the flow of blood over their surface. You don't necessarily have those features in a two-dimensional cell culture."

In an organ-on-chip, however, these mechanical forces can be recreated and applied to multiple different cell types growing next to one another. "You can build what is effectively a model of an arterial wall and begin to ask questions that are very important in disease about how the cells communicate with each other, and how that becomes disrupted under different conditions."

The network is meant to help with the technical development of these devices, but also to spur some collaborative projects. This has happened in Professor Overby's group, with projects looking at pulmonary airways, ovarian cancer and glaucoma.

Sometimes the most important piece of information that can be shared through the network is that a problem has already been solved. "Organ-on-chip approaches are often technically demanding, requiring microfabrication and creating fluidic connections on the micro-scale," he explains. "Difficulties just getting the setup to work are enough to put some folks off. Drawing on the know-how within the network helps overcome this barrier and increase uptake, so that the wider community can benefit from these promising models."

Above: Professor Darryl Overby of the Department of Bioengineering, leads Imperial's Organ-on-Chip Network of Excellence.

> "Sometimes the most important piece of information that can be shared through the network is that a problem has already been solved."

A model for glaucoma

These conversations also extend beyond Imperial. For example, when bioengineer Dr Elizabeth Wheeler was developing an organ-on-chip model to study glaucoma, she learned from one of the leaders in the field: Professor Roger Kamm at the Massachusetts Institute of Technology (MIT), whose group makes a wide range of organ-on-chip models.

Spending six weeks at MIT during her PhD helped Dr Wheeler resolve several technical problems that were holding back her model. "This sharing of expertise enabled me to finish constructing the model, after which I was able to begin experimenting upon it," she says.

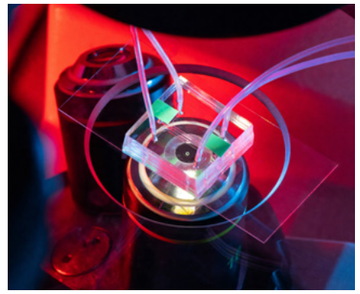
The aim of her project, funded by the charity Fight for Sight, is to explore the mechanism behind primary open-angle glaucoma, in which the optic nerve is damaged by raised pressure inside the eye. This pressure rise is associated with increased resistance in the trabecular outflow pathway, a structure that helps fluid exit the eye through a narrow channel called Schlemm's canal. But little is known about how this resistance is regulated and why the resistance increases in glaucoma to cause elevated eye pressure.

"Because the function of a healthy trabecular outflow pathway is to control fluid flow, it is useful to examine the tissue under different flow conditions, using a microscope," explains Dr Wheeler.

The model consists of a microfluidic device containing two kinds of cells – trabecular meshwork cells and Schlemm's canal endothelial cells – collected from human organ donors. The endothelial cells are spread on a collagen hydrogel containing the meshwork cells, allowing them to form contacts or send signals to one another across the surface.

"Once we have that basic tissue structure in place, we are able to apply flow that mimics the fluid forces these cells would experience within the eye," says Dr Wheeler. The question then is how the cells interact to change resistance, and what opportunities exist to intervene in this process. "Lowering eye pressure is the only way to save vision in glaucoma, so understanding the resistance-generating mechanism is key to developing more effective therapies."

Below: Bioengineer Dr Elizabeth Wheeler, who is developing an organ-on-chip model to study glaucoma.



Collaboration for commercialisation

A further collaboration is essential to this project. Professor Daniel Stamer at Duke University is an authority on the trabecular outflow pathway and one of the few people in the world able to isolate Schlemm's canal endothelial cells. "He kindly provides the human cells that we put into the device," says Dr Wheeler.

Partnership will also be important when the time comes to commercialise the model. "Our long-term goal is to build a high-throughput screening platform for drugs in glaucoma," Professor Overby says. The work needed to achieve this is under discussion in a consortium that brings together Imperial, Duke University, the Georgia Institute of Technology, Columbia University and the Jackson Laboratory.

Before this happens, further model development is needed. In particular, to persuade the endothelial cells to make the same kind of tight junctions they form in Schlemm's canal in the eye. But solving this problem will also be informative.

"By designing the micro-environment, and by thinking about the features you want to engineer into the chip, you are learning about the biological system," says Professor Overby. "It's thinking like an engineer and applying what you learn to a disease you are trying to understand, and that's a beautiful thing." ■

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Community collaboration for training

Gaining the skills needed to work with animals, and ensuring those skills are current, is a collaborative effort at Imperial. Training is organised by a small team within Central Biomedical Services, but a lot of the expertise comes from the academic community itself.

This page and opposite: Amy Wathen, Named Training and Competency Officer (NTCO) with a colleague at an Imperial animal research facility.

Training is for everyone who works with animals at Imperial, regardless of their seniority. “It applies equally to an entry-level animal care technician with GCSEs, up to a researcher who knows more about a particular disease than anyone else in the world,” says Amy Wathen, Imperial’s Named Training and Competency Officer and leader of the Central Biomedical Services (CBS) team.

People working with animals for the first time begin with the rules and regulations that cover animal care and their use, from legislation to individual project licences. Training then goes on to cover practical skills, such as how to handle the animals, how to monitor their health and wellbeing, and how to carry out basic procedures such as injections.

When it comes to more involved procedures and surgery, the veterinary team gets involved. And for specialist procedures, the expertise often comes from other researchers at Imperial and beyond.

“Ideally, we name a designated trainer within each research team working with animals. This is someone who has the experience and is deemed competent, and that person will then train the others in more specialist techniques,” says Ms Wathen. “These are fantastic experts that we have at Imperial, and we are very grateful that many of them are willing to help others.”

Network of expertise

CBS maintains a database of the training people have undergone and the skills they have developed. Even when they have moved on to work at other institutions, it is not unusual for them to be asked to share their experience.

“We have a huge team of designated academic trainers who could spend 20 to 40 hours a month training other people for free. It’s really impressive what these people do,” Ms Wathen says. Training others often helps researchers build experience so they are better placed to write their own project license applications. But the training is also its own reward.

“Academics are not told very often that they are doing a good job, and when you become a trainer that is a way of getting positive feedback,” she says. “An important part of our role is to champion our trainers and cheer them on. This is also why we like to nominate people for the Provost’s Awards.”

The Provost’s Awards for Excellence in Animal Research acknowledge staff who have made advances in the 3Rs (replacement, reduction and refinement), shown openness or demonstrated a long-term commitment to improving research practice. The training itself also follows the 3Rs and, wherever possible, props or cadavers are used rather than live animals.

> An important part of our role is to champion our trainers and cheer them on.”

Above: Amy Wathen, NCTO, and a colleague in an animal research facility.

Regular procedure reviews

The CBS training team carries out a regular review of procedures that are ongoing at Imperial, to make sure they align with changes in the regulations and developments in good practice. These reviews take place at least every three years, or more often if there are major changes, or if the researchers request a check-up.

“We like to be quite approachable, and sometimes people ask us to come and observe, even though they have been passed as competent,” says Ms Wathen. “They want some support from time to time. In those situations, we are able to give advice on improvements or remind them of what they need to do.”

Ms Wathen and her colleagues regularly attend training courses, workshops and conferences themselves to keep up with changes in the regulations and learn about best practice. Another way she stays up to date is by continuing to do hands-on training herself, which is relatively unusual for someone in a coordinating role.

“Keeping in touch and doing the procedures yourself means that you know whether or not a refinement will work,” she says. “It also means I understand the little things, like how cages have changed and how that may lead to handling difficulties.”

The overall aim of the training at Imperial is to have science and welfare working together in the best way possible, but always with an eye to replacement. “In common with other people who work with animals in science, our goal is to be out of a job,” Ms Wathen says. “We would love to see the use of animals replaced. Until we get there, our top priority is making sure the animals receive the best possible care.” ■

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A mouse in an Imperial animal research facility.

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Q&A

Digging into the detail of diabetes

Dr Aida Martinez-Sanchez from the Department of Metabolism, Digestion and Reproduction.

Dr Aida Martinez-Sanchez from the Department of Metabolism, Digestion and Reproduction works on aspects of cell biology that play a crucial role in the development and treatment of diabetes. Her most recent work is exploring how to improve the performance of transplants made from stem cells that could ultimately provide a cure.

The focus of your work is diabetes. What exactly are you looking at?
Inside the pancreas, groups of cells called islets of Langerhans contain beta cells that produce insulin. But these beta cells are not identical. They differ in their biochemistry and function. We think that some of these differences are key to optimal function, while others may influence how quickly beta cells are lost in type 1 diabetes, as certain cells could be more vulnerable to immune attack.

You are particularly interested in microRNAs. What role do they play?
MicroRNAs are tiny molecules in our cells that switch off genes and are very important in the creation and functioning of beta cells.
Our idea is that microRNA content and action may differ within beta cell subtypes and that this is important for their proper function. Understanding these differences will help us identify opportunities to decelerate beta cell destruction and improve the production of islets for transplantation.

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Do you use animals in this project?
This project mainly involves islets from human donors who have died, or islets generated in the lab from human stem cells. But we also take advantage of a mouse model that we created for another project. We know that the beta cells in these mice have the same differences that we see in humans, and we use their islets to optimise and validate our technical approaches with human cells. This can be done without generating additional mouse models, keeping the use of animals to a minimum.

Does this work have other implications for the 3Rs?
Diabetes happens in the whole body and involves interactions between several organs, so eventually we need to examine living, whole-body systems in order to understand the disease. That will be the same for future follow-ups of this project before our findings reach the clinic. At the moment, we hope to identify some microRNAs that are important for the differences between beta cells and manipulate them to make ‘better’ islets. But the next step would be to place these improved islets in diabetic mice to see whether they can cure them. But because we are working now with human cells, whatever we test later in mice will have a much higher chance of being relevant to humans and translatable into treatments. That kind of refinement keeps the number of animals involved to a minimum.

Your research in this area is funded by the Type 1 Diabetes Grand Challenge. How is collaboration important for this project?
I’ve worked previously on type 2 diabetes but never on type 1 diabetes, and they are fundamentally different conditions. So, I needed to work with someone who understood this aspect very well. That is Dr Teresa Rodriguez-Calvo at the Helmholtz Zentrum Munich.

What expertise does she bring to the project?
She does a lot of work imaging the pancreases of people with and without type 1 diabetes, trying to identify the beta cells and whether they are being attacked by immune cells. She has a protocol and microscope in her lab that is specifically configured for this work, as well as all the conceptual and technical expertise required to use it. We have a similar instrument at Imperial, and the idea is that one of our team will go to Munich, learn the technique, and bring it back to the UK. So, alongside the research there will be an exchange of skills.

Who else are you working with?
The beta cells we are looking at all have the same genes, but the microRNAs and messengers they produce are different, so you need sophisticated computational tools to analyse them. For that aspect of the project we are working with Dr Prashant Srivastava, a specialist in bioinformatics and medical statistics at the National Heart and Lung Institute here at Imperial.
So, this project would not exist without collaboration. ■

Community news and achievements

Robert Floyd, Director of CBS, and Dr Victoria Male, Senior Lecturer in Reproductive Immunology, at a forum on animal research.

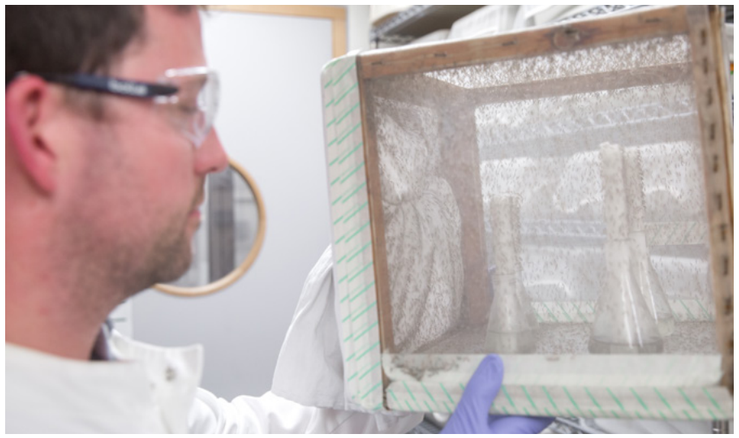
New communications roadmap

Ten years after Imperial's first Action Plan for World-Class Animal Research, Central Biomedical Services (CBS) developed a new roadmap for the future, outlining Imperial's commitment towards communication and education.

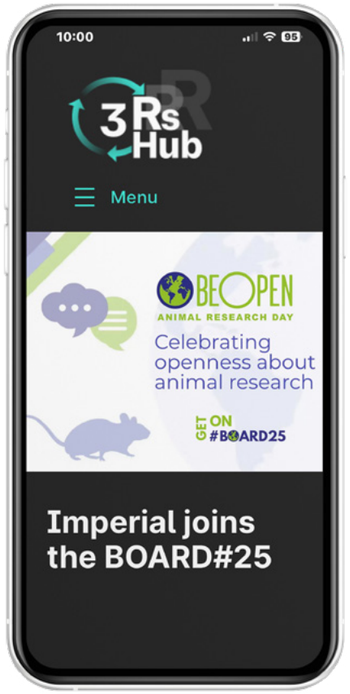
In 2024, with the support of Research England's Enhancing Research Culture Framework, the 3Rs Advisory Group developed a new website, the front-facing aspect of the 3Rs Hub. The website contains a wide range of materials and resources that inspire the application of the 3Rs in everyday work.

A roster of fixed content and other regularly changing theme-related content stimulates critical thinking and discussions around 3Rs topics. The website also serves as a point of reference for the 3Rs Hub educational programme, offering ad-hoc e-learning and video lectures tailored to different interest groups.

In September 2024, to promote the website and its content, the 3Rs Hub hosted a public talk about how animal research is evolving at Imperial and nationwide, in collaboration with the Science Communication Unit. This Friday Forum enabled the hub to reach a broader and more novel audience.



Mosquitoes in the Imperial insectary are studied for research into the malaria parasite lifecycle.



Imperial named a Leader in Openness

In May 2025, the university was confirmed, for the third time, as a Leader in Openness by the not-for-profit organisation Understanding Animal Research.

Leaders in Openness are signatories to the Concordat on Openness in Animal Research. They are recognised for committing considerable resources and energy to follow best practices, embedding openness within their organisations, and making the aims of the Concordat a reality. The assessment process involves a public panel, a peer review process and a public review.

CBS joined the European Animal Research Association for their annual Be Open About Animal Research Day (BOARD#25).

CBS has been making great efforts to engage with the public. In June 2025, CBS joined the European Animal Research Association (EARA) for their annual Be Open About Animal Research Day (BOARD#25). This global, 24-hour social media campaign celebrates openness in the communication of animal research by biomedical institutions. For the campaign, the department produced a video interview with Dr David Peeler. He explained why mice are fundamental to his vaccine research and how he has implemented the 3Rs in his study, with the support of the 3Rs Hub. They also produced a video showcasing how CBS staff care for zebrafish in Imperial facilities.

In 2025, CBS also joined the MRC Laboratory of Medical Sciences gene home exhibition as part of the Great Exhibition Road Festival. They showcased how animal models play a vital role in genetic research for a wider audience.

Shining a spotlight on our community

In 2025, Imperial researchers working on asthma partnered with the Women and Asthma initiatives and Craftspace to engage the public with research in the asthma field through craft and stories, including explaining the use of animal models.

CBS staff working with animal models have also featured regularly in a series of staff profiles called Imperial People. Promoting all levels of staff, from facility managers to support workers, Imperial People highlights how every job is equally important in maintaining the highest standard of care and supporting scientific discoveries.

Christine Larbie, Support Technician in CBS, was profiled in the Imperial People series. She joined Imperial in 1979 when she was 21 years old.

Stay up to date

To keep up to date on animal research at Imperial, including the latest news on research projects and discoveries, awards and resources for researchers and technicians, visit:

The Concordat on Openness in Animal Research

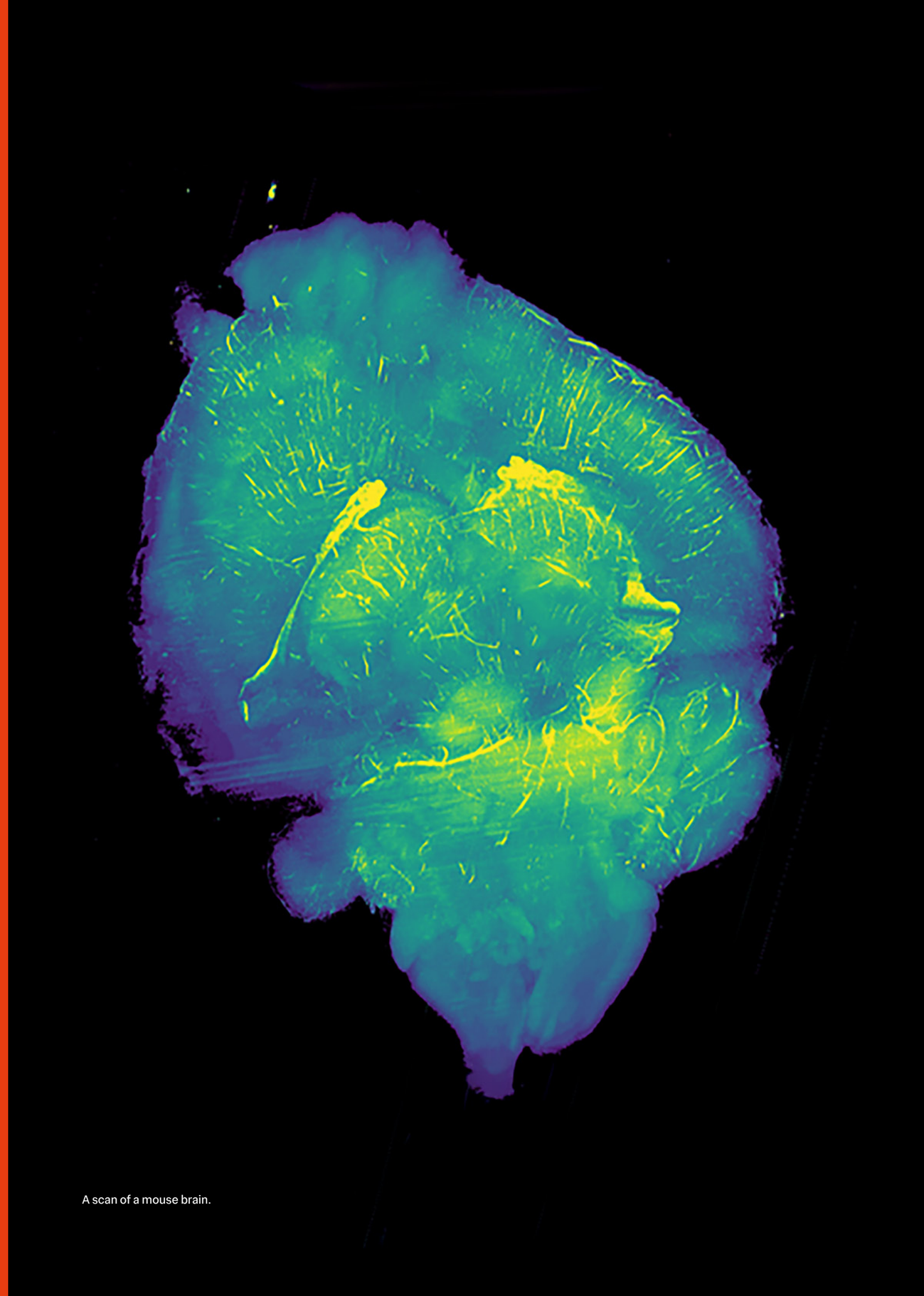
By signing the Concordat on Openness on Animal Research, Imperial has made the following commitments:

01 We will be clear about when, how and why we use animals in research

02 We will enhance our communications with the media and the public about our research using animals

03 We will be proactive in providing opportunities for the public to find out about research using animals

04 We will report on progress annually and share our experiences



A scan of a mouse brain.

www.imperial.ac.uk/animal-research