



Biotechnology and
Biological Sciences
Research Council

BBSRC International: UK bioscience in a global context



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BBSRC's International Mission

“We are committed to promoting international collaborations for bioscience research in universities and research institutes throughout the UK.”

International partnerships are essential for strengthening and maintaining the vibrancy of the UK bioscience research base.

Through international partnerships, researchers are able to collaborate with the best scientists overseas, work across nations to tackle global challenges and ensure that there is impact from our bioscience research, skills and innovation for public good.

We work with a range of funding agencies and organisations, located both in the UK and overseas, to ensure that the UK is a partner of choice for bioscience research.

For every **£1** of BBSRC investment, overseas partner contributed **£1.63** through cash and in-kind contributions (FY 2023-24).

130+

Countries linked to BBSRC via research grants, networks, initiatives, and infrastructure programmes

£450m

Invested in international collaborations since 2012

1343

Number of international grants awarded since 2012

Empowering bottom-up research

BBSRC empowers UK bioscientists to build international partnerships from the bottom-up. We enable researcher-led global collaborations which advance bioscience discovery and innovation, through our diverse international funding partnership approaches.

International schemes

Through BBSRC's international schemes, we offer a range of long-term opportunities to promote collaborative research activities with international partners, to jointly work in areas relevant to BBSRC's strategy, as well as provide access to facilities not available in the UK. Current opportunities include:

- International Institutional Awards – A group of UK research organisations have been awarded international block grants, for the period 2024-2026
- International Travel Award Scheme (ITAS) – provides funding to support short-term visits for UK bioscientists to initiate overseas collaboration

Lead agency agreements

BBSRC's lead agency agreements aim to reduce some of the barriers to working internationally, by providing a framework for joint peer review of proposals. One organisation takes the lead in managing the review process and both agencies accept the outcome of the review process, funding the costs of the successful applications in their respective countries. Recent lead agency agreements have been with:

- The National Science Foundation (NSF) in the USA
- The Deutsche Forschungsgemeinschaft (DFG) in Germany
- The Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP) in Brazil
- Fonds National de la Recherche (FNR) in Luxembourg

International schemes:
Between 2011-2024

565 awards made

£22m invested

Lead agency agreements:
Between 2012-2024

136 awards made

£64m invested

BBSRC international schemes range from short-term travel awards, which help scientists establish new contacts for their existing BBSRC-funded research, through to International Partnering Awards (IPAs), which support longer-term collaborations with overseas scientists.

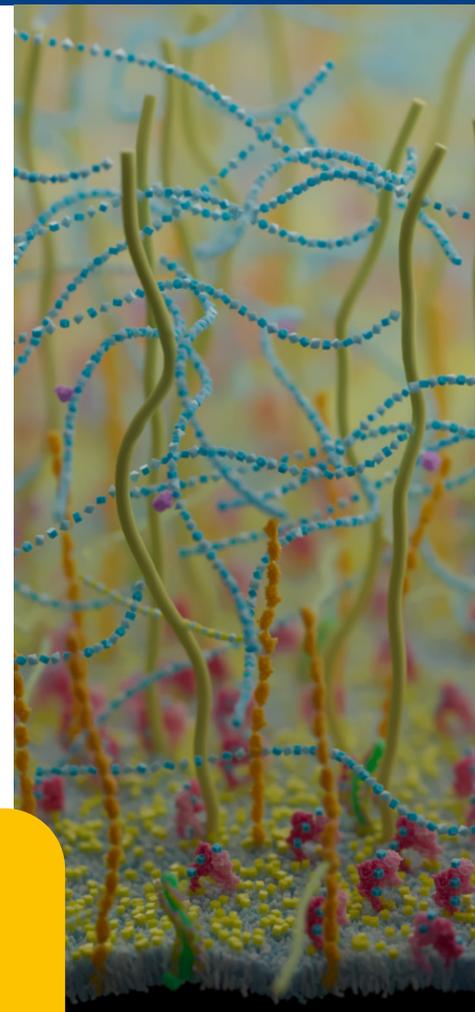
Emerging Tools to Define the Role of Glycocalyxes in Cell Trafficking at Endothelial Walls

Researchers from the University of Leeds and Université Grenoble Alpes utilised £30,102 of IPA funding awarded in 2022 to promote knowledge exchange in AI-based image analysis and cell surface model design to investigate the carbohydrate-rich layer lining our blood vessels, which has a key role in coordinating our immune response.

The exchange visits by PhD students, Postdoctoral Research Associates, and senior researchers laid the foundation for the participants to secure further BBSRC funding. A £742,540 responsive mode grant was awarded in 2023, to develop novel tools to study glycan selectivity and specificity in artificial

blood vessels on a chip. Such selective probes can be a powerful research tool but also have potential medical applications, as they could be used to distinguish cancer from healthy cells. The collaboration with researchers from Grenoble has further developed and successfully secured follow-on funding from international sources including the French National Research Agency.

■ **IPA.** University of Leeds, University Grenoble Alpes, Centre de Recherches sur les Macromolécules Végétales, Laboratoire Interdisciplinaire de Physique.



IPAs: Between 2011-2024

348 projects funded

£11.5m invested

International Institutional Awards (IIA) were piloted by BBSRC in 2024, responding to demand for greater flexibility from the UK bioscience community. Budget was allocated directly to selected research organisations, giving them the flexibility and autonomy to strengthen and initiate international partnerships around the world.

Novel vaccine delivery in pigs

Researchers from The Pirbright Institute and the German Friedrich-Loeffler-Institute have collaborated to develop novel approaches to deliver vaccines in pigs. The researchers used live attenuated pseudorabies virus to deliver heterologous epitopes, which are antibody targets derived from a different organism. This work is therefore exploring a delivery method that could be adapted for a variety of viruses relevant to pigs.

Early career researchers were paramount to the construction of the novel vaccines, displaying neutralising antibody targets from foot-and-mouth disease virus, porcine reproductive virus, and respiratory syndrome virus. Live

attenuated pseudorabies virus strains have shown promise as viral vectors and vaccine trials will be key to further characterise the triggered immune response.

■ **IIA.** The Pirbright Institute, Friedrich-Loeffler-Institute.

IIAs: In 2024

24 awards made

£8m invested

The Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP) is one of the major funding agencies for scientific research in the State of São Paulo, Brazil. BBSRC and FAPESP have collaborated on joint funding opportunities since 2009, namely through BBSRC-FAPESP Pump-Primings Awards (FAPPAs) and the BBSRC-FAPESP lead agency agreement.

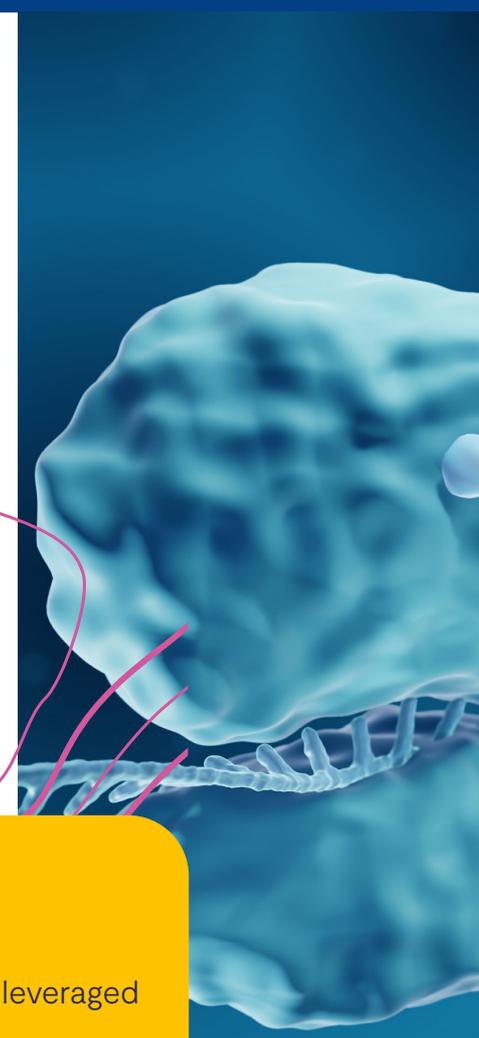
Valorisation of biomass for sustainable bio-synthesis

This FAPPA pump-priming award enabled researchers from the University of Manchester to form a UK-Brazil partnership with researchers from the Bioethanol Science and Technology Centre (CTBE) and industry partner Natura Brasil. The award funded several visits and researcher exchanges between the project partners, developing a research partnership aimed at optimising the biosynthetic pathway for bagasse valorisation; fibrous biowaste that remains after crushing sugarcane. The exchanges and resulting pilot data provided the foundation for the researchers to secure a further £2,082,439, awarded through

the BBSRC-FAPESP joint programme in advanced biofuels which was launched in 2016-17.



■ **FAPPA.** University of Manchester, University College London, Bioethanol Science and Technology Centre (CTBE), Natura Brasil.



FAPPAs: Between 2012-2024

9 projects funded

£250k invested

£300k leveraged

The National Science Foundation (NSF) is an independent US federal agency that supports basic research. Through Lead Agency agreements, BBSRC and the NSF have had a strategic collaboration since 2013.

RiboViz: Understanding protein synthesis from ribosome profiling data

Translating genetic code into functional proteins, is a highly complex and tightly regulated process. Cells utilise molecular machines called ribosomes that read messenger RNA templates and translate them into proteins. This cellular process can be captured using a technique called ribosome profiling, however, analysis of the complex data is inherently difficult.

Researchers from the University of Edinburgh and the University of California, Berkeley, as well as Rutgers University in the United States developed the software suite RiboViz 2, a rigorous and reproducible open-source analysis

pipeline of ribosome profiling data. Tools like this will accelerate research into diseases linked to protein synthesis and enable rational design of synthetic genes. The team shared their research through workshops with attendees from academia and industry, published papers, open-source software, and by sharing best-practices in open-source bioinformatics software development.

■ **BBSRC-NSF/BIO.** University of Edinburgh, University of California, Berkeley, Rutgers University.

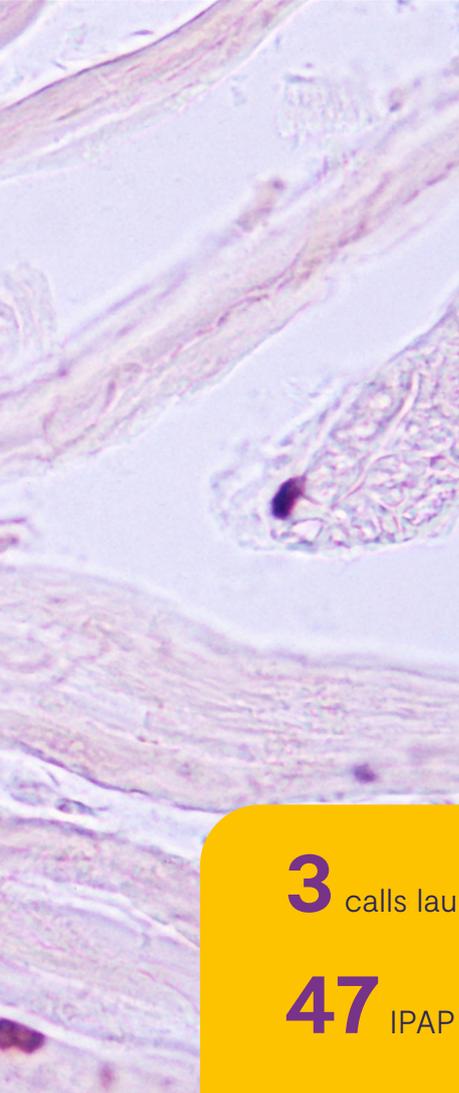
BBSRC-NSF/BIO LAA: Between 2014-2024

90 projects funded **£47m** invested **£58m** leveraged

Fostering strategic partnerships

Through strategic partnerships with international funding agencies and organisations, we ensure that the UK is the partner of choice for bioscience research. Our ambition and programmes deliver across three high-level and interconnected impacts: healthy people, animals and plants; sustainable agriculture and food systems; and a resilient bioeconomy.

The BBSRC International Partnering Award Plus (IPAP) scheme has provided pump priming funds for international partnership building, to enable and support research across strategically-relevant thematic areas.



Engineering synthetic neuromuscular junctions to drive the autonomous function of biohybrid robots

Synthetic cells emulate complex biological structures by aiming to replicate their behaviours. Further, when assembled in conjunction with living cells, synthetic cells may be used to control biological systems via the controlled release of chemicals through a defined interface.

Building on this concept, researchers from Imperial College London and the University of Tokyo have teamed up to engineer synthetic cell - muscle tissue interfaces to control muscle contraction. By combining expertise in engineering biology and biohybrid systems, respectively, the researchers aim to

develop biohybrid robots that utilise synthetic neuromuscular junctions to operate their muscle tissue. In addition to robotics, their research also has applications in tissue engineering, regenerative medicine, and as a biological model system.

■ **Japan IPAP on synthetic cells or genomes.** Imperial College London, University of Tokyo.

3 calls launched across 2022–2023

£10m invested

47 IPAP projects funded

7 countries

The International Science Partnerships Fund (ISPF) puts research and innovation at the heart of our international relationships, supporting UK researchers and innovators to work with peers around the world. It is a £337m Department for Science, Innovation and Technology (DSIT) led fund which launched in December 2022.

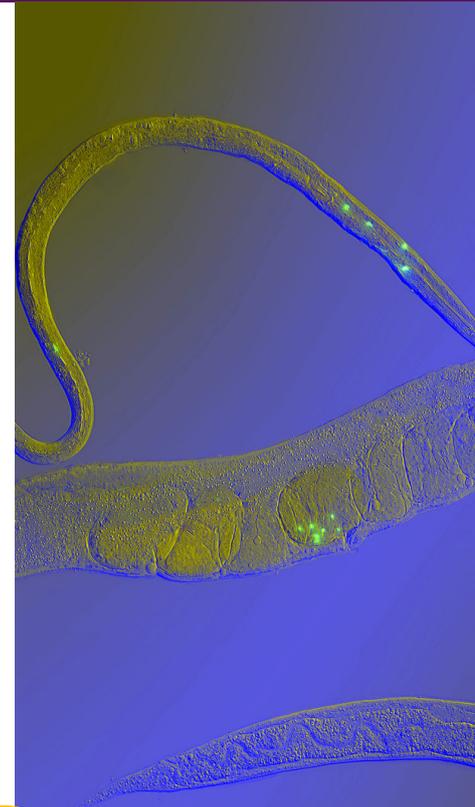
A *C. elegans* whole-brain digital twin

C. elegans is a tiny nematode worm but yet a powerful model organism which has been at the heart of scientific discovery for decades. It is also the first animal that had its genome sequenced, and its anatomy and neural circuitry mapped.

To understand the dynamics of the whole brain and its constituent neuronal circuits, researchers from the University of Leeds are using whole-brain imaging data to build the first digital twin of the *C. elegans* brain. A digital twin is a virtual representation of a physical system built using novel AI tools. If successful, a *C. elegans* digital twin would significantly

enhance our understanding of the *C. elegans* brain and thus the nervous systems of other animals.

■ **ISPF: AI for Bioscience.** University of Leeds, Massachusetts Institute of Technology



AI for Bioscience: In 2023

32 projects funded **£7.5m** invested

The Fund for International Collaboration (FIC) is a £160 million fund supporting international collaborations and was active between 2018–2022. The fund supports UKRI’s aim of promoting the UK as a world class destination, enabling UK researchers and innovators to collaborate with the best international partners across the world.

Engineering more sustainable and resilient crops

Nitrogen plays a key role in plant growth, which means that nitrogen depletion in the soil negatively impacts the growth and yield of crops. The agricultural industry therefore relies on nitrogen-containing fertilisers. However, these are energy intensive to produce and their use often leads to detrimental environmental impacts.

Researchers from the University of Cambridge and Earlham Institute in collaboration with the University of California, Davis identified how a group of genes regulate plants responses to nitrogen. Subsequently, the team has leveraged their research to secure follow-on funding: A \$283k USDA grant

to engineer these genes in tomatoes to improve nitrogen use efficiency, and a £1.5 million BBSRC grant to engineer root growth to maximise nutrient uptake.

■ **Breakthrough Technologies to Advance Crop Breeding.** Earlham Institute, University of Cambridge, University of York, John Innes Centre, University of California, Davis.

Breakthrough Technologies: In 2018

10 projects funded **£1.9m** invested

Maximising opportunities for multilateral partnerships

Maximising opportunities for multilateral partnerships through Horizon Europe and other global initiatives & infrastructures is key to sustaining and expanding global collaborative programmes that are central to advancing bioscience.

Strengthening ties with Europe through emerging opportunities and continuing to be a trusted partner is vital for the UK research and innovation environment and remains a BBSRC strategic objective. In September 2023, the UK reassociated to Horizon Europe, enabling UK researchers to access the world's largest collaborative research and innovation programme, with a €95.5Bn budget until 2027.

Spotlight: Horizon Guarantee

Between 2021 and 2023, UKRI guaranteed lifetime funding for successful Horizon Europe applications following the UK's exit from Horizon 2020.

88

projects within BBSRC remit guaranteed

£47m

UKRI funding

€556m

Horizon Europe funding leveraged

Networks of UK and European partners are core to research and innovation. They help solve the biggest challenges facing our world today and benefit the economy and society in the UK and around the world. BBSRC continues to support pan-European collaborations and encourages researchers and innovators in the UK and worldwide to continue to work together in establishing international consortia.

Creating a sustainable bio-based economy: Bio-plastics

A core principle of a bio-based economy is the creation of value-added products from sustainable and renewable biological resources, in particular 'waste' and by-products.

In an effort to find alternative sources for current petroleum-based plastics, researchers from the University of Warwick, the Centre for Biological Research in Spain, French National Institute of Agricultural Research, and industry collaborator Biome Bioplastics Ltd used synthetic biology approaches to engineer bacteria to more efficiently degrade lignin and convert it into the bio-plastic precursor pyridinedicarboxylic acid (PDCA). Lignin can be found in plant cell walls and thus be sustainably sourced from forest or agricultural waste.

Together with their industry partner, the researchers have applied their research to develop biodegradable tree shelters which aim to reduce the significant environmental impact that results from the use of non-biodegradable plastic shelters and guards.

■ **Horizon 2020 ERA-NET: ERA CoBioTech.** University of Warwick, Centre for Biological Research, French National Institute of Agricultural Research, University of Stuttgart, Biome Bioplastics Ltd, Nova-Institute GmbH.



2 calls in 2017 and 2019

14 projects funded

£5.8m invested

BBSRC plays a leading role in the coordination, development and delivery of international infrastructure programmes which provide cutting-edge facilities, resources and related services used by the scientific community to conduct world class research. BBSRC promotes access to overseas capabilities for our community by working with international initiatives such as:



ESFRI

The European Strategy Forum on Research Infrastructure supports a coherent and strategy-led approach to policy-making on research infrastructures in Europe, and facilitates multilateral initiatives leading to the better use and development of research infrastructures, at EU and international level.

- **ELIXIR:** European life science infrastructure for biological information
- **Euro-Biolmaging:** open access biological and biomedical imaging technologies, training and data
- **EMPHASIS:** The European Infrastructure for Multi-scale Plant Phenomics and Simulation



BBSRC plays a leading role in key international research initiatives, representing the UK in networks and policy forums to contribute to international strategy and align national aims for joint benefits.



Wheat Initiative

The Wheat Initiative's mission is to develop a global strategic research agenda and support its implementation through coordinated actions, knowledge and resource sharing, and efficient investment. The Wheat Initiative brings together 15 countries, two international research organisations and nine private companies.



Human Frontier Science Program

HFSP supports novel, innovative and interdisciplinary basic research focused on the complex mechanisms of living organisms, by awarding research grants and fellowships. BBSRC and the MRC pay the UK contribution to the HFSP's budget. Applications for HFSP Career Development Awards close in the autumn each year.



The European Molecular Biology Organisation

EMBO promotes excellence in life science, by offering a range of courses and workshops for high quality training in state-of-the-art techniques, as well as the Young Investigator Programme, Travel Grants and a Women in Science Award. BBSRC-funded scientists can benefit from EMBO programmes by applying directly to EMBO.



The International Wheat Yield Partnership (IWYP)

IWYP brings together funding from public and private international research organisations. This unique collaboration aligns with BBSRC's sustainable agriculture and food strategic theme.





Tackling global challenges

Bioscience offers significant opportunities to provide solutions to challenges facing society and industries of the future. Through either, partnerships with research intensive countries or the delivery of Official Development Assistance (ODA) funding, BBSRC supports the development of the ideas, skills and capabilities needed to tackle some of the biggest challenges we face as a global society. Most recently, this funding has been awarded through the International Science Partnerships Fund (ISPF).



The Global AMR Innovation Fund (GAMRIF) supported early-stage antimicrobial resistance (AMR) research in LMICs, to tackle the threat of AMR in humans, animals, fish and the environment in a 'One Health' approach.

FARMS-SAFE: Future-proofing Antibacterial resistance Risk Management: Surveillance and Stewardship in the Argentinian Farming Environment

AMR places a significant burden on health systems and economies with an estimated potential loss of up to 3.8% of global annual GDP by 2050. LMICs are disproportionately affected, with extra economic burden placed on agriculture and livestock production even when the weight of the evidence indicates AMR in people results largely from human use and transmission.

Researchers from the UK and Argentina set out to develop a new policy framework to address the use of antibacterials in farming for Latin America. They enrolled and successfully

followed local dairy and pig farms, providing surveillance information for assessing AMR risk and antibacterial medicine usage.

This research is informing local farmers and veterinarians about the issues of antibacterial stewardship and resistance in the Argentinian context, and importantly, raising awareness of these issues in their communities.



■ **GAMRIF.** University of Bristol, Bristol Zoo Gardens, University of La Plata.

5 projects funded in 2019

£4.5m invested

The India-UK partnership to address farmed animal diseases and health (FADH) is jointly funded by BBSRC and India's Department of Biotechnology (DBT). Research funded as part of this bilateral partnership include efforts to advance the mechanistic understanding of host-pathogen interactions in farmed animals as well as research into veterinary antimicrobial resistance.

Developing stable and effective live, attenuated foot-and-mouth disease vaccines

Foot-and-mouth disease (FMD) is a severe and highly contagious viral disease that affects livestock, resulting in production losses and thus significant socio-economic impact. Current vaccination programmes are expensive and only provide limited protection.

Researchers from the University of St. Andrews and Indian Veterinary Research Institute aim to develop more effective FMD vaccines by using a combination of synthetic and molecular biological techniques to create live, attenuated vaccine candidates. As part of this ongoing project, the researchers have developed a non-infectious FMDV

genome which can be used as a model system to study the effects of introducing attenuating mutations. If successful, this research could be an important step towards replacing the current strategy of disease control by mass-slaughter.

■ **FADH.** University of St. Andrews, Indian Veterinary Research Institute Bengaluru, Veterinary Hospital - National Institute of Veterinary Research, Vietnam, Huvepharma.



2 calls in 2014 and 2023

20 projects funded

£11m invested

The Ecology and Evolution of Infectious Diseases (EEID) programme led by the US, is a multilateral programme involving the UK, USA, China and Israel. EEID's thematic focus is identifying the ecological, evolutionary, and social drivers that influence the transmission dynamics of infectious diseases of animals, humans and plants.



Predicting transmission dynamics of newly emerging avian influenza viruses

Avian influenza is a highly infectious disease and new pathogenic strains emerge regularly from the viruses' natural reservoir in wild aquatic birds. Disease outbreaks are particularly devastating when commercial and domestic poultry are affected due to large-scale economic losses.

Researchers from the University of Edinburgh assembled an international team including experts from the US and China to build computational models that were capable of forecasting virus evolution, fitness, and virulence. The ongoing research uncovered the underlying genetic changes that enabled the emergence of the latest 2021/2022 H5N1 avian influenza wave

and its more recent jump into US dairy cattle. Importantly, the researchers used their expertise to help shape national avian influenza policies by acting in an independent scientific advisory capacity for Defra.

■ **EEID.** University of Edinburgh, Animal and Plant Health Agency, U.S. Department of Agriculture (USDA), James Hutton Institute, Moredun Research Institute, Institute of Microbiology, University of Glasgow, French Agency for Food, Environmental and Occupational Health & Safety (ANSES), Scotland's Rural College, University of Georgia, Biomathematics and Statistics Scotland (BioSS).

Between 2012-2024

41 projects funded

£25m invested

£45m leveraged



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