

THE IMPACT OF COLLABORATION: THE VALUE OF UK MEDICAL RESEARCH TO EU SCIENCE AND HEALTH

EXECUTIVE SUMMARY



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Scientists have greater impact when they collaborate internationally.

EU programmes have helped to foster and strengthen scientific cooperation and the UK has been a major contributor to this, especially in medical research. As the UK develops a new relationship with the EU it is vital that negotiations result in the best possible outcome for science and patients across the EU. Although collaboration will continue after Brexit, any limitations on the ability of researchers and institutions to work together could diminish the impact of science both in the UK and the EU.

OVERVIEW

This report identifies some of the main ways in which UK research contributes to medical progress, it highlights the benefit this has delivered for EU science, and ultimately how this has improved the health of patients and the public across the EU. The evidence shows that the UK has made key contributions in five areas:

5 KEY AREAS

- 1 Contributions to advisory bodies, networks and policies that underpin research across the EU and its member states**
- 2 Participation in pan-EU clinical trials, providing notable leadership for rare disease and paediatric clinical trials**
- 3 Co-ordination and hosting of some of Europe's unique large-scale infrastructures for medical research**
- 4 Development of new therapies and medical technologies that benefit EU patients, backed by a thriving pharmaceutical and biotechnology sector**
- 5 Training early career researchers from across the EU, to develop their skills and launch their research careers**

This report was funded by eight leading UK medical research funders and charities, all actively engaged in the EU's health and research landscape. One of the strengths of the UK's medical research sector is the diversity of organisations involved in funding activity and policy dialogue, including medical research charities and patient representative organisations. The UK has a long history of patient involvement, and continues to serve as a model for other EU countries in this area.

This report brings together evidence from a number of disease areas, including cardiovascular diseases, musculoskeletal conditions, cancer and mental health. The research team undertook an extensive literature review, data analysis and in-depth interviews with leading European researchers and institutional stakeholders in the medical research field, as well as developing eight case studies on the UK's contribution to EU science and health.

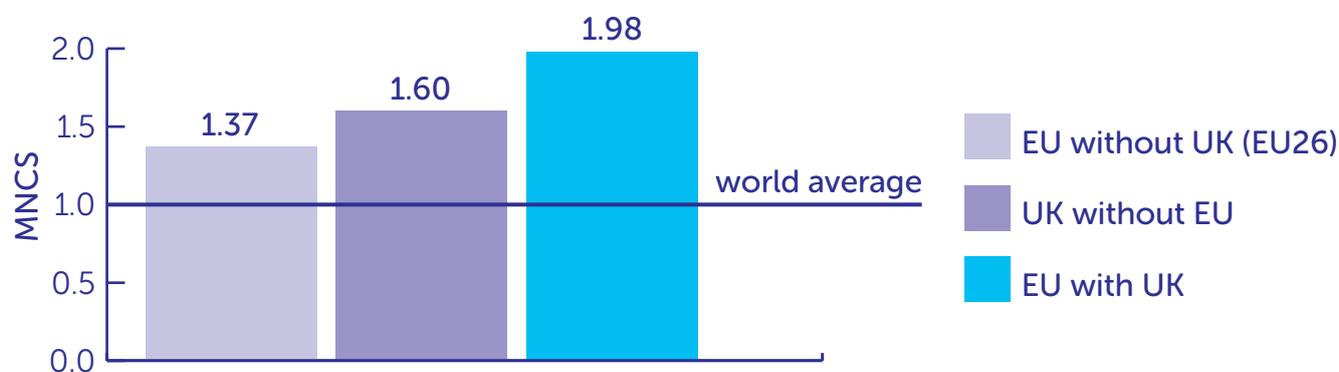
1 CONTRIBUTION OF UK EXPERTISE TO EU COLLABORATIONS, ADVISORY BODIES AND POLICIES

“The UK has excellent organisations and institutions, e.g. the Royal Society, the Academy of Medical Sciences and the Royal College of Physicians. These institutions have a large arsenal of experts who can be put forward for important committees and boards. In the EU setting, we would miss the UK experts if not available, as they have a lot of quality to offer.”
Professor Jos van den Meer, Professor of Medicine, Radboud University Medical Center, The Netherlands

The UK is an important partner in the EU research landscape, contributing to almost 20% of the total research work carried out within the EU health programmes between 2007 and 2016. Collaborating in research like this has mutual benefits, particularly in terms of impact. Bibliometric analysis of EU medical and health research publications shows that collaboration with the UK greatly increases the impact of EU26 publications, and vice versa (see figure 1).

Both the Mean Normalised Citation Score (MNCS) and the proportion of internationally co-authored publications in the top 10% of highly cited publications in their research field is higher for UK and other EU co-publications compared to EU26 only (without UK co-authors) or UK only (without EU26 co-authors). The EU26 already achieves a MNCS score of 1.37 without the UK, which is higher than the world average; but the MNCS score of UK + EU26 publications is 1.98, or twice the world average. Similarly, the proportion of top 10% highly-cited publications increases from 15% to 23% for the EU26 when collaborating with the UK. Increases are also observed for the UK when collaborations with the EU26 are included, albeit to a lesser extent.

Figure 1: Mean Normalised Citation Scores (MNCS) for medical and health research publications.



Source: Data analysis CWTS, Leiden University; Data source: Web of Science core collection Clarivate Analytics

In addition to citation impact, the UK is a strong collaborator, contributing intellectually and materially to pan-European health and life sciences. It plays a central role in the European Strategy Forum on Research Infrastructures (ESFRI) and the development of the European Bioinformatics Institute (EBI) in Cambridgeshire, one of the satellite institutions of the European Molecular Biology Laboratory (EMBL). The UK hosts the headquarters of several other important institutions, such as the European Life Science Infrastructure for Biological Information (ELIXIR), which unites Europe’s leading life science organisations in managing and safeguarding the increasing volume of data being generated by publicly funded research.

Furthermore, UK experts provide valuable advice to many individual research institutions, such as the Scientific Advisory Boards (SABs) of Germany’s Max Planck Institutes. There are 48 UK members of these boards, representing 17% of total members, more than any other EU country.

“The UK has always been a very constructive contributor to European science and research policies”
Magda Chlebus, Director of Science Policy at the European Federation of Pharmaceutical Industries and Associations (EFPIA)

2 DEVELOPMENT OF PAN-EU CLINICAL TRIALS

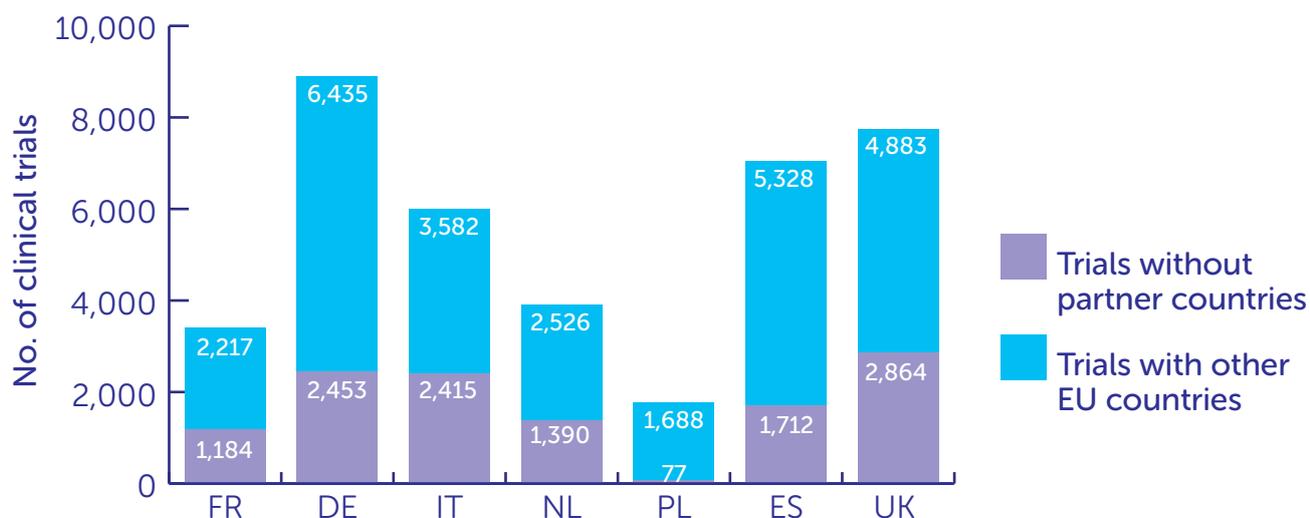
The UK has a long history of evidence-based, ground-breaking medical research – the MRC pioneered randomised control trials in the 1940s, which have since become the gold standard of clinical trial design.

The UK undertakes a huge amount of clinical trials activity, both in national and pan-EU trials. It has the highest number of phase I trials – those testing a new drug or treatment for the first time – in the EU and the second highest number of phase II and III trials after Germany.

Pan-EU collaboration is particularly important for research on rare diseases and clinical trials for children, where there are small numbers of available trial participants in individual member states. In such circumstances, pan-EU collaboration is essential and the UK has led or participated in the largest number of pan-EU clinical trials for rare disease and paediatric treatments.

The UK is an attractive base for pan-EU clinical trials, conducting the third largest number of clinical trials with EU partners, after Germany and Spain. Of 200 clinical trials directly funded by Cancer Research UK, more than a quarter (28%) involve patients from at least one other EU country. This showcases the importance the UK attaches to pan-EU trials, for the advancement of research and the benefit of European patients.

Figure 2: Number of clinical trials conducted by country with or without collaboration with other EU countries



Source: Technopolis Group; European Clinical Trials Database

The UK's Medicines and Healthcare Products Regulatory Agency (MHRA) is recognised as one of the leading national authorities in the field, protecting and improving public health as well as supporting innovation through research and development. The MHRA authorises clinical trials and regulates medicines and medical devices, as well as sharing knowledge and expertise with the European Medicines Agency (EMA). Between 2008 and 2016, the MHRA acted as Scientific Advice Co-ordinator in at least 20% of centralised EMA medicine approval procedures.

The UK's regulators and advisory bodies work with international peers, sharing expertise and providing advice on clinical trials. The MHRA has been instrumental in designing and delivering a robust regulatory environment across the EU, providing an attractive and harmonised framework for clinical trials. This ultimately leads to faster access to innovative medicines for patients across Europe, a view that interviewees for this report shared.

3 THE ROLE OF THE UK'S WORLD CLASS MEDICAL RESEARCH FACILITIES IN EU SCIENCE

“The UK puts a lot of energy in coordinating European research infrastructures.”
Dr Edvard Beem, Co-Director, Netherlands Organisation for Health Research & Development (ZonMW)

Although many EU countries provide excellent medical research facilities, the UK offers resources which are often unique in Europe – providing access to research equipment, lab space and technical support that enables participating researchers to flourish. Four pan-European health-related research infrastructures have their headquarters in the UK, while bio-repositories like the Public Health England (PHE) Culture Collections or the Mary Lyon Centre are widely used by EU research communities, in many cases providing unique strains and cell lines.

The Wellcome Trust Sanger Institute is one of the largest bioinformatics centres in the world, hosting visitors from across Europe working on joint projects. Thousands attend advanced biomedical courses at the Institute each year and millions visit the website.

These scientific facilities are complemented by a legacy of substantial, and growing, investment in population research. The UK supports an unparalleled collection of large-scale population cohort studies, such as the 1946 birth cohort study – the longest continually running study of its kind in the world. These resources provide exceptionally rich data from across a person's lifetime, typically as an open access resource, and are used in large numbers of EU studies, as well as to inform policy on issues ranging from child poverty through to ageing populations and migration.

The quality and completeness of data routinely collected by the UK's National Health Service (NHS) is generally high; for example the English cancer registry is world-leading in its data collection, analysis and research. The NHS encompasses almost all of the UK's diverse population; creating a valuable unified resource for cross-EU epidemiological research.

4 DEVELOPMENT OF NEW THERAPIES AND MEDICAL TECHNOLOGIES

“I think the UK is very mature in translational research, probably more mature than many other countries. There is a real urge to speed up access to the latest innovation in healthcare for the earliest possible benefit of patients”
Dr Pierre Meulien, Executive Director, Innovative Medicines Initiative (IMI)

The UK has one of the largest development pipelines globally, including 500 new biotechnology-based drugs and 600 innovative pharmaceutical product candidates. Looking at existing medicines, around 25% of the world's top 100 prescription medicines were discovered and developed in the UK, and three of the five top-selling drugs globally act on a mechanism discovered by UK researchers to combat rheumatoid arthritis and other inflammatory conditions, revolutionising the treatments available. This is testimony to the strength of the UK research system and its ability to translate discoveries into real world solutions.

Experts interviewed for this report highlighted the UK's capacity to quickly translate innovative solutions into commercial products. This has meant that patients across EU benefited from many advances in therapeutics and devices several years before the rest of the world, thanks to the enabling regulatory environment offered by the EU and the EMA, allowing such UK-rooted products to reach patients within the EU faster.

The UK's medical research community is collaborating with EU counterparts at the forefront of many innovative treatments. This includes the development of a new generation of genetically targeted personalised medicines; cancer immunotherapy treatments; and interventions for wellbeing and mental health, including dementia care mapping (DCM) to deliver more person-centered care (PCC), a model which is now widely used across EU for people with mild to moderate dementia.

NICE, the UK's National Institute for Health and Care Excellence, is at the heart of collaborations with EU counterparts on Health Technology Assessment (HTA) methodologies and projects such as the EU Innovative Medicine Initiative-funded big-data platform – Harmony – which aims to improve care for blood cancer patients across the EU.

5 AN ATTRACTIVE TRAINING ENVIRONMENT FOR EARLY-CAREER RESEARCHERS

The UK contributes significantly to the global research workforce, second only to the USA in terms of the number of science graduates trained. Around 16,000 students from other EU countries are registered on biomedical courses at UK higher education institutions, of which around 6,500 are postgraduates. Of the 5,475 biomedical students from other EU countries that graduated in 2014/15, around 18% took up positions in EU nations outside the UK.

“The UK continues to be an invaluable source of training and inspiration, especially in the life and medical sciences today, through its unique international outlook.”
Professor Werner Kühlbrandt, Director of the Max Planck Institute of Biophysics, Frankfurt

Experts interviewed for this study highlighted the quality of the UK training experience, the valuable skills and networks available, and the positive impact on career progression. Global mobility is a key feature of the UK medical research community with almost 30% of MRC grant

holders taking up positions in other countries following the conclusion of their UK grant (11% going to EU countries and 16% going outside the EU). From 2006-2016, an estimated 650 UK-trained researchers leaving such MRC-funded projects moved to advanced positions in other EU countries, taking with them the training and expertise gained in the UK.

Interviewees for this study said that the UK education system empowers graduates with the ability to think analytically and innovatively, making it a highly attractive destination for early career researchers. The EU’s Marie Skłodowska-Curie action (MSCA) fellowships support the most promising individual researchers from anywhere in the world and the UK was the top destination for fellows under FP7 (2007-2013), with five UK institutions among the top ten organisations (Table 1).

Table 1 Top 10 organisations in terms of Marie Skłodowska-Curie action fellowships (FP7, 2007-2013)

Institution	Country	Number of MSCA fellowships
Centre National de la Recherche Scientifique	France	514
University of Cambridge	UK	300
University of Oxford	UK	299
Imperial College London	UK	261
Max Planck Society	Germany	250
Consejo Superior de Investigaciones Científicas	Spain	250
University College London	UK	177
ETH Zürich	Switzerland	163
Copenhagen University	Denmark	163
University of Birmingham	UK	143

Source: DG EAC, Nov 2014, presented in Avramov, D. (2015) FP7 ex-post evaluation PEOPLE Specific Programme (2007-2013): Rationale, implementation and achievements, Annex 1, Table 1

CONCLUSION

In conclusion, strong research collaboration between the UK and the EU benefits all, enabling discoveries that benefit patients everywhere. This report demonstrates that the UK makes a significant contribution to the success of medical research across the EU. It does this in many ways, from hosting of European research networks, providing leadership in pan-EU trials, acting as a test bed for new discoveries and innovations, to educating and training the next generation of scientists.

The value of research collaboration between the UK and EU is further demonstrated by the higher impact of publications achieved when co-authored by UK and EU researchers. As the UK develops a new relationship with the EU, it is vital that negotiations result in the best possible outcome for science and patients across Europe. Any limitations on the ability of researchers and institutions to work together could diminish the impact of science both in the UK and the EU.

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