

## Written evidence submitted by British Society for Immunology

### Introduction

- 1.1. The British Society for Immunology (BSI) is the largest immunology society in Europe. We represent the interests of over 3000 immunologists working in academia, clinical medicine, and industry. Our main objective is to promote and support excellence in research, scholarship and clinical practice in immunology for the benefit of human and animal health. We are also a founding member of the International Union of Immunological Societies (IUIS), a member of the European Federation of Immunological Societies (EFIS), and work to develop close links with our partners in North America and Australia. This year we are bidding to host the 2022 International Congress of Immunology, the largest global event in immunology and a celebration of the greatest immunology from around the world.
- 1.2. Immunological science underpins many aspects of human health and the progression of disease. The application of immunological research extends across communicable disease and vaccination to the management and treatment of chronic diseases such as diabetes, asthma, allergies, and even cancer. It is also now becoming clear that immune responses are key to the development of many common disorders not traditionally viewed as immunologic, including metabolic, cardiovascular, and neurodegenerative conditions. These diseases are growing in prevalence and represent considerable health challenges for the 21<sup>st</sup> Century.
- 1.3. The BSI welcomes the opportunity to submit evidence to this inquiry on the implications and opportunities for science and research of leaving the European Union (EU). As a nation we are world leading in our immunological research and rank first for research in infection and immunology amongst our G7 partners.<sup>1</sup> As highlighted in our recent report, [\*Immunology: An international, life-saving science\*](#), this world leading status has been built up over many years of global scientific collaboration and information exchange. The strength of our immunological science is an asset we are able to project to attract the best and the brightest minds from around the world. Membership of the EU has greatly facilitated these international links.

### Summary

- Immunology shares with other branches of science an in-built internationalism. Much like the grand challenges immunologists work to resolve – infectious disease, autoimmune conditions, cancer, or antimicrobial resistance for example – immunological knowledge does not respect borders drawn on a map. The referendum outcome has generated a set of very significant challenges. Nevertheless, immunologists remain deeply committed to the international links and connections upon which modern science is based, and are determined to ensure our global relationships continue to expand in this sensitive period.
- The EU has played a hugely facilitative role in promoting scientific collaboration, ensuring fluid researcher mobility, and funding the highest quality scientific research. Negotiations around our exit must seek to preserve the best of these links, such that:
  - The UK maintains full access to Horizon 2020 and all its initiatives in relation to research funding and collaboration. Consideration should also be given as to how the UK can continue to act as a leading nation within the programme, with influence

over decision making and strategy, and how the EU can best utilise our status as a premier scientific nation with world-class expertise in several scientific areas, including immunology.

- The fundamental importance of freedom of movement is recognised and retained within our future relationship with the EU. Failing this, we would urge policymakers to explore bold options for streamlined entry systems for scientists, for example through a bespoke visa framework.
- The UK has a long history of welcoming foreign researchers and benefiting from their extraordinary contributions within immunology and the BSI is proud to represent the interests of members from every corner of the globe. However, many foreign researchers based here will now feel vulnerable. We would advise the Government to immediately guarantee the right of EU scientists to continue their stay beyond the date at which the UK formally leaves the EU. Moreover, we would strongly disapprove of any moves to amend the rights of such individuals to access public services, such as the NHS, or to have their access to in work benefits in some way curtailed.
- The post-referendum period offers fresh opportunities to expand or renew strong links with nations outside of Europe. The Secretary of State for International Trade will have a key role to play in exporting British science around the world, including to established partners such as the United States, Canada, and Australia, but also to emerging knowledge powerhouses in Asia. Showcasing successful existing research partnerships and seeking to forge new ones should be a key focus of future bilateral trade agreements.

**What the effect of the various models available for the UK's future relationship with the EU will be on UK science and research, in terms of:**

*Collaboration*

- 2.1. Immunological knowledge – like antimicrobial resistance, infectious disease, or conditions of age and lifestyle like diabetes and cancer – does not respect borders drawn on a map. UK research plays an internationally leading role in combatting these and other conditions, ranging from basic science to the development of new interventions and vaccines. However, this work is rarely done in isolation. Immunology is an inherently international endeavour. Researchers have always discovered more working together than alone, and immunologists have worked hard over many years to build a strong and intricately linked international community. Nowhere is this more evident than the BSI's upcoming annual Congress – organised jointly with the Dutch Society for Immunology – where colleagues from across Europe and the world come together to showcase cutting-edge research and renew lasting scientific relationships.
- 2.2. In 1981 the proportion of UK research articles involving at least one international co-author was 43%.<sup>ii</sup> By 2012 this had increased to 60%. At the same time, the number of papers authored by UK researchers only has stayed largely static. International collaboration has underpinned the growth in our national research base. More than three-fifths of the UK's international research partnerships are with colleagues in EU member states and collaborations with France and Germany in particular are increasing at a rate faster than any

other EU or non-EU countries. Geographical proximity, common strategic priorities, and shared cultural values undoubtedly play a role in shaping these relationships. However, our full membership of the EU and unfettered involvement in European Framework Programmes has presented unique incentives for participation in collaborative research that are unmatched anywhere else in the world.

- 2.3. Just one example of how membership of the EU supports scientific collaboration can be found in the Be The Cure initiative. Be The Cure is an EU funded collaboration between 24 academic and 14 industrial partners to identify new therapeutic approaches for the treatment of rheumatoid arthritis. The programme is part of the EU's Innovative Medicines Initiative (IMI), a funding framework that aims to connect those involved in academic health research with partners in the pharmaceutical industry in order to accelerate the development of new medicines. IMI is the world's largest public-private partnership in the life sciences industry, with a budget of €3.3bn over 10 years. Be The Cure has received approximately €35m in IMI funding and brings together diverse expertise from 38 partners across 13 European countries. UK participants include research groups in Glasgow, Leeds, Manchester and Oxford. In 2014 the collaborative published a total of 90 papers, accelerating our understanding of rheumatoid arthritis and advancing the development of new tools and diagnostics against a condition for which there is currently no cure.
- 2.4. Given the EU's hugely facilitative role in supporting research collaboration the outcome of the referendum has generated a set of very significant challenges. Future access to research networks is now at the mercy of political negotiation and will be heavily influenced by the model of access ultimately adopted. However, even before we begin any form of exit process, it is increasingly apparent that the referendum has had immediate destabilising impacts on the UK's international scientific partnerships. For example, members have reported to us instances where UK researchers have been asked to step down from joint grant bids by their EU collaborators because we are now seen as a risky or uncertain partner, highlighting early concern that we have been disadvantaged by the referendum outcome.
- 2.5. UK researchers – including in immunology – often occupy significant leadership roles in joint research initiatives. For example, we currently take the lead in 34% of all health related projects under Horizon 2020.<sup>iii</sup> It would be disconcerting if our relegation to associate status or some other form of Horizon 2020 membership were to result in UK researchers being penalised and their status in major grants diminished as a result.
- 2.6. Looking longer term, it is essential that whichever model is adopted for our relationship of the EU preserves our access to joint research programmes and capacity to continue sharing, with European colleagues, the myriad opportunities for working together that are presented by the EU science apparatus. Failure to reach such an agreement – resulting in an outcome that would unnecessarily erect barriers to distance us from some of the best science in the world – would be significantly detrimental to UK immunology, science as a whole, and the national economy.
- 2.7. Nevertheless, we are also mindful of some of the opportunities now presented. In our report [\*Immunology: An international, life-saving science\*](#) we highlight the successful example of the UNITE (Universities and National Institutes Transatlantic Eye Consortium for Human Ocular Immunology) partnership. UNITE comprises a consortium of centres in the UK, US, and China working together and sharing technologies, expertise, and materials to further our

understanding of diseases such as uveitis, age-related macular degeneration, and diabetic retinopathy. Scientists want to collaborate with excellence wherever it is found. The new Secretary of State for International Trade will have a key role to play in exporting British science around the world, expanding our research partnerships on key issues beyond Europe, including to emerging knowledge powerhouses such as China and India. Showcasing successful existing research partnerships and seeking to forge new ones should therefore be a key focus of future trade missions as we seek to negotiate new bilateral trade agreements within and outside the EU.

#### *Free movement of researchers and students*

- 3.1. The strength of our immunology has been an asset we are able to project across the world to attract the best and the brightest to work here. Researcher mobility supports not only a steady flow of students, researchers, and highly skilled workers (some of whom can plug key skills gaps for the UK), but also the fluid transmission of ideas, innovations, and knowledge that drive modern day research. Important too is the accumulation of soft power benefits. Many foreign nationals working or studying here will ultimately return to their home countries to become leaders in their field. Their affinity with the UK and connections built during their time here can significantly benefit our influence abroad.
- 3.2. The UK has a proud history of welcoming and benefiting from the contribution of foreign scientists. This open and welcoming reputation has contributed to an internationally fluid workforce, with 72% of the UK's scientists between 1996 and 2012 having spent time with a non-UK institution.<sup>iv</sup> Today, non-UK academics make up more than a quarter (26%) of staff in our universities, with 16% of these (22,000) coming from within the EU.<sup>v</sup> Based on feedback from our members, it is not uncommon for UK nationals to constitute the minority of staff in immunology labs, such is the diversity of our science base and a measure of the contribution foreign nationals make to our research efforts. The BSI is proud to represent such a diverse community of talented individuals who have done so much to benefit immunology in this country.
- 3.3. The benefits of fluid researcher mobility demand an immigration system that sustains the UK in maintaining its status as a global hub for the highest quality science. A major factor underpinning this has been our adherence, as a member of the EU, to its requirements on freedom of movement. It is vital that this principle, which has supported the UK in becoming host to a diverse community of international scientific talent, be maintained in our future relationship with the EU.
- 3.4. Freedom of movement, alongside EU mobility programmes such as Erasmus and Marie Curie Fellowships, has also supported British researchers in gaining experience and learning new skills from some of the best researchers in Europe. Moreover, UK researchers also have the opportunity to take up junior and senior positions in academia or industry or to study for PhDs at European universities. Looking forward, we must do all we can to ensure that UK scientists remain free to go wherever they need in order to broaden their horizons, learn new skills, and follow great science wherever it is found.
- 3.5. We also believe it is worth highlighting the referendum's effect on how the UK is viewed from overseas and the negative perception this communicates to foreign researchers. We have been made aware of instances of researchers having been offered positions within the UK but

declining citing the referendum. We were also relayed the case of a visiting professor who withdrew from a seminar citing “political instability”. The damage to our international reputation is an immediate threat that endangers the recruitment of talented scientists to fill vital posts.

- 3.6. A further consequence of the referendum has been the impact on non-UK EU and non-EU nationals currently working in the UK. Many now feel vulnerable and unwelcome and there have even been a number of unpleasant xenophobic and racist incidents. These individuals must now also work under a cloud of uncertainty as their right to work becomes the subject of speculation and opaque political negotiation. We would advise the Government to immediately guarantee the right of EU scientists currently located here to continue their stay beyond the date at which the UK formally leaves the EU. We would also strongly disapprove of any moves to amend the rights of such individuals to access public services, such as the NHS, receive in work benefits, or enjoy full access to pension schemes following our exit.
- 3.7. Our strength in immunology is intrinsically linked with the quality of the workforce we are able to employ. Our members are clear that preserving researcher mobility should be a key priority of any negotiations and failure to protect freedom of movement would be extremely unfortunate. The alternative model would require foreign researchers to apply for a visa, either through the Tier 2 (skilled workers) or Tier 1 (exceptional talent) routes. Both are imperfect: Tier 2 migration is subject to an artificial cap, Tier 1 visas are applicable only for a minority (and have been notably underused since they were made available), and both are associated with significant administration and cost burdens. Imposing these barriers to immigration would undoubtedly make the UK less competitive for talent, reducing the pool of highly skilled researchers willing or able to apply to fill key positions.
- 3.8. Maintaining freedom of movement is of paramount importance. However, we recognise that that such a settlement is fortune to wider political negotiation and public sentiment. In the event that preserving freedom of movement is impossible, we would strongly encourage the Government to implement a streamlined entry system for scientists (both within and outside the EU) such that fast and efficient researcher mobility is preserved. Doing so would do much to mitigate the negative impacts of leaving the UK and also send a strong message that the UK remains very much open for business.

#### *Access to funding*

- 4.1. Researchers in the UK are able to access a mixed economy of funders that includes private business, research councils, charities, government departments, and the European Commission. Between 2007 and 2013, the UK’s gross expenditure on R&D was around €226.3 billion. Nearly half of this (45%) came from the private sector. Our reputation as a scientific superpower with a highly skilled workforce makes the UK an attractive location for multinational companies seeking to invest in R&D. Furthermore, access to the European Single Market and the harmonisation of regulatory frameworks between the UK and the EU are similarly attractive for private investment. It remains to be seen how our departure from the EU – which will mean only partial access to the EEA at best and no obligation to standardise regulatory protocols – will affect the investment decisions of internationally mobile research intensive industries, such as the pharmaceutical industry.

- 4.2. The biotechnology and pharmaceutical industry in the UK is world leading. Moreover, immunology is a key foundation for the development of the next generation of therapies (antibody therapies, cellular therapies, small molecules, vaccines, and biologics) by these companies. The impact on industry of losing access to programmes such as IMI and Small and Medium Enterprise Actions (SME Actions) under Horizon 2020 would be to stifle the conditions which promote innovation and enterprise in the private sector. Any decreased pharmaceutical presence in the UK as a result of these and other associated impacts would not only dramatically alter the national research landscape but also the UK economy, such is the size and importance of this industry to the UK.
- 4.3. The EU supports research through a number of interlinked programmes estimated to be worth €120bn from 2014-2020. Approaching two thirds of this is distributed through the European Commission's Horizon 2020 Framework Programme, which allocates funding competitively through proposal calls administered under a number of schemes, including the European Research Council. Universities, research organisations, and small or large businesses within EU Member States are eligible to receive these funds, and they were directly responsible for over 43,000 publications (almost half of them in high impact peer reviewed journals) and more than 1,5000 patent applications between 2007 and 2013.
- 4.4. Our members emphasise the importance of EU funding opportunities. The UK has an exceptional track record of securing EU funding and under the last Framework Programme (Framework Programme 7) the UK secured €6.94 billion in funding from 2007 to 2013 (a value second only to Germany).<sup>vi</sup> During this time Oxford, Cambridge, Imperial College London, and University College London, were awarded more Framework Programme funding than any other universities. At €0.69 billion in 2014/15 alone, EU funding now forms a major proportion of the total research income secured by UK scientists. Our success in securing these grants means that for science and research we benefit disproportionately in relation to the money committed to the EU. The Office of National Statistics estimates that our total contribution to the EU's research budget between 2007 and 2013 totalled €5.4 billion.<sup>vii</sup> This compares to the €8.8 billion (which includes both Framework Programme 7 funding and structural funds earmarked for R&D) we received during the same period. Recent announcements on the
- 4.5. EU funding mechanisms also have some advantages over domestic grants. For one, programmes like the aforementioned IMI work to bring different collaborators together under a consortium. One of the key benefits of IMI is the involvement of industry, which gives scientists access to facilities, equipment, and expertise they wouldn't normally have access to. Moreover, EU Joint Programming Initiatives enable member states to come together in efforts to address major societal issues that are pan-European in nature, such as Antimicrobial Resistance.
- 4.6. EU funding has also played a role in supporting female early career researchers. When the Conservative-Lib-Dem government came into power in 2010 €6.78 million (in real terms) funding was available to specifically support the careers of women in STEM. This primarily came from the UK Resource Centre for Women in STEM, a funding stream which was shut down in 2012. Other funding sources, such as the Royal Society, have also cut funding in this area, such that in 2014/15 only £2.47 million of domestic funding was available to support female researchers.<sup>viii</sup> European funding in this area makes up for diminishing UK programmes, as one immunologist states:

*“In such an environment, women like me rely on EU funding to plug the gap in UK funding sources. Loss of eligibility to EU schemes is likely to disproportionately affect women, as it is well documented that women are less successful at winning grants and making the transition to independent researcher compared to their male counterparts. Furthermore, I am currently on maternity leave, a right protected by the EU, which, if scaled back or lost in post-Brexit legislation, would also potentially damage my ability to remain in science”.*

- 4.7. In addition to female early career researchers, European schemes such as Marie Curie have played a key role in launching the careers of many young scientists. The Marie Curie programme gives researchers the chance to gain experience abroad or in the private sector, exposing them to new ideas and ways of working that can significantly advance their career,
- 4.8. Participation in EU funding schemes is available to non-EU members through associate status, which could likely be attained under any of the future models. However, associate status comes with diminished influence over the setting of EU research priorities. As the case of Switzerland exemplifies, guaranteeing full access to Horizon 2020 may require the UK to accept freedom of movement. Failure to do so now under the terms of Article 50 negotiations or in the future as a result of a political response to public opinion (as happened in the Swiss example) could see the UK’s association with Horizon 2020 relegated to a lower status and UK science marginalised as a result.
- 4.9. Maintaining access to Horizon 2020 funding is vital if we are to thrive as a scientific nation and should be achievable under any of the models available. The EU not only supports world class research here in the UK, but it also brings scientists from across Europe closer together through research consortia, public-private partnerships, and joint action on common issues. Priority should be given in negotiations to continuing our participation in EU funding initiatives. However, if this proves impossible we would expect the Treasury to make up for the loss of funding to an equivalent level at the very least (impacts on investment from the private sector may require additional funding to make up for the shortfall). The Government may also wish to make a powerful statement about its commitment to science and research by increasing the funding settlement beyond that outlined in the CSR last year.

#### *Access to EU-funded facilities, both in the UK and abroad*

- 5.1. The EU supports a number of large scale research infrastructures. In the life sciences, the European Molecular Biology Laboratory (EMBL) is an intergovernmental organisation of 21 treaty members. EMBL acts as an international research institution with five sites across Europe each serving a specific field. The European Bioinformatics Institute (EMBL-EBI) in Hinxton, Cambridge, is one of these sites and functions as a global hub for the hosting, development, and curation of bioinformatics data. EMBL-EBI is a European, rather than EU, institution. However, EU funding makes up the greatest proportion of its external funding. Moreover, with 550 staff representing 57 nationalities (less than half are British), EMBL-EBI benefits significantly from freedom of movement in its efforts to attract international scientific talent.
- 5.2. EMBL-EBI also serves as the main hub for ELIXIR, a consortium of leading life sciences organisations in Europe working on large bioinformatics datasets. EU funding was central to

ELIXIR's establishment and the consortium currently plays a fundamental role in a number of EU research initiatives.

### **What the science and research priorities for the UK Government should be in negotiating a new relationship with the EU**

6.1. We would emphasise the importance of two fundamental priorities in negotiations with the EU. These are:

6.1.1. Maintaining full access to Horizon 2020 and all its initiatives in relation to research funding and collaboration (e.g. ERC grants, Marie Curie Fellowships etc). Consideration should also be given as to how the UK can continue to act as a leading nation within the programme, with influence over decision making and strategy, and how the EU can best utilise our status as a premier scientific nation with world-class expertise in several scientific areas, including immunology.

6.1.2. Securing barrier free entry for scientists, students, and their dependents such that the UK remains an attractive destination for the brightest scientific talent. We would encourage the Government to recognise the fundamental importance of freedom of movement and to make this a key priority for negotiation. However, if this proves impractical for political reasons, we would urge policymakers to explore bold options for streamlined entry through bespoke scientific visa systems.

6.2. While negotiations are underway, and indeed before they begin, we would encourage the Government to also:

6.2.1. Take every opportunity to promote the UK as one of the best places in the world to conduct the highest quality research, making it to the international scientific community that the UK welcomes overseas talent and is very much open for business.

6.2.2. Guarantee the rights of non-UK EU scientists to remain in the UK following our exit recognising the contribution foreign researchers make to immunology and the broader science base.

### **What science and technology-related legislation, regulations and projects will need to be reviewed in the run up to the UK leaving the EU?**

7.1. Harmonisation of legislation and regulation between the UK and other EU member states has been an important feature of our membership. Maintaining common regulatory and legal frameworks would have advantages, particularly in pharmaceuticals and clinical trials. The implementation of a new clinical trials portal and database from 2018 will seek to ensure the highest standards of safety and transparency for clinical trials conducted across the EU. This process will be managed by the European Medicines Agency (EMA), currently based in London. It remains to be seen how the referendum will impact transposition of this legislation in the UK.

7.2. The EMA also plays an important role in market authorisation of new drugs and treatments, providing a central portal through which medicines and devices can achieve EU-wide licensing. Leaving the EU may necessitate the UK implementing its own regulatory mechanisms completely independent of the EMA, similar to Swissmedic in Switzerland. Given the size of the EU market compared to the UK, medicines licensing applications for the EU would be

prioritised over a separate UK process, delaying patient access to innovative new drugs. Moreover, the function of the EMA is surrounded by legal and regulatory teams within pharmaceutical and biotech companies. If the EMA were to leave the UK these companies would likely move their teams abroad as well, contributing to significant loss of expertise in the UK and loss of jobs.

### **The status of researchers, scientists and students working and studying in the UK when the UK leaves the EU, and what protections should be put in place for them**

8.1. As already mentioned, we firmly believe the Government should move to guarantee the status of researchers, scientists, and students currently residing in the UK. Our strength in immunology has much to do with the contribution foreign researchers have long made to immunological science. These individuals are highly skilled and because of this highly sought after across the world. The referendum result has left non-UK EU nationals feeling vulnerable and unwelcome and because of this we are aware of a number of scientists who are now seeking employment opportunities outside the UK. We would encourage the Government to act quickly to counteract this and to put in place policies that not only protect the right of such individuals to remain in the UK but also secure the continued recruitment of talented EU researchers and students in the future.

### **The opportunities that the UK's exit presents for research and collaboration and market access with non-EU countries, and how these might compare with existing EU arrangements**

9.1. Preserving links that allow us to continue tapping into the European scientific powerhouse will be important on the road ahead, but so too are efforts to forge new collaborative relationships outside Europe. The rise of Asia's competitive economies is fuelling a shift in the global scientific landscape. China in particular is emerging as a scientific superpower, and with an annual growth in R&D expenditure averaging 21.6% per annum, the country is expected to become the world's biggest spender on science by 2022.<sup>ix</sup> Science was a key focus during the recent state visit by the Chinese Premier, Xi Jinping, with major deals for life sciences investment and collaboration on issues such as antimicrobial resistance. Our future exit from the EU has prompted fresh emphasis on the development of closer relationships with countries outside of Europe. We are a world leader in immunology, a status which the newly created Department for International Trade would do well to exploit in future trade missions. We would encourage the Government to take considered action in showcasing existing scientific partnerships at the international level, such as the UNITE partnership in immunology, with a view to exporting new multinational partnerships in immunology across the world, including to rapidly growing knowledge economies such as China and India.

## References

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- <sup>iv</sup> [Elsevier \(2013\) International comparative performance of the UK Research Base – 2013](#)
- <sup>v</sup> [CaSE \(2016\) Immigration: Keeping the UK at the heart of global science and engineering](#)
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- <sup>vii</sup> [UK Office for National Statistics 2015 UK Government Expenditure on Science, Engineering and Technology: 2013](#)
- <sup>viii</sup> [Science and Technology Committee \(2014\). Sixth Report: Women in scientific careers.](#)
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