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 members 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.

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.

1.3 As a nation we are world leading in our immunological research and rank first for research in infection and immunology amongst our G7 partners.[i] Immunological research in the UK therefore makes a vitally important contribution to the European science base and the research of our members is of significant value to the overall health, wellbeing, and economic prosperity of populations across the EU-28.

Summary

2.1 Scientists in the UK are free to compete for several European funding streams, derived through the European Union's (EU) Horizon 2020 framework. As a nation we are extremely successful in leveraging EU grants and are second only to Germany in terms of the total share of available funding secured. This comes at a time when the UK Government's commitment to sustaining public financing of science at present levels remains uncertain. Alternative sources, such as those available through the EU, serve as an important means of rebalancing funding for science in line with competitor nations.

2.2 The principle of freedom of movement allows not only for the unimpeded flow of students, researchers, and highly skilled workers across borders, but also for the fluid transmission of ideas, innovations, and knowledge. It is perhaps the most significant advantage of EU membership and its beneficial influence on the UK science base – and indeed the national economy – cannot be overstressed.

2.3 The EU benefits from having common regulatory, legal, and ethical standards through legal frameworks such as the Directive on the Protection of Animals used for Scientific Purposes. Harmonisation of the regulatory system means that member states can be assured of the competency of research standards and practice throughout the EU.

Funding

3.1 Membership of the EU automatically entitles researchers in the UK to make use of a variety of funding mechanisms, primarily channelled through Framework Programme 8 (known as Horizon 2020). The EU's largest ever research and innovation programme, Horizon 2020 is a distribution mechanism for €77 billion worth of investment in science and research across a seven year lifespan, starting in 2014. Over the course of 2015/16 alone UK scientists will be able to compete for €16 billion from this pool.[ii]

3.2 These funding streams are extremely popular amongst the research community in the UK and more eligible applications for Horizon 2020 funding were made from the UK than any other nation in 2014. We are also very successful in leveraging EU grants, securing the second highest share (15%) of the programme's total available funding over the same time period at 15% (only Germany, at 22%, received more).[iii]

3.3 Our members find Horizon 2020 funding streams incredibly valuable, particularly at a time when the future of public funding in the UK remains uncertain. At 1.63%, the UK's total Gross Domestic Expenditure on R&D (GERD) as a proportion of GDP is significantly below the EU-28 average of 2.01% (and indeed the target set by the Horizon 2020 initiative of 3%). Our GERD is also lower than key international competitors, including the United States (2.81%), Japan (3.38%), Germany (2.85%), France (2.23%) and China (1.98%).[iv] Science is by its very nature a global endeavour and the availability of funding for research is a fundamental determinant of our international competitiveness. EU sources therefore play a vital role in helping rebalance investment in line with other advanced economies.

3.4 The importance of European funding is underlined by the fact that many UK institutions employ dedicated teams to support researchers in securing grant and fellowship opportunities from EU sources. University College London for example, which received more Horizon 2020 funding than any other university in Europe in 2014,[v] employs a European Research and Innovation Office to "maintain its position at the forefront of European collaboration in science and technology".[vi] Imperial College London, the second highest performing university, similarly supports those at the university seeking Horizon 2020.[vii] These institutions are by no means alone, and universities throughout the UK adopt similar supportive mechanisms.

3.5 Although membership of the EU does not necessarily preclude access to the Horizon 2020 programme, and "third country" agreements can be made for non-EC states, such as Norway, Israel and the United States, eligibility for the majority of developed countries outside the European Community is not automatic. If a "third country" wishes to utilise Horizon 2020 funding it may only do so as a result of either a specific bilateral agreement or because participation of that country is deemed essential for carrying out the research. Relationships between third country nations and the EU can also change. For example, in following a national referendum in 2014 on imposing immigration quotas, Switzerland had its access to several Horizon 2020 funding streams ended as a reaction to the referendum's outcome.[viii]

3.6 Public funding is of course one aspect, but UK science also benefits from close cooperation with corporate entities based both within the UK and in the wider EU-28. As with science, business is a globally mobile enterprise, and private industry may decide to invest facilities and infrastructure in the UK for a variety of reasons. As a member of the EU the UK benefits from

favourable trade liberalisation and access to a $16.6 trillion a year single market with a workforce of 500 million people.[ix] This, coupled with the UK's world-class basic and applied research base, internationally recognised universities, and unique access to the NHS, is a strong factor in making the UK a good location for R&D intensive industries to locate.

3.7 In particular, the UK has a private R&D focus that is moderately specialised towards pharmaceuticals (pharmaceutical R&D expenditure accounts for 28% of total private R&D spend in the UK).[x] This enables considerable scope for life-sciences researchers, including immunologists, to utilise funding opportunities from private sources. The medicines manufacturer GSK, for example, supports the UK science base right across the spectrum, from discovery to application, as highlighted in their evidence booklet for the upcoming Spending Review.[xi] Any disruption of our relationship with the EU would be perceived as negative by UK-based businesses and could destabilise funding relationships between researchers and private enterprises, such as major pharmaceuticals.

3.8 EU instruments also support UK small and medium-sized enterprises (SMEs) through grants and other support services (e.g. business coaching and access to risk finance). The UK has many immunology SMEs who have benefited from EU backing through assistance that spans initial feasibility assessments to commercialisation of new immunological innovations.

Collaboration

4.1 The application of immunological science has the potential to improve the health and wellbeing of all people, regardless of the country they live in. Immunology, as with science more generally, is therefore a collaborative effort, and breakthroughs are often the result of close working between different labs and institutions across the globe. Simple factors, such as geographical proximity, common strategic priorities, and even shared cultural values, play a part in facilitating collaboration between European researchers. These factors are reinforced by formalised directives and frameworks which seek to synergise the scientific output of EU member states, many of which rank among the best in the world for the quality of their science and research.

4.2 Europe is in itself a scientific powerhouse. In a Thomson Reuters analysis of research output based on Web of Science publications, Europe was responsible for 38% of the world share of citations.[xii] Only the United States (at 33%) is able to compete on volume of scientific output. The same paper finds Europe's share of highly cited papers as a function of scientific output slightly lower than the US (at 1.2% compared to 1.8%) but growing at a steady rate in contrast to a flat trajectory for the US. Europe and the US is the traditional bipartite power bloc in international science, although their dominance is being challenged by select nations in Asia (China, India, Japan) and South America (Brazil). Nevertheless, the UK is a senior producer of EU science, demonstrating a leadership role that underlines the global significance of our science profile. Removing ourselves from the Union would be to forego the enhanced global influence that comes as being a key constituent in a powerful community of scientific nations.

4.3 Opportunities for international collaboration are facilitated by joint funding programmes under Horizon 2020. For example, Joint Programming Initiatives (JPI) pool EU resources as a means of tackling issues of pan-Euro interest as set out under a number of Strategic Research Agendas (SRAs). JPI SRAs focus collaborative R&D on major societal challenges, such as Antimicrobial Resistance[xiii], and enable the European research community to work together and achieve more

than would be possible at the level of a single nation state. In an increasingly globalised world, it is important to recognise that many of the challenges contemporary society faces are truly international in scale (for example pandemic infections). Thus, work to overcome these problems requires coordination at the international level. It would be deleterious for the UK as a whole if we were to be excluded from the joint planning, implementation, and evaluation of European-wide research programmes.

4.4 Opportunities for collaboration also exist beyond these large-scale projects. For example, our members make common use of joint funding opportunities that are extremely valuable as the basis for networking and developing relationships with researchers at institutions across the EU-28. Indeed, 80% of the UK's international co-publications are with colleagues across the EU.[xiv] These partnerships benefit significantly under the inclusive conditions of the EU's "common market" for knowledge and science. A specific example would include work through the European Training & Research in Peritoneal Dialysis (EUTRiPD) initiative. This EU programme funds early career researchers and seeks to bridge the "generation gap" between early and late-stage scientists. It has successfully supported immunologists based in the UK through linkage with peers in Amsterdam, Berlin, Poznan, Madrid, Brussels, Heidelberg, Strasbourg, and Vienna.

4.5 Initiatives such as the Marie Sklodowska-Curie actions, and as an extension of this programme the Innovative Training Networks (ITN) and Individual Fellowships (IF), facilitate researcher mobility throughout Europe, giving individuals experiences in different learning settings and enabling them to try new fields of research. The internationally fluid research community that exists as a product of the conditions provided by the European Union help spread best practice throughout the European Research Area and provides individuals with the opportunity to learn additional transferrable skills from new colleagues. Many of our members have worked throughout Europe and have found their experience both hugely rewarding and extremely beneficial in their own career development.

4.6 Scientific collaboration within Europe is greatly enhanced by the principle of freedom of movement, which allows the scientific workforce to work in different universities, research institutes, and companies with relative ease. Our members identify this as perhaps the most significant benefit of EU membership.

4.7 The UK is a global leader in science and research, a status which has been achieved in large part because we are able to attract the best and the brightest from across the world to work in our institutions. The lack of barriers to workforce and student movement within Europe has greatly enhanced the flow of scientific knowledge and expertise into the UK. Many of our members are themselves non-UK EU nationals and it is not uncommon for them to work in an environment where the majority of their colleagues have come here from countries across the EU.

4.8 In formulating our response to this inquiry, senior immunologists were keen for us to express the great value that able MSc students, PhD students, and postdoctoral fellows from the EU, but based in the UK, bring to our science base. It is reported that many of those who locate themselves here as students often choose to stay for further study or to work and their decision to do so is greatly influenced by the EU's sympathetic arrangements regarding free movement or, additionally, through programmes such as ERASMUS. It cannot be stressed enough the benefit that such individuals bring to our scientific and economic output.

4.9 The value of immigration for science and engineering has been catalogued elsewhere (see BSI submission to CaSE survey on immigration and its impact on UK science and engineering[xv]) and the principle of free movement is a key enabler of the unimpeded flow of people and ideas into the UK that is so beneficial in many ways. It would be of serious detriment to our domestic science base (and indeed national economy) if the UK, which retains an opt-out to the Schengen Agreement, was in any way to re-enforce restrictions on international travel from within the EU.

4.10 Free movement also plays an important part in filling skills gaps, especially in STEM subject areas. The CBI states that 63% of their members report the ability to recruit and transfer staff from across the EU as a beneficial factor for their business. In their survey only 1% of members said that the impact had been negative.[ix]

4.11 Beyond business, 125,300 non-UK EU nationals came to study in UK universities in 2013/14[xvi], generating £2.27 billion for the UK economy.[xvii] Upon graduation many of these students continue on to postgraduate degrees and will subsequently choose to stay and work here either in academia or industry.

4.12 Importantly, collaboration in the EU also includes the operation and management of shared infrastructure and facilities. The UK often takes a leading role in these initiatives, such as with the European Bioinformatics Institute (EBI) and ELIXIR, both located at the Wellcome Genome Campus in Hinxton, Cambridge. EBI and ELIXIR conduct internationally significant research that is the result of close collaboration across associated sites in EU member states.

4.13 EBI in particular is at the heart of modern medicine and hosts the databases and analytical tools which have proved fundamental in the development of new medical therapies. Both receive funding from a variety of sources, including from outside Europe, and many of our members use their tools. They are each examples of initiatives where the UK benefits disproportionately compared to the resources we invest.

Regulation

5.1 EU frameworks and directives have a considerable influence over much of the science that is carried out in the UK. For example, legislation governing the use of animals in scientific research has been transposed to give effect to the EU Directive on the Protection of Animals Used for Scientific Purposes.

5.2 Working under common regulatory frameworks ensures that member states are working an agreed standard in relation to legality, quality, transparency, and ethics. This helps to reduce bureaucracy and streamline protocols. For example, the EU Directive on Clinical Trials seeks to simplify the process through which Member States regulate clinical trials to ensure the highest standards of patient safety are upheld. Through this mechanism information is recorded on an EU-wide portal that allows for a database on the results of all clinical trials conducted in Europe.

5.3 Pharmaceutical manufacturers can also seek to gain market authorisation for new drugs and treatments under a centralised procedure through the European Medicines Agency (EMA). The EMA coordinates expertise from across the European Economic Area (EEA) and allows the regulatory authorities from individual Member States to share data on the reporting of side effects and compliance with various legal requirements. Different authorisation routes also exist,

including through single EU Member States, from which a streamlined application for European-wide authorisation can be made. This is only possible because the regulatory system for medicines is harmonised across the EU and despite their being different authorisation routes (either through the centralised process via the EMA or through individual Member States) each works to a common set of rules.

5.4 Another example would be the work of the European Patent Office, which provides a single patent grant procedure for innovations across Europe. The organisation also works closely with international bodies through, such as the United States Patent and Trademark Office, through bilateral and multilateral partnerships that seek to develop a global patent system that is more efficient in driving strong knowledge-based economies for EU member states. It is unclear how disruption of our membership with the EU would hamper the ability of UK scientists to apply for national and international patents across EU member states and beyond.

Scientific Advice

6.1 Scientific advice on public policy decisions in the UK is chiefly communicated through the Government Chief Science Advisor, a position that is complemented by Chief Scientific Advisers in central Government Departments. These roles exist to ensure decision making on public policy is informed by scientific evidence. It is believed that the UK is in the minority of EU member states in having this mechanism which promotes evidence based policy making.

6.2 The post of European Chief Scientific Adviser was abolished under President Juncker and will be replaced by a new Scientific Advice Mechanism. This system is yet to be put fully in place and we await to see how this system works in practice before commenting on its success.

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