

Written evidence submitted by the British Pharmacological Society (GAP0037)

1. Introduction

- 1.1 The British Pharmacological Society (BPS) is the primary UK learned society concerned with research into drugs and the way they work. The Society has around 4,000 members working in academia, industry, regulatory agencies and the health services, and many are medically qualified. The Society covers the whole spectrum of pharmacology, including laboratory, clinical, and toxicological aspects. Pharmacology is a key knowledge and skills base for developments in the pharmaceutical and biotech industries, and is therefore fundamental to UK industry and R&D. The Society publishes three scientific journals: the British Journal of Pharmacology, the British Journal of Clinical Pharmacology, and Pharmacology Research and Perspectives.
- 1.2 Particular STEM skills concerns are: (a) impact of merging departments of pharmacology into larger and broader academic units (e.g. Life Sciences); (b) lack of investment in clinical pharmacology and (c) the urgent need to maintain support for *in vivo* skills (the use of laboratory animals for research). We also support the broader response made by the Royal Society of Biology. In summary:
- **STEM skills, careers advice and work experience should be embedded as early as possible in the student experience** through strategic partnership between schools, further and higher education, learned societies and industry, including co-creation of learning outcomes.
 - **Vulnerable skills areas in pharmacology, and in the biosciences more generally** require more granular understanding in partnership with employers. Of particular concern is the loss of specialist pharmacologists (with in depth knowledge of the quantitative relationships between dose and response), and the likely impact of this on the training relating to drug discovery, medicine and pharmacy.
 - **Strategic links between educators, trainers and employers are vital:** case studies of 'what works' would be valuable in an evolving industry ecosystem.
 - **Our evaluation of the Integrative Pharmacology Fund (Industry-led Fund for the provision of Education and Training) showed that this investment in *in vivo* skills was successful, but concerns about sustainability remain.** The Society is committed to exploring the report's ten recommendations in collaboration with the laboratory animal research sector.
 - **The UK clinical pharmacology skills gap is a serious concern.** The Society is calling for a strategic approach to workforce planning and collaboration across industry, academia and the NHS. Investment in clinical pharmacology could improve NHS efficiency and help the UK deliver a life sciences industrial strategy.
- 1.3 The Society would be happy to discuss these initiatives and our ongoing work with the Committee.

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2. General points

- 2.1 The Royal Society of Biology response to this consultation addresses STEM skills at a school level, including support for teachers, practical skills, work experience and careers advice. The 2014 ScienceGrrl report¹ recommends investment in STEM Ambassadors as a mechanism for building science capital for teachers and students, through equipping them with resources and training that support real world learning. The Society is building support for our members in this way, through engagement bursaries and resources. We would be keen to increase our impact as part of a national approach. This is as important in terms of widening participation in STEM as it is for addressing skills gaps.
- 2.2 The Royal Society of Biology response also draws attention to the Biological Sciences Research Council and Medical Research Council vulnerable skills report². This report highlighted:
- Interdisciplinarity
 - Maths, Statistics and Computation
 - Physiology and Pathology
 - Agriculture and Food Security
 - Core Research and Subject Specific Skills

During roundtable discussions across the pharmaceutical industry, the Society has heard significant concerns about skills gaps in data sciences and statistics, quantitative pharmacology, clinical pharmacology and *in vivo* skills. Discussions also revealed a demand for skills to make assessments of innovation and business decisions, to work with other disciplines and across translational interfaces. In addition, the Society is concerned about erosion of capacity within the pharmacology education community. We are concerned that amalgamation of pharmacology into broader departments (e.g. Life Sciences), which was in part driven by the Research Excellence Framework, has made it harder to recruit specialist educators³. A lack of expert pharmacology educators was a concern strongly echoed during a recent workshop with around 30 members of our education community. The Society is keen to explore how the Learned Society sector may be able to act as a broker to enhance networks, training opportunities and education and training resources in support of key and vulnerable skills, and the education community. We are currently also undertaking research to better understand the pharmacology education and employability landscape in the UK.

- 2.3 One challenge is the connectivity of the education sector with industry. The Society response⁴ to the Wakeham Review of STEM Degree Provision and

¹ ScienceGrrl (2014) Through Both Eyes: the case for a gender lens in STEM. Available online at:

http://sciencegrrl.co.uk/assets/SCIENCE-GRRL-Stem-Report_FINAL_WEBLINKS-1.pdf

² BBSRC and MRC (2015) BBSRC and MRC review of vulnerable skills and capabilities

<http://www.bbsrc.ac.uk/documents/1501-vulnerable-capabilities-report-pdf/>

³ British Pharmacological Society (2016) Response to Lord Stern's Review of the Research Excellence Framework. Paragraph 14. Available online at:

<https://www.bps.ac.uk/BPSMemberPortal/media/BPSWebsite/Assets/British-Pharmacological-Society-response-to-REF-Review-22-3-16.pdf>

⁴ British Pharmacological Society (2016) Response to Sir William Wakeham's review of STEM degree provision and graduate employability. Available online at:

<https://www.bps.ac.uk/BPSMemberPortal/media/BPSWebsite/Assets/Wakeham-Review-Response-from-the-British-Pharmacological-Society.pdf>

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Graduate Employability⁵ raised concerns about limited work experience and placements as well as the quality of employment data. Another important non-HE graduate area would be to expand life sciences apprenticeships, leveraging City & Guilds qualifications and expanding the current Pharmaceutical Sciences course to include other pharmaceutical industry disciplines, apart from pharmacy technician training.

- 2.4 The Society runs a Diploma in Advanced Pharmacology and a workshop programme, which support key areas of pharmacology education and training⁶. The Society has recently worked with an expert group, including both employers and educators, to develop our new undergraduate pharmacology core curriculum⁷. We will use our curricula and understanding of pharmacology education and training needs to inform our future role in addressing this challenge, for example in developing distance learning opportunities and focused resources.

3. Clinical pharmacology skills gap

- 3.1 Clinical pharmacology skills are at risk in the UK^{8,9}. Investing in clinical pharmacology presents an opportunity to improve efficiency in the NHS and support the delivery of a UK industrial strategy for the life sciences. Its impact is seen in UK-wide, high level leadership as well as at a hospital level but workforce planning is only driven locally without consideration of what the UK stands to lose if these skills are further eroded. This is a serious mismatch. The Society is urgently campaigning¹⁰ for a joined-up, strategic approach to clinical pharmacology workforce planning and recruitment.
- 3.2 Clinical pharmacology is the only medical specialty in the NHS focusing on the safe, effective, and cost-effective use of medicines. The specialty provides leadership in the use of medicines. Its benefit is felt across the NHS in primary and secondary care, but also in areas like regulation and medicines assessment/appraisal. An ageing population represents a huge challenge for the NHS and clinical pharmacologists have the skills to optimise the care of such patients, who are likely to use multiple medicines. Clinical pharmacologists are experts in experimental medicine, designing early-phase clinical trials and establishing NHS clinical research facilities. They are also researching pioneering medicines in universities and the biopharmaceutical industry. Clinical

⁵ Wakeham Review of STEM Degree Provision and Graduate Employability (2016) Available online at: <https://www.gov.uk/government/publications/stem-degree-provision-and-graduate-employability-wakeham-review>

⁶ <https://www.bps.ac.uk/education-careers/courses-workshops/diploma>

⁷ British Pharmacological Society (2016) Undergraduate pharmacology core curriculum. Available online at: <https://www.bps.ac.uk/education-careers/teaching-pharmacology/core-curricula/undergraduate-pharmacology-core-curriculum>

⁸ British Pharmacological Society (2015) Clinical Pharmacology: A Dynamic Medical Speciality Essential UK Healthcare. Available online at: <https://www.bps.ac.uk/BPSMemberPortal/media/BPSWebsite/Clinical-Pharmacology-A-dynamic-medical-speciality-essential-for-UK-Healthcare.pdf>

⁹ ABPI (2015) Bridging the skills gap in the biopharmaceutical industry: Maintaining the UK's leading position in life sciences. Available online at: http://www.abpi.org.uk/our-work/library/industry/Documents/Skills_Gap_Industry.pdf

¹⁰ <https://www.bps.ac.uk/about/our-campaigns/clinical-pharmacology-the-nhs>

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pharmacologists have jointly developed the Prescribing Safety Assessment with the UK Medical Schools Council. It was the first single, national, online assessment of prescribing competency and has been taken by around 36,000 UK medical students. All new doctors will be required to take the Prescribing Safety Assessment before their first year of practice after graduating.

- 3.3 A recent report¹¹ commissioned by the British Pharmacological Society demonstrates that for every pound invested in clinical pharmacologists, almost £6 can be saved by the NHS through more efficient use of medicines and fewer adverse drug reactions. The cost savings delivered by employing additional clinical pharmacologists in line with Society targets could pay for around 1,600 extra nurses or 600 extra doctors¹².
- 3.4 There are now only 72 clinical pharmacology consultants in the UK. Both the British Pharmacological Society and the Royal College of Physicians recognise this as a shortage. The Royal College of Physicians recommends that there should be 440¹³ and with this in mind, the Society is calling for a more achievable initial increase to 150 clinical pharmacology consultant posts by 2025. The Society estimates that the number of people in specialty training would need to almost double to meet this target. The speciality is also not growing in line with the overall consultant workforce¹⁴. Between 2002-2014 the overall UK consultant workforce had increased by 72% (from 7547 consultants to 13003), but clinical pharmacology did not increase at all in this period. The numbers fluctuated: a low point of 52 consultants in 2006, and a high point of 77 consultants in 2012.
- 3.5 A debate in the House of Lords on 12 September 2016¹⁵ highlighted the challenge of workforce planning. Health Education England (HEE) operates a supply and demand model. This works for large specialties, but as shown in paragraph 3.4, clinical pharmacology is small. Most NHS trusts do not have a clinical pharmacologist consultant and are not aware of the benefits of having one - and so, they will never ask for one. HEE recognises no demand and therefore does not increase supply. This has a knock-on effect on the next generation of clinical pharmacologists. Low numbers of consultant posts deter potential trainees from applying, and the low take up of current training posts further compounds the problem. As paragraph 3.6 shows, the speciality cannot afford to lose the potential trainees it does connect with.

¹¹PricewaterhouseCoopers (2016, commissioned by the British Pharmacological Society) Clinical Pharmacology and Therapeutics: The case for savings in the NHS. Available online at:

<https://www.bps.ac.uk/BPSMemberPortal/media/BPSWebsite/Assets/CPT-case-for-savings-in-the-NHS.pdf>

¹²Salary estimates of £32,000 (nurse) and £81,000 (doctor) according to 2015 Annual Survey of Hours & Earnings, published by the ONS. They represent the mean gross full-time salary, including any incentive or overtime pay.

¹³Royal College of Physicians of London (2013) Consultant physicians working with patients: The duties, responsibilities, and practice of physicians in medicine. Available online at:

http://www.rcplondon.ac.uk/sites/default/files/consultant_physicians_revised_5th_ed_full_text_final.pdf

¹⁴ Royal College of Physicians London (2016) 2014-15 census of UK consultants and higher specialty trainees. Available online at: <https://www.rcplondon.ac.uk/projects/outputs/2014-15-census-uk-consultants-and-higher-specialty-trainees>

¹⁵ <https://www.bps.ac.uk/news-events/news/society-news/articles/clinical-pharmacology-debate-in-the-house-of-lords>

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- 3.6 There is low awareness of clinical pharmacology as a medical specialty among medical students and junior doctors. Changes to medical curricula mean that students are less likely to encounter pharmacology as a discipline in an organ-based teaching environment. In addition, there is about one consultant in clinical pharmacology to 500 undergraduates, compared to one cardiology consultant to only 40 undergraduates¹⁶. Awareness and experience of a pathway, and engagement with role models within it, are pre-requisites to following any career path, as shown at a school level by the ASPIRES project¹⁷. In 2016, the Society set up a special-interest group to support those training in clinical pharmacology and will run a 'Clinical Pharmacology Day' on 25 October 2017 to help raise visibility of the specialty and the awareness of potential trainees.
- 3.7 Clinical pharmacology skills are not only delivered by those who follow a medical training pathway, but also those coming through a biosciences route. The long-standing shortage of translational medicine/clinical pharmacology skills was confirmed by the Association of the British Pharmaceutical Industry (ABPI)¹⁸ and includes both routes. An industry member told us that new pharmacology/biomedical science graduates are being trained on a 2 year graduate entry programme to bring in new talent. Better representation of clinical pharmacology in undergraduate degrees is another strategy the Society is pursuing (see paragraph 2.4). The Society is working with ABPI, MRC and National Institutes for Health Research (NIHR) to review careers and training information across academia, industry and the NHS. The Society is also keen to understand skills gaps at a more granular level, to explore our role in supporting training and whether new models of training (e.g. degree apprenticeships, distance learning) would be valuable. To begin this work, the Society held meetings with various industry stakeholders over the course of 2016, see paragraph 2.2.
- 3.8 Existing specialty trainees have also told us that it can be hard to access additional training (e.g. toxicology) unless they are already in a recognised centre. This inequality of access to training needs to be addressed. The Society is investing in training across the UK, and is considering this issue alongside the activity described in paragraph 2.4.
- 3.9 Although clinical training schemes with industry exist (e.g. Wellcome Trust clinical rotation scheme), a member within industry tells us it has been challenging to ensure that the clinicians work on industry projects and that supporting clinical

¹⁶ British Pharmacological Society (2014) A prescription for the NHS: Recognising the value of clinical pharmacology and therapeutics. Available online at: https://www.bps.ac.uk/BPSMemberPortal/media/BPSWebsite/BPS_A_prescription_for_the_NHS_FINAL_SP%281%29.pdf

¹⁷ King's College London (2013) ASPIRES Young people's science and career aspirations, age 10-14 <http://www.kcl.ac.uk/sspp/departments/education/research/ASPIRES/ASPIRES-final-report-December-2013.pdf>

¹⁸ ABPI (2015) Bridging the skills gap in the biopharmaceutical industry: Maintaining the UK's leading position in life sciences. Available online at: http://www.abpi.org.uk/our-work/library/industry/Documents/Skills_Gap_Industry.pdf

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training is expensive. Their response has been to embed clinicians in research projects at a much earlier stage and to view the collaboration as a long-term one rather than a short rotation. High quality models of collaboration are essential in the context of developing new medicines and accelerating access to them.

4. *In vivo* skills gap

- 4.1 The Society is a signatory of The Concordat for Openness on Animal Research¹⁹ supporting the use of animals in research where there is no alternative, and the 3Rs: the replacement, reduction and refinement of the use of animals in research. The use of animals is currently an essential component of the drug discovery and development process and have led to many new drug candidates with novel modes of action. Unfortunately, many of these have failed in the clinic and companies are attempting to reduce the risk of failure in their discovery programmes. This “de-risking” includes conducting preclinical animal studies to build confidence that a novel mechanistic approach is likely to be both efficacious and safe, identification of ‘translational biomarkers’ to facilitate ‘go/no-go’ decisions early in the clinical trial process, and studies to relate pharmacodynamics and pharmacokinetics for candidate drugs.
- 4.2 In 2004, in response to concerns about a shortage of *in vivo* skills^{20,21}, the British Pharmacological Society and partners launched the Integrative Pharmacology Fund (IPF) with contributions totalling £4 million (from AstraZeneca, GSK and Pfizer). Subsequent contributions from Government and other funders raised the total to £22 million. The fund aimed to sustain the complete academic pipeline of *in vivo* education, training and development.
- 4.3 Just over a decade later, the 2015 ABPI Skills Report²² noted that initiatives such as the IPF have helped the skills gaps and should be continued to ‘avoid recurrence of skills gaps in these areas’. BBSRC and MRC have stated that “there were concerns about the future supply of individuals with skills to work with whole animals and with an holistic understanding of the physiology of laboratory and farmed animals”²³. The IPF was a collaborative initiative to support networks, people and expertise for *in vivo* sciences in the UK. The principles and practices were sound but cannot be viewed as a one shot solution.
- 4.4 The Society evaluated the IPF in collaboration with the University of Exeter. The report was published in December 2016²⁴. Throughout the evaluation process, the

¹⁹ Understanding Animal Research (2016) Declaration on Openness on Animal Research. Available online at: <http://www.understandinganimalresearch.org.uk/files/9614/1041/0310/declaration-on-openness.pdf>

²⁰ ABPI and Biosciences Federation (2007) In vivo sciences in the UK: sustaining the supply of the skills in the 21st century. See also: ABPI (2005) Sustaining the Skills Pipeline in the pharmaceutical and biopharmaceutical industries; and ABPI (2008) Skills Needs for Biomedical Research: Creating the Pools of Talent to Win the Innovation Race.

²¹ British Pharmacological Society (2004) A survey of integrative physiology/pharmacology teaching undertaken by the BPS and The Physiological Society, pA2 Online Vol. 3 No. 2: 10–11. Available online at: <http://www.pa2online.org/articles/article.jsp?volume=5&issue=2&article=31> Note that ‘in vivo education’ here involved practical work conducted that required a personal licence.

²² ABPI (2015) Bridging the skills gap in the biopharmaceutical industry: Maintaining the UK’s leading position in life sciences. Available online at: http://www.abpi.org.uk/our-work/library/industry/Documents/Skills_Gap_Industry.pdf

²³ BBSRC and MRC (2015) Review of Vulnerable Skills and Capabilities. Available online at: <http://www.bbsrc.ac.uk/documents/1501-vulnerable-capabilities-report-pdf/>

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aim was to understand past interventions and to discuss the future of *in vivo* education and training. The IPF increased the ability of UK universities to deliver high quality *in vivo* education, training and research. Centres of Integrative Mammalian Biology (centres of excellence) were a particular success, developing strong local networks, fostering of new research collaborations and sharing good practice. However, there are significant concerns about sustainability now that the funding has ceased. The evaluation team made ten recommendations for future action from the evidence base and the common principles that led to success.

- 4.5 Core learning outcomes for undergraduate and postgraduate *in vivo* sciences modules are required. They should be developed in partnership with the *in vivo* community and guided by research into the outcomes of different education and training interventions. Research and training collaborations between academia, industry and the NHS should be encouraged and *in vivo* apprenticeships jointly established. Small “pump-priming” grants should be provided to help early career researchers who are using *in vivo* techniques. Laboratory animal technologists support many research projects and their skills training and career progression should be high priority so that they can have greater involvement. There are opportunities for best practice in *in vivo* research to be communicated through networks and expert groups across the disciplines. Finally, public engagement and openness about animal research need to be promoted by all involved and supported by academic institutions. Overall, there is a need for an integrated, national approach to reinforce UK capacity for *in vivo* education, training and research in higher education, and to encourage improvements to animal welfare, the 3Rs and research outcomes.
- 4.6 Changes in the industry landscape have shifted the need for *in vivo* skills from big pharmaceutical companies to Contract Research Organisations (CROs) and/or biotechnology companies and Universities²⁵. Members have told us that capacity for training is a challenge in these smaller organisations. Recruitment is also an issue. One member employed by a CRO told us that they are “heavily reliant upon those that have been in industry for some time to develop more junior staff”. They noted the major difficulty of recruiting *in vivo* scientists except on the regrettable occasions when pharmaceutical companies downsize. There are also fewer mid-career level people who can take up positions when they do become available.
- 4.7 A major concern is that as a result of the limited opportunities to receive *in vivo* training, the skills gap will enlarge as and when current *in vivo* scientists retire, decide move abroad or need to change career. It is clear that new models of training and work experience are needed, and there may be opportunities through creative engagement with CROs/SMEs as well as the apprenticeship levy²⁶

²⁴ Lowe JWE, Collis M, Davies G, Leonelli S, Lewis DI and Zecharia AY (2016) An evaluation of the Integrative Pharmacology Fund: Lessons for the future of *in vivo* education and training. London: British Pharmacological Society. www.bps.ac.uk/futureinvivo

²⁵ ABPI (2016) The Changing UK Drug Discovery Landscape. Prepared by TBR’s Economic Research Team and CBSL. Available online at: <http://www.abpi.org.uk/our-work/library/industry/Documents/the-changing-UK-drug-discovery-landscape.pdf>

²⁶ ABPI (2016) Written evidence submitted by the Association of the British Pharmaceutical Industry to the Committee on Education, Skills and the Economy inquiry into Apprenticeships, APP0067.

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. The challenge of strategic collaboration with industry and the Society's approach to it is raised in paragraphs 2.2, 2.4 and 3.7.

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