Pharmaceutical Science Expert Advisory Panel:
Developing the Pharmaceutical Science Workforce

1. Aim of this paper

The aim of this thought leadership paper is to raise the profile of the pharmaceutical science workforce and highlight what workforce development it needs. It will also address the ongoing importance of science within the education for pharmacists. The paper will support the development of RPS education and workforce policy in this area.

2. Introduction

The UK Pharmaceutical Science (and Life Science) industry is reliant on a highly skilled and qualified workforce that is multidisciplinary in composition and flexible across sectors and geographies. Similarly, Schools of Pharmacy are reliant on an appropriately qualified pharmacists and pharmaceutical scientists to teach students, undertake leading edge research and be role models for the pharmacists and pharmaceutical scientists of the future.

> *'Pharmaceutical science encompasses the basic, applied and social sciences and plays a part in all stages of the journey of a medicine, from its discovery as a new molecule and formulation as a medicine, to its manufacture, approval by the regulatory agencies and ultimate use. Pharmaceutical science in the UK has a long and excellent record of medicines research and development, being at the forefront of many major advances in modern medicines.'*
> **New Medicines, Better Medicines, Better Use of Medicines**

Encouraging investment in scientific education and training to ensure a highly skilled and adaptive pharmaceutical science workforce was a recommendation from 'New Medicines, Better Medicines, Better Use of Medicines[1]

The recent government green paper: 'Building our Industrial Strategy[2]' described pillars to drive this forward including:

1. Investing in science, research and innovation;
2. Developing skills;
3. Cultivating world leading sectors.

These pillars will form the basis of this paper.

[1] New Medicines, Better Medicines, Better Use of Medicines. London: Royal Pharmaceutical Society; 2014
[2] Building our Industrial Strategy. Green Paper. London: HM Government; 2017

ROYAL PHARMACEUTICAL SOCIETY

3. Investing in science, research and innovation

UK investment in research and development is, at 1.7% of GDP, well below the OECD average of 2.38%[3]. An increase in the number of PhDs in pharmaceutical science should therefore be supported by the Industrial Strategy Fund. It will also be important to fund post-doctoral posts and more senior fellowships. This includes applied health scientists and clinical academics (although some support is available from the National Institute of Health Research and Medical Research Council, this is not sufficient to support the strong scientific base that the UK needs).

In order for the UK to remain competitive in pharmaceutical science, young people, of secondary school age, need to be encouraged into science. The UK is home to some of the top universities in the world, indeed three are in the top 10: Oxford (1st), Cambridge (4th) and Imperial College, London (8th)[4]. Furthermore, of the most highly rated schools of pharmacy, three are also in the top 10: Nottingham (6th), Kings College London (7th) and University College London (8th)[5] . The higher education sector should be balanced by a stronger technical education sector (delivering chemical, life science and pharmaceutical & polymer company apprenticeships) that addresses skills shortages in pharmaceutical and life sciences.

4. Developing skills

MPharm programmes have been restructured in recent years to prepare students for emerging clinical patient facing roles. This has resulted in increased pressure on the time and teaching resource available for the underpinning sciences and thus creates a risk that future skills needs e.g. in bio/chemo/pharmaco-informatics will not be met. Whilst there is a rationale for this rebalancing, it jeopardises the unique expertise of a pharmacy graduate who has a fundamental understanding of the science which is fundamental to all aspects of pharmacy practice as well as a clinical skill set to support the delivery of person centred care. Underpinning sciences and their application to clinical practice do not fundamentally change but clinical guidelines may change so it is important to develop a scientifically trained workforce that can then rapidly assimilate clinical aspects of practice. In addition, most underpinning science is usually delivered early on in the MPharm programme and this can make it challenging for pharmacy graduates to transfer scientific knowledge into professional practice to support problem solving when faced with clinical uncertainty. These complementary perspectives of science and clinical practice are also of value to those at the discovery and development of medicines end of the scientific spectrum as well as those delivering direct patient care.

> *'There is seldom a day goes by when I do not apply my basic science. The foundation of which is from pharmacy school: lipophilic vs hydrophilic, excess lactic acid in blood, Krebs cycle, atomic weight of medicine'.* **Hospital Pharmacist**

[3] Available at: https://data.oecd.org/rd/gross-domestic-spending-on-r-d.htm

[4] Available at: https://www.timeshighereducation.com/world-university-rankings/2017/world-ranking#!/page/0/length/25/sort_by/rank/sort_order/asc/cols/stats

[5] Available at: https://www.topuniversities.com/university-rankings/university-subject-rankings/2017/pharmacy-pharmacology

Embedding a programme for an intercalated BSc in the MPharm degree could be one way to provide curriculum time for additional in depth teaching of aspects of the core science subjects. However, those MPharm students undertaking this route may well need to undertake supplemental science learning in the first year of their MPharm otherwise only a few exceptional students are likely to achieve the required standard. Academic learning could be linked to a six-month pre-registration training placement (as part of the 12-month pre-registration training) in the area of pharmaceutical science, research or innovation, thereby strengthening the supply of registered pharmacists for a large variety of careers which need a sound in depth knowledge of pharmaceutical science – from working in universities to the pharmaceutical industry. Alternatively a Joint Honours Degree could be offered e.g. Pharmacy and Pharmaceutical Science or options could be included in the final year of the MPharm to learn different skills, e.g. an in depth pharmaceutical science final year. Subject areas including pharmacometrics, formulation and drug delivery require strengthening and could form part of such a final year (as long as the foundation for these areas is taught early on).

A number of UK universities offer a BSc in Pharmaceutical Science(s). Some of these courses are offered are by universities without a school of pharmacy. It is not clear how the curricula on these courses are aligned to the future needs of industry (though many offer placements in pharmaceutical companies) nor whether the quality of graduates meets the needs of employers.

The National School of Healthcare Science in England is providing Scientist Training Programmes in Clinical Pharmaceutical Sciences aimed at covering shortages in; Quality Assurance/Quality Control; Aseptics; Production & Manufacture and Supply of Radioactive Substances. Similar programmes should be set-up in other sectors where shortages exist, with equivalent opportunities in the devolved nations. Currently NHS Education for Scotland and NHS Wales offer training programmes for healthcare scientists though these focus on other non-pharmaceutical specialties.

> *'I am a scientist within a formulation group focusing on treatments for allergy and respiratory problems. I spend about half my time in the lab and the other half at my desk. In the lab I formulate dry powder blends and test them.'* **Pharmaceutical Formulation Scientist***

*Available from: http://careers.abpi.org.uk/case-studies/Pages/formulation-scientist.aspx

5. Cultivating world leading sectors.

The pharmaceutical industry generates a large trade surplus of £1.1 billion per annum for the UK[6] and employs over 73,000 people[6]. However, in the last decade, the process of developing medicines has undergone great change and different skills are now required if this impact is to be sustained. Skills gaps in translational medicine and clinical pharmacology have been reported in the UK biopharmaceutical industry[7].

[6] Available at: http://www.abpi.org.uk/industry-info/archive/knowledge-hub/uk-economy/Pages/uk-pharmaceutical-trade.aspx

[7] Bridging the skills gap in the biopharmaceutical industry. Maintaining the UK's leading position in Life Sciences. London: Association of the British Pharmaceutical Industry; 2015

ROYAL PHARMACEUTICAL SOCIETY

In the UK the Medicines and Healthcare products Regulatory Agency (MHRA) and Veterinary Medicines Directorate (MHRA) have delegated responsibility for certification of eligibility for nomination as a QP to three professional bodies: the Royal Pharmaceutical Society (RPS), Royal Society of Biology (RSB) and Royal Society of Chemistry (RSC) (the 'Joint Professional Bodies') –this provides synergy between pharmacy and the life sciences. There are gaps in the skills base in the pharmaceutical industry with Qualified Persons. Pharmacy formulation is also reported as a skills gap as well as general concerns about recruiting more experienced staff and graduates or PhDs/Post-doctorates.

Restructuring/reorganisations of the pharmaceutical industry alongside its changing profile in the UK will mean that elements of the pharmaceutical science workforce will need to be able to re-skill or up-skill in order to remain flexible and adaptable. Support in the provision of accessible education and training should be provided.

Similarly, the UK is one of the leading countries in applied health sciences research and much of the health services research informing current pharmacy practice has been underpinned by leading edge methodological approaches. However, this approach is not yet universal and there is a need to ensure that accessible education and training in this area of science is at the threshold of developments.

It is also essential that Brexit is negotiated so that the UK pharmaceutical and biotechnology industries have access to European markets, and any lost research income is replaced.
Over recent years the rapidly increasing cost and complexity of research has meant that collaboration with colleagues both within and beyond the EU has become more important. Consideration needs to be given to aspects such as researcher mobility, the purchase, operation and maintenance of joint equipment, as well as the dissemination and exploitation of the research.

Current scientists and researchers, together with those EU nationals who come to work in the UK prior to departure from the EU, should have the right to remain for the duration of their existing contracts or courses under the same conditions as before. This must include scientists and researchers who have permanent positions with open-ended contracts. Similarly, current undergraduate and postgraduate students, together with those EU nationals who have come to the UK prior to any formal departure from the EU, should continue to be charged fees equivalent to UK students.

Recommendations:

1) **Scope out the number of PhDs, post-doctoral posts and fellowships in pharmaceutical science.**
2) **Advise the General Pharmaceutical Council what the science content of the MPharm curriculum should be and input to the revision of the initial education and training standards for pharmacists.**
3) **Identify how the gaps in the skills base for QPs and pharmacy formulation can be addressed utilising the pharmacist and pharmaceutical science workforces.**

Pharmaceutical Science Expert Advisory Panel, October 2017