

WHAT DOES THE FUTURE HOLD FOR PHARMA IN THE UK?

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WHAT IS THE IMPORTANCE OF PHARMA TO THE UK ECONOMY?



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ECONOMIC IMPORTANCE

The pharmaceutical industry is vital in sustaining a healthy population and boosting the overall economy within the UK. This health and wealth agenda has been recognised by the Government as seen in their 'Plan for Growth', highlighting that health research has a pivotal role in the national economy.

Public and charitable sectors' investment in Life Science research is considerable: public investment through Medical Research Council, Technology Strategy Board and National Institute for Health Research; charities including The Wellcome Trust and Cancer Research UK. In more recent times, there has been a real shift with these groups coming together as public-private partnerships working strategically towards common goals, sharing expertise and often risks and benefits.

However, the majority of UK medical research is still supported by the pharmaceutical industry. Pharma spends £12.1m a day on R&D, the largest private sector investor.¹ It employs 72,000 people across the UK and 27,000 of those work in R&D.² It contributes 9% of global investment but the market remains low in terms of uptake at 3%. The pharmaceutical trade surplus in 2009 contributed £7bn to the UK economy.³

It is vital we remember the

UK's strong heritage, for example, in terms of citations with many ground breaking publications and a flow of Nobel prizes, which continue to demonstrate our depth of capability within biomedical research. Data from 2010 show that four of the leading universities in the world were in the UK, and one out of six of the most prescribed medicines today have been invented here. This historical excellence is recognised as world leading but to maintain a global position in R&D we need to address some of the challenges that currently face us.

DRUG DISCOVERY & DEVELOPMENT

Developing innovative medicines is a long, risky and expensive process which takes between 12-15 years and costs up to £1bn per medicine. The risk is clearly realised considering that 25,000 compounds will be synthesised at drug discovery, 25 of these will make Phase 1 clinical trials, only 5 will receive a positive marketing authorisation from the regulatory authorities and only one of these medicines will recoup investment following launch. In addition, there have been many later stage failures recently as hurdles become significantly higher. Hence, the current model of pharmaceutical development is changing as the current one is no longer sustainable. The key concern is that we have to become more successful to combat major

illnesses that remain areas of unmet medical need.

This has become of increasing importance given the demographics of our ageing population. Research therefore is very much focused in areas including cancer, diseases of the elderly such as arthritis, and other neuro-degenerative illnesses, particularly Alzheimer's disease. A breakthrough in any of these areas would be good news across all stakeholder groups.

CHALLENGES

Innovative medicines for unmet medical need is the driver for drug discovery. The challenges are many, including: the falling productivity and attrition rates in drug development, the escalating costs of these failures and also of the actual process, and the higher regulatory and societal hurdles to have your medicine used. I am referring here to the need to demonstrate 'value' as well as an appropriate risk/benefit for any new medicine. Competition is also increasing from the emerging markets, especially in China and India who are building their science and clinical capabilities. These countries are often able to recruit many more patients into later phase clinical trials where thousands of patients are needed to compare a new medicine to the gold standard of care. This is a concern for two reasons: firstly we are losing out on contributing to these studies

but in addition we know that the UK is a particularly conservative market and that clinicians who have experience of a medicine are more likely to prescribe it once it receives its licence.

The latest data we have from the National Endowment for Science, Technology and the Arts (NESTA) report shows that in 2010, only 1.4% of patients in global clinical trials were entered from the UK. However, working with the National Institute for Health Research (NIHR) we are starting to see improvement in the UK in terms of attracting and delivering on clinical trials.

The UK has the second lowest uptake of innovative medicines in the EU. There is some variability across therapy areas, but for cancer medicines launched in the last 5 years, we are one of the lowest countries in terms of uptake. This is an issue as not only are we depriving patients of new innovative medicines that they would receive as standard in many other countries, but in addition, this slow uptake impacts on the sustainability of R&D. It also makes it harder to convince companies to place significant research investment here.

WHAT HAVE WE ACHIEVED?

The Office of Life Sciences set up under the previous government, with ABPI as the industry lead for the R&D pillar, has been instrumental in starting to change the direction of this downturn. The skills gap highlighted in the ABPI Skills Report from 2008 is being addressed, in particular, in the areas of clinical pharmacology and in-vivo science. This has continued to be a key area of importance now led by Cogent under the current government.

Open innovation is increasingly embraced as a new model for research, with greater collaboration desired between industry, academia and the NHS. The Translational Research Partnerships have been formed which provide an internationally unique approach to supporting collaboration with the pharmaceutical industry. They provide a single point of access to collaborate with world-class investigators in the UK's leading academic and NHS centres. Working in partnership with industry, they drive early and exploratory development of new medicines, technologies and other interventions.

The TRPs are now operational in 2 broad therapeutic areas (Joint and related Inflammatory disease; and Inflammatory Respiratory disease) and welcome projects from pharmaceutical companies. Other models of open innovation are happening including the MRC-ABPI immune-inflammation collaborative research consortia.

The pharmaceutical industry has accepted that the day of blockbusters is well and truly over and the new world will be medicines for targeted treatment of sub populations, based on understanding the science better or stratified medicine. This will require a coherent, multi-stakeholder strategy to address the challenges this raises in terms of drug discovery, regulatory challenges and in addition pricing challenges in order for these medicines to actually be used. The right medicine at the right time in the right patient is the way of the future, which should improve treatment concordance and also provides a sound economic model whereby the NHS is only paying for medicines it knows are going to benefit the patient. Recently, there has been the

launch of the £50m investment by the Technology Strategy Board into stratified medicine focusing on immune-inflammation and cancer.

WORK IN PROGRESS

The Academy of Medical Sciences report on clinical research focused on streamlining and reducing the bureaucracy surrounding clinical trials in the UK and the recommendations of this report were very much welcomed by industry. Embedding a culture of research across the NHS is also vital if we want to attract quality clinical trials. In the last 12 months we have seen a real cultural change with Chief Executives in the NHS wanting to engage with industry in discussing how their Trusts can become involved in ground-breaking research to the benefit of their patients.

Real World Data has been a priority for the ABPI for the last few years, using these data to demonstrate the value of medicines; and widening the UK's appeal for conducting such studies. We have developed a Guidance document, launched in May 2011, which has been well received by our members and the NHS. The Real World Data Guidance document can be downloaded from our website here:

<http://www.abpi.org.uk/our-work/library/guidelines/Pages/real-world-data.aspx>

We are in the process of finalising a White Paper detailing why we believe the UK can be competitive in developing this area of expertise. This particular approach was highlighted by the Prime Minister recently stating that it would make the UK the most attractive place in the world to place research and develop life-saving drugs. Not only will that benefit patients,

but it will help to create new jobs and economic importance.

THE FUTURE

The commitments from the Government in the 'Plan for Growth' were all very welcome especially the setting up of a single Health Research Authority to streamline clinical trials. We need to ensure that timelines are met and that the change in culture is evident, and best practice learnings from initiatives such as the North West Exemplar continue to be shared and promulgated across the UK, if we wish to be a global hub for research and development. The business conditions need to be attractive for research to be placed in the UK – the development of the Patent Box, R&D tax credits and improvement to the pricing and reimbursement system, all need to encourage diffusion of innovation across the NHS. The NHS Futures Forum for the first time announced the duty for the Secretary of State to promote research again emphasising the importance placed on research to improve the health and wealth of our nation.

Partnerships and an eco-system for research are clearly the new way of working but we are left with a few unanswered questions.

How can we ensure uptake of innovative medicines within the UK which would encourage further R&D and also benefit patients? Can the Government look at other incentives to encourage research bases to be placed within the UK? How do we ensure we keep the momentum around some of the positive work on-going and deliver?

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WHAT IS THE FUTURE FOR THE RESEARCH-LED PHARMACEUTICAL INDUSTRY?



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Richard Ascroft has worked for Eli Lilly and Company since 1993 and held a variety of roles in sales, clinical research management, public policy and market access.

From antibiotics to antiretrovirals, penicillin to proton pump inhibitors, medicines have contributed significantly to creating a healthier world. Over the twentieth century, life expectancy has doubled in some parts of the developed world and innovative medical advances have played an important role in helping people live longer, healthier lives.¹

There has never been such demand for new medicines as there is today. In the developing world population increases have resulted in growing demand for effective medicines and vaccines, particularly for the world's three most devastating diseases: HIV/AIDS, malaria and tuberculosis. While in emerging economies growing middle classes in countries, such as China, India, Brazil and Russia, are increasingly demanding medical care comparable with that available in North America and Europe.

In countries such as Britain and the United States social and political agendas are being shaped by ongoing ideological and economic debate over how to meet rising medical costs, and how the growing burden should be split between individuals, the state and private payer organisations. Reforming health systems is a very real challenge when faced with the demographic reality; over 15 million people in the UK are currently identified as having a long-term condition² and by

2033 people over 65 will account for 23 per cent of the population.³ Coupled with the current economic slowdown, it is not surprising that payers around the world – both public and private – are persistently pursuing strategies to hold down spending on innovative medicines and demanding greater proof of the value of those medicines.

We know that medicines are a system enabler and that using the right medicine, in the right patient, at the right time, can save money as well as achieve a good outcome for the individual. For example, Alzheimer's disease is often acknowledged as one of the greatest challenges to social and healthcare systems the developed world faces. Yet were a treatment to be developed which delayed the onset of Alzheimer's Disease by five years it could save \$550bn per year by 2020 in the United States alone.⁴ Even for conditions commonly regarded as already having a number of treatment options, such as diabetes, there remains huge room for improvement.

It is widely accepted that the science behind drug discovery is becoming more challenging, as researchers strive to understand complex conditions such as Alzheimer's disease and cancer.

Additionally, the regulatory barriers medicines are required to overcome are getting higher,

with medicines required to undergo evaluations for cost-effectiveness as well as safety and efficacy. It is therefore little surprise that just one in 10,000 discovered compounds becomes an approved medicine for patients, and only 3 out of every 20 approved medicines recoup sufficient revenue through sales to cover their developmental costs.⁵

It is clear that there is an overwhelming need for more innovative medicines to be developed in order for the world to overcome the social and economic burdens which result from poor health. For this to happen there needs to be a robust and thriving global pharmaceutical industry which can only result from urgent action by both industry and governments.

WHAT CAN INDUSTRY DO?

Today the global pharmaceutical industry is at a crossroads. It is clear that the business models of the past – reliant on 'blockbuster' medicines – are no longer sustainable. We can't simply perform the same old rituals and hope for a different outcome. We must build new models of working that are leaner, swifter and more adaptive to the challenges of the global environment: essentially we must 'reinvent invention'.

We must build an understanding of patients' needs



into the earliest stages of research and assess the potential of new molecules in terms of what's truly valued by patients, physicians and payers. We must anticipate the concerns of regulators so that we can answer their questions in our clinical testing. Most importantly, we must increase the speed of research and reduce the cost of bringing a new medicine to market.

At Lilly, we have taken the concept of reinventing invention to our core, and have moved from a pharmaceutical company where we own every aspect of the value chain to one based on collaborative networks. Called 'Fully Integrated Pharmaceutical Network' – or FIPNET – this enables us to work with appropriate partners, including academic institutions and biotech companies, to increase our knowledge and share investment, risk and reward.

In the UK, the Lilly Centre for Cognitive Neuroscience provides an excellent example of our innovation through FIPNET working. Based at our research centre in Surrey, this network brings together a consortium of academic scientists from six leading British and Irish universities and industrial scientists from Lilly who work together to seek to enhance the probability of clinical success for molecules targeted at conditions involving cognitive dysfunction.

In addition, Lilly has established a number of virtual drug development networks, known as 'Chorus', which design, interpret, and oversee early-stage development through a network of connected organisations outside Lilly. Using this approach, Chorus currently manages 15 molecule programmes with a dedicated staff of only 29 scientists and has been able to reach clinical

proof of concept about 12 months earlier and at half the cost when compared to the current industry model. Taken together with our own early-stage portfolio, we are now confident that Lilly has the largest pipelines in the company's history with 70 molecules in development, 33 of them in Phase II or Phase III. This is three times as many as in 2004.

WHAT CAN GOVERNMENTS DO?

Changes by the industry alone are not enough. Governments around the world need to take steps to address the challenges faced by the industry, not only to increase the number of innovative medicines reaching patients, but also as the life sciences industry is a potential growth sector which can assist countries in rebalancing their domestic economies.

Currently in Britain the biosciences sector creates and sustains professional, high-value jobs and infrastructure. In the UK the pharmaceutical industry directly employs 72,000 people, 26,000 of them in research and development (R&D)⁶ with over 200,000 more employed indirectly.⁷ The pharmaceutical industry invests more in R&D in the UK than any other industrial sector – approximately £12 million every day.⁸

Lilly is proud to be a part of the UK's robust pharmaceutical sector. We employ more than 1,400 staff in the UK across three sites; a research centre in Surrey, a manufacturing facility near Liverpool and a sales and marketing operation in Basingstoke. Over the past year, Lilly invested £130 million in R&D within the UK.⁹

However, the Government cannot afford to be complacent

and assume that the life sciences sector will continue to invest in the UK. Recent site closures and consolidations by global pharmaceutical companies across the UK highlight the competitive and mobile nature of the industry, with many countries offering substantial incentives to attract investment.

Making investment decisions is multi-factoral, and many companies weigh up a number of factors; including the underlying market conditions, the skills and labour market and the fiscal incentives. The British Government needs to examine its policies in each of these areas to ensure they are integrated and that Britain is offering a truly world-class environment.

Of greatest importance are the underlying market conditions. Every business needs stability across factors relating to the ability to sell its product, including a stable economic environment, open and outward looking markets and a fair regulatory system. For the pharmaceutical industry this also includes swift access to and uptake of new medicines for the local population. In addition, the UK is in the unique position of being a global reference within the pharmaceutical industry; a quarter of the world looks to the UK to reference both Health Technology Assessment and price, further strengthening the importance of the UK environment.

For beneficial market conditions to be created there needs to be a comprehensive assessment of a medicine's value, reflecting the viewpoints of patients, providers, payers, and industry. This value assessment should be reflected not only in pricing, but also in decisions on reimbursement

and patient access to new medicines. As the Government moves towards the creation of a new system of pricing and reimbursement for medicines – value-based pricing – it is imperative that they seek to ensure that the true cost of a medicine is valued, including the benefits to carers and wider society. The system for valuing medicines must also recognise and reward innovation, particularly incremental innovation. In modern medicine, improvements in treatments are made incrementally, through a series of small steps. Cancer medicines are a good example, where patients have benefited from important incremental improvements in side-effect profile and mode or ease of administration as well as survival. Any system of valuing medicines must recognise these incremental advances.

Secondly, for the pharmaceutical industry to thrive in the UK the Government must ensure the skills base in the UK remains competitive. A key determinant in any investment decision for the pharmaceutical industry is the availability of appropriately skilled staff. Evidence suggests that access to highly skilled staff remains a concern for the industry and 45 per cent of employers have reported difficulty in recruiting STEM (science, technology, engineering and maths) graduates.¹⁰ Of particular concern is the lack of practical skills – such as in vivo sciences – amongst graduates, and urgent action needs to be taken to ensure Britain does not fall further behind countries such as India and China.

Britain must also improve its offering as a location for clinical trials, which is an area of historic strength for the UK. Yet clinical trials are very mobile, and a perfect storm of unpredictable

and high costs, over-burdening and fragmented bureaucracy and slow recruitment of patients has resulted in Britain's advantage slipping away. Britain has fallen from the third highest market share of clinical trials activity in 2000 to ninth by 2006.¹¹ The Government has recently announced proposals to combine and streamline approvals under a health research regulatory agency, which we welcome; however, it must not simply add a layer of bureaucracy to an already highly bureaucratic process.

Finally, for Britain to remain

an attractive location for investment there must be competitive fiscal incentives. The R&D tax credit system is one of the least competitive in Europe and the UK currently ranks 19th in the OECD ranking of R&D cost savings; a drop from 13th in 2004.¹² The Government needs to demonstrate its commitment to the life sciences sector by increasing their offering to inward investors, and we welcome early progress in this area.

Concerted and co-ordinated actions by the Government and the pharmaceutical industry will

enable the sector to continue to grow and flourish. Britain can be at the heart of this growth, and maintain its position as an attractive location for life sciences industries if the Government take comprehensive and decisive action.

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WHAT DOES THE FUTURE HOLD FOR PHARMA IN THE UK?

HEALTHCARE INNOVATION IN THE UK – A Royal Society of Chemistry Position Paper



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The pharmaceutical industry (pharma) has made important contributions to quality of life, longevity, economic growth and education at all levels, and is a key component of the government's growth strategy. A vibrant pharma R&D sector generates outstanding medical and economic benefits and is fundamental to the UK science base.

For decades, the UK had been a world leader in medicines R&D with at least 10 of the top-selling drugs (>\$1bn annual sales at peak) having UK-trained PhD organic chemists as named inventors. In 2008, the pharmaceuticals and biotechnology sectors invested £4.3bn in R&D (making it the leading UK sector for R&D investment), employed some 67,000 skilled staff, and contributed around £8.2bn to GDP. Pharmaceuticals have

been consistently in the top three UK industrial sectors in terms of trade surplus generating £6bn in 2008.

However, the industry is now under considerable pressure due to pricing constraints on new medicines, escalating R&D costs, losses of billions of pounds of revenue as major patents expire, and stagnant productivity. Consequently, the sector is undergoing substantial contraction with closure of

research centres and the loss of thousands of skilled jobs. Unless the UK responds to such significant changes, the future flow of new drugs will slow to a trickle. A new model for drug discovery is urgently required to capitalise on UK's outstanding track record and world class talent and to ensure our future leadership in healthcare innovation.



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A WAY FORWARD

The RSC proposes an action plan that deals with four inter-related themes and provides a clear and coherent framework for sustaining innovation and productivity in healthcare, and aligning investment and policy in medicines research along a single, compelling vision. The proposal builds upon the UK's outstanding track record of investment and innovation in drug discovery and unique strengths in terms of talent, training, collaborative networks and funding opportunities.

SCIENTIFIC QUALITY

The basis of the UK's success has been the ability of the UK-based pharmaceutical industry to retain a rich pool of highly talented and well-trained scientists, ensuring that healthcare challenges have been addressed through the application of world-class science.

ADVOCACY

It is critically important for the medicines research community to articulate clearly and consistently how the invention and development of new drug treatments has served to benefit patients and that continued investment in key areas of medical need will be required to address the existing and future needs of an ageing population. Coupled to this is the recognition that chemistry is at the heart of translating biological discoveries into much needed new medicines and that without chemical enablement, most new medicines research would flounder.

FUNDING AND REIMBURSEMENT

At a time of rising R&D costs and diminishing research budgets, there is a clear need for the UK to develop a national strategy for investment and reimbursement that will serve to incentivise medicines research in defined areas of high medical need. A coherent approach would help funding bodies to align their investment priorities and so ensure benefit to patients is realised and return on investment is maximised.

INFRASTRUCTURE

In order to safeguard the UK's scientific leadership in medicines research and underwrite the next wave of innovative medicines, a step-change in research infrastructure will be required to ensure the UK remains at the forefront of the latest scientific advances.

STATUS

The global pharmaceutical industry has come under considerable regulatory and economic pressures over the past years, and continued contraction is now threatening healthcare innovation. New medicines will be essential to alleviate unsustainable pressures on healthcare budgets as the population ages but increasing emphasis is now placed on cost/benefit analyses to justify reimbursement, and negative regulatory decisions after multi-year drug development programmes are wasteful of R&D investment. Safety demands have also escalated such that a single clinical trial for a new cardiovascular agent can involve up to 20,000 patients, while new drugs for diabetes now have to undergo an additional 2-year safety study

before approval. Consequently, the costs of discovering and developing a new medicine have escalated to well over \$1bn, but return on investment has deteriorated sharply in the face of fierce economic and regulatory pressures.

In addition to external pressures, pharma is losing billions of dollars in revenues as major drugs come off patent, but which are not being replaced at an equivalent rate despite escalating R&D budgets over the past two decades. Biotech was once regarded as an endless source of potential products for pharma, but both sectors have weakened in parallel as venture capitalists are unwilling to wait between 5-10 years for an adequate return on high risk investments. It is essential that UK Biotech is revived through innovative funding mechanisms that balance risk and a sustainable return on investment so that the sector can continue to make major contributions to future healthcare needs.

A common reaction to internal and external pressures was through mergers and acquisitions to create monolithic organisations driven largely by commercial considerations rather than R&D productivity. For example, a recent mega-acquisition created a world-wide research group of over 12,000 scientists with a combined pre-merger R&D budget of \$11bn. However, drug discovery cannot be industrialised in the same way as cars or steel and productivity has not increased in pharma over the past decade, although R&D expenditure has ballooned to unsustainable levels. In future, drug discovery will be carried out by smaller and more nimble organisations

with clear objectives, reporting lines and accountability.

In response to these economic, regulatory and organisational threats, pharma is going through an extensive round of downsizing with site closures, redundancies and significant budget reductions. The UK has been particularly hard hit with closures by AstraZeneca, GlaxoSmithKline, Pfizer, Merck and Roche in recent years, with thousands of skilled scientists losing their jobs and livelihoods. Of course, individual hardship is also reflected by reduced tax inflow at national and local levels, erosion of a positive balance of payments, reduced industry support for science education at all levels, and for community activities. Contraction of pharma is also a major concern for the next generation of UK-trained research scientists as employment prospects have been seriously threatened, and the nation's science base will be weakened. Whilst these events present significant challenges, there is also a unique opportunity now to redeploy world class medicinal chemists released by pharma as part of a re-shaping of the UK's medicines research landscape. One attractive option is to build this medicinal chemistry expertise into a series of dedicated drug discovery hubs co-localised with therapeutic area clusters as this fundamental skills base barely exists in UK academia.

The economic consequences of pharma downsizing are obviously serious, but such dramatic reductions in research capacity also threaten future healthcare innovation in the UK, particularly in the light of an ageing population. Not only has

the pharma research base contracted but therapeutic areas such as neuroscience and obesity are being downsized, despite high medical need and limited effectiveness of current therapies. In addition, these diseases are particularly burdensome in terms of healthcare costs as illustrated by a recent analysis which shows that the cost associated with the treatment of dementia is twice that for cancer.

Meagre returns on investment have largely forced pharma to exit antibiotic R&D, even though the WHO has forecast a disaster due to rapid and unchecked increases in microbial resistance. Indeed, the devastating effects of HIV and MRSA, for example, underline the need for a strong pharmaceutical R&D sector to invent new drugs to control known and unexpected medical challenges in the 21st century. Given the scale of pharma contraction in the UK, the shortfall in healthcare innovation cannot be made up by academia and charities in their current format as there is neither the scale nor experience. In addition, these bodies largely focus on diseases of the developing world and cancer, and there are little or no drug discovery initiatives in the public sector addressing serious conditions such as obesity and schizophrenia.

The developing gap in healthcare innovation is particularly concerning as the UK has well-established strong academia/industry/clinical research partnerships in drug discovery and development that have taken years to build, but which simply do not exist in developing countries. If these world class drug discovery teams

are allowed to fragment, it will be extremely difficult to re-build such quality from scratch. It is essential that the UK's unique medicinal chemistry talent pool is nurtured, supported, and integrated into multidisciplinary translational initiatives as a fundamental core skill to facilitate and exploit innovative biology emerging from UK laboratories. UK medicinal chemists are particularly successful in inventing the synthetic molecules that provide cost effective oral therapies that are the mainstay of any healthcare system. While biological based drugs are making a significant impact, this therapeutic class will not remove the need for affordable small molecule "drug pills" taken by mouth for chronic diseases.

Pharma's response to stagnant productivity was to create monolithic organisations, but the number of NCEs approved by the FDA has barely changed over the past decade, and attrition during discovery and development has remained above 90%. Greater consideration needs to be given to the reasons for compound failure which include poor target validation, suboptimal animal and human safety, heterogeneous clinical trials rather than targeted patient sub-groups, and insensitive methodologies where placebo response can confound a positive signal to a novel mechanism of action. In addition, "chemistry space" needs to be expanded significantly to access hundreds of novel biological targets that are involved in important diseases, but are beyond the reach of current drug templates. International pre-competitive collaborations such as the

European InnoMedPredTox, the Innovative Medicines Initiative and the Structural Genomics Consortium are addressing some of these issues, as are a series of precompetitive workshops being coordinated by the RSC across the UK but investment needs to be increased in order to reduce R&D risk.

SPECIFIC ACTIONS FOR MINISTERS

We recommend a UK-wide strategy for medicines that will:

- enable funding bodies to be more effective in supporting a new model for medicines R&D
- revitalise areas of high medical need such as obesity and psychiatric disorders
- ensure reimbursement of new medicines is based on an informed evaluation of risk/benefit and takes into account the full costs of innovation.

The UK must strengthen research that crosses disciplines and sectors, an integral component of drug discovery. Importantly, we need to recognise and capitalise upon the central role played by chemists in medicines R&D. Specifically, science and funding policy needs to:

- encourage industrial, academic and clinical researchers to work together to identify the most relevant disease targets and which patients are most likely to benefit from new medicines in order to maximise the chances of success with clinical trials
- support the creation of a network of Therapeutic Centres of Excellence (such as the Drug Discovery Centre, Imperial College) where experienced medicinal

chemists can work alongside disease experts to apply the latest scientific advances to discover new medicines. These centres could be sited at academic institutions, or at repurposed facilities previously part of large Pharma.

The UK needs to be well-equipped and financed to meet successfully the healthcare challenges of the 21st century, particularly for an ageing population. A sustainable drug discovery model, comprising a network of national facilities, spin-outs and CROs working alongside large Pharma, will bring significant medical and economic benefits to the UK, strengthen our science base and provide exciting career opportunities for world class scientists trained in our Universities.