HM Government

Industrial Strategy

Life Sciences Sector Deal

INDUSTRIAL STRATEGY

Foreword

Across the world, advances in science and technology are transforming the way we live our lives. Nowhere is innovation more life-changing than in medicine, healthcare and their associated fields.

New discoveries and the application of new technologies mean we can diagnose illnesses earlier and more accurately, create new treatments and ensure existing ones are more effective, and make care more beneficial and comforting. Billions of people throughout the world are being supported to live longer, healthier and happier lives.

The United Kingdom is extraordinarily well placed to play a leading role in this revolution in the life sciences. Our universities and research institutes rank among the best in the world. They nurture and attract some of the most inventive people on earth. We are both a home to some of the most successful global life sciences companies and a hotbed for new businesses bringing discoveries and new techniques to a wider market. Our National Health Service is a prized national asset – as the most admired health system in the world, the nation's biggest employer, a deep source of learning and the means of translating discoveries into care.

To realise the full potential and greatest impact of these strengths in innovation, education, healthcare and business – and their future applications and opportunities – we must join them together. Partnership is pivotal to our Industrial Strategy and integral to the ambition of this Life Sciences Sector Deal.

The agreement that has been reached follows on from, and starts to implement, the Life Sciences Industrial Strategy published in August 2017.

The deal brings together the government with universities, charities and more than 25 businesses – large and small – to make a joint commitment to invest in all parts of the United Kingdom.

These investments will create high quality, well-paid jobs. They will also produce real benefits for patients – such as through allowing earlier diagnosis of conditions and speeding up access to new treatments.

This Life Sciences Sector Deal is just the beginning. During the months and years ahead we will deepen the collaboration between the partners and join with new participants as we help realise the vision set out in August.

At this exciting time in the development of the life sciences industry we are determined, together, to keep Britain a leader in a field that will transform the lives of generations to come.

Rt Hon Greg Clark MP
Secretary of State for Business, Energy and Industrial Strategy

Rt Hon Jeremy Hunt MP
Secretary of State for Health

Professor Sir John Bell GBE, FRS
Regius Professor of Medicine, The University of Oxford

Industrial Strategy at a glance

We will create an economy that boosts productivity and earning power throughout the UK

Industrial Strategy is built on 5 foundations

We will set Grand Challenges to put the United Kingdom at the forefront of the industries of the future:

AI & Data Economy
We will put the UK at the forefront of the artificial intelligence and data revolution

Clean Growth
We will maximise the advantages for UK industry from the global shift to clean growth

Future of Mobility
We will become a world leader in the way people, goods and services move

Ageing Society
We will harness the power of innovation to help meet the needs of an ageing society

Key policies include:

Ideas

- Raise total research and development (R&D) investment to 2.4 per cent of GDP by 2027
- Increase the rate of R&D tax credit to 12 per cent
- Invest £725m in new Industrial Strategy Challenge Fund programmes to capture the value of innovation

People

- Establish a technical education system that rivals the best in the world to stand alongside our world-class higher education system
- Invest an additional £406m in maths, digital and technical education, helping to address the shortage of science, technology, engineering and maths (STEM) skills
- Create a new National Retraining Scheme that supports people to re-skill, beginning with a £64m investment for digital and construction training

Infrastructure

- Increase the National Productivity Investment Fund to £31bn, supporting investments in transport, housing and digital infrastructure
- Support electric vehicles through £400m charging infrastructure investment and an extra £100m to extend the plug-in car grant
- Boost our digital infrastructure with over £1bn of public investment, including £176m for 5G and £200m for local areas to encourage roll out of full-fibre networks

Business Environment

- Launch and roll out Sector Deals – partnerships between government and industry aiming to increase sector productivity. The first Sector Deals are in life sciences, construction, artificial intelligence and the automotive sector
- Drive over £20bn of investment in innovative and high potential businesses, including through establishing a new £2.5bn Investment Fund, incubated in the British Business Bank
- Launch a review of the actions that could be most effective in improving the productivity and growth of small and medium-sized businesses, including how to address what has been called the 'long tail' of lower productivity firms

Places

- Agree Local Industrial Strategies that build on local strengths and deliver on economic opportunities
- Create a new Transforming Cities fund that will provide £1.7bn for intra-city transport. This will fund projects that drive productivity by improving connections within city regions
- Provide £42m to pilot a Teacher Development Premium. This will test the impact of a £1,000 budget for high-quality professional development for teachers working in areas that have fallen behind

An independent Industrial Strategy Council will assess our progress and make recommendations to government.

Executive summary

The Life Sciences Sector Deal builds on the ambitious Life Sciences Industrial Strategy, led by Professor Sir John Bell. Published in August 2017, the strategy sets out recommendations for our world-leading life sciences industry to drive growth, increase productivity, improve the use of data, reinforce our science base, deepen our skills and secure benefits for patients throughout the United Kingdom.

The government and the life sciences sector have worked extensively since August to agree a first phase of a ground-breaking deal, working together strategically to enhance the attractiveness of the UK. This collaboration includes more than 25 organisations – businesses large and small across biopharma, medtech and diagnostics, charities and academia. Our globally-renowned NHS is a key partner in delivering the deal. It builds on the UK's many strengths, including our world-class science base and business-friendly environment while also taking action on the areas we know need improvement, such as helping small companies scale up, increasing access to finance and further advancing collaboration with the NHS. We expect significant further agreements to be reached in early 2018 as further phases of the deal are agreed.

The deal is aligned to the foundations set out in the Industrial Strategy – ideas, people, infrastructure, the business environment and places – and supports its vision for the world's most innovative economy; good jobs and greater earning power for all; a major upgrade to the UK's infrastructure; the best place to start and grow a business; and prosperous communities across the UK. Some areas have greater focus in this deal – which is intended as the first in a series with the life sciences sector to support its ambition to make the UK a top tier global hub for biomedical and clinical research and medical innovation. This is the vision set out in the Life Sciences Industrial Strategy, and which this deal takes forward.

Ideas

The Industrial Strategy White Paper sets out how the government is investing to establish the UK as the world's most innovative economy. In the White Paper we announced a further increase in **research and development (R&D) investment of £2.3bn in 2021/22, raising total public investment in R&D from around £9.5bn in 2016/17 to £12.5bn in 2021/22**, as well as a commitment to work with industry to **boost spending on R&D to 2.4 per cent of GDP by 2027. This will increase to 3 per cent over the longer term**. This Sector Deal shows how the life sciences sector can play an important part in meeting this commitment with a stream of new commercial investments made, including the announcement of a major investment in discovery science from **MSD**[1]. This builds on the strong base provided by world-leading UK companies such as **AstraZeneca** and **GlaxoSmithKline** and other substantial commitments in this field. The government and industry are working closely together to improve the UK's clinical trials environment – a key source of inward investment in the sector – with action underway to streamline approvals processes and industry taking forward cutting-edge novel trial designs.

The Health Advanced Research Programme will aim to put the UK at the forefront of work to address the global healthcare challenges of the next 20 years. It will seize the opportunities in new technologies that will shape our world such as genomics and artificial intelligence (AI), and which will create new industries in the process. Working with industry, charities, the NHS and universities, the Industrial Strategy Challenge Fund 'Data to early diagnostics and precision medicine' programme will invest up to £210m[2] to enhance the power of health data and technology to diagnose life-changing diseases at the earliest possible stage.

Business Environment

In the past, scientific discoveries have not always led to the manufacture of the resulting products in the UK. Our strategy intends to change that. The government has committed £162m to develop the manufacturing infrastructure for innovative medicines and enable small and medium-sized businesses to produce advanced therapies. This includes two new national centres – the Medicines Manufacturing Innovation Centre and Vaccines Development and Manufacturing Centre – alongside the existing national centres and three advanced therapy treatment centres that will be co-located in hospitals across the UK. Building on our existing infrastructure supporting cell and gene therapy, these investments will make the UK a uniquely attractive location for complex medicines manufacturing and support our ambition to become a leading hub for advanced therapy manufacturing. Companies are already recognising this: **Seqirus**, the world's second largest influenza vaccine manufacturer and a global leader in pandemic response, has just announced its £40m investment in a new high-tech 'fill and finish' facility in Liverpool, creating nearly 100 high-value jobs, in addition to the 600 staff already there.

We want the UK to be the best place to start and grow a business. The Life Sciences Industrial Strategy focused on access to risk capital to allow the expansion of highly innovative companies and, importantly, the scaling of those companies through the use of more patient capital.

The government's response to the consultation *Financing Growth in Innovative Firms*[3] addresses the points raised in the strategy with a plan to release over £20bn of patient capital investment to finance growth in innovative businesses over 10 years.

The NHS is a key part of the business environment for the life sciences industry. The response to the Accelerated Access Review is an important commitment from the UK government, including a streamlined approvals system and an £86m investment to support small and medium-sized businesses and evidence collection to get the right products to patients. This deal restates the commitment by the government, the NHS and industry to collaborate closely – an invaluable feature of the UK life sciences landscape. It highlights examples of this collaboration in practice and the significant benefits it can bring to NHS patients. This deal also supports the development of measures to improve the UK's health data infrastructure working with NHS England, NHS Digital and Health Data Research.

Places

The Industrial Strategy set out our goal of helping prosperous communities to thrive across the UK. Life sciences is a UK-wide sector with world-class clusters found across the country – from biotechnology in Fife to medtech in South Wales. This deal supports the government's aims to strengthen growth and opportunity across the country, with pioneering investments in Manchester, Leeds, Sheffield, Glasgow and South Wales. **A £350m investment programme in the Leeds City Region** will build on the opportunities in this leading medtech hub. We are taking measures to support leading clusters by developing the infrastructure and transport links they need, for example, through a £215m Housing Deal with Oxfordshire and a £5m commitment to develop proposals for Cambridge South station.

People

The government set out its vision for generating good jobs and greater earning power for all in the Industrial Strategy. To do this, we need to ensure that we are equipping citizens for jobs shaped by next generation technology. The Life Sciences Industrial Strategy highlighted how, for example, the emerging field of data science, particularly bioinformatics and clinical data analytics, is moving at pace across the sector. This deal sets out how industry is taking steps to address this through apprenticeships and how it will work with the government to monitor uptake and ensure standards that are important to the sector are prioritised. These actions will help support the industry's ambition to reach 20,000 apprenticeships in the science sector by 2020[4]. This deal also recognises the importance of a streamlined system to enable highly-skilled workers to come to the UK.

Life Sciences Sector Deal

Key commitments

Ideas

To be the world's most innovative economy.

Government action to support life sciences

Raise the intensity of research and development (R&D) in the UK

- We will increase investment in R&D to 2.4 per cent of GDP by 2027 and 3 per cent over the longer term - delivering an estimated increase of £80bn over the next 10 years.
- In the White Paper we announced a further increase in R&D investment of £2.3bn in 2021/22, raising total public investment in R&D from around £9.5bn in 2016/17 to £12.5bn in 2021/22. This means that, based on current forecasts, total support for R&D will increase by a third by 2021/22.
- The Autumn Budget announced an increase in the rate of the R&D expenditure credit from 11 to 12 per cent with effect from 1 January 2018.

Strengthen the environment for clinical trials

- We will invest through the National Institute for Health Research in research infrastructure in the NHS. New contracts worth more than £950m will start over the next five years.
- The Health Research Authority will speed up approvals for clinical trials and reduce the burden on NHS Trust R&D departments.

Establish the Health Advanced Research Programme (HARP)

- Following the approach of the Defence Advanced Research Projects Agency (DARPA) established in the United States, the Life Sciences Industrial Strategy proposed an advanced research programme in health through which industry, charities, the NHS, universities and the government will collaborate on long term healthcare projects with industrial benefits. Our approach to delivering the vision for the Health Advanced Research Programme will be laid out in future phases of the sector deal.
- Initial collaborations include the 'Data to early diagnostics and precision medicine' programme with up to £210m from the Industrial Strategy Challenge Fund[5] including:
  - Genomics: Whole genome sequencing of UK Biobank and extension of the cancer genome pathway; and
  - Digital diagnostics and artificial intelligence: Use of AI in pathology and radiology diagnostics, demonstrating these technologies at scale within the NHS.

Sector action to support life sciences

Life sciences companies will make increasing commitments to investing in the UK.

A pipeline of new investment will be announced subject to final business approvals, during the months ahead. So far, investments announced include:

- Following a long-standing collaboration with the University of Oxford, Novo Nordisk this year announced the establishment of a new £115m research centre in Oxford, aiming to discover innovative medicines for people with type 2 diabetes, employing up to 100 scientists and occupying a new building from mid-2018;
- This builds on significant investments already made into the UK by AstraZeneca and Vertex Pharmaceuticals; and
- Alongside the deal, MSD[6] announced its commitment to establish a state-of-the-art new UK Discovery Centre in London, focused on early bioscience discovery and entrepreneurial innovation. This will lead to 150 new research roles and c.800 additional staff at the site.

Collaborations between companies and academia, developing innovative clinical trials, including:

- The Medicines Company partnership with the University of Oxford's Clinical Trial Service unit and Epidemiological Studies unit involves a more than $100m contract for a multi-year clinical trial with 15,000 participants for a new cholesterol-lowering investigational drug; and
- Janssen Pharmaceutica NV, one of the Janssen Pharmaceutical Companies of Johnson & Johnson, and the University of Oxford intend to collaborate on novel clinical trial methodologies focusing on mental health disorders such as depression, an NHS priority area.

A diverse range of life sciences organisations will collaborate with government on advanced health research projects:

- Organisations including GSK and AstraZeneca will work in partnership with the government to contribute to the whole genome sequencing of the UK Biobank and the extension of the cancer genome pathway from the 100,000 Genomes Project, building on the NHS contribution;
- Major companies including Philips, Roche Diagnostics and Leica are in discussion with the government and the NHS to develop a trail-blazing digital pathology programme using artificial intelligence. A similar programme is being explored with the sector in radiology where we have had interest from Philips, Siemens, GE Healthcare and Toshiba Medical Systems; and
- Leading health charities (including Wellcome Trust, Bill & Melinda Gates Foundation and Cancer Research UK) are coming together to explore concepts and potential structures to shape the future of the Health Advanced Research Programme.

Business Environment

To be the best place to start and grow a business.

Government action to support life sciences

Support the growth of medicines manufacturing

- A £146m investment programme from the Industrial Strategy Challenge Fund will support measures to grow medicines manufacturing, including:
  - £12m on a Medicines Manufacturing Innovation Centre;
  - £66m on a Vaccines Development & Manufacturing Centre;
  - £12m on the expansion of Cell & Gene Therapy Catapult Manufacturing Centre in Stevenage;
  - £30m to establish three Advanced Therapies Treatment Centres;
  - £25m to support collaborative R&D; and
- A further £16m from the Industrial Strategy Challenge Fund will grow advanced therapies manufacturing capacity in viral vectors.

Improve the UK environment for businesses with the potential to scale up

Realise over £20bn of patient capital investment over 10 years through a number of actions, including by:

- Establishing a new £2.5bn Investment Fund incubated in the British Business Bank, unlocking £7.5bn through co-investing with the private sector;
- Giving pension funds confidence that they can invest in assets supporting innovative firms as part of a diverse portfolio. The Pensions Regulator will clarify guidance on investments with long-term horizons. With over £2tn in UK pension funds, this has the potential to transform the supply of capital to innovative firms; and
- Significantly expanding the support that innovative knowledge-intensive companies can receive through the Enterprise Investment Scheme (EIS) and Venture Capital Trusts (VCTs) while introducing a test to reduce the scope for and redirect low-risk investment, together realising over £7bn of new investment in high-growth firms through EIS and VCTs.

Government action to support life sciences

Implement the Accelerated Access Review, as outlined in November, to improve access to new technologies in the NHS by streamlining pathways and supporting small and medium-sized businesses:

- Establish an Accelerated Access Collaborative to develop a streamlined pathway to bring breakthrough products to market and then to patients;
- £86m of government funding focused on supporting innovators and the NHS locally;
- A digital health catalyst which supports small and medium-sized businesses partnering with the NHS to develop technologies; and
- Improve NHS England's commercial capacity and capability.

Support development of measures to improve the UK's health data infrastructure working with NHS England, NHS Digital and Health Data Research to:

- Develop a number of regional, interoperable Digital Innovation Hubs which support the use of data for research purposes within the legal framework, and meet the strict parameters for sharing data and the security standards set out by the National Data Guardian;
- Set out clear and consistent national standards and approaches for data and interoperability;
- Streamline legal and ethical approvals for data access for researchers via NHS Digital; and
- Create a sandbox for secure, remote data access for anonymised data in a safe environment.

Deliver on the 12 actions to support and apply research in the NHS published in November by NHS England in partnership with the National Institute for Health Research.

Sector action to support life sciences

Match-funding for Industrial Strategy Challenge Fund investment

- The government's commitment to medicines manufacturing has leveraged industry pledges of up to £253m in Industrial Strategy Challenge Fund healthcare competitions, creating an environment to support further investments in the manufacturing of complex medicines in the UK, including vaccines and advanced therapies.

Advanced therapies

- UK advanced therapy small and medium-sized businesses have seen growth and investment in the last year, including Oxford Biomedica, Touchlight Genetics and Adaptimmune.
- Many are scaling up operations to include early-stage manufacturing:
  - Autolus and Cell Medica will be the first companies to move in to the Cell and Gene Therapy Manufacturing Centre; and
  - $1m Thermo Fisher BioServices' CryoHub located at the Cell and Gene Therapy Manufacturing Centre in Stevenage will support these small and medium-sized businesses.

Other companies are investing in their own manufacturing facilities.

Private sector investments & growth

Measures such as improved access to finance enable businesses to grow more easily, including small and medium-sized firms, and attract international organisations:

- A major healthcare investor, Apple Tree Partners, has signalled its intention to create a biopharmaceutical company in the UK;
- During the development of the strategy, Seqirus have committed to £40m investment in a new high-tech 'fill and finish' facility in Liverpool, creating nearly 100 high-value jobs; and
- In **advanced therapies** both the number and amount of finance raised by UK companies has surged – from 22 companies in 2012 to 64 in 2017, and investment raised since 2013 is in excess of £1.3bn. For example, Immunocore has received a $40m investment from the Bill & Melinda Gates Foundation to collaborate to develop products against infectious diseases.

Sector action to support life sciences

Better collaboration between the industry and the NHS to transform patient services and greatly improve care pathways

- Industry will play a key role in the newly established Accelerated Access Collaborative, chaired by Sir Andrew Witty;
- A major Johnson & Johnson Medical Devices collaboration has begun in east London around orthopaedic services. The agreement focuses on improving performance, by delivering 12 per cent more theatre utilisation and reducing patient stay in the hospital by 25 per cent, over the period of the contract;
- Johnson & Johnson Managed Services have partnered with Guy's and St Thomas' NHS Foundation Trust to deliver an Orthopaedics Centre of Excellence; and
- Smith & Nephew is developing a new model for wound care in community trusts, designing a digital tool that will support frontline community nurses with point-of-care decision-making support and drive better standardisation of care. The company estimates that the programme will drive significant improvements in patient outcomes, resulting in shorter treatment duration and more wounds healed, and release significant nurse resources (around 9 nurse FTEs per Clinical Commissioning Group).

Places

To have prosperous communities throughout the United Kingdom.

Government action to support life sciences

Implement a regional approach to the life sciences sector deal by working closely with key clusters and the devolved administrations. Immediate actions include:

- Partners across the Leeds City Region, including universities, local authorities, the NHS and industry are establishing a **£350m investment programme in the region's leading medtech hub;**
- Experts in academia, industry and health are coming together at the **Sheffield Olympic Legacy Park to deliver two pioneering projects**: the Orthopaedic and Rehabilitation Research and Innovation Centre and the Centre of Child Health and Technology;
- A **£215m Oxfordshire Housing Deal** to fund local infrastructure investment and housing, as part of the Cambridge-Milton Keynes-Oxford corridor;
- A **£5m commitment to develop proposals for Cambridge South station** and a study to consider future enhancements; and
- **Construction of the Expressway between Cambridge and Oxford** as laid out in the second Roads Investment Strategy.

Sector action to support life sciences

The regional strength of the life sciences sector and integration with the NHS supports investment and partnership across the country.

Major developments in key clusters in the UK include:

- BBI Group, manufacturers of medical diagnostics, announced in February 2017 that they will centralise their manufacturing and development activities into a Centre of Excellence and a new global headquarters for the Group at the Border Technology Park in Crumlin, South Wales;
- BioClavis, a new spin-out from Californian molecular profiling company BioSpyder, is to be based at the Clinical Innovation Zone at Glasgow's Queen Elizabeth University Hospital, creating 43 new jobs;
- The Northern Health Science Alliance (NHSA), working with both local and global industry, will work with the government to support the growth of the north's life science and health innovation economy. The NHSA has identified a strong commercial pipeline of investment for future waves of the sector deal; and
- QIAGEN, a leading provider of molecular testing solutions that enable valuable insights to be gained from any biological sample, intends to partner with Health Innovation Manchester to develop a genomics and diagnostics campus.

People

To generate good jobs and greater earning power for all.

Government action to support life sciences

Work with the sector to ensure a highly-skilled workforce by reinforcing the skills base across the UK and enabling high-skilled immigration

- Reinforcing the domestic skills base in partnership with industry:
  - The government will work with employers to **monitor the impact of the apprenticeship levy** and continue to analyse all apprenticeship starts;
  - The government will work with the Institute for Apprenticeships to **prioritise standards brought forward by the sector and identified as Industrial Strategy priorities**; and
  - The government will work with the **Science Industry Partnership** and connect it with **Skills Advisory Panels (SAPs)**. SAPs will produce analysis of skills supply and demand to inform Local Industrial Strategies and post-16 skills provision.
- Enabling skilled workers to come here, including:
  - **Change immigration rules** to enable world-leading scientists under the Tier 1 route to apply for settlement after three years;
  - Make it quicker for **highly-skilled students** to apply to work in the UK after finishing their degrees; and
  - **Reduce red tape** in hiring international researchers.

Sector action to support life sciences

Industry-led skills initiatives:

- The Science Industry Partnership and the Association of the British Pharmaceutical Industry will conduct **apprenticeship surveys to complement government analysis of apprenticeship uptake across the sector;**
- Industry will develop **Trailblazer apprenticeship standards to meet key skills gaps**, e.g. on bioinformatics, regulatory affairs and clinical trial specialists; and
- Industry will bring together employers and local skills partners through Science Industry Partnership Cambridge to drive collaborative approaches to tackling skills challenges.

Ideas

Raise the intensity of research and development (R&D) in the UK

The government is investing to establish the UK as the world's most innovative economy and the life sciences sector is at the forefront of this drive. The Life Sciences Industrial Strategy emphasised the considerable opportunities for the industry to collaborate with the outstanding and highly productive UK science base.

The UK government has recognised the value of increasing R&D funding, demonstrating its commitment to furthering UK excellence in this field by announcing in the Industrial Strategy a further increase in investment of £2.3bn in 2021/22 from the National Productivity Investment Fund, raising total public investment in R&D to £12.5bn that year alone.

The government is committed to working with industry to increase spending on R&D to 2.4 per cent of GDP by 2027, and then to 3 per cent over the longer term. This could increase public and private R&D investment by as much as £80bn over the next 10 years and will require government and private sector collaboration. Life sciences, as the most R&D-intensive sector of the UK economy, is likely to benefit substantially from this uplift.

The Life Sciences Industrial Strategy highlighted the strength of the science base in UK universities. Co-locating strong, private sector science with academic centres of excellence is a significant opportunity for discovery science. Examples of new technology with powerful potential for both basic and discovery science include the Diamond Synchrotron and the new technology of cryoelectron microscopy, for which Richard Henderson at the Medical Research Council's Laboratory of Molecular Biology in Cambridge won the Nobel Prize in 2017.

Global life sciences companies are recognising this strength through their actions. Global pharmaceutical company, **AstraZeneca**, stressed the opportunities and benefits associated with co-location when they announced their decision to move their main UK research campus from Alderley Edge, Cheshire, to a new global corporate headquarters and research facility on the **Cambridge Biomedical Campus** adjacent to the Addenbrooke's and new Papworth Hospital sites, the University of Cambridge and leading research institutions. This will be one of their three major global research centres and the company is investing some £2bn per annum on UK-associated R&D. Construction of the £500m facility is well underway and is scheduled to be fully operational in eighteen months' time with 2,000 staff based at the Cambridge Biomedical Campus.

Following a long-standing collaboration with the University of Oxford, **Novo Nordisk** this year announced the establishment of a new £115m research centre in Oxford, aiming to discover innovative medicines for people with type 2 diabetes, employing up to 100 scientists and occupying a new building in summer 2018.

Vertex Pharmaceuticals has significantly increased its footprint in the UK since 2015, establishing its international headquarters in London with 128 employees and growing its Oxford R&D site to 140 employees, the majority of whom are scientists.

And alongside this deal, **MSD**, known as Merck and Co Inc in the US and Canada, has announced its commitment to establish a state-of-the-art life sciences discovery research facility in London, focused on early bioscience discovery and entrepreneurial innovation. The new UK Discovery Centre is anticipated to create 150 new research roles and the new site will accommodate approximately 800 additional staff for the UK domestic market and other European clinical functions currently based in MSD's UK Hoddesdon headquarters. MSD believes that locating a research facility in London will expand MSD's opportunity to engage with leading researchers in the UK and Europe.

These significant investments demonstrate the UK's ongoing position as a world leader in this field and are particularly important because they create the fundamental

intellectual property on which the sector survives. A strong discovery base is also associated with a growing capacity in both clinical development and manufacturing in the future.

The Life Sciences Industrial Strategy also highlighted the importance of facilitating convergent science activities, as the interface between life sciences and physical sciences is likely to underpin many important commercial opportunities for the future. The government is already creating opportunities for this to happen in the public sector, including through the creation of **UK Research and Innovation**, intended to bring scientific disciplines closer together, and investment in the **Francis Crick Institute** and the **Health Data Research UK** programme. The **Rosalind Franklin Institute** in Harwell will bring together life scientists with engineers and physical scientists, and companies are already discussing opportunities to develop state-of-the-art drug discovery programmes on the campus before the facility is built.

Strengthen the environment for UK clinical trials

The Life Sciences Industrial Strategy highlighted the progress the UK has made so far in delivering large-scale clinical trials with industry over the last ten years. However, it also noted that there are opportunities to further improve translational science and attract more clinical trials from industry – a significant source of inward investment in the life sciences sector.

Progress is already being made. The government, through the **National Institute for Health Research**, has invested significantly in research infrastructure in the NHS, with new contracts worth more than £950m over the five years from April 2017. This includes investments in National Institute for Health Research Biomedical Research Centres, Clinical Research Facilities for Experimental Medicine and Experimental Cancer Medicine Centres (co-funded with Cancer Research UK and health departments in the UK and devolved administration governments). This infrastructure provides the expertise and facilities the NHS needs for first-class research that life sciences researchers can access at any stage of the clinical development process.

The **Health Research Authority** (HRA) has initiated a number of changes to improve the speed of approvals for clinical trials and reduce the burden on NHS Trust R&D departments. Recent work to integrate and optimise approval processes has been supplemented by a review of the HRA research systems. Automation of processes, which supports or replaces decision-making, has the potential to reduce workload for ethics committees and to improve further the consistency, speed and efficiency of the approvals service. NHS England is working with the Department of Health, the HRA, the National Institute for Health Research, NHS Improvement and industry partners to reduce delays caused by individual hospital trusts negotiating research costs, which remains one of the major obstacles to rapid site set-up.

The Life Sciences Industrial Strategy also identified opportunities for undertaking novel and more efficient trial designs, including the use of digital real-world evidence, facilitated by innovative regulation.

The UK and UK companies have already shown themselves to be world-leading in this field: **GSK's** ground-breaking **Salford Lung Study** examined the safety and effectiveness of a new treatment (Relvar® Ellipta®) for chronic obstructive pulmonary disease and later for asthma patients. Salford was the world's first digitally-enhanced Randomised Controlled Trial (RCT) to include a broad and inclusive population of patients in an everyday clinical practice setting, embracing a novel approach to clinical trial design. It was made possible through a unique collaboration between GSK, North West e-Health, the University of Manchester, Salford Royal NHS Foundation Trust, University Hospital of South Manchester, NHS Salford, and GPs and community pharmacists in Salford, Trafford and South Manchester. Patients with chronic obstructive pulmonary disorder treated with Relvar® Ellipta® achieved superior reduction in exacerbations compared with 'usual care'.

Further collaborations between companies and academia to develop innovative trials have recently been announced:

- **The Medicines Company** is undertaking two exciting projects in this arena. The first is intended to demonstrate how late-stage trials can be run more cost-efficiently using streamlined processes and digital tools. This programme, partnered with the University of Oxford's Clinical Trial Service Unit and Epidemiological Studies Unit involves a more than $100m contract for a multi-year clinical trial with 15,000 participants for a new cholesterol-lowering investigational drug. Patients will be recruited from the UK and the United States, with the Oxford team running the trial. The Medicines Company also agreed a project this year with the **Greater Manchester Health and Social Care Partnership**, valued at up to $10m to develop their understanding of the Greater Manchester population's unmet need and economics related to heart disease, stroke, and peripheral artery disease, enrolling patients from the area into a global clinical trial programme and with the anticipation of designing improved care pathways, potentially improving patient outcomes and the economic efficiency of care.

- **Janssen Pharmaceutica NV**, one of the Janssen Pharmaceutical Companies of Johnson & Johnson, and the **University of Oxford** intend to collaborate on novel clinical trial methodologies in the UK; these would include so-called platform trials, focusing on mental health disorders such as depression, an NHS priority area. The platform trial methodology is a new approach that could allow multiple novel pharmaceutical agents and other therapies to be efficiently tested in parallel.
- Leading charities are also driving action in this area, with **Wellcome Trust** and the **Bill & Melinda Gates Foundation** exploring routes to improve international good clinical practice guidelines in an attempt to deliver more effective and efficient studies.

Exploratory development and early translational research

The Life Sciences Industrial Strategy called for a substantial effort to be made to network UK centres of excellence around therapeutic areas to provide opportunities for collaboration with industry in early development activities. Since the report was published, the UK has launched an integrated transplant trials network which links a trials facilitatory hub and 22 regional transplant centres, 10 of which receive upfront research nurse funding. The **IMPACT network**, led by Professor David Marks of Bristol and Professor Charlie Craddock from Birmingham, is one of only two integrated transplant trial networks in the world and aims to deliver prospective stem cell transplant trials. Funded by **NHS Blood and Transplant** and the charities **Anthony Nolan** and **Leuka**, IMPACT works within the facilitatory infrastructure of the National Institute for Health Research and the National Cancer Research Institute. Importantly, the network permits the delivery of trials to regulatory standard. Data from one of the first IMPACT trials, developed in collaboration with an east coast US pharmaceutical partner, will inform a licensing application for one of their lead compounds.

The National Institute for Health Research is bringing together funded centres of excellence in early translational (experimental medicine) research. It has established National Institute for Health Research Translational Research Collaborations in inflammatory joint diseases and inflammatory lung diseases, and is exploring new collaborations in areas of patient need. The National Institute for Health Research has also created a national BioResource for Translational Research in Common and Rare Diseases which enables people to participate in early translational research on the basis of phenotype and genotype. It increases collaboration by bringing together leading researchers across England, including in rare diseases – a key UK strength – and links closely with the UK's 100,000 Genomes Project.

Establish the Health Advanced Research Programme

The Life Sciences Industrial Strategy recognised the need to identify very high impact projects that address the major healthcare challenges of the future and have the potential to create opportunities for whole new commercial sectors over the next 20 years, while also transforming patient care.

Our approach to delivering the vision for the Health Advanced Research Programme will be laid out in future phases of the deal. Leading health charities, such as **Wellcome Trust**, the **Bill & Melinda Gates Foundation** and **Cancer Research UK**, are coming together to explore concepts and potential structures to shape the future of the programme.

This deal contains significant concrete commitments to deliver on the Life Sciences Industrial Strategy's vision for the Health Advanced Research Programme and take forward infrastructure projects on key areas of focus identified in the strategy: through the 'Data to early diagnostics and precision medicine' Industrial Strategy Challenge Fund programme, we will invest up to £210m[7] to enhance the power of health data and technology to diagnose life-changing diseases at the earliest possible stage and develop precision treatments to cure them. This will be matched by funding and in-kind contributions from the sector, as well as strong collaboration with the NHS.

Genomics

The UK is uniquely positioned to be the global leader in this field thanks to major projects such as UK Biobank and the 100,000 Genomes Project exemplified in the partnership between Genomics England and NHS England.

As such, it is a highly attractive place for both pharma and in vitro diagnostics industries to invest. The population cohort resources in the UK are world-class, reflecting a 20-year history of investment into large-scale research assets that follow large populations of patients over time. The NHS-based 100,000 Genomes Project has pioneered the use of whole genome sequencing technology in routine clinical care and has successfully established this technology for clinical application with Illumina, a DNA sequencing company, as the major partner. As the price of genome sequencing falls, the UK can create even larger datasets, particularly through the ongoing link with the NHS and the NHS England plans to introduce whole genome sequencing as part of the genomic testing directory. This will allow for the rapid evolution of precision medicine and identification of better drug targets for the industry. A new genomics industry is beginning to emerge from this, with UK companies like **AstraZeneca, Cambridge Epigenetix, Genomics plc and Congenica** working with **Genomics England**. Patients will benefit from earlier, more accurate diagnosis and more effective treatments. Continuing to grow and invest in these large-scale research platform assets will result in major UK successes in this field.

The genomics programme described in the Life Sciences Industrial Strategy has made considerable progress over the past six months. To build on this, organisations including **GSK** and **AstraZeneca** will work in partnership with the government to contribute to the whole genome sequencing of the **UK Biobank** and the extension of the cancer genome pathway from the 100,000 Genomes Project, building on the NHS contribution and ensuring that the UK remains globally competitive in this area. The cancer programme in the **100,000 Genomes Project** will sequence 50,000 genomes from cancer patients, specifically those with tumours with major unmet need, which might include lung, colorectal and some types of breast cancer. This, together with the NHS plans to introduce whole genome sequencing, will create the largest repository of sequences aligned with clinical and lifelong data in the world. Access to the UK Biobank, NHS and Genomics England datasets via a single, unified, secure portal will provide many opportunities for the industry to benefit from a better understanding of disease. Availability of this data will significantly improve the identification of robust, validated drug targets, and will also considerably advance the ability to use genomics to deliver more directed, precise healthcare, bringing significant benefits to UK patients.

Understanding the metabolome (the molecules, pathways and interactions involved in the process of metabolism) is yet another tool for identifying the mechanisms of disease and therefore finding target molecules towards which to direct treatments or interventions, for example, by identifying defects. To expand the phenotypic data in these populations it is also proposed to apply metabolomics to these samples, where relevant, to create large sets of small molecule data across cohorts and in patients where sequencing provides evidence of genetic disease. To support this approach, the world's leading metabolomics company, **Metabolon**, is discussing its role as a strategic partner in the programme.

Digital diagnostics & artificial intelligence in healthcare

In the Industrial Strategy White Paper, the government recognised life sciences as one of six priority sectors where it can work with industry to support adoption of machine learning and artificial intelligence (AI) technologies at scale. There is an important role for AI in healthcare – providing more precise decisions and reducing cost – with the potential to transform many NHS services including radiology and pathology.

More accurate diagnosis can lead to early effective treatment and save lives. Linking large-scale longitudinal data on health and treatments with genomic and biomedical analyses will help develop new technologies to improve patient outcomes. Combined with enhanced image analysis, we can create new products and services such as machine learning-based data analytics tools that will help diagnose diseases earlier and assist clinicians in choosing the best treatment for individual patients, helping to transform NHS diagnostic services.

The opportunity to deliver AI solutions at scale in the UK, aligned to a vibrant research base, has attracted the attention of major companies developing digital pathology platforms including **Philips, Roche Diagnostics** and **Leica**. These companies are in discussion with the NHS, the research community and the government to shape a programme of work. The UK also has many smaller companies specialising in data analytics, diagnosis and related areas that will benefit from closer cooperation and innovation support in this area. The government will contribute from the 'Data to early diagnostics and precision medicine' Industrial Strategy Challenge Fund programme[8], which we expect to be match-funded by industry, to support NHS and industry collaboration in digital pathology, creating the basis for a new global industry in which AI and machine learning will play a prominent role.

In radiology, major players such as **Siemens, Philips, GE Healthcare** and **Toshiba Medical Systems** recognise the opportunity to provide a new wave of tools to aid in the diagnosis and management of diseases. Many small companies are springing up, capable of developing algorithms to combine data from multiple sources across the research and clinical communities to reduce healthcare costs, improve accuracy and ultimately patient outcomes. The 'Data to early diagnostics and precision medicine' Industrial Strategy Challenge Fund programme will provide a framework for NHS England, healthcare providers, researchers and imaging companies to work together to demonstrate, develop and evaluate new solutions in the NHS at scale.

Business Environment

Support the growth of medicines manufacturing

The Life Sciences Industrial Strategy noted the significant contribution life sciences manufacturing makes to the UK economy. As this deal demonstrates, the government and the life sciences industry are already working effectively together to further increase productivity, create high value jobs and increase exports. The work of the Medicines Manufacturing Industry Partnership on its technology roadmap[9] and Advanced Therapies Manufacturing Action Plan[10] helped to secure £146m of Industrial Strategy Challenge Fund support for medicines manufacturing.

This £146m will fund two new national centres – the **Medicines Manufacturing Innovation Centre** and a **Vaccines Development and Manufacturing Centre** – adding to the existing national centres: the **Cell and Gene Therapy Catapult**, including its manufacturing centre, and the **National Biologics Manufacturing Centre**. Together, these centres will make the UK a uniquely attractive location for developing technologies and investing in medicines manufacturing.

Industrial Strategy Challenge Fund programmes will also support advanced therapies including manufacturing, because of their potential to create a major shift in the benefit to patients – and in some cases to deliver cures.

Advanced therapies include cell and gene-based therapies, gene editing technologies (to repair or replace faulty genes) and nucleic acid (DNA and RNA) therapies. Many of these products use viral vectors to deliver to the target cell. Small and medium sized businesses in the UK are global leaders in this field, and many have experienced rapid growth and investment in the last year:

- **Oxford BioMedica's** lentiviral vector platform technology has been endorsed by the FDA through approval of Novartis's CAR-T cell therapy product, Kymriah™. Continued growth is assured through recent regulatory filings by Novartis in both Europe and in the United States, and with additional OXB strategic partnerships with other organisations, including Orchard Therapeutics.
- **Touchlight Genetics** is expanding operations at Hampton, London, with a Good Manufacturing Practice (GMP) facility to synthetically manufacture commercial-scale DNA (for gene therapy/gene editing/DNA vaccines) in two weeks, disrupting decades-old fermentation approaches.
- **Adaptimmune**, with its pipeline of T-cell therapies to treat cancer, has to date raised over £300m and invested in new facilities for its growth and has over 200 UK employees. In 2017 alone it raised $100m.

Many of the 64 advanced therapy developers in the UK are poised to scale up operations, including manufacturing. These investments are internationally mobile but our ambition is for the UK to become a global hub for advanced therapy manufacturing. Early signs are encouraging:

- **Autolus and Cell Medica** are set to be the first companies to move into the Cell and Gene Therapy Catapult Manufacturing Centre in Stevenage;
- **Thermo Fisher** will invest over $1m in a 4,500 sq ft CryoHub co-located with the Cell and Gene Therapy Catapult Manufacturing Centre in Stevenage; and
- Other companies such as **Oxford Biomedica, Touchlight and Cobra Biologics** are already investing in their own manufacturing facilities. Cobra Biologics's rapidly growing order book for its advanced therapy products and services, 98 per cent of which are exported, means that they need to increase capacity in both plasmid DNA and viral vector manufacturing.

As a further signal of intent to propel this emerging sector forward, **three advanced therapy treatment centres are to be established across the UK** and an additional **£16m of Industrial Strategy Challenge Fund programme support for capital projects** will help to address the critical shortage in viral vector manufacturing capacity. Innovate UK will look at the demand for this type of support in planning future support to the life sciences sector.

Other companies are also recognising the UK as an attractive place to invest in manufacturing: **Seqirus**, the world's second largest influenza vaccine manufacturer and a global leader in pandemic response has just announced its £40m investment in a new high-tech 'fill and finish'

facility in Liverpool, creating nearly 100 high-value jobs, in addition to the 600 staff already based there.

Improve the UK environment for businesses to scale up

The government wants the UK to be the best place to start and grow a business. In considering growth, the Life Sciences Industrial Strategy focused on improving access to risk capital to allow the expansion of highly innovative companies and, importantly, enabling of those companies to scale up through the use of more patient capital.

The government's response to the consultation *Financing Growth in Innovative Firms*[11], part of the Patient Capital Review, addresses a number of the points raised in the strategy. It announced an action plan to release over £20bn of patient capital investment to finance growth in innovative firms over 10 years by, for example:

- **establishing a new £2.5bn Investment Fund incubated in the British Business Bank** with the intention to float or sell once it has established a track record. By co-investing with the private sector, a total of £7.5bn of investment will be released;
- **investing in a series of private sector funds of scale**. The British Business Bank will seed the first wave of investment with up to £500m, releasing double its investment in private capital. Up to three waves will be launched, attracting a total of up to a total of £4bn of investment;
- **doubling the annual allowance for people investing in knowledge-intensive companies through the Enterprise Investment Scheme (EIS)** and the annual investment those companies can receive through EIS and the Venture Capital Trust scheme, as well as introducing a new test to reduce the scope for and redirect low-risk investment, together unlocking over £7bn of investment in growth;
- **backing first-time and emerging fund managers** through the British Business Bank's established Enterprise Capital Fund programme, supporting at least £1.5bn of new investment; and
- **backing overseas investment in UK venture capital**, expected to release £1bn of investment.

The government is continuing to explore the potential for a mutually beneficial relationship with the European Investment Fund once the UK has left the European Union. Allocation of resources across programmes would be reconfigured if the UK did not retain a mutually beneficial relationship.

The government will also support long-term investment by **giving pension funds confidence that they can invest in assets supporting innovative firms** as part of a diverse portfolio, and by **changing the qualifying rules in Entrepreneurs' Relief** to remove the disincentive to accept external investment and consulting on the detailed implementation of that change.

The Budget also announced an increase in the rate of the **R&D expenditure credit from 11 per cent to 12 per cent** with effect from 1 January 2018.

There are a number of positive developments in the sector, including the establishment of new companies. For example, a major healthcare investor, **Apple Tree Partners**, has signalled its intention to create a biopharmaceutical company in the UK.

Small and medium-sized businesses in the life sciences sector have been successful in raising finance from both public capital markets and private sources. In advanced therapies, both the number of UK companies and the amount of finance they have raised has surged – from 22 companies in 2012 to 64 in 2017, with more than £1.3bn in investment raised since 2013[12]. For example, **Immunocore** has received a $40m investment from the **Bill & Melinda Gates Foundation** to collaborate using their T-cell receptor-based technology to develop products against infectious diseases.

Implement the Accelerated Access Review

The NHS is a key part of the business environment for the life sciences industry, which raised concerns about the pace of uptake of new technologies in the NHS through the Life Sciences Industrial Strategy and the Accelerated Access Review.

The Accelerated Access Review response commits the government and partners to delivering the review's vision, an important step forward in delivering the Life Sciences Industrial Strategy ambitions in this area. A key element is the creation of the **Accelerated Access Collaborative**, chaired by Sir Andrew Witty.

The Accelerated Access Collaborative will work to streamline pathways to market, including by developing and owning the Accelerated Access Pathway, an expedited route to bring cost-effective breakthrough products to patients as quickly as possible.

The Accelerated Access Collaborative will facilitate bespoke partnerships between the NHS and the life sciences industry to deliver the world-leading innovation required to achieve better patient outcomes. In parallel, NHS England is strengthening its commercial capability to develop mutually beneficial commercial deals, delivering better value for money. Responsibility for the Patient Access Schemes is being transferred from the Department of Health to NHS England, creating a single point of contact for companies looking to access the NHS.

Underlining its commitment to this agenda, the government announced up to £86m to support innovators and the NHS in overcoming barriers to getting the right new, innovative technologies to patients. The **Academic Health Science Networks** will provide national and local support for innovation, ensuring innovators can access the support they need and a new scheme will support small and medium-sized businesses in developing an effective evidence base for their products.

Better collaboration between the industry and the NHS to transform patient services and greatly improve care pathways is a significant opportunity. These involve the NHS and the industry working together on particular care pathways to improve their efficiency. Particular successful examples of such collaborations include:

- A major **Johnson & Johnson Medical Devices (JJMD)** collaboration has begun in east London around orthopaedic services. JJMD has developed Care Advantage, a programme designed to meet the increasing need for value-based healthcare solutions in hospitals. This approach offers tailored support to help hospitals and healthcare providers improve a patient's treatment pathway and reduce costs. Following several successful national pilot programmes, in December 2016 JJMD & **Barts Health** entered a strategic commercial agreement for the provision of orthopaedic implants for hip, knee & trauma procedures with Care Advantage. The agreement focuses on improving performance, by delivering 12 per cent more theatre utilisation and reducing patient stay in the hospital by 25 per cent, over the period of the contract.
- Further to this, **Johnson & Johnson Managed Services**, and **Guy's and St Thomas' NHS Foundation Trust** announced a new 15-year partnership to deliver an Orthopaedics Centre of Excellence at Guy's Hospital. The programme is designed to optimise the standard of care for orthopaedic patients by expanding and redeveloping the orthopaedics centre at Guy's Hospital, meaning more patients will have access to services. Plans include the development of new state-of-the-art operating theatres, making the Centre of Excellence a hub for education and training, and offering a dedicated space to facilitate leading-edge research to improve clinical outcomes for patients. The partnership will also focus on streamlining the supply chain to create efficiency and reduce costs. Redesigning patient pathways and introducing innovative new technology in this way will allow Guy's and St Thomas' to improve the overall experience of patients having surgery in the institution.
- **Smith & Nephew** is developing a new model for wound care in community trusts. They are designing a digital tool that will support frontline community nurses with point-of-care decision-making support and drive better standardisation of care. The company estimates that the programme will drive significant improvements in patient outcomes, resulting in shorter treatment duration and more wounds healed, and release significant nurse resources (around 9 nurse FTEs per Clinical Commissioning Group).

Support development of measures to improve the UK's health data infrastructure.

NHS data is a precious resource. As the Life Sciences Industrial Strategy highlighted, there remains a significant opportunity to create greatly improved data infrastructure around the UK that has the potential in the first instance to improve the quality of care provided to NHS patients, and to support better planning and delivery, allowing NHS managers to run their services more effectively.

The benefits of this infrastructure for research activities are also clear, allowing for the development of algorithms to transform clinical services and evaluation of new, innovative medical products in a more systematic way. The size of the UK population, combined with a long-established cradle-to-grave healthcare system, means that the scale of patient data potentially available is unique.

The government wants to enable data to flow in a legal, secure and appropriate way to ensure that these potential benefits can be maximised. Wherever possible, for purposes other than direct care, anonymised data would be used. We will implement the **National Data Guardian's** recommendations to give patients a choice about how their personal data is shared for research and to be transparent with patients about how their personal data has been used.

By supporting appropriate access to data for researchers, we aim to strengthen the UK's position as a global centre for clinical research and innovation.

In response to the Life Sciences Industrial Strategy, **the government will be working to develop a number of regional, interoperable Digital Innovation Hubs** which support the use of data for research purposes within the legal framework, and meet the strict parameters for sharing data and the security standards set out by the National Data Guardian. They will create controlled environments for real-world clinical studies, the application of novel clinical trial methodology, and the comprehensive evaluation of new innovations so that patients can benefit from scientific breakthroughs much faster. NHS England, NHS Digital and Health Data Research UK in partnership with others will lead the delivery of this programme, drawing on input from multiple stakeholders including the academic sector, the life sciences industry, the charity sector and patients.

The Life Sciences Industrial Strategy made a number of other recommendations on how to improve the UK's data infrastructure and ensure the right conditions exist to realise the benefits outlined above.

NHS Digital is making good progress on taking these forward:

- It is working with partners to deliver a range of work programmes aimed at setting out clear and consistent national standards and approaches for data and interoperability and supporting researchers to engage with NHS Digital, for example through work to streamline legal and ethical approvals for data access; and
- NHS Digital is working to build a remote data access environment that will enable external customers to remotely login, and appropriately access data for analysis.

Deliver on the 12 actions to support and apply research in the NHS

The paper *Twelve actions to support and apply research in the NHS*, published in November 2017 by NHS England in partnership with the National Institute for Health Research, recognises that research activity is increasingly core business for the NHS, and that increased research participation leads to improved healthcare performance.

This paper includes a number of commitments including to simplify NHS research processes; to articulate the NHS's own research priorities better; to enhance the NHS data infrastructure; to support advanced research into leading edge technologies; and to improve and simplify our adoption ecosystem. These actions to support and apply research in the NHS recognise the opportunity for a double win: both to grow the UK economy, and to do so in a way that helps ensure a sustainable NHS for taxpayers.

Places

Implement a regional approach by working closely with key clusters and the devolved administrations

As highlighted in the Life Sciences Industrial Strategy, the sector's commercial activity is very broadly spread across the whole of the UK and there are a number of strong and emerging life sciences clusters.

We anticipate that the next phase of the Sector Deal will be an opportunity to further identify and develop regional approaches to implementing the Life Sciences Industrial Strategy, working closely with life sciences clusters and the devolved administrations. For example, we will work across the north of England in partnership with the **Northern Health Science Alliance**, (NHSA), along with the local and global businesses, to support the growth of the North's life sciences and health innovation economy. The NHSA has identified a strong commercial pipeline of investment for further waves of the Sector Deal. The Northern Health Science Alliance, MedCity, Life Sciences Hub Wales, NHS Research Scotland, Northern Ireland life sciences cluster and the GW4 Alliance have also come together to welcome the Life Sciences Industrial Strategy and set out how they can work with governments across the UK to respond to its recommendations and promote the sector.

The strategy also noted that the UK government and local partners, working together, have an important role to play in helping clusters to flourish and there has already been positive progress in a number of areas since the strategy's publication:

- **QIAGEN,** a leading provider of molecular testing solutions that enable valuable insights to be gained from any biological sample, intends to partner with health innovation Manchester to develop a genomics and diagnostics campus.
- Partners[14] across the Leeds City Region, including universities, local authorities, the NHS and industry are establishing a £350m investment programme in the Leeds City Region's leading medtech hub, including, as part of a new **Innovation Quarter** in Leeds city centre, **Nexus, a £40m Innovation Centre** driven by the University of Leeds, which will actively incubate and grow start-ups, and the **Leeds Health and Social Care Academy** providing joined-up training and development for the 57,000 people who work in the health and care sector across the City of Leeds.

- Increasing the infrastructure within tech clusters to accommodate the expansion in life sciences in the coming years has been a major focus of many of the academic centres and hospitals in the UK. New science parks are planned in Birmingham, Newcastle and Manchester, and large increases in capital infrastructure spending are occurring at Guy's Hospital (King's Health partners), King's Cross, Imperial West, Oxford and Cambridge. These plans will create several billion pounds' worth of new capital infrastructure to support growth in all these clusters.
- Following the National Infrastructure Commission's report, the Autumn Budget set out an ambitious integrated programme of infrastructure, housing, business investment and development for the Cambridge-Milton Keynes-Oxford corridor, including:
  - a **Housing Deal with Oxfordshire that will see the government invest up to £215m** to fund local infrastructure investment, affordable housing and capacity support, in return for ambitious levels of housing and a county-wide joint statutory spatial plan;
  - a **£5m commitment to develop proposals for Cambridge South station.** The government is also starting a study on the enhancements needed to accommodate future rail growth across Cambridgeshire; and
  - construction will begin on key elements of the Expressway between Cambridge and Oxford in the second Roads Investment Strategy.
- **Experts in academia, industry and health are coming together at the Sheffield Olympic Legacy Park to deliver two pioneering projects:** the **Orthopaedic and Rehabilitation Research and Innovation Centre;** and the **Centre of Child Health and Technology**. The Orthopaedic and Rehabilitation Research and Innovation Centre aims to be one of the world's leading research and innovation centres for musculoskeletal injuries, rehabilitation, treatment and technology. Its purpose will be to not only improve patient outcomes; but also drive the productivity of the UK's workforce, by reducing sickness absence and to rapidly design and develop advanced technologies. The second project, the Centre of Child Health and Technology, will develop cutting-edge technologies to deliver the world's most advanced healthcare for children, focusing on dramatically improving the outcomes of children who are suffering from mental health conditions.

- There is a thriving life sciences sector in Wales with particular strengths in medtech. **BBI Group**, manufacturers of medical diagnostics, announced in February this year that they will centralise their manufacturing and development activities into a centre of excellence and a new global headquarters for the Group at the Border Technology Park in Crumlin. With a **Welsh government grant of £1.8m**, the investment will provide excellent career opportunities in the South Wales Valleys region and provide a significant boost to the local economy, creating 50 new jobs in Wales by 2020.
- **BioClavis**, a new spin-out from Californian molecular profiling company BioSpyder, is to be based at the Clinical Innovation Zone at Glasgow's Queen Elizabeth University Hospital, creating 43 new jobs. BioSpyder's investment has been supported by a £3.3m Seek & Solve research and development grant from Scottish Enterprise. It forms part of a total investment of £9.7m, which will see BioClavis adapt BioSpyder's TempO-Seq platform technology into a novel diagnostic tool for precision medicine in a number of high-value clinical indications, in close collaboration with the health service and university researchers.

People

Ensure a highly-skilled workforce by reinforcing the skills base across the UK and enabling high-skilled immigration

The success of the UK's Industrial Strategy is contingent on the ability to train and recruit a workforce equipped with the skills we need. For life sciences, that encompasses a breadth of skills, from data analytics and technical support to clinical and manufacturing expertise.

The Life Sciences Industrial Strategy highlighted the importance of both developing home-grown skills and maintaining access to the best talent from around the world that underpins the sector's success. The Autumn Budget announced that to support its ambitions on innovation and R&D, the government is encouraging the best and the brightest international scientific and research talent to work in the UK. The government will change immigration rules to enable world-leading scientists and researchers endorsed under the Tier 1 (Exceptional Talent) route to apply for settlement after three years; make it quicker for highly-skilled students to apply to work in the UK after finishing their degrees; and reduce red tape in hiring international researchers and members of established research teams, by relaxing the labour market test and allowing the UK's research councils and other select organisations to sponsor researchers. This is alongside the expansion of the exceptional talent route, benefiting current and future leaders in the digital technology, science, arts and creative sectors.

The government has also worked with the **Science Industry Partnership** and the **Association of the British Pharmaceutical Industry** to form the initial elements of this first phase of the Sector Deal. There will be further opportunity to take forward this partnership working in future phases of the Sector Deal to ensure the UK skills base continues to meet the diverse needs of the sector.

The Life Sciences Industrial Strategy highlighted how the emerging field of data science, particularly bioinformatics and clinical data analytics, is moving at pace across the sector, including within the NHS. Regulatory affairs was also considered an important area for development and the Strategy recommended an increasing role for apprenticeships in addressing skills gaps in these fields.

The life sciences industry is already developing apprenticeship standards in these priority subjects. The bioinformatics standards are expected to be ready for starts next year, with medical and chemo informatics to follow. Work on clinical trials and regulatory affairs standards is also underway.

The government will work with the **Institute for Apprenticeships** to prioritise development of standards brought forward by employers in the life sciences sector and identified as a priority through the Industrial Strategy Sector Deal process. We expect the Institute for Apprenticeships to prioritise the development of standards in sectors which are priorities for the Industrial Strategy. The government will provide guidance to the Institute for Apprenticeships on these priority areas, alongside other considerations that the IFA has been asked to take into account, such as the critical development of improved standards to replace old 'framework' apprenticeships and development of standards for T levels, work which underpins overall reform.

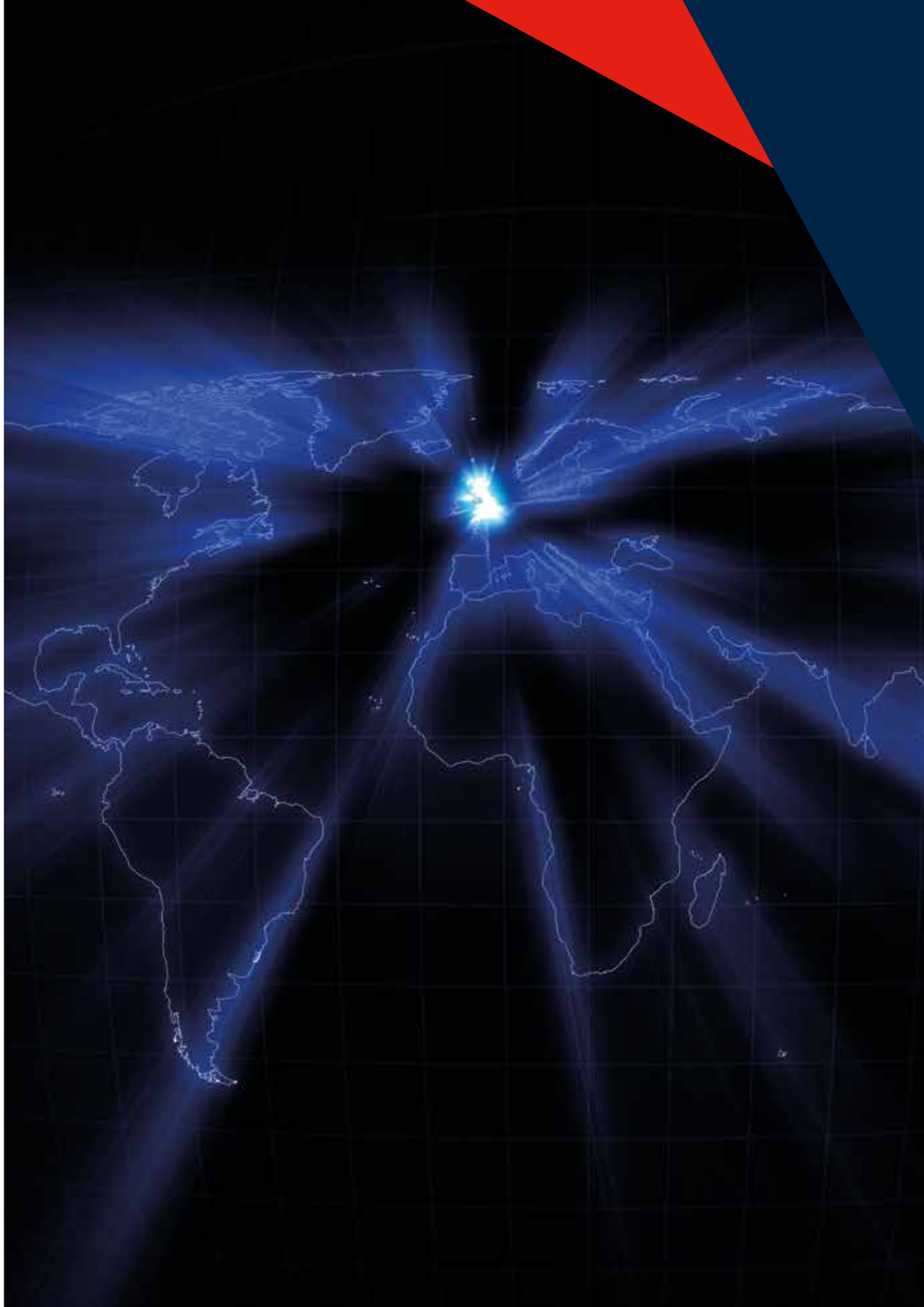
The government will work with employers to monitor the impact of the Apprenticeship levy and continue to analyse all apprenticeship starts (by place and sector subject area), assessing the impact on other types of employer investment. This will be complemented by the sector's activity, with the Science Industry Partnership and the Association of the British Pharmaceutical Industry conducting surveys of apprenticeship uptake in the sector.

These actions will help support the industry's ambition to reach 20,000 apprenticeships in the science sector by 2020[15].

The Science Industry Partnership is also rolling out a regional approach to meeting the industry's skills needs, starting with a group in Cambridgeshire that will enable employers and local skills partners to drive a local approach to skills delivery, including involvement in apprenticeship standard development; collaboration on apprenticeship delivery; access to the Science Industry Partnership Ambassador Programme and more. With nearly half of businesses reporting a shortage of STEM graduates as being a key factor in being unable to recruit staff, this industry-led STEM Programme will showcase the vast array of careers in science-based industries to students in schools and colleges in the area. The Science Industry Partnership is keen to take forward this approach in other priority areas, including Oxford and the North West, with the government helping to establish ties with local employers, schools, Local Enterprise Partnerships and the Careers and Enterprise Company as needed.

The government will work with the Science Industry Partnership, to ensure alignment with the new **Skills Advisory Panels**, which will comprise employers, colleges and the government. Skills Advisory Panels will produce robust evidence driven analysis of skills supply and demand to inform Local Industrial Strategies and post-16 skills provision.

The government is also committed to ensuring that the NHS can build and maintain the clinical excellence and capacity required to support outstanding translational research.



Implementation plan

Key deal activities

Date	Milestone
Aug 2017	Life Science Industrial Strategy launched
Aug 2017	£146m Industrial Strategy Challenge Fund Wave 1 announced for leading-edge healthcare
Oct 2017	£16m ISCF Wave 1 funding announced for viral vectors competition
Nov 2017	Response to the Accelerated Access Review, including £86m funding
Nov 2017	Budget and response to Financing Growth in Innovative Firms
Nov 2017	Industrial Strategy including up to £210m for early diagnostics[16] - ISCF Wave 2
Dec 2017	Phase one of the Life Sciences Sector Deal announced
Jan 2018	Sector Deal Oversight Board's first meeting
Jan 2018	Implementation plan for the Sector Deal agreed by board
April 2018	Projects allocated funding under ISCF Wave 1 begin
Dec 2018	Annual Review of the Sector Deal

Governance

Oversight of the implementation of the Sector Deal will be led by an Implementation Board, which will review progress against objectives at each of its quarterly meetings.

The Implementation Board will be jointly chaired by industry and the government, and its membership will be made up of a mix of relevant policy officials and industry representatives covering the core themes of the deal. Exact membership will be announced ahead of the first meeting but as a guiding principle, members will need to be sufficiently senior to ensure genuine accountability, to drive delivery and to take action as needed to address risks and challenges. It will also need to ensure broad representation of the sector (pharma, medtech, diagnostics, digital, charities, academia) and a clear voice for small and medium-sized businesses.

The Implementation Board will be supported by sub-groups to oversee each component of the deal listed above, chaired by dedicated policy leads from the government and the industry. These sub-groups will be responsible for monitoring and challenging the delivery of joint work programmes. In many cases, the day-to-day delivery of individual programmes will sit with existing organisations e.g. Innovate UK or Biobank UK. Sub-groups will not replace the governance structures of these organisations, but they will provide progress updates to the Implementation Board on each theme of the Deal.

Where appropriate, existing groups, e.g. the Medicines Manufacturing Industry Partnership, will be used to build on existing expertise and avoid duplication.

An early role for the Implementation Board will be to agree implementation plans for each section of the Deal, including agreed success metrics.

Once Sector Deals enter the implementation phase post-launch, they will report on progress bi-annually to BEIS ministers responsible for Sector Deals. The Implementation Board will be subject to challenge sessions from government ministers on an annual basis as part of the overall Sector Deals programme.

The Implementation Board is responsible for reporting to the government on delivery at regular intervals. The Industrial Strategy team will provide the challenge on delivery timetable, metrics and ambition on outcomes as well as providing updates and escalation to ministers across the suite of Sector Deals.

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