

OXFORDSHIRE'S RESPONSE TO THE GLOBAL PANDEMIC

A LIFE SCIENCES ECOSYSTEM IN ACTION

JANUARY 2021

OXFORDSHIRE'S WORLD-LEADING RESPONSE TO COVID-19

In January 2020, when Covid-19 was still unknown to much of the world, Oxfordshire's scientists were already working on a response.

The county's well-established life sciences ecosystem – which includes pioneering academic and medical institutions, unique research establishments, and hundreds of biomedical companies – was able to mobilise immediately.

The region is world-renowned for its work in medicine, research and diagnostics, and has a long-held expertise in vaccinology and immunology.

Throughout 2020, its collaborative, innovative and pioneering approach has led the way in the fight against Covid-19.

Oxfordshire's response has included:

- Virology, genomics and structural biology research
- Vaccine and treatment research, clinical trials and manufacturing
- Diagnostics development
- Data, digital services and shared information
- Medical devices



GLOBALLY-IMPORTANT RESOURCES



Oxfordshire has a unique combination of life sciences resources, unparalleled anywhere in the world.

INSTITUTIONS:

UNIVERSITIES:

The University of Oxford has been named #1 for medicine for the past nine years (THES). Over 5,000 people work in the University's Medical Sciences Division which generates 7,000 research outputs pa. The University's Jenner Institute is one of the world's largest research institutions dedicated to non-profit vaccine research. Oxford Brookes University has an active research-led Department of Biological and Medical Sciences.

NATIONAL RESEARCH RESOURCES:

Key organisations within the Harwell HealthTec Cluster include the Rosalind Franklin Institute, a new national government-funded institute dedicated to bringing about transformative changes in life science through interdisciplinary research and technology development; the Diamond Light Source, the UK's national synchrotron and the Science and Technologies' Facilities Council's Central Laser Facility.

All have made their infrastructure, equipment and resources available for rapid Covid-19 research.

HOSPITALS:

The Oxford University Hospitals NHS Foundation Trust is a leading medical research and teaching establishment.

LIFE SCIENCES CLUSTERS AND SITES:

- Old Road Campus (University of Oxford)
- John Radcliffe, Nuffield & Churchill Hospitals Quarter
- Milton Park
- Oxford Science Park
- Oxford Business Park
- Begbroke Science Park
- Harwell Campus
- Oxford Technology Park

DEVELOPMENT INFRASTRUCTURE:

Development, research and funding bodies create the infrastructure for life sciences to grow.

- Science and Technology Facilities Council, part of UK Research & Innovation, a government body that directs research and innovation funding
- Oxford Academic Health Science Network, which puts innovation into clinical practice
- Satellite Applications Catapult: at the interface between health tech, space and data
- Oxfordshire Local Enterprise Partnership, which acts as a catalyst and convenor to drive the county's growth. OxLEP awarded funding to the Clinical BioManufacturing Facility, a vital link between academic research and clinical drug development, enabling rapid progress into clinical trials
- Oxford BioEscalator, a biotech incubator, founded in 2018 with £11m of government funding secured by OxLEP. In 2020 its 13 start-ups raised £320m and two new companies were created.

EXPERTS AND WORKFORCE:

Professors Sarah Gilbert, Adrian Hill and Andrew Pollard from the Jenner Institute/Oxford Vaccines Group have led the way in the development of the 'Oxford' vaccine. Other significant figures include Professor Sir John Bell (University of Oxford's Regius Professor of Medicine) and Professor Helen McShane (director of the National Institute Health Research, Biomedical Research Centre). Professors Martin Landray and Peter Horby are professors of emerging infectious diseases and Global Health, and Peter is also chair of the UK government's Respiratory Virus Threats Advisory Group. Professor Sarah Walker, Professor of Medical Statistics and Epidemiology at the University of Oxford, is Chief Investigator and Academic Lead for the National Covid-19 infection survey. Structural biologist Professor David Stuart is director of life sciences at the Diamond Light Source.

An estimated 800 people working in Oxfordshire's life sciences sector have been involved in the Covid response. Nearly 6% of Oxfordshire population (>25,000) work in life sciences and healthcare.

SUCCESS STORIES

Two of the top 10 UK life sciences companies by total funding received are based in Oxfordshire:

- Oxford Nanopore (£650m raised)
- Immunocore (£281m raised) [source: Beauhurst]

"Oxford has enormous medical research power"

Professor Gavin Screaton, Head of Medical Sciences Division, University of Oxford

THE BREAKTHROUGH VACCINE

On 4 January 2021, at Oxford's Churchill Hospital, 82-year-old Brian Pinker became the first patient to receive the Oxford AstraZeneca coronavirus vaccine.

By that day, more than half a million doses of the vaccine were ready for use, and the UK government had ordered a further 100 million doses – enough for most of the UK population.

It was a significant landmark for a vaccine whose development had begun the previous January – and for a process that normally takes years.

The vaccine was the product of one of the earliest breakthroughs in understanding the virus. The team at the Jenner Institute acted immediately when the first six virus sequences were published from China in early January 2020. They built on their experience

of having successfully modified a chimpanzee adenovirus to create a human immune response and of having made and safety-tested a vaccine for MERS by December 2019.

The vaccine went from design to the first human clinical trials in a record four months. By the end of April 2020, the team from the Jenner and University of Oxford spin-out Vaccitech signed a milestone agreement with AstraZeneca with a commitment to non-profit distribution in the developing world and equitable global access. By the autumn, it had been tested on 24,000 people worldwide and phase 3 trials showed 70.4% efficacy. It was approved by the UK's Medicines and Healthcare products Regulatory Agency on 30 December 2020

It currently stands out from other current vaccines as a low cost, stable



solution suitable for widespread distribution.

Meanwhile, from September, Oxford Brookes' spinout company Oxford Expression Technologies was working in partnership with Vaxine, an Australian biotechnology company, to accelerate the creation of a Covid-19 vaccine. Like the Oxford/AstraZeneca one, it will be added to the COVAX portfolio, a WHO-supported global collaboration to accelerate the development, production, and equitable access to Covid-19 tests, treatments, and vaccines.



PIONEERING DIAGNOSTICS AND DIGITAL HEALTH

Diagnosis, testing and digital technology are all playing a part in managing the spread of the pandemic. Some of it is genuinely cutting edge on a global scale.

Accurate testing to find out who has, or has had the virus, has been the focus of urgent attention. Several Oxfordshire companies have been focusing this type of testing and how to scale it up.

By February, **GeneFirst** had produced two real-time 90-minute PCR

(polymerase chain reaction) tests which see whether someone currently has Covid-19.

Oxford Nanopore's sequencing technology is being used to support rapid, large-scale analysis of Covid-19 samples globally. **Sense Biodetection** is developing a diagnostic test that can be used in any primary care setting and give results in 10 minutes.

Oxford University spin-out Oxsed has developed low cost rapid tests that

are being used at Heathrow and trialled at Hong Kong airport. The company's acquisition by Hong Kong company Prenetics in October will enable the test to be rolled out to airports globally. Machine learning developed by data visualisation company **Zegami** is being used to diagnose Covid-19 from lung X-rays.

Monitoring: An app developed by **Sensyne Health** is being used to help people at home monitor their symptoms, and is part of a broader strategy to provide a platform that enables the delivery of care to patients remotely. **Isansys's** remote wireless monitoring system is allowing clinicians to identify and predict deteriorating patients faster and with less nurse to patient contact, while freeing up intensive care beds.

FAST-TRACKED TREATMENT TRIALS AND NOVEL THERAPIES

The University of Oxford has led two national platform trials for the treatment of Covid-19.

- **RECOVERY** is the world's largest clinical trial of treatments for hospitalised patients, involving 176 hospitals and 18,000 patients, and has tested six different drugs to date.
- **PRINCIPLE**, the first clinical trial in Covid-19 patients in primary care – involving 2,000 patients so far – has looked at home treatments to prevent hospitalisation.

CATALYST is a collaborative trial with Birmingham University into drugs to mitigate the severity of reactions. Further work has been carried out on monoclonal antibodies.

Oxfordshire-based companies **Perspectum Diagnostics** and **BerGenBio** are each involved in global treatment trials.

New therapies have been developed, with several companies pivoting from their work in other disease areas such as oncology to focus on Covid-19.

Izana Bioscience is developing

monoclonal antibody therapy to relieve acute respiratory distress. Novel immunotherapy company **Scancell** is developing a DNA vaccine.

New technology is helping to speed up research, diagnostics, therapeutics and vaccines. **Absolute Antibody** has engineered SARS-CoV-2 neutralising antibodies derived from individuals infected with Covid-19 into recombinant formats useful for Covid-19 research and diagnostic development which are now available to scientists and diagnostic developers worldwide.

The **Native Antigen Company** has introduced ten new monoclonal antibodies recognising SARS-CoV-2 as a resource for researchers working in vitro diagnostics, therapeutics and vaccines. It is collaborating with **Oxgene** to use its technology to scale up the manufacture of Covid-19 antigens and has recently taken on the lease of a 50,000 sq ft facility at Oxford Technology Park.

Exscientia is using AI to shorten the pre-clinical stages of drug development by up to 75% and reduce costs.



THE MOONSHOT

National synchrotron **Diamond Light Source** at Harwell has been able to probe the many small chemical 'fragments' of the SARS-CoV-2 protease as potential drug target binding sites at unprecedented speed and scale. Diamond has been a key participant in the global Covid Moonshot effort, which has brought together international scientists from academia and industry in a non-profit initiative, in conjunction with machine learning-powered medicinal chemistry company **PostEra**. Moonshot has used crowdsourcing techniques to call on chemists around the world to design new inhibitors using the rich fragment data it has managed to capture. All data has been made available to the world's scientific community. **Exscientia** and **Scripps Research** also screened over 15,000 drug molecules at Diamond using AI.





EPIDEMIOLOGY AND PUBLIC HEALTH

Oxford expertise has been instrumental in tracking Covid-19.

The UK's National Covid-19 infection survey is run from Oxford. Dr Sarah Walker, Professor of Medical Statistics and Epidemiology at the University of Oxford, is the survey's Chief Investigator. Oxford University researchers provide weekly UK-wide data for the Office of National Statistics as part of the national Covid-19 Infection Survey.

In November, the University signed a partnership with Thermo Fisher Scientific to ramp up its capacity to deliver testing data and create a new rapid testing laboratory able to carry out 50,000 tests per day.

University of Oxford's feasibility (FACTS) study is assessing **Lateral Flow Tests**.

A research initiative called **Co-SPACE**, supported by NIHR Oxford Health Biomedical Research Centre, the Oxford and Thames Valley NIHR Applied Research Consortium and the UKRI Emerging Minds Network Plus, has been tracking how families have been coping throughout the pandemic to identify what advice, support and help can protect young people's mental health.

The **Blavatnik School of Government** created the Oxford Covid-19 Government Response Tracker (OxCGR) to examine the policy interventions of international governments.



MANUFACTURING

The Vaccines Manufacturing and Innovation Centre (VMIC) on the **Harwell Science and Innovation Campus** is a highly specialist facility that will house the country's first bespoke strategic vaccine development and manufacturing capability. Planned in advance, its construction has been fast-tracked. VMIC is working to be partially open in 2021 and to be operational in 2022. When operational, VMIC will have the capability to manufacture up to 70 million doses of pandemic vaccines within a six month timeframe.

Founded by the University of Oxford, Imperial College London and the London School of Hygiene and Tropical Medicine, the **VMIC** is helping to scale up all vaccines. As part of the national vaccines industry taskforce, its expertise has helped devise the 'Virtual VMIC' to enable vaccine manufacture until the main facility is ready.

Integral to designing the vaccine manufacturing process has been the **Clinical BioManufacturing**

Facility, the University of Oxford's GMP (Good Manufacturing Practice) manufacturing facility, which provides the link between academic research and clinical drug development, enabling rapid progress into clinical trials.

In September, **Oxford Biomedica**, a leader in gene and cell therapy, signed a supply agreement with AstraZeneca for large-scale commercial manufacture of the AZD1222. It has since doubled its manufacturing capacity at OxBox, its new 7,800m² commercial manufacturing centre in Oxford.

The region's high-tech manufacturers quickly geared up to make ventilators during the first wave of the pandemic including **Oxford Optronix**, **Penlon**, **OES Medical**. Engineering companies **Prodrive** and **Williams Advanced Engineering** also pivoted their operations to contribute to the effort to create ventilators, while medical device maker **Owen Mumford** provided 10 million rapid blood testing devices.

FIND OUT MORE AND JOIN US

Oxfordshire is aiming to become one of the world's top three innovation ecosystems by 2040. Would you like to be part of this success story?



If you are interested in being part of this exciting ecosystem, or would like more information, please contact:

Sebastian Johnson
Head of Innovation & Investment
Oxfordshire Local Enterprise Partnership
sebastian.johnson@oxfordshirelep.com
+44 (0) 7917 088122