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A life sciences ecosystem like no other

Oxfordshire's response to COVID-19

4th May 2020

A life sciences ecosystem like no other



- With scores of pioneering academic institutions, many hundreds of innovative life sciences companies, unique research facilities such as the Diamond Light Source Synchrotron, and thousands of people employed in the sector, Oxfordshire is leading the international response to COVID-19.
- The life sciences clusters in Oxfordshire comprise the Oxford University Hospitals NHS Foundation Trust, Oxford Health NHS Foundation Trust, the University of Oxford and Oxford Brookes University, Harwell Science and Innovation Campus (now also a Life Sciences Opportunities Zone), Culham Science Centre, Oxford Science Park, Old Road Campus, Milton Park and Begbroke Science Park.
- Oxfordshire's response to COVID-19 was immediate – a mass-mobilisation which is witnessing ground-breaking research around vaccines, diagnostics and treatments, all within a unique ecosystem, in addition to the rapid acceleration of the Vaccines Manufacturing and Innovation Centre, the only one of its kind in Europe.
- Development of the University of Oxford's primary vaccine candidate, ChAdOx1 nCoV-19, has been undertaken in record time. The process of designing the vaccine to starting clinical trials, which usually takes several years, has been reduced to just four months. The human clinical trials have already started, with the potential for results by Autumn.



Oxfordshire's response to 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, including ventilators



Close up: Oxfordshire's ecosystem

- Oxfordshire has over 25,000 people employed in Life Sciences and Healthcare, representing 5.6% of the population (ONS 2018). On its own, the **Medical Sciences Division** at the **University of Oxford** consists of 5,611 academics, researchers, clinicians, general practitioners and administrative staff, 1,631 graduates and 1,703 undergraduate students, generating 7,000 research outputs pa (OU 2020).
- Some of the world's leading experts are based in Oxfordshire, including lead vaccine researcher Professor Sarah Gilbert, Professor Sir John Bell, Professor Helen McShane, Professor Adrian Hill, Dr Matthew Duchars, Professor Andrew Pollard, Professor Peter Horby, Professor Martin Landray and Dr Sandy Douglas.
- As well as scientists and clinicians, Oxfordshire is also home to other leading scholars in related disciplines. For example, the **Blavatnik School of Government** created the Oxford COVID-19 Government Response Tracker (OxCGRT) which examines policy interventions made by international governments. The **Oxford Vaccine Group** was one of five organisations to receive UKRI funding, with their project assessing infection rates in children and teenagers and informing policy on the relaxation of lockdown measures.



Close up: Oxfordshire's ecosystem

- Organisations in the county play an internationally important role, with development, research and funding bodies including the **Science and Technology Facilities Council (STFC)**, the **Oxford BioEscalator**, the **Oxfordshire Local Enterprise Partnership**, the **Oxford Academic Health Science Network** and the **Satellite Applications Catapult** (sitting at the interface between health tech, space and data).
- Key organisations within the **Harwell HealthTec Cluster**, including the **Rosalind Franklin Institute**, the internationally important **Diamond Light Source** and STFC's **Central Laser Facility** have offered up their infrastructure, equipment and resources for rapid-access COVID-19 research. For instance, **structural biology computer scientists** from the STFC have determined the three dimensional structures of the proteins produced by the virus and in so doing progressed the basis for inhibitor drugs and vaccines.
- Construction work has begun on the **Harwell Science and Innovation Campus** ahead of schedule to build the highly specialist facility that will house the **Vaccines Manufacturing and Innovation Centre (VMIC)**. It will provide the country's first bespoke strategic vaccine development and manufacturing capability, although **VMIC** is already poised to become a manufacturing unit in response to the current pandemic.
- A support programme has been launched by the **Oxford Foundry** for small businesses who are tackling COVID-19, focussed on achieving rapid scaling.



Vaccines, treatments and diagnostics

- The University of Oxford's Jenner Institute has partnered with **Oxford Biomedica**, Vaccitech and the **Oxford Vaccine Group** to rapidly develop, scale-up and manufacture a potential vaccine called ChAdOx1 nCov-19, one of the leading vaccine candidates in development globally. Led by Professors Gilbert, Hill and Pollard, they have enrolled 1,110 volunteers to test the vaccine, which may be ready by September 2020. On 30 April, AstraZeneca and the University announced a landmark agreement for the global development and distribution of the vaccine.
- The University of Oxford is also leading two national platform trials for the treatment of COVID-19. RECOVERY is led by Professors Horby and Landray; PRINCIPLE is led by Professor Butler. Additionally, a new platform trial called CATALYST, is being developed in collaboration with Birmingham, led locally by Professors McShane, Richards and Ho. Further work on monoclonal antibodies is being led by Professors Screaton and Townsend.
- University of Oxford Professors Hippersley-Cox and Watkinson are leading an analysis of the concomitant medications being taken by COVID-19 patients and whether some make people more susceptible or less susceptible. The research will give indications around which drugs to test.
- Scientists from the University of Oxford's Engineering Science Department and the Oxford Suzhou Centre for Advance Research have developed rapid testing technology for COVID-19.

Vaccines, treatments and diagnostics

- **Izana Bioscience** is trialling Namilumab, it's Phase III ready, fully monoclonal antibody therapy for patients with rapidly-worsening health.
- **Perspectum Diagnostics** has started a trial of chloroquine or hydroxychloroquine with azithromycin, with promising results in China and France.
- **Scancell**, the developer of novel immunotherapies for the treatment of cancer, has also initiated a research programme to develop a vaccine for COVID-19.
- **BerGenBio**, a clinical-stage oncology biopharma company based at the **Oxford Science Park**, has announced that its once-a-day oral drug, **Bemcentinib**, is the first to be fast-tracked as a potential treatment for COVID-19 through the government's ACCORD trial initiative.
- Sequencing technology from **Oxford Nanopore** is being used globally to support genomic epidemiology and help characterise the virus and inform public health authorities. The company is also participating in a UK-wide and recently formed genome sequencing alliance, to enable rapid, broad, large-scale sequencing analysis of samples from patients testing positive for COVID-19.



Vaccines, treatments and diagnostics

- The **Native Antigen Company** and **Oxgene** are collaborating to accelerate production of SARS-CoV-2 reagents by combining Oxgene's proprietary Adenoviral Protein Machine technology with NAC's antigen development expertise. **Absolute Antibody** is providing antibody engineering, manufacturing services and coronavirus-related reagents.
- **Protein Production UK**, based at **The Rosalind Franklin Institute**, in collaboration with the University of Oxford, Diamond Light Source and the **Research Complex at Harwell**, is developing reagents with structural biologists which will stabilise selected SARS-CoV-2 proteins, key targets for therapeutics and vaccines, for further analysis including imaging. In mid-April it was also revealed that their researchers have isolated nanobodies – a type of antibody used in research, which bind to the 'spike' protein of the SARS-CoV-2 virus.



Vaccines, treatments and diagnostics

- The **NIHR Oxford Biomedical Research Centre** has allocated funding to six COVID-19 research projects in an attempt to improve treatment, understand how the virus interacts with chronic diseases, recognise the longer-term effects of infection on organs, vaccine safety, the role of antibodies in plasma therapy and blood biomarkers that determine adverse reactions.
- Research called **Co-SPACE**, supported by **NIHR Oxford Health Biomedical Research Centre** (a collaboration between the University of Oxford and Oxford University Hospitals NHS Foundation Trust), the **Oxford and Thames Valley NIHR Applied Research Consortium** and the UKRI Emerging Minds Network Plus, will track children and young people's mental health throughout the COVID-19 crisis to identify what advice, support and help can actually protect their mental health.
- Sarah Walker, Professor of Medical Statistics and Epidemiology at the **University of Oxford** is leading government research to track COVID-19 in the general population. 20,000 households across England are being contacted to take part in the first wave of the serological study. The study will help improve understanding around the current rate of infection and how many people are likely to have developed antibodies to the virus.



Pioneering digital health and testing

- **Exscientia** and **Scripps Research** have partnered with the Diamond Light Source to use AI and bio-sensors to screen over 15,000 clinical drug molecules for their effectiveness in treating COVID-19.
- **Nye Health** has rapidly upscaled its platform to allow all GPs in the NHS to carry out appointments remotely, specifically in response to the current pandemic.
- **Oxford University Press** has made content from online resources and leading journals freely accessible to assist COVID-19 researchers, medical professionals and policy makers.
- **Zegami** has developed a digital tool that could improve coronavirus diagnosis and guide treatment decisions based upon data visualisation of infected lungs.
- Start-up company **PostEra Inc.** and an international group of scientists have teamed with the Diamond Light Source to form a non-profit initiative called the COVID Moonshot. Their aim is to find clinically effective antivirals more rapidly, through crowdsourcing new inhibitor designs from chemists across the world.
- Professors Greenhalgh and Tarassenko at the University of Oxford are leading work to put pulse oximeters in people's homes so they can home monitor their own oxygen saturations.



Pioneering digital health and testing

- **Sensyne Health** has launched a new COVID-19 software application, called Cvm-Health the Good Neighbour app, to help people monitor their own health and support members of the community most in need.
- **Systems Biology Laboratory** is testing frontline NHS staff in response to the coronavirus pandemic. They are running around 100 tests a day and providing frontline testing twice a week for 14 GP practices across the county.
- Two organisations at **Culham Science Centre** have developed tests in the global fight against the pandemic. **Sense Biodetection** has an accelerated programme to launch a simple disposable test that uses a nasal swab to give a result in under ten minutes. **GeneFirst** has developed a test which has already been evaluated by Public Health England (PHE). The real-time PCR test provides results in 90 minutes by using molecular diagnostic equipment in hospitals and research labs.
- Several other Oxford University Innovation spin-out companies have been involved in the response. **Avacta** has partnered with Cytiva to develop and manufacture an Affimer-based point-of-care rapid test intended for screening of large populations to diagnose the COVID-19 coronavirus infection. **Onfido** is developing remote patient verification and immunity passports for governments battling coronavirus and **Oxehealth** is utilising a digital care assistant to support patient isolation.



Medical devices, including ventilators

- **Isansys** is responding to massive demand for its Patient Status Engine which provides high grade monitoring of patients in high dependency beds and at home.
- **Oxford Optronix** has partnered with Mercedes-AMG High Performance Powertrains, UCL and UCLH to rapidly develop a cPAP breathing device and accompanying oxygen monitor.
- **Penlon** has secured MHRA approval for their new Prima ESO2 ventilator and have accelerated production alongside its manufacturing of Smith's paraPAC devices.
- **OES Medical** is responding to the national demand for ventilators via OEMs customers and is developing new technology in response to current need.
- **Prodrive** is helping manufacture ventilators through the sub-assembly of parts.
- **Williams Advanced Engineering** is playing a significant role in an aerospace consortium producing ventilators with an aim to quickly manufacture 5,000 Smith's ParaPAC300 ventilators, using rapid motorsport processes.
- **Owen Mumford** has supplied the NHS with more than 10 million finger-pricking devices to stock the regional Nightingale field hospitals.
- A large number of technicians and engineers from across the **Science and Technology Facilities Council** at Harwell are leading training for others to carry out testing and calibration of new ventilators. The highly-skilled staff will train some 300 people from a range of organisations who are taking part in the ventilator challenge project.

For further information:

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

