

Life Sciences Innovation and Responding to COVID-19

Ministerial Foreword



On 10 May as Minister for Trade, Investment and Innovation, I was asked by Jeanne Freeman, Cabinet Secretary for Health and Sport to lead engagement with Scotland's life science sector in support of the Scottish Government's response to the COVID-19 pandemic.

This report sets out the work of the sector including across test supply chain, vaccine development and repurposing of drugs.

This is the second update I have produced following the publication on 4 June which outlined the work done to ensure continuity of PPE supply to frontline services and the creation of Scottish PPE supply chains. That report was preceded by a statement I made in the Scottish Parliament on 27 May 2020 (link available in report annex).

The Scottish Government has continued to develop a collaborative response to COVID-19 to support Scotland's Test and Protect priorities, which are outlined in the following publications: *COVID-19: A Framework for Decision Making*, published on 23 April 2020 and the update *Scotland's Testing Strategy: Adapting to the Pandemic* published on 17 August 2020.

I have been working with colleagues from NHS National Services Scotland, our economic development agencies Scottish Enterprise and Highlands and Islands Enterprise, as well as the Scottish Manufacturing Advisory Service (SMAS), Life Sciences Scotland, and trade bodies to maximise the contribution of the life science sector in Scotland to the fight against COVID-19. I have spoken directly with many of the businesses involved in this effort to understand how we can best support their efforts.

We have a strong life science ecosystem in Scotland because of previous investment in a broad range of areas. This support has boosted company investment in R&D, which represents just under a fifth of the total Business Enterprise Research and Development (BERD) spend in Scotland in 2018. The life sciences sector in Scotland continues to flourish with, on average, just under 10 per cent year on year growth in turnover since 2010. We are on track to meet the Strategy ambition to increase turnover in the sector to £8 billion by 2025.

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This report aims to provide a snapshot of just some of the innovation in the sector to support testing supply chains as well as vaccine development and associated supply chain. It cannot possibly capture all of the activities taking place and I would like to reiterate my thanks to all those who have played a part in any way to help Scotland continue to tackle this virus. I must also mention the many highly skilled lab technicians and researchers within our universities and hospitals who are working long and hard to support our aims.

Our work will continue for as long as it is needed and we will continue to need your support in those endeavours.

IVAN MCKEE
MINISTER FOR TRADE, INVESTMENT AND INNOVATION
26 August 2020

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Introduction

This publication will highlight activities across the life science sector in Scotland to support the global response to COVID-19. This is split into the following sections:

Section A: Life Sciences Sector in Scotland

Section B: Life Sciences industry support for COVID-19

Section C: Academic Centres of Excellence

Section D: Skills Response

Section E: Innovation Support and Opportunities

Section F: Sampling and Laboratory Developments

Section G: Summary of Scottish Businesses engaged in COVID-19 response

Section A: Life Sciences Sector In Scotland

Scotland has a thriving life sciences sector and is home to many world leading companies, academic and research organisations and is at the forefront in scientific innovation across a number of fields.

The Scottish Government recognises the important of the sector and our holistic approach is reflected in our strategy, *The Life Sciences Strategy for Scotland: 2025 Vision*. The implementation and momentum of the strategy is led by the Life Sciences Scotland (LSS) Industry Leadership Group, which brings together key figures from the private and public sectors to drive industry-wide collaboration and alignment. Its aim to increase the industry's contribution to the Scottish Economy to £8 billion by 2025.

We have made strategic investments in conjunction with our enterprise agencies over a number of years to ensure Scotland is the location of choice for new inward investors and to provide the environment to see our home grown success stories expand and venture into new markets.

Our approach forges the vital close working relationship between industry, the NHS and academia (the 'triple helix'). We have invested in developing centres of excellence in order to keep making those ground-breaking discoveries in medical treatments and attracting world class researchers who see Scotland as a choice location for collaborative research. There have also been significant investments in city deals in Glasgow, Edinburgh, Inverness, Aberdeen and Dundee to support the sector.

This investment by the Scottish Government and our agencies has helped the sector play a valuable role in the economy, by contributing £2.4 billion GVA and the sector has achieved, on average, year-on-year turnover growth of 10% since 2010.

It also contributes just under one fifth of our Business Enterprise Research and Development spend, and is a major contributor to our exports.

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Section B: Life Sciences industry support for COVID-19

Many Scottish business have been involved in supporting the COVID-19 response in Scotland as well as wider UK and global responses. We have been working with Scottish-based companies in the key areas of:

- Testing supply
- Repurposing Drugs;
- Vaccines Development and
- Vaccine Supply Chain.

Testing Supply Chain

Since the start of the pandemic the demand for test capacity, and the materials required to take samples and process them in labs, has increased exponentially. In March 2020 the Scottish Government's requirement was to secure enough supply of test capacity and test sampling kits to undertake 30,000 diagnostic tests per week in Scotland. This has since increased significantly as the Test and Protect plans have developed.

The most recent testing strategy will increase that figure up to 65,000 tests completed per day for Scotland, with many more tests being processed in Scotland to support the response across the rest of the UK.

One of the companies which helped to meet the greatly increased demand for test swabs was Dundee-based **Hutchison Technologies** which works in many sectors including in medical technologies. The company pulled together a commercial proposition ensuring NHS Scotland could purchase approved and quality assessed medical supplies. They played a major role in sourcing viral test swab kits to address urgent shortages in NHS Scotland and delivered a total order of 3.4 million swab sample kits.

The company is now looking to expand its international operations after successfully supporting NHS Scotland with virus testing equipment in the fight against coronavirus.

A similar supply issue across the UK during that time was the provision of extraction media for use with the test swabs. **E&O Laboratories** based in Bonnybridge rose to the challenge. The company had previously received support to expand their premises including a £425,000 Regional Selection Assistance (RSA) grant in 2015 to build a new manufacturing facility in Cumbernauld.

In response to the pandemic, the company expanded from making filled petri-dishes for the NHS to include ready-to-use products and producing a special type of Viral Transport Medium that makes the analysis of test samples safer and more straightforward

By using a formulation from NHS Scotland labs the company used their skilled staff in research and development, business development, and procurement to find out what, where, when and how to best respond. The company also set out to understand and adapt including re-engineering machines for automation and retraining of staff. This

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innovative approach led to the company obtaining a £7 million contract with NHS Scotland.

Testing in Scotland has taken place in both NHS labs, rapidly expanded to meet the demands of the crisis, and the Lighthouse Laboratory in Glasgow. To optimise results both key NHS labs and the Glasgow Lighthouse Laboratory have received dedicated support from the enterprise agencies, in particular the Scottish Manufacturing Advisory Service, which is working to optimise the throughput of test samples by the adoption of LEAN manufacturing principles.

ThermoFisher Scientific, with Scottish sites at Inchinnan and Perth, has been a key industrial partner of the NHS work at the Lighthouse Laboratory at the University of Glasgow, Queen Elizabeth University Hospital Campus. Other partners include Scottish based businesses BioAscent and BioClavis and also the University of Dundee and the Beatson Institute.

The company supplies both testing machines, used in Lighthouse Laboratories across the UK, and the chemical test kits used to process test samples in the laboratories. The company is seeing increased demand for their products used in the COVID-19 PCR testing workflow and is building increased manufacturing capacity in Scotland. This multi-national company will shortly supply 20 million tests per week globally.

They are also supporting the UK response with 4.5 million sample collection and transport kits provided weekly as a result of a \$25 million investment by Thermo Fisher Scientific in Perth.

The company is supporting global vaccine development work. Thermo Fisher Scientific is making a significant investment of \$100 million in the Inchinnan site in support of Europe, Middle East and Asia bioprocessing customers and importantly the vaccine development work happening in the UK. This will also increase headcount at the site.

The company has previously received Regional Selection Assistance (RSA) funding of £1.9 million from Scottish Enterprise to bring £12.6 million into the Advanced Granulation Technology facility in Inchinnan, creating 30 jobs and safeguarding 47.

BioAscent is a contract research organisation based in BioCity in Newhouse, Motherwell. The company helped create Scotland's new Lighthouse Laboratory and provides biotechnology and pharma expertise by using its library of compounds for companies to design, make and test new drugs.

BioClavis launched its operations in Scotland at the end of 2017. It is a personalised diagnostics spin-out from BioSpyder, a US-based biotechnology company established in 2012. BioClavis is based in Scotland's Precision Medicine space on the Queen Elizabeth University Hospital campus in Glasgow. Its mission is to enable the cost-effective healthcare of individual patients through the use of gene-based diagnostic testing in coordination with established healthcare systems.

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Repurposing Drugs

In response to the virus, the approval and use of drugs required a quicker process to ensure companies could secure approval that could cut years off the time usually taken for medications to become available to people with illnesses related to their COVID-19 diagnosis. In Scotland this had led to some companies obtaining Medicines and Healthcare products Regulatory Agency (MHRA) approval to test drugs for use in treatments in related conditions.

Novabiotics in Aberdeen has been testing one of its drugs on COVID-19 patients with secondary lung infections. The antibiotic helps them tackle difficult to treat and drug-resistant bacteria.

Since 2005 the Scottish Investment Bank has supported NovaBiotics with over £3 million in equity and loans, representing a 18.2% stake in the company. The company also works closely with the University of Aberdeen.

Glasgow-based biotechnology company **TC BioPharm (TCB)** is planning initial clinical trials at the Edinburgh Royal Infirmary. to start safety trials on an experimental therapy designed to kill COVID-19 infected cells. The company is a world leader in clinical use of gamma-delta T cells (GDTs) which are the first line of defence in viral infection and are pre-programmed to target a wide range of diseases including many cancer types. TCB is a pioneer of the first scalable allogeneic gamma delta T cell therapy platform.

The company have had significant Scottish Enterprise support totalling £4,685,160 in equity and grants.

ILC Therapeutics based in BioCity in Newhouse is currently developing a treatment for moderate and severe psoriasis and in June 2020 announced work with the University of St Andrews to progress a potential treatment for COVID-19 towards clinical trials. The partnership will focus on ILC Therapeutics' drug Alfacyte and the role it can play in preventing COVID-19 induced Acute Respiratory Distress Syndrome (ARDS) which could help reduce the need for patients to be on a ventilator and also limit the damage to a patient's lungs.

Also in BioCity and responding to the prevention of ARDS is **Lamellar Biomedical Limited**. In April 2020 the company announced a new programme to address the potentially fatal consequences of COVID-19 on respiratory function to reduce the damaging and often fatal inflammatory response known as Acute Respiratory Distress Syndrome (ARDS) seen in patients. Lamellar is backed by both institutional and private investors, including Invesco and Scottish Enterprise.

Pneumagen in St Andrews has accumulated evidence indicating that its drug candidate successfully treats coronavirus infections. In May 2020, the company announced it had received £4 million investment from Thairm Bio and the Scottish Investment Bank to allow the clinical development of Neumifil for the universal treatment of respiratory tract infections caused by flu and COVID-19. The company is progressing towards first-in-human trials early 2021.

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Across Europe there is also work to develop greater public-private partnerships to accelerate the discovery and development of urgently needed medicines to treat SARS-CoV-2, the virus that causes COVID-19.

Exscientia, a spinout from the University of Dundee, is part of the new CARE (Corona Accelerated R&D in Europe) consortium supported by the Innovative Medicines Initiative (IMI) and launched on 18 August 2020. The company specialises in AI drug discovery to accelerate the pre-clinical phase of drug discovery and following significant investment has established further operations in Oxford (HQ) and Osaka, Japan. Exscientia will lead the small molecule drug design activities in the CARE consortium, using the power of Artificial Intelligence (AI) to accelerate the pre-clinical phase of drug discovery.

To help with continued supply for the relief of respiratory symptoms, GSK sites in Scotland have also been critical to producing salbutamol for use in inhalers and has been working with NHS National Services to produce additional stock to be used within COVID-19 hubs and assessment centres across NHS Scotland.

Global pharmaceutical company, **GSK**, has a significant presence in Scotland and is critical to the global pharmaceutical supply network producing active pharmaceutical ingredients for antibiotics, respiratory inhalers, HIV medicines and dermatology products that support over 23 million patients on a daily basis worldwide.

Vaccine Development and Supply Chains

Scotland has a major role to play in the development of a COVID-19 vaccine: from providing tissue samples, to providing pharma support services, undertaking pre-clinical trials and manufacturing the final vaccine.

Globally there are collaborations developing vaccinations as a simple, safe, and effective way of protecting people to build on the body's natural defences to build resistance to specific infections and make the immune system stronger.

The most widely discussed in the UK are the candidates being developed by collaborations involving the University of Oxford/Astra Zeneca using a recombinant viral vector vaccine and Imperial College, London using mRNA technology.

Another company directly supporting the UK-wide response is Livingston based **Valneva**, part of a French group, which is a specialty vaccine company providing prevention against diseases with major unmet medical needs. Valneva has U.S Food and Drug Administration (FDA) approved manufacturing site in Livingston which is currently dedicated to drug substance production for viral vaccines.

In April, 2020 Valneva and US biopharmaceutical company Dynavax announced a collaboration to advance vaccine development for COVID-19 using a conventional approach of highly purified inactivated vaccine candidate against the SARS-CoV-2 virus.

The site has had continued Scottish Enterprise support including £250,000 to support the creation of an R&D Hub in 2015. Recently the company received a £925,000 R&D

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grant related to the development of a separate viral vaccine. As part of its broader COVID-19 response, Valneva plans to further invest in its manufacturing facility in Livingston, Scotland.

ReproCell Europe based at the West of Scotland Science Park in Glasgow, is also supporting vaccine development following recent expansion supported by £150,000 from Scottish Enterprise in 2017 to move into the West of Scotland science park.

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The company is a partner in a European consortium to develop a COVID-19 mRNA vaccine. This is not a first line vaccine but more for seasonal reoccurrences - administered intranasally. The proposed vaccine is intended primarily for high risk populations such as healthcare workers and families of confirmed cases.

Vaccine Supply Chain

Scottish organisations are supporting major programmes on the development pathway for COVID-19 vaccines. This includes testing, validation, reagent supply, fill/finish, or the provision of preclinical, or clinical testing platforms.

The companies involved are extremely innovative, demonstrating capabilities held within only a few organisations globally. They are continuing the long tradition of Scotland making pioneering advances in medicine and technology.

The businesses maintain the highest level of specialism, especially in viral vaccine and gene therapy developments

Across various sites in Scotland (Glasgow, Stirling and Penicuik) the German-owned **Merck BioReliance** manufactures comprehensive solutions for viral vector therapies, including Adeno-Associated Virus vectors. To support that work the company have received Scottish Enterprise support of £125,000 over the last five years to provide primarily capital investment to support laboratory expansion and training.

The company has been heavily involved in safety testing of vaccines and has been working with AstraZeneca. In addition, the company is working with a European pharmaceutical company which will be going through clinical trials and they hope to make large numbers of doses available in 2021.

The US-owned **AskBio** (Asklepios BioPharmaceutical, Inc) in Edinburgh is also an AAV (Adeno-associated virus) gene therapy company dedicated to developing life-saving medicines that cure genetic disease. AskBio's approach is to leverage their extensive scientific capability to develop an AAV platform-based approach to deliver vectorised antibodies targeting COVID-19 either as a preventative or as a treatment, particularly to those who are immunologically vulnerable (e.g. older people).

Another company providing safety and security is Clydebank based **SGS UK Ltd**. Part of a Swiss group the company provides a comprehensive range of biopharmaceutical testing services, and has been deeply involved in COVID-19 vaccine programmes, having joined the consortium with Oxford University to provide biosafety testing in April 2020, and then partnering with leading European biotech company ReiThera to fast-track the development and production of a single-dose COVID-19 vaccine in June.

The company received Scottish Enterprise support for their expansion project in 2017 worth £9.6 million, supporting 19 new scientific jobs and safeguarding 50. To recognise their ambitions they have also received an R&D Grant award of £1.79 million.

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Vaccine development is moving at pace and companies such as Edinburgh-based **Ingenza**, which specialises in the application of industrial biotechnology and synthetic biology, is providing efficient, scalable bioprocesses. The company is applying its proprietary “visABLE” biomanufacturing platform to accelerate development and testing of a COVID-19 vaccine. If successful, the platform will facilitate rapid scale-up and production of vaccine components.

A vital part of the process is in the process of fill-finish of vials for clinical trials which is an important part of the process in biopharmaceutical manufacturing for safety reasons. Stirling-based **Symbiosis Pharmaceutical Services** is a contract manufacturing organisation (CMO) that specialises in the GMP manufacture and sterile fill-finish of vials for clinical trials. Its biologic and small molecule production capabilities support biotech and pharmaceutical companies across the world that require injectable products.

In June, the company signed a supply agreement with AstraZeneca for sterile manufacture of their adenovirus vaccine for AstraZeneca sponsored clinical trials. Under the agreement, Symbiosis will provide AstraZeneca with fast-track access to sterile vaccine drug product manufacturing capacity.

The agreement follows AstraZeneca's recent announcement of a licensing agreement with the University of Oxford for the global development, manufacturing, and distribution of the same vaccine candidate which is in clinical trials at multiple sites in the UK. The company has been supported by Scottish Investment Bank, representing a 25% equity stake.

Also in Edinburgh, the Boston head-quartered US company **Charles River Laboratories** are currently doing safety testing work for a potential therapy as well as doing safety testing for one of the leading vaccine candidates. The company themselves are working on over 40 vaccines and potential therapies.

In order to support vaccine development clinicians and researchers need access to human tissue samples. **Tissue Solutions** in Glasgow has partnered with Cambridge Blood and Stem Cell Biobank (CBSB) at the University of Cambridge to ensure those at the frontline of developing tests and vaccines can access COVID-19 samples as quickly as possible. That is a major partnership, as it is estimated that there are well over one hundred COVID-19 vaccines in preclinical stage and a number of candidate vaccines in clinical evaluation using a range of platforms.

Scotland's largest life science company **IQVIA** based in Edinburgh continues to support companies with access to clinical trials across a breadth of areas including in long-term follow-up COVID-19 patients and gathering evidence on COVID-19 impact.

In addition the development of antigen testing remains another fast-moving area of global focus.

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Only last week (August 2020) US-owned **LumiraDx**, based in Stirling, received Emergency Use Authorization (EUA) from the U.S. Food and Drug Administration (FDA) for their new antigen test. This allows for a COVID-19 test result to be available in 12 minutes – which can revolutionise the fight against the virus. The tests will be manufactured in Scotland, creating local jobs and again highlighting the important R&D work that is being done in Scotland. The firm is US-owned, with headquarters in London, Research and Development and manufacturing in Stirling, and Sales offices in Arbroath.

In 2018 LumiraDX received funding from the Bill and Melinda Gates Foundation to support their work on priority global health diagnostic tests, and to accelerate access to these areas and other tests for patients living in low income countries.

Support is also coming from perhaps the unlikeliest of places.

Biobest Laboratories Ltd, founded in 1995 and based in Edinburgh, is a veterinary virology, serology, and DNA diagnostics company and normally offers a range of tests for the diagnosis of infectious disease in cattle and other animals. They now have a service level agreement in place to undertake testing on behalf of the NHS.

Section C: Academic Centres of Excellence

Scotland's role in this global effort, working both alongside global pharma companies and on independent research, is testament to the drug discovery and development capabilities of the sector and its ability to provide innovative solutions to international partners.

This section highlights some of the ground breaking research, therapeutic treatments, clinical care, testing, excellent scientific advice and many collaborative academic – business projects which will play a key part in our economic recovery. In the Scottish Government this is led by the Chief Scientist Office (CSO).

Support has also been provided through the Scottish Government: Rural & Environmental Science & Analytical Services (RESAS) organisations such as Moredun Research Institute which has also been working in collaboration with industry.

Moredun Research Institute has been working with Scotland's Rural College (SRUC) to support the NHS by providing extra capacity for vital testing of samples within their laboratory facilities at Pentlands Science Park in Midlothian.

The collaborative team will be using Moredun's specialist high-containment facilities, for working with high hazard group pathogens to enable the safe handling of samples for SARS-CoV-2. The testing is combined with SRUC veterinary labs' capability to deliver high throughput PCR testing.

The team, who would normally be working on delivering diagnostics to support livestock health and welfare, are re-purposing laboratory space and equipment to help NHS colleagues by providing capacity for around 1000 tests a day.

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Clinical Trials

The University of Glasgow will be leading the phase II/III part of the University of Oxford COVID-19 vaccine trial in Glasgow in partnership with the NHS. In collaboration with Oxford University's trials, 250 health and care staff living in Greater Glasgow and Clyde will be invited to take part in the trials

The University of Dundee is leading the clinical trial of a new anti-inflammatory drug it is hoped may reduce instances of severe lung damage and death in COVID-19 patients. COVID-19 causes the development of slowly worsening lung damage called acute respiratory distress syndrome (ARDS) in around 10% of patients admitted to hospital. Finding treatments that can prevent the development of ARDS and improve patient recovery is one of the top priorities for COVID-19 research.

Key research work is also being undertaken in response to the Covid emergency at a number of other centres in Scotland.

The Centre for Virus Research at Glasgow University will be working on a potential new therapy with Cambridge-based Avacta's Affimer biotherapeutics and reagents. The collaboration will study the way in which the Affimer reagents prevent infection and Avacta is using this growing body of data actively to secure a large pharmaceutical partner to develop these potential therapeutic candidates rapidly.

The University of Dundee's Drug Discovery Unit (DDU) has received €5 million of funding to develop antiviral treatments for COVID-19 and future coronaviruses. This significant investment by the COVID-19 Therapeutics Accelerator, initiated by the Bill & Melinda Gates Foundation, Wellcome and Mastercard, will enable DDU scientists to begin work immediately on identifying novel anti-coronavirus agents. The three-year Lead Optimization for Coronavirus Infections (LO4CVI) project will focus on identifying safe, orally dosed candidate drugs with the potential to tackle acute infections and reduce transmission in the general population.

As part of the above program, the Universities of Glasgow and Dundee have been awarded £225,000 to rapidly screen for potential COVID-19 treatments. Researchers at the MRC-University of Glasgow Centre for Virus Research (CVR) in partnership with the University of Dundee Drug Discovery Unit (DDU) will use the funds to rapidly screen a large collection of existing approved medical treatments for other diseases to find any that would be effective against SARS-CoV-2, the virus which causes COVID-19. The team believe it may be possible to rapidly repurpose existing therapeutics to combat the COVID-19 pandemic.

Section D: Skills Response

Companies have continued to retrain and recruit new staff in the life sciences sector. The need for specialists with flexibility, people who think creatively about problems, and business leaders who can adapt their operations are more vital than ever. Our enterprise and skills agencies are working closely together with industry to ensure the changing requirements for the workforce are met and that there are clearly defined pathways and support for our young people.

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Industry has taken part in the development of a Skills and Training Strategy in advanced therapies for Scotland – supporting the growth of this key sub-sector. That work has been supported by the Scottish Universities Life Sciences Alliance (SULSA) and the Life Sciences Scotland Industry Leadership Group to bridge the gap across industry and our education system around the response to COVID-19 and future pandemic preparedness.

The aim is to develop new training programmes and occupational standards to satisfy the sector with new talent, particularly in the Good Manufacturing Practice, formulation of medicinal products, quality processes, bioprocess engineering and bioinformatics.

Skills Development Scotland has created the Life Sciences Modern Apprenticeship framework to create more flexible pathways for those wanting to undertake careers in exciting areas such as gene and cell therapies and vaccine manufacture. Over 20 apprentices are to start on the Modern Apprenticeship (MA) in these specialist areas and will be part of the Advanced Therapies Apprenticeship Community (ATAC), funded by the UK Cell and Gene Therapy Catapult.

Section E: Innovation Support and Opportunities

Scotland has a long and enviable tradition and globally renowned for the many inventions and technological advances over the years, none more so than the life sciences sector. The ingenuity and flexibility demonstrated over the past few months have been remarkable in the innovative collaborative response to COVID-19.

From beta blocker to Ultrasound our inventions have influenced the modern world, saving and enriching peoples' lives. Scotland provides support and guidance on innovation in collaboration across public sector, academia and through industry-led collaborations.

The Scottish Funding Council in partnership with Scottish Enterprise and Highlands and Islands Enterprise, established a programme of Innovation Centres (ICs) which bring together the expertise and capabilities of Scotland's universities, research institutes, colleges and businesses, to address problems and opportunities identified by industry. Their aim is to enhance innovation and entrepreneurship across Scotland's key economic sectors, create jobs and grow the economy. They have worked collaboratively with industry and academic partners to help tackle COVID-19 on a range of projects.

Interface connects businesses to Scotland's 23 universities and research institutions. The service is designed to address the growing demand from companies and organisations which want to engage with academia for support required to create and develop new products, services and processes.

The Interface Business Engagement team has been using their established networks and proactively reaching out to industry and academic contacts to highlight opportunities to assist in the national effort against COVID-19.

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Alongside this, many of the companies that have been previously supported by Interface to collaborate with academic teams, rapidly repurposed their products, processes and services to support the medical response.

Whilst this report concentrates on specific companies there are activities being supported by the Medicines Manufacturing Innovation Centre (MMIC) and they are continuing to focus on strengthening our manufacturing capabilities and supporting the UK Vaccines Taskforce.

Section F: Sampling and Laboratory developments

Scotland's Testing Strategy: Adapting to the Pandemic published on 17 August refers in greater detail to developments and expansion in both the sampling (swab-taking) and the laboratory infrastructure and capacity in Scotland.

Access to sampling (swab taking) has grown rapidly and there are now a number of established channels available which enable clear pathways for accessing testing to be defined and shared publicly.

Further demands on capacity in the immediate future will come from an anticipated rise in people with COVID-19 like symptoms over the winter months.

Surveillance testing programmes will also therefore require capacity around both PCR test processing and antibody test processing. We know with winter coming that we will need to continue to build this capacity and its sustainability.

We intend, working with the UKG programme, to continue to build sampling pathways, and to build laboratory processing capacity to approximately 65,000 tests per day between NHS Scotland laboratories and the Lighthouse Lab in Glasgow.

The Lighthouse Laboratory is a crucial component to enable increased testing in Scotland. We have an agreement with the UK Government that it will operate on a Scotland first approach, up to the level of 40,000 tests per day. Ongoing liaison with the University of Glasgow ensures an integrated approach to the service across Scotland, both in terms of quality and performance of service delivery.

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Section G : Summary of Scottish organisations engaged in COVID-19 response

This is short summary of companies and universities in Scotland supporting COVID-19 test supply chain, vaccines, novel therapeutics and repurposed therapies. This is not an exhaustive list.

Snapshot of Involvement in COVID-19 Vaccine & Therapy Development Programmes		
Global companies with Scottish base	Scottish companies	Universities
Thermo Fisher Charles River Labs GSK IQVIA Valneva ReproCell Europe Merck BioReliance SGS UK Ltd AskBio LumiraDx	E&O Laboratories Hutchison Technologies BioAscent Biobest Laboratories BioClavis Exscientia TC BioPharm Tissue Solutions Novabiotics Pneumagen Lamellar Biomedical ILC Therapeutics Ingenza Symbiosis	Edinburgh Glasgow Dundee Aberdeen

Conclusion

The demands of this pandemic are unprecedented. Scotland's response has been innovative, collaborative and one which we can all be proud of. The Life Sciences sector in Scotland was already a success story, and the experience of recent months demonstrates how much potential there is to increase its strength and grow into the future, making a difference to the lives of people across the world and continuing to provide economic opportunities in Scotland.

This report provides a snapshot of some activities and my thanks go out to the many more businesses from the 770 organisations and 41,000 staff in the sector who are supporting this work and those that are working at the forefront of scientific and technological advances in other treatments and therapeutics.

It is important that the sector in Scotland continues to invest in innovation to support the global response to the pandemic.

Link to Supporting Publications

Testing Strategy:

[Coronavirus \(COVID-19\): test, trace, isolate, support strategy](#) (4 May 2020)

Testing Strategy – 17 August:

[Coronavirus \(COVID-19\): Scotland's Testing Strategy - Adapting to The Pandemic](#)
(17 August)

PPE DOCUMENT – 4 June:

[Coronavirus \(COVID-19\): report on Personal Protective Equipment supplies](#) (4 June)

PPE Statement – 27 May:

[Meeting of the Parliament \(Virtual\)](#) (27 May) – Click PDF, statement “Manufacturing (Support for NHS Scotland)” begins on page 27

Laboratory Sectoral guidance:

[Coronavirus \(COVID-19\): guidance for laboratories and research facilities](#) (29 June)

Other Economic support for companies information:

[Coronavirus \(COVID-19\): support for businesses](#) (5 May)