

Competition Code: 2005_UKRI_IDEAS_COVID19

Total available funding is £20,000,000 (Innovate UK, figure taken from PAF) £50,000,000

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
B G RESEARCH LIMITED	Evaluation and EUA validation of a production ready portable, Point-of-Need Platform for detection of COVID-19 direct from nasal swabs in 30 minutes.	£959,598	£911,618

BG Research have a simplified method for testing patients for infections caused by viruses, the QuRapID-XF technology. Developed in response to the Ebola outbreak, it enables portable testing directly from patient samples. This removes the need for a lab or expert users -- important as it was designed to be used in resource poor environments in rural Africa.

This project will generate a direct from nasal swab test for COVID-19 infections that could be used anywhere, for example at ports of entry or via first responder. At-Point-Testing (APT) will be vital to effectively deal with COVID-19 in the UK. This approach is a highly sensitive, portable platform that ensures infected and those with no symptoms but infected(early stage) patients can be rapidly identified and isolated . . The portable molecular testing system can be used anywhere and gives results within 30 minutes while the patient waits . Hence facilitating immediate isolation and contact tracing.

This COVID-19 test will work directly from nasal swabs, but the technology detects directly from saliva, blood, urine or other crude samples. QuRapID-XF assays are simple, so can be performed by non-expert personnel such as soldiers and nurses and large numbers of while-you-wait tests could be performed. Antigen tests based on molecular diagnostics are many times more sensitive than lateral flow tests, immunological tests, and can be used to differentiate between different viral diseases causing e.g. respiratory symptoms, such as the flu.

This project will see the scaled release of this platform technology.

PHE will be able to deploy their own assays onto the platform to rapidly respond to future outbreaks of blood borne and respiratory viral diseases. QuRapID-XF can also bring low cost testing to poorer developing nations.

As the approach doesn't require nucleic acid extraction and uses our own reagent and instrument, there will be none of the supply chain issues seen relating to testing and so it will be possible to deliver large numbers of tests rapidly in response to any future outbreaks.

The assay will go through a performance evaluation at multiple sites and countries, ensuring that the test will be highly sensitive. This technology allows the UK to respond to biosecurity threats, and outbreaks of human or veterinary viral diseases globally, reducing mortality and economic losses caused by disease.



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APPT-HEALTH LTD	A new innovation in approaching vaccine programme administration and public engagement using accessible digital communications technology at-scale.	£376,276	£301,021

A national vaccine programme will be a huge undertaking. It will be a challenge from an operational, resourcing and technical perspective, to make sure that the programme is efficiently delivered, prioritising those with the greatest need in a safe and effective manner.

In this situation business-as-usual approaches to administrating vaccination programmes through NHS primary care (which rely on expensive and timeconsuming combinations of posted letters and staff led phone-calls) are not suitable.

Appt-Health (Appt) is a social enterprise whose mission is to make equitable access to preventive healthcare effortless in the UK. For the last year we have been leading an Innovate UK funded project to develop an innovative patient engagement tool which is integrated into GP practice IT systems and uses digital communications to increase the public uptake of NHS Health Checks.

We use accessible digital technology, SMS and automated voice, to make it easier to access important preventive healthcare appointments. Preliminary analysis has shown that our approach is 46% more effective (in terms of uptake, cost-effectiveness and required administrative time) than the status quo.

We propose a repurposing of Appt's patient engagement technology to drive public uptake of COVID-19 vaccination appointments and reduce the administrative pressure on primary care.



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	COVID-19 contact-tracing: Secretarium proposal to maximise impact while keeping privacy at heart	£662,700	£530,160

Governments across the world are evaluating means to move out of COVID-19 lockdown gradually. Until researchers find a vaccine, the most effective solution appears to be infection-chain investigations, to notify encounters of infected people to self-isolate and get tested. However, those solutions raise many valid privacy concerns.

The collected information, while essential for investigations to be carried out properly, can lead to mass surveillance. To protect our collective freedom, it is crucial to put in place insurances that the data will not be accessed unlawfully and that the usage is restricted to its intended use. These insurances will maintain a democratically agreed balance between the need for data on the one hand and civic rights on the other.

Exposure investigations face many efficiency challenges. Automatically tracing citizens with their mobile phones has been technically limited for years to address rightful privacy concerns. The NHS is currently recruiting 18,000 contact tracers, but manual tracing is highly intrusive, can't scale, and is unlikely to identify all contacts adequately. Both automatic and manual tracing techniques are complementary and need a secure collaboration service to maximise the global impact of cluster investigation while preserving people's privacy.

Secretarium has built a secure solution, currently used in financial services, that enables individual institutions to collaborate whilst keeping their respective confidential data private. We use the latest cryptography and hardware security technologies to guarantee that private data is never disclosed, as it remains encrypted even during processing. This is highly innovative because it is easy to secure data in storage and in transit using traditional encryption techniques, but it is very hard to keep it secure while being processed by a computer programme.

We started adapting our technology for COVID-19 infection investigation in March, and are preparing collaboration tools to efficiently investigate infection clusters while preventing mass-surveillance. For example, this will enable infection cluster investigators to get in touch with patients without having to know their identity. By improving privacy in this way, it will give the general population more confidence and trust to use the system without fearing that their personal data is going to be misused.



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TISSUE CLICK LTD	COVID-19: APTAMER-BASED DIAGNOSTICS KIT FOR THE EARLY AND RAPID DETECTION OF COVIDS	£110,302	£88,242
University of Salerno		£32,932	£26,346

APTA-COVID aims to develop **a user-friendly kit** for the early and fast diagnosis of COVID (and its future mutants) infection. Computer modelling will enable the identification of a library of relatively small molecules (called aptamers) able to recognise different domains of the COVID-19 spikes. These molecules will be grafted on to magnetic nanoparticles to become **a powerful tool to capture, concentrate and detect small amounts of viruses in oral swabs/saliva samples**. This will be done by incubating the magnetic nanoparticles with the sample for only 15 min, attracting them with a magnet and after washing out the excess, incubate them for 15 min with free aptamers tagged with fluorescent molecules: each recognising a different virus spike domain. After a final wash, particles that fluoresce under illumination with an inexpensive UV torch will signal the presence of the virus. This kit will be much more cost-effective than the one currently available (£50 for 1000 samples). More individuals will be tested in a shorter time period thus enabling earlier detection of infection and geographical mapping of outbreaks enabling fast actions by clinicians and policymakers.



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OXFORD EXPRESSION TECHNOLOGIES LIMITED	Covid-19: a rapidly scalable SARS-Cov-2 vaccine platform based on recombinant spoke protein manufactured in insect cells using flashBAC to maximise yield and quality	£681,769	£545,415
Vaxine Pty Ltd		£4,000,000	£0

The best validated approach to protect individuals against coronaviruses such as COVID-19 is to target the spike protein that surrounds the particle and which plays a key role in cellular attachment and virus cell entry. One of the safest ways to make spike protein for use in a vaccine is to use a production system based on a virus that can only grow in insect cells. This baculovirus can be reprogrammed to make the COVID-19 spike protein. Once the modified baculovirus is used to infect insect cells propagated in bioreactors, it results in the release of the spike protein into the liquid medium supporting growth of the cells. The spike protein can then be extracted, purified, mixed with an adjuvant and used as a vaccine. The adjuvant helps to stimulate immunity in those receiving the vaccine to ensure protection from COVID-19 and has the added advantage that it helps to protect against adverse vaccine reactions that may cause damage to the lungs. With our partner Vaxine Pty Ltd, a major vaccine company, we plan to have initial batches of COVID-19 vaccine produced for Phase 1 trials and processes designed for optimised large scale manufacture within 12 months.



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SENTINEL BIOSENSOR LTD	C-Detect, a monitoring and alerting wearable vital signs monitor.	£494,766	£395,813

C-Detect is a wearable monitor detecting deterioration in people who may have COVID-19 or who have tested positive. C-Detect lets the user know if they can self-isolate as their vital signs are not deteriorating or if they should seek help. The device also includes a bluetooth social distancing feature and integration with the Apple\\Google tracing program.

C-Detect has been developed by an award winning team who worked with 5 Academic University Hospitals to develop a new state-of-the-art, vital-signs monitor. The device had to have medical grade accuracy but with consumer levels of usability. C-Detect is a cut-down version of that sensor that has been targeted at COVID-19\.

Having passed Clinical trials not only in hospitals but also in patients homes, transitioning tried and tested technology from our flagship sensor into C-Detect was a natural progression allowing us to address COVID-19 directly. Whilst testing is important, it does not stop people being infected and spreading the virus. Constant monitoring with a device such as C-Detect stops the spread of infection at the earliest time by informing the user that they may be infected and should self-isolate or seek robust medical assistance.

Continuous monitoring delivers many advantages in conditions other than COVID as early detection in a wide range of conditions results in better patient outcomes and cheaper treatment.



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QINETIQ LIMITED	A Machine Learning Approach to Predicting Localised COVID-19 and Applying its Operational Relevance to Resource Utilisation	£79,074	£79,074

COVID-19 has placed an unprecedented demand on the healthcare system of the United Kingdom. The substantial operational burden on health services has precipitated the need to parallelise operational analysis and disease modelling for effective management and emergency planning. This project will address the increasingly significant gap between operational demands and COVID-19 disease transmission. We will tackle the issue of predicting localised coronavirus transmission by using artificial intelligence techniques to inform predictions in greater granularity. This will enable operational simulations to assess where there is a dearth of resources and how to plan for these scenarios. Ultimately, using the results obtained by this study, we will create a model that can predict trends about the occurrence and severity of COVID-19 cases in real time within given localities. Such an integrated model will not only help to eliminate the reporting time differences in conventional disease surveillance systems but also minimise the societal costs and economic losses caused by COVID-19\. Due to a large number of unplanned admissions at the A&E departments, it is of vital importance to study the patient attendance to improve the medical treatment and to save the costs of human and medical resources.



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COLORIFIX LIMITED	Dual – action antiviral dyes to support the fight against COVID-19	£235,060	£188,048
University of Cambridge		£221,588	£177,270

Colorifix has pioneered the production, deposition and fixation of natural pigments on diverse types of fabrics and externally validated their antimicrobial properties against pathogens common in hospital settings. Some of these pigments are also known to possess antiviral activity. Using the support from this grant, we aim to produce the next-generation of safe, sustainable and effective natural antiviral dyes to support the fight against COVID-19\. Colorifix will team up with two leading research groups from the University of Cambridge, with expertise in virology, nanomaterials and photo triggered chemistry, which will help establish new R&D platforms in a niche area of antiviral dye design, with a significant potential for IP generation. To achieve our goals we will identify the best natural antiviral pigment candidates that will then be produced in a safe industrial microorganism using our expertise in synthetic biology. Antiviral pigments will be combined with antimicrobial dyes previously developed by Colorifix and externally validated to create a unique pigment formulation with dual antiviral/antimicrobial action. Our dyes are permanently bound to fabric, offering durable, long-lasting and safe (non-leaching) anti-COVID19 fabric, with potential effective neutralisation of other common viruses and bacteria responsible for respiratory conditions, a major comorbidity factor which contributes to the number of severely affected COVID patients. Unlike other surface formulations, our antiviral fabrics do not aim at the physical removal of the virus, but complete deactivation through dual mode of action both in dark and on exposure to sun or ultraviolet light. As a consequence, dramatic reduction of transmission rates of the virus can be achieved. Harnessing our patented technology, pigment-producing microorganisms will be used to dye fabrics with application from healthcare (PPE), to general clothing, packaging or public transport sectors. Besides the impact on infection prevention, Colorifix's patented approach has a substantial environmental impact by significantly reducing the use of chemicals and water in the manufacturing process, which also impacts the overall cost. We will collaborate with external academic and industrial partners to validate the antiviral potential of the new dyes and to ensure they meet safety standards. Colorifix has strong relationships with international fashion brands, mills and dye houses, including GM-licensed European production sites, which means the product can be scaled up quickly and integrated into existing manufacturing chains offering a rapid route to market.



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	Covid-19: Intelligent Workforce Tracking and Tasking through Infrastructure Free Indoor Localisation	£490,020	£392,016

Navenio is a pioneering UK business with a unique, "best-in-class" indoor geolocation technology that helps organisations to manage their people and equipment more effectively -- without the need to install new infrastructure.

This Innovate UK supported project will rapidly enhance Navenio's Intelligent Workforce Solution (IWS) feature-set across infection control rapid-response cleaning, porter tasking and workforce management, helping companies and healthcare providers to respond more effectively to the unique challenges presented by the Covid-19 pandemic.

In the short-term, this project's outputs will dramatically improve patient flow within hospitals, including patient discharge, which will free up beds for new patients and help make sure that scarce resources are available to those that need it most.

In the mid-to-long term, Navenio will use the improvements developed as a result of this project to rapidly expand the utility and benefits of its IWS system beyond healthcare organisations, including expansion to retail, government and education sectors.



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INTELLIGENT FINGERPRINTING LIMITED	Sensitive POC diagnostics for the rapid detection of COVID-19 virus	£704,572	£563,658

Public description

The project will use Intelligent Fingerprinting's existing technology -- which features highly sensitive lateral flow technology and fluorescence measurement techniques within a portable test reader -- and be developed to create a 'point-of-care' test that allows COVID-19 testing to be carried out quickly and safely by non-medical professionals. Intelligent Fingerprinting will work with researchers at the Institute of Global Health Innovation at Imperial College London to validate its testing approach and accelerate development.

A fingerprint-based system could play a significant role in enabling rapid coronavirus testing at the point of care. Current diagnostic tests for coronavirus -which tell whether people have the COVID-19 virus -- can take hours or even days if the test sample needs to be sent off to a laboratory for analysis. In contrast, the Intelligent Fingerprinting approach, which works by collecting fingerprint sweat onto a small test cartridge for analysis using a portable reader, has potential to deliver a positive or negative COVID-19 result on-site within just ten minutes. The system is hygienic and non-invasive and by using the sweat from fingerprints rather than nasal or oral fluid samples, there is no hazardous biological waste associated with each test.

Intelligent Fingerprinting's testing solution features a small, tamper-evident screening cartridge onto which ten fingerprint sweat samples are collected, in a process which takes less than a minute. The Intelligent Fingerprinting portable DSR-Plus analysis unit then reads the cartridge and provides a positive or negative result on-screen in ten minutes. Combining the DSR-Plus reader with a dedicated coronavirus testing cartridge would provide the basis for a robust, extremely sensitive and rapid COVID-19 test that is suitable for deployment at a range of locations.

Fingerprint testing using a portable system would also be particularly valuable in supporting simple and easy testing by non-medically trained staff at multiple sites across the UK, such as care homes and workplaces.



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SA VORTEX LIMITED	SMART SANITISATION: DEVELOPMENT AND EVALUATION OF A SMART HAND SANITISER SYSTEM FOR USE IN THE OFFICE ENVIRONMENT	£334,999	£334,999
University of Leeds		£126,503	£126,503
University of Sheffield		£109,060	£109,060

SA Vortex Ltd (Savortex), a UK SME specialising in smart hand hygiene technology used in the washroom, is working with the Universities of Leeds and Sheffield to apply its expertise to smart hand sanitisation given the threat from Covid-19 to make buildings safer. This project will develop and deploy an innovative smart IoT hand sanitiser device that connects into the buildings smart operating system to provide a range of functions. This new system will improve the standards of hand hygiene (HH) in workplaces by offering non-touch technology, increased visibility/messaging capabilities via a built-in video screen and an innovative monitoring system. It will be able to detect when it is used and by whom by sensing users work identity cards, and in extremis deny building entry to each worker unless their hands have been sanitised. The R&D phase will allow Savortex to produce and test fully-functioning IoT hand sanitiser units with a video display, personalised app and monitoring system for offices, and provide a building manager IoT portal showing building network sanitiser data. No other hand sanitisation system deploys such IoT capabilities.

The UK Government advises that HH is a key measure against the spread of Covid-19\. The use of sanitisers is a critical preventative intervention. The bulk of R&D on monitoring of sanitiser usage has focused on the clinical setting (see Galleryzk & Handiyan, 2020) and this project will fill an urgent gap in terms of knowledge and impact, as well as providing a solution that will improve office workers health and mental wellbeing.

By testing 200 units across at least 4 research settings, including the Department of Justice through the involvement of the Active Building Centre Ltd, a UK Govt RTO, the research component of the project aims

to understand:

a) where sanitisers should be placed for optimal usage and to enhance sanitisation protocols;

b) best practice for monitoring and access control strategies to increase HH and employee wellbeing;

c) how motion graphics/message strategies can influence sanitiser use.

The Universities of Leeds and Sheffield will engage with buildings employees and managers to research their receptiveness to utilising the technology from both a personal and a corporate level. Savortex will additionally create a building manager IoT portal that can be used by buildings managers to rank their success in delivering the highest levels of hand sanitisation achievable.



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WEARABLE TECHNOLOGIES LIMITED	Wearable Technologies - Scaleup/Funding Of Existing Solution For Ensuring Social Distancing On Industrial Work Sites To Enable Them To Stay Open	£892,588	£714,070

Short video showing the solution in action -[https://vimeo.com/422508431][0]

Problem: Inability to demonstrably enforce social distancing amongst industrial workers is forcing economy to be shut down and putting at risk key infrastructure, with massive economic and social cost. Shutdowns are currently indiscriminate. For every 100,000 workers on 3 months furlough, this costs the Coronavirus Job Retention Scheme ("CJRS")/Treasury c.£750m.

Solution Overview: SCALEUP/FUNDING of WTLs existing connected worker IoT platform - sensor hub on each worker and cloud platform which can assist social distancing in the industrial workplace and provide real-time data to enable data-based safety and productivity decision-making by employers and government.

Whilst other social distancing devices are beginning to appear on the market, they do not deliver real-time data on "2m bumps" between workers to dashboards to enable employers to make data led decisions on the effectiveness of their social distancing policies, eliminate overcrowding.

[0]: https://vimeo.com/422508431



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ONCIMMUNE LIMITED	IMmunity Profiling of pAtients with Covid- 19 for Therapy and Triage (IMPACTT)	£643,732	£514,986
MEDICINES DISCOVERY CATAPULT LIMITED		£541,356	£541,356

The IMPACTT project will study the immune profiles of 3,000 patients infected with SARS-CoV-2 in order to understand our immune responses to the virus.

This project will generate five outputs:

- 1\. Generation of a panel of immune related biomarkers that are predictive of response to treatment, including adverse events
- 2\. Understanding why some patients have very mild symptoms, yet others have severe reactions that result in ventilation and even loss of life;
- 3\. Identification of novel therapeutic targets;
- 4\. Publicly available database of the immune profiles of 3,000 patients;
- 5\. Creation of a biorepository of 3,000 patient samples to support further research into the SARS-CoV-2 virus.



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LEAF SYSTEMS INTERNATIONAL LIMITED	Scalable and low-cost plant-based production of SARS-Cov-2 antigenic variant proteins to support research activities and diagnostics manufacture	£116,796	£93,437

In the first six months of 2020, the SARS-CoV-2 virus has contributed to almost half a million deaths worldwide. Our understanding of the biology of the virus is key to minimising the continued human and economic impact of COVID-19 by developing effective diagnostic tools and vaccine candidates.

All viruses evolve as they spread through an infected population with mutations at the genome level giving rise to structural and antigenic differences at the protein level. The evolution of SARS-CoV-2 has followed a similar pattern in that since the first complete genome sequence of virus was published, antigenic variants have been observed in the population. It is currently unknown whether these emerging variant strains will provide an advantage to the evolving virus and what effect these mutations will have on the virus's ability to evade the human immune system of previously infected individuals or give rise to increased pathogenicity.

In this project, we propose to help researchers further their understanding of the impact of these viral variants by providing timely access to samples of the mutant versions of these major antigenic proteins as soon as they are discovered. In order to expedite the production of these proteins we will use our proprietary plantbased expression system, Hypertrans(R), which enables extremely high-level and rapid production of proteins. By employing this system, we hope to generate purified, recombinant protein for newly emerging variants of the virus within a few weeks of their discovery. These variant proteins will then be supplied to research groups and diagnostic manufacturers here in the UK and abroad to enable them to characterise the behaviour of these proteins in their assays providing answers to these key questions.

Because our expression system is readily scalable, when a new viral variant protein has been demonstrated to be increasingly prevalent within a population, we can rapidly move to generate large quantities of this material at lower cost than traditional methods. This enhanced speed and cost-effective manufacturing ability will facilitate the production of cheaper, more accurate diagnostic tests that can recognise multiple SARS-CoV-2 strains. This will be particularly essential if a second wave of outbreak occurs with a variant strain that is undetectable by current serological tests.

Importantly, this work will address both the current SARS-CoV-2 outbreak and place the UK in an excellent position to respond far more rapidly to any future outbreaks of similar pathogens that have pandemic potential.