

Results of Competition: UKRI Ideas to Address COVID-19 – Innovate UK De minimis Strand

Competition Code: 2005_UKRI_IDEAS_COVID19_DEMINIMIS

Total available funding is £120m

Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
DATA LANGUAGE (UK) LTD	0238 AI Classification of COVID - 19 studies to ensure clinical guidance and healthcare policy is informed by current meta-analysis of all available evidence	£97,892	£97,892

Note: you can see all Innovate UK-funded projects here: <https://www.gov.uk/government/publications/innovate-uk-funded-projects>

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Project description - provided by applicants

This project will deliver a new set of machine learning (AI) models to classify COVID-19 human-based clinical studies with structured data from Cochrane's bioinformatics vocabularies.

This innovation will enable the discovery, evaluation and synthesis of the most relevant and up-to-date COVID-19 primary evidence from around the world, to answer as quickly and comprehensively as possible specific clinical questions currently being prioritised by clinicians and healthcare policy advisers.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
BLUEBERRY THERAPEUTICS LIMITED	Development of a coupled inactivating transport medium and RNA purification protocol for SARS-CoV-2	£66,132	£66,132
TECREA LIMITED		£33,626	£33,626

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Project description - provided by applicants

The standard method for detecting SARS-CoV-2, the virus responsible for causing COVID-19, is called "RT-PCR" (reverse transcription, polymerase chain reaction). RT-PCR works by directly detecting the virus genetic material in patient samples and as such it requires the virus genetic material (its genome) to be intact in these samples in order to work. Because of this samples for screening need to be handled as if they are infectious and this requires the use of specialist facilities for handling.

Ideally, clinical samples would be collected into a transport medium that would inactivate the virus whilst ensuring that its genetic material remains intact for RT-PCR. This would allow handling of samples without the need for the specialist facilities required to protect operators from potential infection. Some such media exist but are usually based on very caustic chemicals meaning that they cannot necessarily be used in some settings.

In this project we aim to develop a new safe transport medium for the collection of patient samples for RT-PCR. This transport medium is based on a chemical that has a long history of safe human use and doesn't have the issues associated with caustic chemicals. Additionally, by modifying this chemical we aim to enhance the properties of the transport medium such that it will aid in the detection of virus by RT-PCR. Finally, the agents developed from this project can also be used as the basis for the development of new disinfectant products for clinical, industrial and personal use.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
IMMUNDNZ LIMITED	COVID-19: Unravelling the changing immune environment of human lung cells in a search for biomarkers that are predictive for a cytokine storm	£83,892	£83,892

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Project description - provided by applicants

There is a lack of models and biomarkers to predict the severity and outcome of a COVID-19 infection. Such biomarkers could help in predicting the expected intensive care beds that are needed. Importantly, there are few or no models to use in the laboratory that are safe, that can study the immunologic progression of viruses in a condition that does not involve human volunteers or animal models but demonstrates possible effects in human cells in a human-like tissue environment.

Severity in COVID-19 infection is related to the so-called cytokine storm, an excessive production of signalling proteins to immune cells to come to the site of infection in response to an inflammation in the lungs. This leads to hyper-inflammation which could eventually kill a patient. In case of a cytokine storm, the immune system begins to destroy lung cells and makes breathing difficult.

We propose to develop a safe experimental model that can be customised to mutated forms of the virus to unravel the changing immune environment of human lung cells in COVID-19 infection in a search for biomarkers associated with the infection. The model will enable tests of people to predict the progression of an infection into a cytokine storm.

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Manufacturing Technology Centre	The Development of Aerosol Generating Procedure (AGP) Shields for Anaesthetic Use	£116,043	£116,043

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Project description - provided by applicants

The ability to manage the exposure of NHS staff to COVID-19 has been driven predominantly by the adoption of stringent PPE. Though effective, it does not reduce the viral load present in the working space, generally the hospital theatre, and does not address the concern that theatre capacity has been significantly diminished by the essential need to deep clean taking a longer time than before. The project will develop the application of a shield to address both issues. Firstly, through the reduction of viral load, the risk and consequences of exposure could be alleviated and, secondly, by containment within the shield. The project will improve theatre throughput back to a sustainable "new normal" state. The intent of the research project is to develop the production volume ready process required, conduct a service evaluation of the shield in a cohort of hospitals and to establish a logistical and business model for their wider use across the UK health support network.

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AGPLUS DIAGNOSTICS LTD	Development of AgPlus rapid electrochemical immunoassays for COVID-19	£174,845	£174,845

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Project description - provided by applicants

SARS-CoV-2 or COVID-19 is virus that is currently spreading throughout the world. Relatively little is understood about the virus but we are learning fast and it is clear that we need to have good diagnosis to support quarantine and treatment. What is known is that the virus has a serial interval of 4 days and 1-3% of the population may be pre-symptomatic but still transmitting the virus. It takes 2-14 days to show symptoms after infection with the 97% of people developing symptoms within 11.5 days. There is a clear global challenge to halt the spread of this disease and to strengthen the ability of all healthcare systems to cope better with future epidemics.

Key to this is accurate fast diagnostic testing for the virus or immune status of patients. AgPlus' diagnostic assays for detecting specific immune responses to the COVID-19 virus will allow for a) confirmatory testing (rule in rule out) of those with symptoms, understanding that in some instances the symptoms may be due to bacterial infection b) monitoring treatment efficacy in those that have tested positive to ensure they are responding and when safe to release from isolation c) potential to be a companion diagnostic to support drug/ vaccine development and d) to determine if you have had a COVID-19 infection.

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AMPLIFYFI LTD	Zoonotic Early Warning Scanner (ZEWS)	£49,580	£49,580

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Project description - provided by applicants

The current Covid-19 pandemic has had a catastrophic impact on global health and the economy. Despite Asia having experienced similar outbreaks of this nature in the recent past, as a global community we were not able to identify the signals early enough in order to make the necessary preventative measures. AMPLYFI would like to further enhance it's AI-driven technology to look at millions of historical data sets and look for early indicators of viral outbreaks. This could come from news articles, social media, sectoral reports, academic papers or anywhere that might provide that vital insight. The aim is to create a system that can identify and alert governments and society in general to early signals so that they can make the interventions much earlier and prevent these contagions having such a catastrophic impact

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
MEDISYNE LTD	COVID-19: Optimising fluid management in COVID-19 patients: an innovative urine-output monitoring system for the early detection of clinical deterioration in hospitalised patients.	£25,000	£25,000

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Project description - provided by applicants

Critically unwell COVID-19 patients in hospitals worldwide require regular monitoring of how much urine they produce as a guide to their hydration and health. Urine-output monitoring is a tedious, time-consuming task that is manually undertaken by highly trained nursing staff who could be focusing on other healthcare tasks. Human error in measuring, recording and alerting changes in urine output can result in delays in treatment and poorer outcomes due to conditions like sepsis and acute kidney injury.

In the busy hospital environment, even small delays in providing fluid resuscitation in response to changes in clinical parameters, such as reducing urine output, can result in poorer outcomes. In this project we will build an automated urine output monitoring device that will free healthcare staff to focus on other important tasks, such as monitoring sick patients' breathing and heart, and will alert them if the device identifies the patient has deteriorating urine production. Using this novel device, we will undertake a study to provide insights into how urine output is related to outcomes in patients with COVID-19.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
TRACTIC LIMITED	TravelSpace - Passenger booking application for demand management for Train Operators	£107,328	£107,328
NIKL DESIGN LTD		£15,000	£15,000
TEN TRANSPORT CONSULTANCY LIMITED		£15,000	£15,000

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Project description - provided by applicants

TravelSpace is an overlay booking system to give passengers additional virus safety support by giving passengers the information they need to make safe decisions around public transport and reducing the need for passengers to spend unnecessary time in long queues. TravelSpace does this by giving train operators a booking system for a given service (as opposed to turn up and go or booking a specific seat).

The main purpose is to manage the flow of passengers before they arrive at the station and avoid (or limit) the need to have a queuing system in place. TravelSpace would work in association with the current passenger information feeds to manage demand/capacity.

Several use cases must be accommodated so that each ticket type can be dealt with, disabled passengers or passengers needing extra assistance must also be catered for.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
ENOVATION CONSULTING LIMITED	The Oxford Box Aerosol Shield & The Paediatric Oxford Box Aerosol Shield	£32,294	£32,294
One Group Engineering Ltd		£37,635	£37,635

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Project description - provided by applicants

SARS-2-Covid is not an airborne virus, but it has been proven that during aerosol generating procedures, such as intubation and extubation, the virus becomes airborne.

Healthcare staff performing these procedures are at high risk of contracting the virus.

Even with adequate PPE, the viral load transmitted to the face, neck and trunk of healthcare staff makes the process of 'doffing' (safely removing PPE) extremely dangerous.

An aerosol shield box:

- * significantly reduces the amount of viral load transmitted to staff
- * significantly reduces settling time to the environment
- * improves staff safety
- * has positive psychological effects on healthcare staff who, by protocol, have to consider all patients positive to COVID19 if not previously tested
- * allows operating theatres to be cleaned and turned round more quickly, without compromising safety

Existing aerosol shield boxes that are currently available have a number of design limitations that restrict their use across the healthcare sector.

Through a collaboration between renowned medical specialists and high tech innovators, the Oxford Box aerosol shield has been designed to overcome the identified limitations by:

- 1\ allowing more access for staff to manoeuvre their arms and equipment within the box
- 2\ accommodating larger patients
- 3\ being able to be used on a variety of bed and trolley widths
- 4\ being lighter
- 5\ being suitable for thorough cleaning and re-use
- 6\ being compact, foldable and easy to store
- 7\ being affordable

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As a result of its innovative design the Oxford Box will be a safe, cost effective shield that will continue to be used as a means of barrier protection long after the pandemic has subsided, as the aerosol infection risk will always be present during intubation and extubation.

A proof of concept prototype of the Oxford Box has already been built and tested, and medical approval has been recently granted by Oxford University Hospitals NHS Trust. A proof of concept prototype of a paediatric Oxford Box is currently being tested by Oxford University Hospitals NHS Trust.

The aim of this project is to finalise the designs of the two Oxford Boxes, which will comply with international as well as UK standards, and then manufacture a pre-production batch for market testing. The project aim to produce a state of the art aerosol shield that is affordable for the NHS trusts, and apply the transition to circular economy commitment to this product.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
CITEAB LIMITED	An AI powered data platform to help researchers rapidly identify and evaluate research reagents to investigate and mitigate the effects of COVID-19	£66,142	£66,142

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Project description - provided by applicants

The study of a newly emerged virus like Sars-CoV-2 relies on novel research tools and hundreds of suppliers from across the world are striving to make thousands of such products available to researchers. These tools open new opportunities for experiments, but provide a challenge to researchers; how do they efficiently find the reagents they require for their experiments. Especially when purchasing the wrong reagent can waste weeks of research time. CiteAb will build a dedicated search and discovery platform to help solve this urgent need.

We will use our text mining and AI technology to identify the use of Sars-CoV-2/COVID-19 reagents within publications and use it to provide an ongoing stream of data. This cited reagent data will be combined with information from our network of global reagent suppliers to provide a complete overview of available Sars-CoV-2 reagents and how they have been used in published research. We will then build a dedicated Sars-CoV-2/COVID-19 platform to allow researchers to search and evaluate this data.

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OXFORD NANOIMAGING LIMITED	ONI-CoV2RNA: A single step imaging-based assay for direct detection of SARS-CoV-2 RNA	£514,279	£149,552
Imperial College London		£149,890	£119,912
MEDICINES DISCOVERY CATAPULT LIMITED		£30,616	£30,616

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Project description - provided by applicants

Diagnostic testing for SARS-CoV-2 has so far detected only 1 in 4 infections across the community (Office of National Statistics), with devastating consequences that could have been prevented if testing of asymptomatic carriers had been in place. The Department of Health's National Testing Strategy continues to boost COVID-19 diagnostic testing capacity (134,890 tests/day, 12th July) to support the NHS test and trace program, and better control outbreaks to prevent the second wave of COVID-19 cases. Nevertheless, the current UK median turnaround time for testing is around 27 hours, and most tests are performed on symptomatic individuals or NHS workers at risk. The government currently relies on innovation to meet its ambitious targets to enable testing of suspected contacts within international standard 24-hour turnaround times, and diversify access to testing (e.g. doubling mobile units, exploring alternative sampling methods).

ONI is developing a novel method to specifically detect SARS-CoV-2 in under 10 minutes by removing time-consuming and costly sample preparation steps, using widely available reagents and making sample analysis automated, faster and safer.

Our single-step SARS-CoV-2 detection assay will allow direct swab testing by placing a nasal/pharyngeal sample into a collection tube containing a viral lysis/labelling buffer. The assay will run on ONI's Nanoimager instrument, a unique desktop-format microscope with well-established single-molecule imaging capabilities. Together with partners at Imperial College London and Medicines Discovery Catapult (MDC) we will perform side-by-side validation with existing tests on COVID-19 clinical swab samples and assess its ease of use in a clinical setting through Imperial College's Healthcare NHS Trust. We will then roll out 15 Nanoimagers in key locations to boost national testing capacity with an additional 200,000 tests/month.

Our test will remove the need for high-containment facilities and specialised personnel with automated assay operation, facilitating its use in de-centralised clinical and non-clinical settings. With our compact platform, testing may be extended to key workers on a routine basis, including clinics, care homes and schools during the return to normal activities. Once regulatory approval is secured, our assay will support testing at airports and companies, where our compact and rapid platform will allow detection of SARS-CoV-2 genetic material in asymptomatic carriers in a few minutes, helping reduce infection spread and minimising further economic losses for hard-hit sectors. The ONI-CoV2RNA assay has the potential to allow rapid, de-centralised single-step coronavirus testing UK-wide.

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PRITCHARD SPRAY TECHNOLOGY LIMITED	Covid-19 - SARS-CoV-2 Multi Surface Disinfection Spray System	£177,000	£177,000

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Project description - provided by applicants

COVID-19 presents unique challenges to healthcare systems. Effective infection control involves cleaning (remove organic matter, dust etc.) and disinfection (reduce number of micro-organisms to a level where they are not harmful)

With the threat of a second wave; as reported on the BBC 17-07-2020, being warned of by public health experts, providing effective tools to fight this disease in medical setting is imperative.

VIRUSEND(tm) has utility across all sectors and will be the only product of its type that has proven efficacy against COVID-19 along with a broad range of bacteria and other viruses. This will help protect health by minimising the spread of the virus, enable employers to meet their legal obligations to reduce risk as far as practically possible and provide an environmentally friendly and sustainable solution to infection control.

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HEALTHWAVE LIMITED	COVID-19 and Inequality: An analysis of inequity of access to remote NHS healthcare	£191,784	£153,427
NHS Somerset CCG		£3,250	£3,250
SOUTH WEST PENINSULA AHSN LIMITED		£710	£497

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Project description - provided by applicants

****www.healthwavehub.com****

The way we design public services is always changing. Technology increasingly plays a central role in ensuring that people can access vital assistance and high quality support equitably. We all want to be able to deliver and access responsive and tailored public services - but solutions can sometimes appear complex and difficult to put into action. Our mission at Healthwave is to engage with communities at specific, hyper-local levels. We surface the frictions and enablers to change, empowering communities to inform the way services are designed and delivered.

****Healthwave Limited - what we do****

We're a modern research team gathering independent insights for commercial use by healthcare organisations to help shape the way healthcare is delivered. Our unique solution gathers insights from those on the frontline and within our communities who are better placed to evaluate impact and influence change. Themes and interventions are visualised through our client-facing hub showing results and opportunities in near real time to drive rapid learning and decision making.

****Our Work during COVID-19****

Healthcare provision has changed through the rapid implementation of digital and remote methods of service delivery due to COVID-19. There has been little focus on how this change has impacted patients isolated by the new digital shift. The literature on digital exclusion shows three indicators as consistently strong predictors of internet access and use: age, education, and disability (Helsper & Reisdorf, 2017). However, these studies were not conducted within the context of a UK-wide change in how care is delivered. This study helps fill this gap by providing insights into the frictions to accessing and engaging with digital and remote delivery methods due to COVID-19.

There exists a great potential for inequity of access for certain groups of people with a clear risk of adverse impact on levels of morbidity and mortality. The urgent identification of these patient groups via rapid, widespread, and innovative data capture methods to assist NHS decision makers is now required to plug this gap in provision. This fits with NHS strategic priorities.

Our work will help policy-makers and senior clinical staff understand this cohort of patients drawing together all relevant data into a dashboard format. This study will help optimise the technology that has already been adopted, rather than proposing alternatives. Thereby supporting rapid commissioning and decision making processes currently underway in the NHS.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
PROJECT PITLANE LTD	MedicCom - Overcoming the communications barriers caused by Personal Protective Equipment (PPE)	£125,443	£125,443
University of Leicester		£37,128	£37,128

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Project description - provided by applicants

The need to wear PPE has suddenly changed the way in which doctors and nurses communicate with patients, with relatives, and with each other. When treating the most serious cases, hospital staff wear breathing apparatus and masks that greatly restrict the ability to speak. This type of PPE means that important communication becomes distorted and difficult to hear. Patients, especially the deaf, elderly or blind, are being given critical, life changing, information by someone they can hardly hear. Relatives cannot be with their loved ones, so have to be given information by telephone, via a remote and distorted voice. There is further concern about patient safety incidents that have happened due to errors from miscommunication within clinical teams. This was the subject of a Royal College of Emergency Medicine "Safety Flash" to the NHS in July 2020 "Communication Errors with PPE".

Our solution is a communications device (called MedicCom), which will be worn by health and care staff to overcome multiple communication barriers. Staff will wear a bone conduction or throat microphone, clearly picking up their voice, even when wearing a respirator mask. When talking to a patient, or to the medical team around the patient, the MedicCom device will act as a voice amplifier, with signal processing algorithms delivering clear natural sounding speech. To enable normal telephone conversations with relatives, the MedicCom will use Bluetooth to connect to a mobile phone, such that the patient's relative will be unaware that the doctor or nurse is wearing PPE. A cable will also enable the MedicComm to be plugged into the hospital's internal phone system to talk to colleagues in other departments or receive incoming information from the ambulance service.

This project is a collaboration between engineers from Formula One Racing teams, a University, and a NHS Hospital Trust. Project Pitlane is a not for profit company that uses the know-how of the UK's world-leading motor sport industry to achieve public good. We have developed a prototype MedicCom device and aim to rapidly make the verified MedicCom available to the NHS.

PPE use in healthcare is likely to continue for the foreseeable future and there is a worldwide urgent need to overcome the barriers to communications caused by changed medical practice, including PPE. The MedicCom will have a worldwide market and may be used in other situations (e.g. care homes) where difficulties in hearing staff due to PPE are an issue.

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