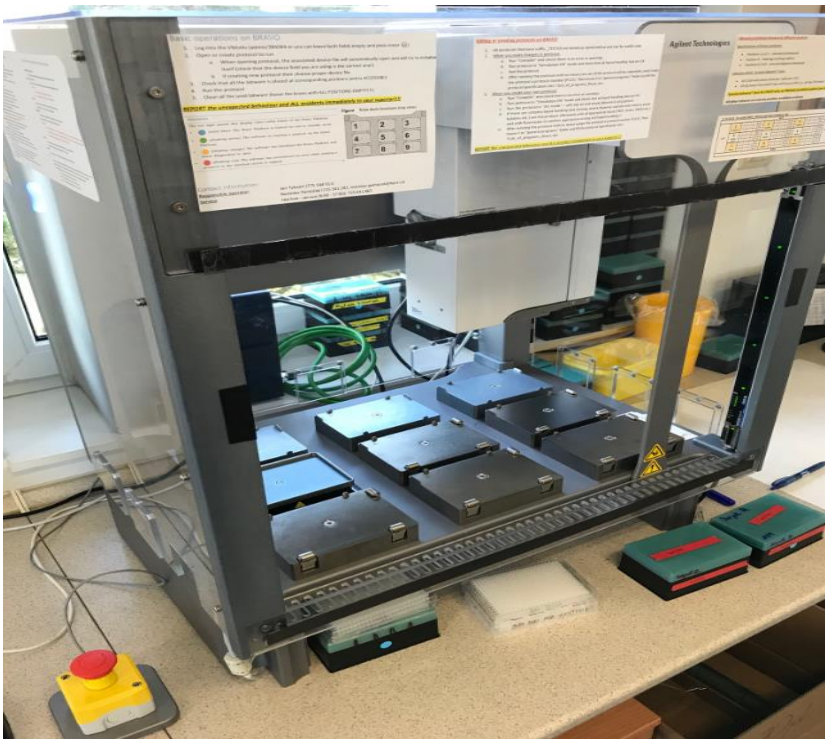
Hack the Crisis – Winners

1st place: DIANA Biotechnologies

The aim of the project is to contribute to the overall capacity of ultra-sensitive COVID-19 testing in the Czech Republic, which is critical for successfully lifting the quarantine measures, as well as fighting a possible new wave of infections in the future. DIANA Biotechnologies are developing an automated solution to test for the presence of the COVID-19 virus in clinical samples. The technology is primarily based on the widely adopted ultra-sensitive method of RNA isolation and subsequent quantification using the RT-PCR method.

DIANA Biotechnologies are currently finishing the development of the testing kits and preparing them for clinical validation. The method will be validated and ready for implementation in clinical laboratories in summer. It should support the smart quarantine project and increase the testing capacity of laboratories before the expected arrival of the second wave of the COVID epidemic in fall. *„Our company is also working on other testing methods, especially on ultra-sensitive serologic tests for COVID-19 antibodies, as well as on PCR detection of viral RNA from alternative clinical materials, especially saliva, which would allow for self-collection of test samples. This would expand the testable population and reduce the burden on the current system of sample collection,“* said Martin Dienstbier, the co-founder and CFO of DIANA Biotechnologies.



2nd place: COROVENT

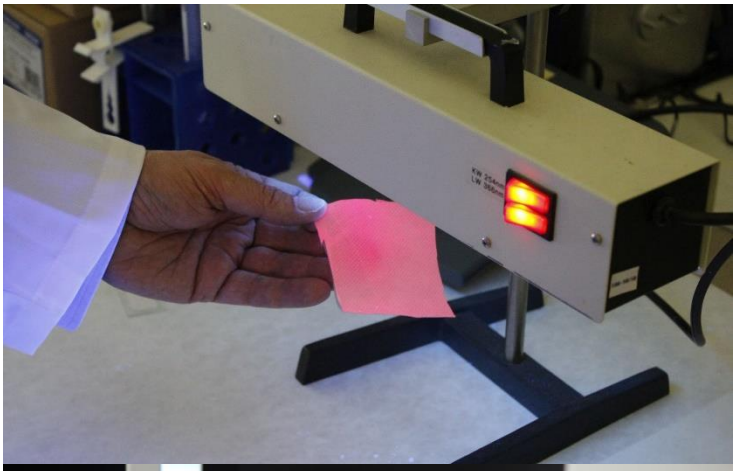
The lack of reliable pulmonary ventilators in many countries around the world led to a situation in which doctors had to decide which patient would have a chance to survive and who would not. Unfortunately, producing a large number of standard ventilators is not simple: they are designed and built using custom-made components which are not readily available. This led to the idea of building a ventilator from components widely available on the market and generally used for other purposes. The challenge brought together the inventors from the Czech Technical University and Czech and European industrial parts makers: CoroVent was born.

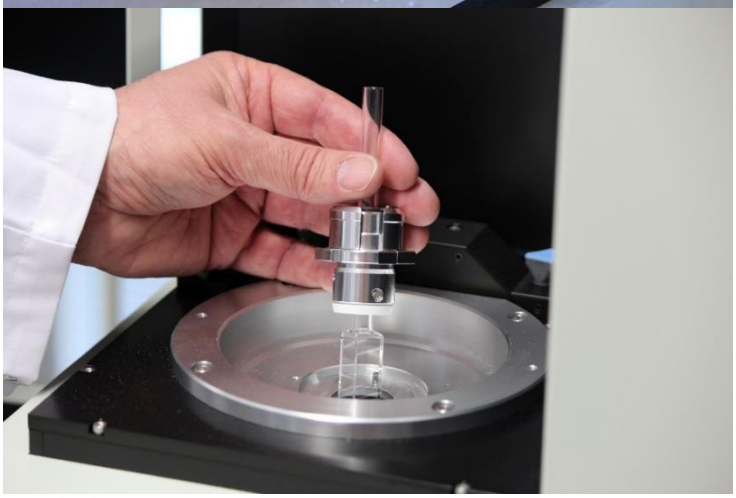
As the only group in the world, CoroVent created a pulmonary ventilator which can be mass-produced in times of crisis, saving the lives of patients with the most severe form of COVID-19. Now, CoroVent aims to develop the design further so that the ventilator can be used outside of the state of emergency as well. And so that it can serve not just in poorer countries, but all over the world, as an affordable, yet excellent ventilator suitable to be part of the emergency material reserves and ready to be deployed in any future crisis

3rd place: Active nanofilters against COVID-19

The spin-off LAM-X, which was established through the joining of forces of Charles University and the Academy of sciences via the companies Charles University Innovations Prague s.r.o. and i&i Prague s.r.o., is a great example of how the worlds of research, academia and actual practice can be combined to literally fight the coronavirus.

In response to the current situation, LAM-X changed its existing development plan and is currently focusing its strengths and resources on the development of special nanofiltres that are adapted for use as a part of face masks. Not only does the active nanofiltre have the ability to capture a broad range of microorganisms, but this innovative solution also makes it possible to effectively eliminate microorganisms in a natural way after briefly exposing them to light. This added function makes the technology very unique and it can thus be of significant help in the fight against the coronavirus. At present, LAM-X is collaborating on development with the Technical University of Liberec.





Special prize: 5 project: Grey Cortex, Oxygenerator, Kaleido, Hunter Games and FreMEn contra COVID

Grey Cortex

The Brno-based company Greycortex decided to stand up against cyberattacks on hospitals and began development of the GreyCortex Mendel product, which will automatically respond to newly arising threats and attacks. In addition to that, it will even stop attacks in the most highly automated manner possible. The objective is thus a solution that, with its technical parameters, outperforms the current technologies used to combat cyberattacks not only in the Czech Republic, but worldwide. *"This is a significant advancement over the existing product. At this time, cyberattacks and threats are detected and it is possible to provide information about them in time. The previously mentioned advancement would enable not only detection, but also the possibility to actively respond to or, more precisely, actively stop attacks without the necessity of human intervention,"* explains Petr Chaloupka, director and co-founder of Greycortex.

Thanks to that, medical facilities would be able to fully focus on their work, i.e. treating patients and saving lives, without having to deal with issues involving cybersecurity and cyberattacks, which hinder their primary mission.

Oxygenerator

In connection with the global COVID-19 pandemic and its further development in the Czech Republic and elsewhere, it is clear that in order to improve and stabilise the health condition of a large number of patients, there is a greater need to provide patients with oxygen-enriched air. In cooperation with the company MemBrain s.r.o., the Institute of Macromolecular Chemistry of the Academy of Sciences of the Czech Republic designed and developed a device called an oxygenerator, which can produce slightly pressurised air with a high content of oxygen, the amount and concentration of which can be easily regulated.

Thanks to this device, the use of invasive mechanical lung ventilation, which involves the insertion of a tube in the patient's throat, can be avoided. A key component of the oxygenerator is a membrane module based on hollow fibres that is able to release oxygen up to eight times faster than nitrogen (the main component of air). At the same time, the membrane filters out all viruses and bacteria.

The device can also be easily modified into a compact and mobile version, which enables it to be used in the home environment, in vehicles of the integrated rescue system and in nursing homes. The oxygenerator can be safely operated even by a layman without medical training and it is thus also suitable for home use when respiratory support is required.

Kaleido – virtual travel for seniors

Due to the coronavirus epidemic, seniors' homes and other care centres have become completely isolated and are now operating on a limited basis in the current period of easing safety measures. Even though clients remain protected against the virus, they are suffering mentally. A team from the Flying Kale organisation, which is focused on incorporating virtual reality into education and social care, wants to bring variety into the lives of seniors. They came up with the Kaleido project, in which they are offering seniors' homes Oculus Go virtual-reality headsets equipped with special programs that simulate trips around the Czech Republic and throughout Europe. When wearing the headsets, seniors can fly above the North Sea, walk the streets of Prague and marvel at the beauty of London and Amsterdam. Seniors, including those confined to bed, can thus look beyond our country's borders. *"A narrator accompanies the seniors on every trip. It entertains and teaches them, and asks them about their own memories. The seniors thus begin to reminisce and can share their experiences with others after returning to reality,"* explains the project's originator, Marek Háša.

The goal is for the trips to become part of active therapy, as videos in virtual reality stimulate the brain to such a degree that they contribute to slowing the onset of dementia. The project also includes a program for simple rehabilitative exercises. At present, the Flying Kale team is finalising the first version of the product and has completed rigorous testing with seniors.

Hunter Games – or learning through play

Hunter Games, which develops interactive, geolocational and plot-based experience games in which players resolve a series of tasks and break codes similarly as in outdoor escape game, wants to help overcome the difficult period in isolation due to the spread of the corona virus. The developers want to transform distance learning, which can be boring for children, into something entertaining and attractive by means of a social platform via mobile telephones. Students would thus simply download the application and compete with each other while also learning. *"The greatest strength lies in the possibility of a large number of users in one project. For example, a project focused on geography can be targeted at all students in the Czech Republic,"* explains CEO Luboš Němeček.

The developers are currently collaborating with the Academy of Sciences on a pilot project focused on literature. Users of the application are urged to complete tests and tasks or to solve riddles. Correct answers and completion of tasks advances them through the project to the end. This virtual competition thus motivates students to work without having to sit side by side.

FreMEn contra COVID

Scientists from the chronorobotics laboratory at the Czech Technical University are deploying artificial intelligence in the fight against the spread of the coronavirus by introducing the globally unique FreMEn contra COVID project, which is based on the supposition that the virus spreads where people gather together in crowds. They are offering the “Nebojsa” application, which is able to predict the occurrence of crowds and queues in particular places several days in advance. Thanks to that, everyone can determine when the largest number of people will be present in a given place and plan necessary errands accordingly.

Algorithms deployed and verified in social robotics will be used for prediction. The tool will be based on a combination of time-spatial models used in intelligent robotics with infection-risk models. A benefit of this is that the application protects the privacy of users. Only those who are interested can anonymously assist with data collection through the FreMEn Explorer application. The more people involved in the project, the more precise the predictions will be.

https://www.youtube.com/watch?v=E6yph7xyvqI&feature=emb_title