



**Initiative featured at the RIAC's
Report developed to support
countries' efforts to address
COVID-19's impact**

Overview of Brazil's Inventions, Technologies and Tools to Address Covid-19's Impact

Multiple Entities



Brazil

Shared by: Foreign Ministry of Brazil through the Permanent Mission of Brazil to the Organization of American States (OAS)

Information updated on June 4, 2020

The Foreign Ministry of Brazil through the Permanent Mission of Brazil to the Organization of American States (OAS) reported the following Inventions, Technologies, and Tools that have been developed and deployed to help mitigate the health and social impacts of the COVID-19 pandemic.

CORONAVIRUS SUS

The Ministry of Health (MS) has a website for providing the public with information about the pandemic and has developed an application for iOS and Android, called CoronavirusSUS, which provides information and recommendations to the public based on self-assessment of the health conditions.

Website:

https://play.google.com/store/apps/details?id=br.gov.datasus.guardioes&hl=en_US

JOINT VENTURE EMBRAPII (BRAZILIAN COMPANY OF RESEARCH AND INDUSTRIAL INNOVATION)/ ELDORADO INSTITUTE/ BRAILLE COMPANY

EMBRAPII approved a grant of BRL 2.3 million (approximately USD 450 thousand) for the development of an Extracorporeal Membrane Oxygenation (ECMO), in partnership with the Eldorado Institute (one of the units comprising the EMBRAPII system) and the Braille Company. This ECMO adds oxygen and removes carbon dioxide from the bloodstream, in a machine outside the human body (such as in hemodialysis). Although this equipment already exists outside Brazil, the technology supported domestically is more efficient, allowing for the improvement of medical interventions at lower costs. The manufacturing of the device will be 100% national. The equipment should be ready for delivery in eight weeks for an



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initial batch of 100 units to be distributed to 21 facilities already capable to perform extracorporeal oxygenation.

Besides aiding the treatment against acute respiratory failure, one of the main outcomes of COVID-19 severe cases, the use of the equipment is also advised for adults or children in several other conditions, such as cases of heart transplantation, myocardial infarction and cardiac arrest. EMBRAPII will bear 50% of the costs of the projects designed to combat COVID-19 infections.

Website: <https://braile.com.br/en/>

MECHANICAL VENTILATOR PROJECT BY USP

Researchers from the Polytechnic School (Poli) at the University of São Paulo (USP) are developing a project for a mechanical lung ventilator that can be produced by authorized manufacturers, rapidly and at low cost, to supply emergency units for patients affected by COVID-19. While a conventional respirator has a market price of around BRL 15,000, the ventilator designed by USP could be marketed for around BRL 1,000. A team of about 40 people are involved in the initiative, which estimates that production could start in five weeks. The project has an “open source” license, open for use by those interested in producing the ventilator. USP will lead the project designs, but the manufacture process will be carried out by the private sector.

Website:

<https://bit.ly/2XjoXdn>

MCTIC-INCT TERANANO-UFU IMUNOSCAN

Within the scope of the Virus Network initiative, the National Institute of Science and Technology in Theranostics and Nanobiotechnology (INCT TeraNano), based in Uberlândia, developed two types of sensors for diagnostics of Covid-19, in partnership with the Federal University of Uberlândia (UFU) and with the company Imunoscan.

The first type of sensor is a photonic one. It is a laser technology that splits saliva into chemical groups and allows the diagnosis of Covid-19. The test is performed by means of a device containing a detector which does not need a reagent. The diagnosis is processed through artificial intelligence and the result comes out in less than 1 minute. The device with the photonic sensor can be bought by laboratories and clinics at the cost of around BRL 90,000 (around USD 17,300), and each exam will cost around BRL 40 (around USD 7.70). Each device can process between 400 and 500 results daily. The equipment used to perform the exams is imported, but the whole part of artificial intelligence developed to offer the rapid diagnosis was developed by the INCT TeraNano.

The second prototype is a mobile electrochemical sensor, similar to a USB flash drive, which can be connected to a smartphone. This USB drive has a microchip, where drops of saliva are placed. For each tested patient, a new microchip is used. The diagnosis comes out in about 1 minute. The cost of each test should vary from about BRL 50 (USD 9.60) to BRL 100 (USD 19,20). The mobile electrochemical sensor is already used to test other



types of diseases and viral infections, such as tuberculosis, dengue and zika.

INOVA-UFPB: MECHANICAL VENTILATOR

The Technological Innovation Agency of the Federal University of Paraíba (INOVA-UFPB) developed a lung ventilator that uses touch-screen technology and is equipped with multibiometric system, in addition to wireless connectivity that enables remote access, as well as real-time monitoring and operation through a smartphone app.

According to the developers, who filed the patent application with the Brazil's National Institute of Industrial Property (INPI) on April 2, the current production cost is approximately BRL 400 (USD 77), much less than the average cost of the ventilators available on the market (approximately BRL 15,000.00, or USD 2,800). Manufacturing should be done by a company registered with Brazilian Health Regulatory Agency (ANVISA), and the device still needs to pass tests carried out by the National Institute of Metrology, Standardization and Industrial Quality (INMETRO). It is an "open innovation" project, whose license is open to anyone interested in producing the lung ventilator. For that purpose, interested parties can contact INOVA-UFPB through inova@reitoria.ufpb.br.

"IN LOCO" STARTUP

The "In Loco" startup is specialized in solutions for smartphone-based geolocation and has adapted its technology to monitor social isolation, including the generation of disaggregated isolation reports by specific neighborhoods, so that public authorities can create targeted educational campaigns and tailor-made inspection routines.

The technology developed can also monitor the growth of local hospital capacity and improve the allocation of health workers. The startup makes sure that the data are general, collective and respect people's privacy. The municipality of Recife has already adopted the tool.

Website: <https://www.inloco.com.br/en/>

HI TECHNOLOGIES

The startup Hi Technologies, based in Curitiba, State of Parana, announced the development of a rapid test for Covid-19 detection that provides results in 10 minutes. The large-scale production of the test kit is underway, with delivery of kits in April. The startup is known for the Hilab device, which integrates internet of things (IoT) and artificial intelligence to perform remote exams by collecting drops of blood in the Hilab (available in pharmacies), that transmits information to the laboratory responsible for analyzing the result, issuing and signing the respective report. Hilab is already capable of testing for HIV, dengue, zika and hepatitis, in addition to measuring cholesterol levels, blood glucose and other issues.

Company's contact details:

Hi Technologies

6.400B, Rua Eduardo Sprada, Cidade Industrial,
Curitiba, Parana.

<https://hitechnologies.com.br/site/>



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TIMPEL

The startup Timpel developed an electrical impedance tomography device and software to monitor patients requiring artificial ventilation. The device minimizes the side effects of using mechanical ventilation and decreases the time of dependency on equipment by offering more objective criteria for its use, which otherwise would mostly rely on intuitive decision by the doctors. Developed through a project supported by FAPESP, more than 150 units of the device are already in operation in hospitals in Brazil, Europe, the United States, Japan and the Middle East.

Website: <http://www.timpel.com.br/>

BIOTECAM

Biotecam, an environmental biotechnology startup, is adapting its registered cleaning polluted water device to become an air purifier suitable for areas with gatherings of people infected by Covid-19. The product innovates by its low energy consumption, 50% lower than the average of its competitors. The product was developed in partnership with the Instituto Federal Fluminense (IFF) and the Brazilian Company for Research and Industrial Innovation (Embrapii). It is estimated that the level of disinfection stays above 95%. For a field hospital, the estimated cost of manufacturing the equipment is BRL 50,000, and it is expected that the adaptation of the equipment will be ready in two months.

Website: <https://www.biocam.com.br/>

MAGNAMED

The Magnamed company, which developed the emergency lung ventilator called 'OxyMag', signed a contract with the Ministry of Health to deliver 6.5 thousand devices until August of the current year. The manufacturing effort will count on the partnership with other companies such as Positivo, Suzano, Klabin, Embraer, Flextronics, Fiat Chrysler and White Martins. OxyMag was developed with the support of the FAPESP Program called Innovative Research in Small Business (PIPE), between 2006 and 2012. Magnamed currently manufactures 1.8 thousand ventilators, 40% of which are used in intensive care units (ICUs) and exported to more than 60 countries, from where it gets 40% of its revenue, in addition to own factory in the United States. According the report "2020 Global ICU Ventilator Market Outlook ", Magnamed is presently one of the main world manufacturers of lung ventilators, together with companies like Medtronic, Philips and GE.

Website: <https://www.inovacoesmagnamed.com.br/english>

AKAER

The AKAER company, installed in the Technological Park of São José dos Campos and specialized in designing aeronautical systems and products, designed a bell-shaped protective equipment to be used by medical staff during intubation/extubation procedures to be conducted on patients,



situations in which the contamination risk is considered to be high. The device has been named “Hygiea Shield”, and interested parties are allowed to access both the project and the manufacturing and assembly instructions. The company delivers the device at the cost of manufacturing and shipping. Website: <http://www.akaer.com.br/en/our-company/welcome/>

AURRATECH

The AURRATECH company has a technology of biological decontamination through steam, designed for indoor environments and called "Fog in Place", which employs biocidal solution in particles smaller than one micron, capable of suspension in the air for a long period, thus allowing for 100% of contact with surfaces in the space where it is used. This cleaning technology started being used about four years ago in orange juice factories and has proven effective against coronavirus. During the current pandemic crisis, it was used in Spain, in buildings such as the one in which the Ministry of Finance is located.

Website: <https://www.aurratech.com/>

WEBSENSORS - ARTIFICIAL INTELLIGENCE

The Websensors tool, developed with support of FAPESP and designed for data and text mining, is being used to analyze the evolution of the COVID-19 pandemic. By being able to extract data from news texts, in order to get information about "what happened", "when it happened" and "where it happened", Websensors enables the daily adjustment of the models for the spread of the disease. The information gathered on the pandemic is openly accessible at: <http://websensors.net.br/projects/covid19/>.

DHMED

The startup DHMed, installed in the Scientific Park and Technological Institute of PUC-RS (TECNOPUC) boosted its performance for the distribution of ventilators and supplies, and for the repairing of hospital equipment. The company has received orders for 200 ventilators so far, 70 of which have already been delivered.

Website: http://www.dhmed.com.br/bem_vindo

FEVVER

The artificial intelligence startups Hoobos and Radsquare, incubated in the Albert Einstein Hospital (Eretz.bio), have developed a system that measures the temperature of people at distance through computer vision. The system, which is installed in the hospital, is capable of identifying patients with fever and automatically inform nursing staff, which should initiate a screening protocol and isolation.

Web pages: <https://hoobox.one/> and <https://www.radsquare.ai/>

LUCKIE TECH

The startup Luckie Tech, based in São José dos Campos, developed a service that employs several Artificial Intelligence technologies in a device in the format of a bandage, which sticks to the body and is capable of sending real time information such as temperature and heart rate, for possible



medical interventions. Used in cancer patients, the device has been adapted through the development of parameters such as monitoring of fever and degree of oxygenation, so that it can be used in patients with Covid-19.

Website: <http://luckietech.com/>

TISSUELABS

The company TissueLabs (which manufactures organs and tissues in laboratory) directed its scientific team to the development of a platform for the study of Covid-19 in the lung epithelium. The platform is free of charge, and should allow researchers to use cells from patients with comorbidities, like asthma, to create customized three-dimensional tissues that will be able to serve as an environment for studying how the virus behaves in specific cases, as well as what would be the effect of drugs on the evolution of the virus.

Website: <https://www.tissuelabs.com/>

SAVELIVEZ

The startup, which participated in the Startout Brazil Program, developed a virtual assistant called Livia.bot, which provides information on symptoms of the COVID-19 as well as on blood donation centres throughout Brazil.

Website: <https://savelivez.com/en/>

AYA TECH

Through nanotechnology, the startup, which took part in the Startout Brasil program, created a disinfectant called Gy, which has the potential to substitute sanitizers and is capable of eliminating COVID-19 among other communicable diseases.

Website: <https://www.aya-tech.com.br/en/home-2/>

NSF-EMBRAPII-IFSC: “UV Ray Mop” and Decontamination Chamber

EMBRAPII, the Institute of Physics of the University of São Paulo in São Carlos and the Brazilian company NSF (specialized in food decontamination) adapted a project for an ozone decontamination chamber initially designed for food decontamination to be used for the sterilization of masks and other individual protection equipment. NSF and the university of São Paulo have also developed a “UV Ray Mop” for the decontamination of hospitals and clinics floor. The UV radiation destroys the protein protection and the genetic material of any virus, including the novel coronavirus.

Website: <https://www.nsfsaude.ind.br>

MANAUS SAMEL GROUP AND TRANSIRE INSTITUTE: “VANESSA” PROTECTION HOOD

The hospital group Samel, from the city of Manaus, and the Transire Institute (a R&D laboratory that promotes research on software, hardware and biotechnology) developed a protection hood for non-invasive Bipap ventilation for patients with acute respiratory failure caused by Covid-19. The hood is made of an easy-to-handle PVC frame and covered by a transparent vinyl film, which provides visibility as well as protection against potential



infections. The cost of the hood varies from BRL 50 (USD 9) to BRL 280 (USD 50).

Website: <https://institutotransire.org.br/covid19cabineprotecao/>

NANOX-ELKA

The startup Nanox and the plastics industrial company Elka have developed a reusable mask composed of a flexible polymer, that fits easily to the shape of different faces, as well as silver and silica antimicrobial microparticles.

The development of the mask was funded by the São Paulo Research Foundation.

Website: <http://www.nanox.com.br/en/>

COLAB-EPITRACK: “BRAZIL CORONA FREE” APP

Colab, a collaboration platform, and Epitrack, a health data analyses startup, launched the “Brazil Corona Free” platform, which monitors and maps COVID19 cases in Brazil by heatmaps. The app will issue warnings for potential surges of the disease in order to inform municipal and state-level authorities.

Website: <https://www.brasilsemcorona.com.br>

NEURALMED

Neuralmed is a startup that employs AI to detect COVID-19 by analyzing thorax x-ray exams. The platform is freely available for health professionals.

Website: <https://neuralmed.ai/blog/toolcovid/>

BIOLOGIX

The startup Biologix adapted its IoT system built for diagnosing and monitoring sleep apnea to monitor patients with mild symptoms of COVID-19. The startup is incubated at the Hospital Israelita Albert Einstein.

Website: <https://www.biologix.com.br/>

APTAH BIOSCIENCES-IPT-EMBRAPII: Rapid tests

The Institute for Technological Research (IPT), EMBRAPII and the biotech startup Aptah Biosciences (a participant of the Startout Brasil Program) joined forces to develop a prototype of a one-hour rapid diagnostics test for COVID-19 that detects virus-specific RNA. As a pregnancy rapid test, it does not require the use of lab equipment.

Website: <https://www.aptah.com.br/>

FAPES (RESEARCH FOUNDATION OF THE STATE OF ESPÍRITO SANTO) - CALL FOR PROJECTS

FAPES has launched a research call for projects to tackle or mitigate the damage caused by COVID-19 in the amount of BRL 1.8 million (equivalent to USD 330 thousand). The proposals should aim at developing diagnostics tests, therapies, ventilators, digital technologies, vaccines, medicaments, as well as social and economic development, among other areas.



FUNCAP (RESEARCH FOUNDATION OF THE STATE OF CEARÁ) - FUNDS FOR EMERGENCY PROJECTS

FUNCAP has already allocated BRL 3 million (equivalent to USD 550 thousand) for emergency projects to tackle COVID-19 on projects for the development of diagnostics tests; clinical trials; helmet-based ventilation; for the production of 13 million disposable masks; 16,800 faceshields and other individual protection equipment; for training; for the development of software for monitoring the disease and managing the health system; among others.

FAPESP (RESEARCH FOUNDATION OF THE STATE OF SÃO PAULO)

FAPESP has already approved six projects of startups to combat COVID-19 in the amount of USD 1.2 million. The projects are as follows:

- The development of electric impedance tomography equipment, by Timpel;
- The development of low-cost portable ventilators, by Setup Automation;
- The production of real time results diagnosing kits using RT-PCR method, by Celco Ciotec Brasil;
- Development of games for monitoring physical and mental health for elderly people, by Isgame;
- Development a system for fever screening using thermal imaging cameras, by Opto Tecnologia Optrônica;
- The development of low cost sorological diagnostics tests, by Biolinker Biologia Sintética.

EMBRAPII-SENAI-ABDI: 2nd INNOVATION CALL

The Brazilian Company of Research and Industrial Innovation (EMBRAPII), the National Service for Industrial Training (SENAI) and the Brazilian Association of Industrial Development (ABDI) approved 10 more projects to combat COVID-19. In total, 25 projects have been approved amounting to USD 820 thousand (of USD 4.9 million to be invested). The projects are as follows:

- An easy-to-be-installed biological filter for ventilators, by Oliverri;
- A liquid biocleaner for all surfaces, by Soleá Brasil;
- Virus-killing biomolecules, by S Cosmetics;
- Alcohol-based cleaner for large areas, by Tanac;
- Polymer composite for ventilators diaphragm, by Tanac;
- Software platform for fever screening using thermal imaging cameras, by Opto Tecnologia Optrônica;
- Hardware platform for fever screening using thermal imaging cameras, by Ponfac;
- Smart remote covid-19 screening, by Novus;
- Antiviral coating spray with silver nanoparticles against COVID-19, by TNS Nanotecnologia;



- Nanocapsules spray for antiseptic shielding, by Ipel Itibanyl.

BUTANTAN INSTITUTE: VACCINE RESEARCH

Butantan Institute (a state-owned biological research lab) is developing research on a vaccine against COVID-19 using the multiple antigen presenting system platform (MAPS). The technique employed is expected to activate the immunological response more effectively than conventional vaccines that adopt aluminum hydroxide.

ABDI-MICROSOFT-RADIX: EPIMATCH PLATFORM

ABDI, Microsoft and Radix Engineering and Software have developed the EPIMatch platform, a virtual marketplace to connect demand and supply for individual protection equipment.

Website: <https://epimatch.abdi.com.br>

PUCRS (PONTIFICAL CATHOLIC UNIVERSITY OF RIO GRANDE DO SUL) - COVID-19 TEST

Researchers at PUCRS have developed molecular diagnostics tests for COVID-19 that detect the virus from nose and throat fluids, with results ready in six to eight hours. The low-cost test, differently from standard molecular tests, does not require the use of probes. The estimated cost is USD 40.

INATEL (NATIONAL TELECOMMUNICATIONS INSTITUTE) – EMBRAPII - VENTRIX - VENTILATOR

The research institute INATEL, (located in the State of Minas Gerais), together with the company Ventrix, has developed, with financial support from EMBRAPII, an electronic ventilator that innovates on its digital pressurization system and that requires no use of Artificial Manual Breathing Units (AMBU). 50 units of the equipment are expected to be produced in the next 90 days.

UEMA (STATE UNIVERSITY OF MARANHÃO) - PORTABLE VENTILATOR

UEMA has developed a prototype of a low-cost portable ventilator (that weights 6 kg) for temporary use for patients waiting to be admitted to an Intensive Care Unit. The ventilator is designed to be assembled in a garage-sized shop and uses no imported parts. Such a shop should be able to produce 25 pieces of the equipment. The costs were not disclosed but the ventilator is expected to be 30 times cheaper than conventional ones.

UFC-UNIFOR-FUNCAP-ESP-FIEP - "Elmo" Helmet-Based Ventilator

The Federal University of Ceará (UFC), FUNCAP and the Public Health School of Ceará (ESP) have supported the development of "Elmo", a helmet-based non-invasive ventilator made of PVC and latex to be used by patients with COVID-19 admitted in public hospitals.



BNDES GARAGE ACCELARATION PROGRAM

Startups that took part in the Brazilian Development Bank`s (BNDES) acceleration program have developed solutions for tackling COVID-19, such as:

- PikCells. The startup originally works with automation of lab research. Pikcells, that was the winner of the BNDES program (and also a participant of the Startout Brasil Program), pivoted to develop methods of screening patients using artificial intelligence. Website: <https://www.pikcells.com>
- iBench. The online marketplace platform for laboratory products launched the donation campaign "Taq no Covid" aimed at collecting supplies for the production of diagnostics tests. Website: <https://www.ibench.com.br>
- Cloudia. The startup joined the "Brazil Corona Free" app platform with its chatbox technology. Website: <https://www.cloudia.com.br/clients/startup-saude>
- Remedin. The startup granted free access for users of its app that searches the cheapest drugs available in nearby drugstores. Website: <https://www.remedin.net>

