

CaixaImpulse

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## ***Six projects that address the pandemic.***

Since the outbreak of COVID-19, researchers have been working around the clock to develop urgently needed new therapies, vaccines and diagnostic strategies. The [“la](#)

[Caixa” Foundation](#) launched a special CaixaImpulse Express Call at the end of March for innovative projects that specifically address this unprecedented global emergency.

Six projects led by Spanish and Portuguese research centres have now been selected to receive a total of €1.8 million to fast-track their progress towards the market and society. Their objectives range from developing novel vaccines, diagnostic kits, and antiviral agents, to decentralizing the production of medical ventilators in order to meet the current overwhelming demand.

We stand a better chance of rapidly immunising the world’s population if several effective vaccines are developed concurrently. For this reason, CaixaImpulse has selected three projects that are designing and testing novel strategies for a SARS-CoV-2 vaccine. The teams behind these projects have extensive experience in vaccine development, and one of them already has a detailed roadmap that predicts potential market entry within 8-10 months of project completion.

The [World Health Organization](#) has also emphasised the importance of detecting cases early to limit the spread of the disease. One of the selected projects proposes an innovative diagnostic kit that, if successful, will overcome some of the important barriers of current tests, and allow for its rapid deployment throughout the Spanish healthcare system.

The remaining two projects include the development of an antiviral which could block the replication of SARS-CoV-2 and similar viruses, and a community-based approach for the rapid and low-cost production of medical ventilation equipment. Importantly, each of the projects not only addresses the current pandemic, but also equips us with vital new tools that could help prevent potential future outbreaks.

The selected projects are summarized below:

### **CoV2-BMEP and CoV2-TMEP: two novel polyvalent multiepitopic vaccines against SARS-CoV**

Researchers at the [Centro Nacional de Biotecnología](#) (CNB-CSIC) are developing a novel vaccine strategy against the SARS-CoV-2 virus that causes COVID-19, with the aim of preventing its spread and possible future outbreaks. Project leader Mariano Esteban will use the CaixaImpulse funding to design and preclinically validate new compounds with immunogenic activity targeting conserved (less susceptible to mutation) regions of the SARS-CoV-2 structure. By enhancing the production of antibody-inducing lymphocytes and cytotoxic cells, these agents are expected to provide powerful and long-lasting immunity against SARS-CoV-2 and similar viruses, as well as increased resistance to ongoing virus evolution.

### **SARSVAX: Development of a multi-epitope vaccine for SARS-CoV-2 using the PLASMIVAX vaccine platform**

SARSVAX is a new vaccine being developed by team of researchers at [Instituto de Salud Carlos III](#) (ISCIII) under the coordination of Michael McConnell. Their innovative approach combines multiple virus components with novel DNA technology that stimulates the immune response. The group is now working to achieve the preclinical validation of their SARS-CoV-2 vaccine prototype—which is based on a robust vaccine platform developed by the National Centre for Microbiology—as well as to establish a manufacturing process and initiate regulatory

steps. This technology is expected to induce an excellent immune response in the general population, and therefore has very high potential for transfer to the pharmaceutical sector.

### **Development of a translational COVID-19 Vaccine**

Ronit Satchi-Fainaro's team from [Tel Aviv University](#) and Helena Florindo and team at the [Faculdade de Farmácia da Universidade de Lisboa](#) previously developed a vaccine nanoplatform that is highly effective in stimulating antibody production against cancer. When the coronavirus crisis broke, the two teams re-directed their collaborative efforts to develop a SARS-CoV-2 vaccine, which co-delivers adjuvants and antigens that they discovered by integrating bioinformatics with large-scale statistical analysis. This approach has already been shown to increase the production of antibodies that can neutralize the virus and stimulate immunity. Based on these results, this nanoplatform will lead to a safe and efficacious COVID-19 vaccine.

### **RNA-targeted small-molecule agents against SARS-CoV-2**

José Gallego and his group at the [Fundación Universidad Católica de Valencia San Vicente Mártir](#) aim to develop an antiviral agent that blocks SARS-CoV-2 replication by acting on its RNA. The researchers have identified several classes of compounds with potent antiretroviral activity, including approved drugs susceptible to repurposing. They are now exploring their effect on SARS-CoV-2 replication, and will later select the best candidates to be evaluated in preclinical trials. They will also identify new molecules that bind to specific structures formed by viral RNA. If the compounds are found to be effective in preventing SARS-CoV-2 replication, the molecules could also be used as wide-spectrum antivirals against future outbreaks. The laboratories of Kris White and Adolfo García-Sastre ([Mount Sinai](#), New York) and Vicente Marchán ([Universitat de Barcelona](#)) also participate in this project.

### **Simple and rapid SARS-CoV-2 diagnostic test by phi29 polymerase amplification**

Researchers at [Centro Nacional de Investigaciones Oncológicas](#) (CNIO) and [Centro de Biología Molecular Severo Ochoa](#) (CBMSO-CSIC) are developing a SARS-CoV-2 diagnostic kit based on a reliable pre-existing detection method for nucleic acids, which will be improved to detect viral genomic RNA. Their novel test, COVI-PHI, is cheaper and faster than existing tests, and based on intellectual property developed in Spain. Thus, the project, co-led by Felipe Cortés (CNIO) and Luis Blanco (CBMSO), will allow for a rapid deployment of COVID-19 testing in the Spanish primary healthcare system. In addition, COVI-PHI could be the best diagnostic option for portable devices in low and middle income countries. Finally, these new developments could potentially be applied to many other pathogens, significantly widening the market potential of this test.

### **Atena Ventilator development and decentralized production**

The COVID-19 pandemic has placed unprecedented strain on healthcare systems around the world. In particular, the medical ventilation systems which increase the survival of patients are in short supply. The Atena - Medical Ventilator project, led by Tiago Rebelo from the [Centre of Engineering and Product Development](#) (CEiiA) aims to meet the extremely high demand for ventilation equipment. This community-based approach provides a low-cost, easily assembled, and locally produced solution, through the development, prototyping, testing and decentralized

**industrialization of a new mechanical invasive ventilator.**