Barcelona Institute of Science and Technology

PRESS RELEASE

BIST Ignite Awards 2020

BioSpad project wins award to develop more affordable brain diagnostic tests

- **The second award-winning project, BioVac (ICN2 / IBEC), populates nanoparticles with antigens to create a new generation of vaccines against untreatable infections and multi-resistant bacteria.**
- **IMB-CSIC and an Italian company have joined the IFAE and ICFO teams to accelerate the development of BioSpad devices, which measure blood flow in the brain.**
- **The BIST Ignite Awards 2020 Ceremony will be held on March 11 at the La Pedrera Auditorium.**

Barcelona, February 19, 2019. The research projects **BioSpad and BioVac** are the recipients of the **BIST Ignite Awards 2020**, endowed with 50,000 euros each. **BioSpad**, is co-led by the ATLAS Píxels group (Prof. **Sebastian Grinstein**), of the High Energy Physics Institute (IFAE), and the Medical Optics group (Prof. **Turgut Durduran**), of the Institute of Photonic Sciences (ICFO). The project **BioVac** is a collaboration of the Nanostructured Functional Materials group (Prof. **Daniel Ruiz**), of the Catalan Institute of Nanoscience and Nanotechnology (ICN2), and Bacterial Infections: Antimicrobial Therapies group (Prof. **Eduard Torrents**), of the Institute for Bioengineering of Catalonia (IBEC). This contribution will allow these groups, hosted in centres of the Barcelona Institute of Science and Technology, to further develop both projects, each responding to an important unmet medical need.

BioSpad Project

Cortical **blood flow** is a **biomarker of health and proper functioning of the brain**. Alterations in the supply of oxygen through the blood can cause serious degradation in neural function and, therefore, the monitoring of cerebral blood flow has become an important tool for the diagnosis and control of diseases associated with ischemia and other vascular pathologies such as cancer and stroke.

Diffuse Correlation Spectroscopy (DCS) is a non-invasive diagnostic test developed in recent years that allows the measurement of cerebral blood flow. DCS uses an infrared light source to access the cerebral cortex, and by studying how photons propagate in the tissue obtain information about blood flow therein. The ability of DCS to measure tissue hemodynamics also makes it suitable for monitoring and control of treatments such as chemotherapy, radiotherapy or arterial revascularization.

Current **limitations to the use of DCS in medical applications is its cost**, since detectors capable of "reading" the information supplied by the photons are expensive —a few thousands of euros per device—, as a consequence of their non-standardized production system. In contrast, the prototype developed by the IFAE and ICFO groups, within the framework of the BioSpad project, *"permits their standardized production, in the same way chips for mobile phones or computers are manufactured",* explains Prof. **Sebastian Grinstein** (IFAE).

"What we have done is adapt silicon detectors we use in the detection of fundamental particles in large accelerators such as CERN, sensitive enough to capture even a single photon, to create ***a prototype that allows series manufacturing, which will reduce production cost almost 100 times****"*, adds the researcher.

"The non-invasive detection of blood flow in tissues is of great importance for the diagnosis and treatment of many diseases. This project will facilitate the transfer of our technologies to many more health applications that can help thousands of patients", says Prof. **Turgut Durduran** (ICFO).

The first phase of the project, which started a year ago thanks to a 20,000 euros grant of the BIST Ignite programme, has demonstrated the feasibility of producing a device that fulfils a large part of the requirements for the DCS using CMOS industrial standards. With the endowment of the BIST Ignite Award 2020, the winning groups will further develop the device design. *"We will work to integrate in a single chip the detection, amplification, digitalization and processing of photons, which will allow us to move towards miniaturization and think of wearable devices for remote monitoring or the prevention of vascular risks"*, says Prof. Grinstein.

The evaluation panel noted in particular that the BioSpad project responds to an important unmet medical need and, consequently, has a very high market potential. The panel also stressed that the team had actively sought external collaborations, resulting in the **Barcelona Microelectronics Institute** (IMB-CNM-CSIC) joining the project as a partner. The project has also attracted the attention of an Italian chip manufacturer that could participate in the production of the device. If expectations are met, a new DCS device could reach the market in three to four years.

BioVac Project

It is estimated that in 2050 about 12 million people will die around the world because of infectious diseases. The reason is two-fold. First, antibiotics are becoming less effective due to the resistance developed by the bacteria to antimicrobial treatments. Second, there are still several infectious diseases for which most of the vaccines used nowadays, mainly based on live-attenuated pathogens, are ineffective. The BioVac project, a collaboration of the groups Nanostructured Functional Materials (Nanosfun) of **ICN2,** and Bacterial Infections: Antimicrobial Therapies (BIAT) of **IBEC**, address these challenges with an innovative approach.

The hypothesis behind the project is that polymeric particles that mimic the size and shape of the target bacteria, and incorporate antigens from this pathogen, could cause the immune system to produce an immune reaction better than by administering the antigens alone, and without the risks and limitations of introducing attenuated bacteria.

"The first phase of the project demonstrated, through in vitro and in vivo experiments, that functionalized biomimetic nanoparticles achieve an immune response superior to the administration of free antigens and allowed us to identify the most efficient combinations of antigens", explains Prof. **Daniel Ruiz** (ICN2). *"The BIST Ignite Award will allow us, during the second phase of the project, to investigate the optimization of antigen combinations and test the concept with new bacterial cells for which there is currently no vaccine available"*, adds Dr. **Claudio Roscini**, postdoctoral researcher at the same ICN2 group.

The evaluation panel valued that the project features a simple and elegant concept with a clear short-term biomedical application. It also underscored the highly productive first phase and the clarity of the objectives and work plan for the second phase, as well as the potential of the project to raise

funds from public administrations and private foundations to allow the project to reach a clinical phase.

The BIST Ignite Awards 2020 will be delivered during the ceremony to be held next **March 11**, at **6.00PM**, at the **La Pedrera Auditorium**. At the event, BIST will announce the five projects selected in the BIST Ignite programme 2019 call. These projects will receive 20,000 euros each to fund an initial eight-month development phase, and will compete for one of two BIST Ignite Awards 2021 based on their results.

Since the inception of the BIST Ignite programme in 2016, eight **BIST Ignite Awards** (THEIA, INWOC, GENSTORM, ENGUT, Q-SPET, PHASE-CHROM, BIOSPAD y BIOVAC) have been awarded, including the two presently announced. They were selected from among 18 initial-phase projects funded through yearly competitive calls. In total, these projects received **760,000 euros** in funding from BIST and have involved over 150 researchers. Additional information about the BIST Ignite Programme can be found at https://bist.eu/ignite/.

About BIST

The Barcelona Institute of Science and Technology (BIST) is a leading institution of multidisciplinary research encompassing seven Catalan research centres of excellence. By fostering collaboration among members of its diverse scientific community, BIST aims to play a leading role in pushing the frontiers of science while becoming a global reference for training outstanding research talent.

The centres of the BIST are the Centre for Genomic Regulation (CRG), the Institute for Bioengineering of Catalonia (IBEC), the Institute of Photonic Sciences (ICFO), the Institute of Chemical Research of Catalonia (ICIQ), the Catalan Institute of Nanoscience and Nanotechnology (ICN2), the Institute for High Energy Physics (IFAE), and the Institute for Research in Biomedicine (IRB Barcelona).

Media contact:

Barcelona Institute of Science and Technology (BIST)
Adela Farré, Head of Communications
afarre@bist.eu
T. +34 626 992 057