



SafelCP to create a smart monitor to non-invasively measure intracranial pressure

New project coordinated by ICFO with the participation of UPF, ProCareLight and VHIR

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At the beginning of this year, **SafelCP**, a project, which was financed by the last call for Strategic Projects of the Spanish Research Agency with European Next Generation funds, launched with the objective of **creating and testing a low-cost, easy-to-use monitor that will be placed at patients' bedside in order to non-invasively monitor intracranial pressure values**, a step forward in the monitoring and non-aggressive treatment of different brain pathologies

The design of this device is based on the latest scientific advances in the field of biophotonics and machine learning, one of the subfields of artificial intelligence. For this reason, the project's research team is led by experts in the field. **Turgut Durduran, ICREA professor at ICFO**, leader of the Medical Optics group and expert in Biophotonics, is the

project coordinator. From the Universitat Pompeu Fabra (UPF), **Gemma Piella, DTIC-UPF professor** and head of the University's BCN MedTech Research Unit, as well as an expert in machine learning, participates in the project. Beyond the academic and research side, the project also has the collaboration of the Vall d'Hebron University Hospital to carry out different clinical studies, led by **Professors Juan Sahuquillo, Professor of Neurosurgery, and Maria Antonia Poca, PI of the SafeICP project at the VHIR**, both coordinators of the Neurotraumatology and Neurosurgery Research Unit (UNINN) at the VHIR. **ProCareLight (PCL)**, a company specialized in safe laser techniques that spun-out of ICFO in 2013, also participates in the project.

Gemma Piella (DTIC-UPF) describes the general objective of the project as follows: "The idea is to use machine learning to predict a patient's intracranial pressure and its evolution based on non-invasive measurements". When the project is developed, SafeICP will help open up new ways to diagnose intracranial hypertension and related abnormalities and pathologies in a wide variety of patients, from newborns to adults.

"It is very exciting to be able to expand the frontiers of knowledge to address unmet clinical needs through the use of non-invasive techniques, such as near-infrared diffuse optics," comments ICREA Professor at ICFO Turgut Durduran. Thanks to these new diagnostic pathways, more knowledge will be acquired to design personalized, faster and safer treatments for a wide variety of pathologies caused by intracranial hypertension, such as brain trauma or concussions and hydrocephalus or craniosynostosis, among others "If we succeed, this will be one of the pioneering uses of machine learning, to extract new information and bring intracranial pressure monitoring to those patients who, with current tools, we cannot reach, or who need a sensor implanted inside the skull to do it."

SafeICP allows the measurement of intracranial pressure with non-invasive techniques, unlike most current diagnostics, which require the introduction of a probe into the brain

It is especially important that these diagnoses can be made using non-invasive techniques, that is to say, that do not involve the physical penetration of medical instruments into the body. Until now, "the diagnostic approach and treatment of intracranial hypertension usually involves invasive probes placed directly in the brain," recalls Gemma Piella (DTIC-UPF) to underscore the innovative nature of SafeICP. The project is based on the latest advances in biophotonics to monitor intracranial pressure levels via laser.

Recent advances in the field of biophotonics have made it possible to develop increasingly robust technologies for the non-invasive investigation of blood pressure, which is essential for the diagnosis, monitoring and therapeutic treatment of neuronal pathologies. SafeICP will be one of these new technologies, along with others that already exist such as near-infrared spectroscopy, a non-invasive neuroimaging technique.

For the development of the SafeICP project, the knowledge in biophotonics has been combined with other advances of the last decades in the field of physics and engineering,

especially in the field of machine learning, as well as with the accumulated experience in the transfer of these technologies to the clinical field.

A project financed by the call for Strategic Projects of the Spanish Research Agency with Next Generation funds

SafeICP was made possible by funding from the EU's Next Generation Funds. This is one of the projects financed by the call for Strategic Projects of the Spanish Research Agency within the framework of the Recovery, Transformation and Resilience Plan of the Spanish State to distribute these European funds. One of the funding lines of this call was intended for safe physical methods for the diagnosis and treatment of diseases.

Potential for implementation on the national and European scale

The relationships of the promoters of the SafeICP project with scientific networks in the field of biophotonics and neuroscience at national and international level will facilitate the dissemination and implementation of the technology resulting from this project. The partners of the SafeICP project are part of the following networks in Catalonia and Spain: [Barcelona Medical Photonics Network](#), [Xartec Salut](#) and [i4KIDS](#). At the European and international level, they are part of the following networks and organizations: LaserLab Europe, Society for Functional Near-infrared Spectroscopy, EPIC, Rare Neurological Diseases (ERN-RND), European Reference Network for Rare Malformation Syndromes, Intellectual and Other Neurodevelopmental Disorders (ERN-ITHACA), European Reference Network for Craniofacial Anomalies and ENT disorders (ERN-CRANIO). SafeICP is also related to projects funded under the EU Horizon 2020 Program such as [VASCOVID](#) and [TinyBrains](#).



SafeICP partners at kick-off meeting at ICFO



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