

ICFO and VITALA Technologies awarded a "Proyecto en colaboracion publico-privada 2022"

New project towards the widened use of Carbon-13 MRI in clinica and pre-clinical metabolic imaging using quantum sensors fo quality control purposes

November 20, 2023

Carbon-13 (13C) Magnetic Resonance Imaging (MRI) is an emerging molecular-imaging tool that has huge potential to transform the understanding of disease diagnosis and treatment, especially in early stage detection. A chemical compound of interest, usually a small-molecule metabolite, is prepared in a special hyperpolarized (HP) state with a boosted 13C magnetization of around 10,000 times its normal level. Then, after its administering to a patient, the anatomical distribution of the compound plus its metabolic products are mapped spatially and temporally by MRI. The technique allows rapid and pathway-specific investigation of metabolic processes which provides information on diseases such as cancer, ischemia, inflammation, necrosis, acute renal failure, cardiovascular disease and diabetes,

among others.

The new project, called i¿½**SEE-13-MRI - Scope and Efficiency Extended 13C Magnetic Resonance Imaging**", is funded as part of the i¿½Proyecto de Colaboracion Publico-Privada 2022i¿½ (Project for Public-Private Collaboration 2022) by the Spanish Ministry of Science and Innovation and the State Research Agency (la Agencia Estatal de Investigacion). It involves ICFO and **VITALA Technologies**, S.L., a biotech spin-off from IBEC, also a CERCA center and fellow member of the BIST scientific community.

The project will provide a two-fold approach to widen what clinicians and researchers are able to i¿½seei¿½ using 13C MRI: VITALA will work on new routes to produce hyperpolarized tracer metabolites with long lifetimes, while ICFO will focus on techniques to continuously and non-destructively monitor their polarization using quantum sensors. In particular, microfabricated quantum atomic magnetometers with outstanding sensitivity will be developed at ICFO, enabling improved quality control of HP tracers as compared to the procedures currently performed, which are slow and strongly degrade the polarization state of the tracers. Combined, these technologies seek to **widen access to early detection of disease** and **break barriers towards future commercial exploitation of HP-13C imaging in preclinical and clinical stages of drug discovery**.

The project is coordinated by **Dr Maria Alejandra Ortega Machuca**, co-founder and current COO/CTO of VITALA Technologies. VITALA has recently developed and patented organ-on-chip (OoC) devices to accurately emulate in vivo cell and tissue models in vitro.

ICFO's team is led by **Dr Michael Tayler** from ICFO's **Atomic Quantum Optics** (AQO) research group headed by **ICREA Professor Morgan Mitchell.** Earlier this year, the group demonstrated a prototype atomic magnetometer device for monitoring hyperpolarized [1-13C]-pyruvate, the most widely used tracer in 13C metabolic imaging. The development of the device will demonstrate the competitive potential for high-throughput in vitro MRI screening studies that are currently part of VITALA's services, as well as in 13C MRI human clinical trials.

The i¿½Proyecto de Colaboracion Publico-Privadai¿½ program is part of the Spani
h Research, Development and innovation program that is oriented to the challenges faci
g society.

Project reference: CPP2022-009771



Spanish Ministry of Science and Innovation and the State Research Agency