
Post-doctoral position in Optical monitoring for the endothelial health evaluation in post-intensive-care COVID-19 patients

ICFO is offering a postdoctoral position to a well-qualified, highly motivated and dynamic young scientist who wishes to enhance his/her scientific career in a friendly and stimulating environment.

The successful candidate will be joining the **Medical Optics Research group** led by **Prof. Dr. Turgut Durduran**. ICFO-Medical Optics (ICFO-MEDOPT) group was founded in 2009 by Dr Turgut Durduran as an inter-disciplinary group that develops new technologies using advanced photonics for pre-clinical and clinical bio-medicine.

The group's main expertise is in diffuse optical monitoring and tomography which uses photon diffusion to probe "deep" (0.1-10cm) into tissues. Our research aims to advance the field in theoretical instrumentation and application oriented approaches in parallel. We focus on applications in neurology and oncology and in both pre-clinical animal model studies and in clinical human studies.

Inter-disciplinary, collaborative work forms the core of our vision and we routinely work with biomedical centers, hospitals and engineering departments in Spain, around Europe and abroad. In particular, we have strong ties with other centers in Barcelona area and with researchers at the University of Pennsylvania, USA.

PROJECT DESCRIPTION

A large majority of COVID-19 patients who are treated at the intensive care unit (ICU) develop severe muscle weakness. This is because of the direct effects of the virus but also because of the invasive therapies and management at the ICU. Since the onset of the pandemic, thousands of patients are observed to experience limiting fatigue and poor functional status, hindering their return to normal life. "Long COVID" has made headlines and is partially referring to this problem. Current data from the pandemic suggests that it will persist in more than half of these patients even after one year. As thousands of severe COVID-19 survivors struggle to return back to their normal lives, to their jobs, their education, this is emerging as a major socio-economic problem reducing the quality of life of these patients beyond what would otherwise be due to other detrimental consequences of severe COVID-19. However, the impact of this so-called "ICU acquired weakness" can be reduced by early physical rehabilitation programs that start from when the patient is still at the ICU. This was demonstrated in other critical populations, similar to severe COVID-19 patients, such as patients suffering from acute respiratory distress syndrome due to other viral or bacterial infections. However, a "one size fits all" solution is not possible since every patient needs a different approach and early physical activity could worsen some of the patients. Therefore, detecting those patients with a higher risk or degree of muscle impairment and its precise origins at early stages remains a challenge for critical care clinicians. To date, physical examination is the main diagnostic tool for muscle weakness, but physical examination performance is very limited in the critical care setting. At an ICU, patients are receiving sedative agents and other drugs, have limited mobility due to invasive procedures and are unable to collaborate in many cases. Therefore, a specific parameter, able to objectively detect muscle impairment and explain origin at early stages is highly desirable. This will allow personalized physical interventions, aimed at achieving improved functional status at discharge.

To date, optical technologies, such as near-infrared-spectroscopy (NIRS) and diffuse correlation spectroscopy (DCS), have demonstrated their value in the evaluation of the health of the capillaries and other small vessels (microvasculature) in muscles. They are safe, portable and relatively low-cost. Since COVID-19 is considered to be a disease primarily affecting the microvasculature, our aim is to evaluate the microvasculature of critically ill COVID-19 patients at the ICU, once the lungs have improved and active physical rehabilitation is about to be initiated.

We hypothesize that the degree of alterations in the microvasculature of the skeletal muscle will be correlated to the degree of muscle weakness. The confirmation of our hypothesis and the generated scientific information will allow us to early detect those patients at higher risk of developing muscle weakness as results of the severe COVID-19. In turn, a personalized training and rehabilitation programme could be defined.

In this project funded by the La Marató TV3, ICFO and Parc Taulí hospital will work together and collaborate with other networks such as HEMOCOVİD-19 and VASCOVİD to address these issues with state-of-the-art optical technologies.

Tasks:

- Adaptation of near-infrared spectroscopy/diffuse correlation spectroscopy hybrid system.
- Collaboration with HEMOCOVİD-19 & VASCOVİD projects for system development and development of procedures for vascular occlusion test evaluation.
- Data acquisition and analysis.

Eligibility and Conditions

Candidates must hold an internationally-recognized Ph.D.-equivalent degree (or evidence of its completion in the nearest future) in areas such as physics, biomedical engineering, electrical engineering or related areas in the field of diffuse optics and biomedical optics.

Also, the appointee will preferably have:

- Experience in biomedical optics.
- Experience in opto-electronics.
- Experience in modeling photon propagation in tissues.
- Experience in clinical data analysis and interpretation.
- Should be familiar with tools such as Matlab, R and Python.

The contract is offered for up to 2 years.

ICFO is an equal opportunity employer. Candidates are selected exclusively on merit and potential on the basis of submitted application material. No restrictions related to disabilities, citizenship or gender apply to ICFO positions. ICFO abides by the principles of openness, efficiency, transparency, supportiveness, and international comparability as stated in the European Charter for Researchers and the European Code of Conduct for the Recruitment of Researchers.

Application procedure

The formal application should be submitted online via <https://jobs.icfo.eu/?detail=602>.

Suitable candidates are requested to submit:

- Presentation letter with a declaration of interest,
- Curriculum Vitae, including contact details,
- The contact e-mail of two potential referees.

Candidates may contact jobs@icfo.eu for formal enquiries regarding the application, as well as address scientific enquiries to turgut.durduran@icfo.eu

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