

An interview with Dr. Udo Weigel

CEO and Co-founder of HemoPhotonics



Could you give a brief explanation of the mission and vision of HemoPhotonics?

HemoPhotonics was founded in 2013 as spin-off company of ICFO with the mission to develop non-invasive optical technology for biomedical research applications. The vision behind this venture was to pave the way for optics-based diagnostic devices providing new and/or complementary medical information to established diagnostics which will have an important positive impact on the outcome of the management, treatment of and rehabilitation from diseases and critical conditions of the neurovascular system with a signature in the tissue oxygenation and hemodynamics. The field of diagnostic applications include stroke, traumatic brain injury, neonatal neuropathologies, other neurologic injuries and various types of cancers.

What is your main market?

The biomedical research community represents at the present stage our most important customer group. There are two good reasons for this: Research-oriented communities are not only open to adoption of new technology with potential in their field, they are also potential collaborators in studies on the way to support the process for gaining approval from the legal authorities to introduce the optical technology to the medical market on a larger scale.

Why are you betting on this technique and not any other?

The measurement of the thyroid gland with diffuse optics is challenging due to the fact that it has significant overlying tissue and there is a high variability of internal structure and conditions among a patient group. However, it has been recently shown that optical methods can characterize the thyroid and there is potential to differentiate healthy from diseased conditions in this application with a high prevalence in the adult population. Despite having a powerful routine diagnostic method (ultrasound imaging), optical examination can help to improve this differentiation based on the tissue blood flow and oxygenation and as a consequence reduce unnecessary surgeries on the thyroid gland. Another strength of our optical technology is that it can be in general well combined with other diagnostic technologies (e.g. ultrasound imaging), allows to minimize alterations of current routine examinations in order to provide the complementary hemodynamic information. This was the origin of a dedicated European project that

brought together several European research institutes (ICFO, Politecnico di Milano) and SMEs to develop for the first time a combined ultrasound optical scanner for thyroid glands and bring it in few years to the medical market. HemoPhotonics had the responsibility for the integration and commercialization.

How would you describe the development of the technique you use and what stage you are currently in?

Near-infrared spectroscopy (NIRS) has been used in science for a while to determine optical parameters of turbid media. Major steps for application to biological problems were made when people became aware of the accessibility of deeper tissue (few cms) in the physiological window. A multitude of illumination and detection configurations in NIRS have been developed to measure tissue constituents and their concentration, mainly oxygen for research on many medical problems. In combination with NIRS measured tissue oxygen saturation, diffuse correlation spectroscopy (DCS) - a specific technology commercialized by HemoPhotonics - offers to derive a tissue oxygen metabolism parameter, which can be considered a tissue health indicator or a biomarker for certain diseases or tissue damage conditions.

How long will it take to integrate the technique in ERs in hospitals? Are there any current devices being tested in hospitals?

Presently, there are already hybrid prototype devices used in intensive care units of hospitals in Barcelona, Copenhagen and Milan for research studies. Feedback from medical end-users is the recognition that providing an indication about tissue health can make an important impact on their work and help to personalise the patient management. Some concern may be shared by end-users related to the complexity of the new devices and the possible impact on the established clinical workflow, which are certainly aspects addressable by good engineering solutions.

What are the main obstacles that you believe you need to overcome to have these devices used in as many hospitals as possible?

Besides the technological challenges and concentrating on the right medical application, a major obstacle is undoubtedly the regulations for medical devices that require important investments over several years to successfully fulfil the approval process.

Can the device be implemented in other markets of interest? What other applications could it have?

The most important impact will be achieved in applications with high prevalence in the population like stroke, neurodegenerative diseases, and cancer. In addition, other very specific fields might also have commercial interests, e.g. vascular and sports medicine, hemodynamic monitoring during surgery. ■