ABSTRACT

Title:
Evaluation of microvascular function and skeletal muscle oxidative metabolism by near infrared spectroscopy in ageing, disuse and disease: technological advances aimed to extend current physiological knowledge

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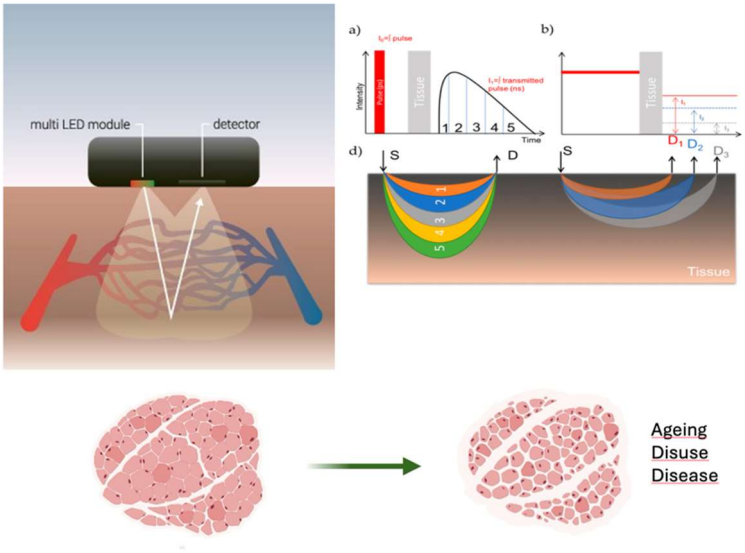
Research Theme/Topic:
Physiology, NIRS, Muscle metabolism, Microvasculature

Main Abstract:
Near infrared spectroscopy is non-invasive approach based on the interaction of light in the near-infrared region (650-900 nm) with chromophores (mainly heme groups) contained in biological tissues. At skeletal muscle level, NIRS has been extensively used to assess endothelial (vascular) function or reactivity as well as monitoring tissue oxygen uptake during exercise and muscle oxidative capacity. The earliest, and still most common instruments used were continuous wave (CW) near-infrared spectrometers, where the light source is of constant intensity and the transmitted light intensity is detected, providing only changes in light attenuation. However, the near infrared light propagation within biological tissue is hugely affected by changes in tissue optical properties of the whole volume of tissue under the optical fibers (i.e. scattering coefficients). A more recent time-domain (TD) approach, based on pulsed picoseconds lasers and fast detectors sensitive to the single photon, allows calculation of absolute changes in deoxygenated and oxygenated heme groups, and discrimination of the relative contribution of signals coming from upper layers of the tissue from those originating in deeper layers.



This project will improve physiological understanding of microvascular function and skeletal muscle oxidative metabolism adaptations to aging, disease and disuse by performing extensive data collection of CW and TD NIRS on young and elderly healthy subjects, patients with neurological diseases and people undergoing to mild or severe form of disuse. Results will serve as a reference to create instrument-specific reference values for better identifying abnormalities in physiological indexes of endothelial function and muscle oxidative metabolism.

References

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