

Using infrared light to activate and inhibit neurons in vivo

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Prof. Mahadevan-Jansen develops applications of optical techniques for detection of pathology. Her primary research at the Vanderbilt Biomedical Photonics Laboratories, is to investigate the applications of optical spectroscopies and imaging for cancer diagnosis and guidance of therapy. She received her bachelor's and master's degrees in Physics from the University of Bombay, India, and a master's and PhD degrees in Biomedical Engineering from the University of Texas at Austin. She joined the Vanderbilt engineering faculty in 1996. She is currently the Orrin H. Ingram Professor of Biomedical Engineering at Vanderbilt University and holds a secondary appointment in the Department of Neurological Surgery. Dr Mahadevan-Jansen is an associate editor of Neurophotonics as well as Applied Spectroscopy and serves as a reviewer of more than 20 journals and as chair of numerous professional conferences. She has authored over 200 peer-reviewed publications.

We have demonstrated that electromagnetic stimulation in the form of pulsed infrared light can initiate ion channel exchange and trigger an electrical response (or lack thereof) in neural cells and tissues. This label-free approach that we call infrared neural modulation produces highly selective responses that portend interesting applications in the arena of man-machine interface and enhancement of human capabilities. We have successfully shown that INM can elicit a response in the peripheral and central nervous system in aplysia, mice, rats, guinea pigs, cats, non-human primates and humans with high spatial selectivity and no damage. However the fundamental biology and physics of the process by which this electromagnetic pulse triggers a bio-electric response at the cellular and sub-cellular level remains largely unresolved. We hypothesize that multiple mechanisms may be at play that are selectively activated depending on the laser parameters and neural system under study. In this presentation, an overview of INS with applications in cells, peripheral nerves and the brain will be presented with an example of how this technique may be translated in to humans.

Tuesday 3 October 2017, 11:00

ISOF 12 – Meeting Room (1st floor)

CNR Research Area

Via Gobetti 101, Bologna