FIU Engineering & Computing
Department of Biomedical Engineering

Wallace H. Coulter Foundation
Biomedical Engineering Seminar Series

Jana M. Kainerstorfer Ph.D., is an Associate Professor of Biomedical Engineering at Carnegie Mellon University and holds courtesy appointments in the Neuroscience Institute and Electrical & Computer Engineering. Her lab's research is focused on developing noninvasive optical imaging methods for disease detection and/or treatment monitoring, with an emphasis on diffuse optical imaging. Her research mainly focuses on clinical translation of optical methods for monitoring cerebral perfusion and developing tools for assessing cerebral health in traumatic brain injury. Other applications of diffuse optics span fetal health monitoring as well as brain imaging in marine mammals. She serves on program committees at national and international conferences (including the SPIE Photonics West as well as OSA Topical Meetings) and served as Conference Chair for the OSA Biophotonics Congress: Optical Tomography and Spectroscopy in 2022 and Conference Chair for the Photonics West: Clinical and Translational Neurophotonics subconference. She further is an associate editor for Journal of Biomedical Optics (SPIE) and got elected as a senior member of the Optical Society of America (now OPTICA). Her research has been funded by AHA, NIH, ONR, DARPA, NSF, and the Air Force, including the NIH R21 Trailblazer as well as AHA Scientist Development Grant.

10/28/2022

Dr. Jana M. Kainerstorfer

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Friday, October 28th, 2022 | 9:00 AM | EC 2300

Non-Invasive Optical Imaging of the Brain – from the Clinical Bedside to Marine Environments

ABSTRACT: Neurovascular coupling (NVC), which is the interplay between neuronal and vascular function, and cerebral autoregulation (CA), which is the mechanism that regulates cerebral blood flow, are important biomarkers of cerebral health. While both are related to cerebral blood flow, the link between NVC and CA is not well understood. In particular, the influence of intracranial pressure (ICP) and blood pressure, which can alter CA, on NVC, is not well characterized. Understanding the interplay could not only potentially help monitor patient's health better and predict outcome, but also help optimize treatment, for instance in traumatic brain injury and hydrocephalus patients. To tackle questions about the interplay between NVC and CA, but also systemic influences on NVC, such as blood pressure, heartrate, and respiration, we have conducted non-human primate studies, where ICP was controlled based on fluid infusion in the ventricles. Using a combination of electroencephalography, near-infrared spectroscopy, and diffuse correlation spectroscopy, we measured neuronal and vascular responses during a visual stimulus task. Using these data, we found that NVC changes as a function of ICP and CA. Particularly, the shape of the hemodynamic response function was found to be indicative of CA intactness, making it a potent biomarker of CA. This talk will focus on the optical imaging methods used to develop NVC based biomarkers of cerebral health. Data from animal models as well as clinical populations will be presented. Additional methods will be described, including a novel approach to non-invasively measure ICP based on hemodynamic signals obtained with optical sensors. Lastly, systemic influences, such as extreme hypoxia, on cerebral perfusion will be discussed. For this, data from marine mammals and elite human breath-hold divers will be presented, which help shed light on cerebral health and perfusion under prolonged apneas.

Through the generous support of the Wallace H. Coulter Foundation, the Department of Biomedical Engineering facilitates weekly lectures each year during academic terms. Experts in all areas of Biomedical Engineering are invited to provide a research seminar and to meet with faculty and students to discuss the latest developments and research in Biomedical Engineering.

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9:00 AM | https://bme.fiu.edu/seminars