NEURON COUNTING AND OPTICAL CHARACTERISTICS IN HUMAN BRAIN TISSUES: A NONINVASIVESTUDYINVISIBLE ANDNEAR-INFRAREDSPECTRA

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Brain tissue optical properties, such as scattering coefficient, scattering length, and g value, are critical parameters for several biomedical applications and neuroscience research, including optical imaging and spectroscopy. However, measuring these properties accurately can be challenging due to the complex nature of brain tissue and the variety of measurement techniques available. However, there have been reports of discrepancies in optical property measurements obtained from different techniques. Specifically, we will examine the literature to identify the largest reported range of values for these optical properties and the used techniques. Understanding the sources of discrepancies in measuring optical properties in brain tissues and developing strategies to address them. This is crucial for advancing our knowledge of brain tissues through optical imaging techniques. This can help with brain-related disorders diagnosis and treatment. We aim to identify the main sources of variation and help researchers develop strategies to minimize these discrepancies. Such strategies could include optimizing sample preparation protocols, standardizing measurement techniques, and using multiple techniques to cross-validate results.

For the first time, we may be able to non-invasively measure the density of neurons in the cerebral cortex gray matter at different optical windows (700 to 2400 nm). Using tissue transmission or backscattering and the Mie model, structural properties, such as the density of neurons, in the gray matter of human brain tissue, will be explored for the first time. This is a significant step toward studying the state of neurons in a person with the potential for neurodegenerative diseases. This will allow appropriate intervention at an early stage of the disease.

Overall, in this paper we will be able to measure neurons density noninvasively in brain tissues. We also will provide a comprehensive understanding of the sources of discrepancy in measuring optical properties in brain tissues.

Biography

Jamal Ali received his B.S. in Physics from Yarmouk University in Jordan and an M.S. in Physics from the City College of New York (CCNY). He got his master's degree in Science Education from Queens College. He obtained his Ph.D. in Physics from the City University of New York (CUNY) working at the Institute for Ultrafast Spectroscopy and Lasers (IUSL) of the City University of New York (CUNY). He worked on "Light Propagation in Paint and Prostate Tissues Media Using Visible to Mid-IR Spectroscopy and Imaging Techniques" for his thesis.