

VISUALIZATION OF THE INTACT TISSUE-ELECTRODE INTERFACE WITH MULTIPHOTON MICROSCOPY

Matthew M. Holecko II, Justin C. Williams*, Stephen P. Massia
Harrington Dept. of Bioengineering, Arizona State University, Tempe, AZ 85287
***University of Wisconsin, Madison, WI,**
E-Mail: jwilliams@engr.wisc.edu

KEY WORDS: Histology, multiphoton microscopy, immunohistochemistry, neural tissue, microelectrode.

Advances in microelectrode technology have had a significant impact on the field of neuroscience. The reasons for these recent advances and the continuing drive to create even better neural interfaces stems from the potential applications for creating and maintaining a long-term neural implant. These applications include: gaining a better understanding of neural functions and complex neural networks; development of devices to provide an interface with the central nervous system; signals that control function; prosthetic devices that interact with the environment; and the treatment of various neurological disorders via drug delivery. Hence, the potential scientific impact of having reliable, long-term neural devices is the main driving force behind neural electrode research and development [1]. This paper presents the logical progression of visualization of the intact interface between an implantable micro-device for recording and stimulating neural tissue and the surrounding neural tissue using various microscopy techniques. This progression entails initial trials using non-functional electrode implants in vitro, to non-functional electrodes in vivo, and finally to functional electrodes in vivo using several different imaging modalities.

References;

[1] Turner, J.N., et al., Cerebral astrocyte response to micromachined silicon implants. *Experimental Neurology*, 1999. **156**, 33-49 (1999).