8th Annual
LLNL/LPC Science and Engineering Seminar Series
Theory to Practice: How Science is Done

Choosing the Right Tool for the Job: Microneedles

Erik Mukerjee, PhD, Biomedical Engineer
Center for Micro and Nano Technology, LLNL

Thursday, October 5th, 2017
6:00-7:15 pm
Building 2400, Room 2420

Free and open to the public

Abstract: This seminar will focus on the application space of microfabricated needle systems for direct interaction with the epithelial multilayer and dermis. The systems come in two distinct flavors: (Hollow) A minimally invasive method for sampling biological fluids is a prerequisite to performing either periodic or continuous monitoring of physiological systems. In particular, blood and cellular interstitial fluid contain important metabolic and immunological biomolecules whose time varying concentrations are important indicators of various states of health and disease. (Electrically Conductive) The evidence of the existence of Na+ current generation during epidermal wounding has been demonstrated in animal models; however, few in vivo human studies have been conducted due to method limitations for measuring these endemic electrical wound currents (e.g. fragility, spatial resolution, measurement depth). Therefore, probing these scenarios requires spatially controlled, highly reproducible and robust microneedle systems that can get the job done when its only skin deep.

Erik V. Mukerjee, Ph.D. is a member of the Technical Staff in the Engineering Directorate and the Center for Micro and Nano Technology at Lawrence Livermore National Laboratory. Erik received the B.S., M.S., and Ph.D. degrees in Biological Sciences, Electrical and Computer Engineering, and Biomedical Engineering, respectively, from the University of California, Davis in 1993, 2001, and 2003. His research areas of interest are monitoring and manipulating of human physiological systems through interfacing with bioMEMS microdevices. His thesis and dissertation work at UC Davis focused on silicon microneedle-base structures for bi-direction transdermal fluid flow and intraepithelial wound potential measurements. During the past few years, Erik has worked on a diverse set of projects consisting of MEMS pressure sensors, MEMS vertical vortex micromixer, microelectrode arrays for epiretinal prosthesis, polymer coated micro-cantilever array for chemical detection, MEMS-based multiplexed polymer coating system for micro-cantilevers, micro-differential scanning calorimetry for explosives detection, gas phase CO2 reclamation, CWA detection, iCHIP and New Generation biometrics and bio-forensics. In addition to his technical work, Erik serves as a member of the DoD Forensics Science and Technology Working Group. He has co-authored conference and journal publications in the areas of engineering and biology.