Print this Page for Your Records Close Window

Program#/Poster#: 624.19/UU17

Title: Elastomer-based multi-electrode arrays for activation of spinal cord white matter tracts: evaluation of surface stimulation selectivity

Location: San Diego Convention Center: Halls B-H

Presentation Start/End Time: Tuesday, Nov 06, 2007, 10:00 AM -11:00 AM

Authors: ***K. W. MEACHAM**[1], L. GUO[1], S. HOCHMAN[2], S. P. DEWEERTH[1];
[1]Dept of Biomed. Engin., GA Tech. & Emory Univ., Atlanta, GA; [2]Dept. of Physiology, Emory Univ. Sch. of Med., Atlanta, GA

We are characterizing the ability of an elastomer-based multi-electrode array (MEA) to specifically activate the spinal cord surface of the *in vitro* rat spinal cord. Fabricated MEAs comprise of thin-film gold electrodes encased in polydimethylsiloxane (PDMS) and have been designed to wrap conformably around the cord. This conformability provides improved mechanical impedance matching and electrode contact with the spinal cord surface. Ultimately, the purpose of these MEAs is to stimulate white matter tracts for selective recruitment of spinal cord functional systems for activation of coordinated motor output.

Our experimental setup involves wrapping the MEA around the isolated *in vitro* spinal cord of the juvenile rat (P10-P15) and stimulating various thoracic (T4-T8) spinal cord funiculi using a bipolar current configuration. The degree of stimulus spread is assessed by recording surface compound action potentials (CAPs) at multiple circumferential sites distant to the site of activation. For recording, a glass suction electrode (40-50 mm internal diameter) is placed approximately 10 mm caudal to the stimulation site to record CAP responses in 50 mm lateral increments from the site of the peak response. Recorded CAP signals are then evaluated based on the rectified and integrated signal (mV*ms). The decay of this CAP response value over distance is used to determine stimulus selectivity.

Preliminary results from MEA stimulation on the ventrolateral funiculus demonstrate that flat-electrode MEA selectivity compares favorably to that evoked with rigid, tungsten bipolar stimulating electrodes, with the area under the CAP response decaying at a rate of 0.15 mA*ms/mm for MEA stimulation and at a rate of 0.10 mA*ms/mm for the tungsten electrode control. The threshold signal value required to reliably elicit a threshold CAP response using a charged-balanced single pulse was higher for the MEA, however, which required a 700mA/500ms pulse, as compared to a value of 300mA/100ms for rigid, bipolar tungsten electrodes. Further characterization of MEA stimulus selectivity will include evaluation of a novel, conical-shaped MEA electrode geometry for improved contact and stimulus isolation.

Disclosures: **K.W. Meacham**, None; **L. Guo**, None; **S. Hochman**, None; **S.P. DeWeerth**, None.

Support: NIH Grant EB006179

[Authors]. [Abstract Title]. Program No. XXX.XX. 2007 Neuroscience Meeting Planner. San Diego, CA: Society for Neuroscience, 2007. Online.