A NOVEL STIMULUS ARTEFACT REMOVAL TECHNIQUE FOR HIGH-RATE ELECTRICAL STIMULATION

Heffer L.F.[1] and Fallon J.B.[1, 2]
[1]Department of Otolaryngology, The University of Melbourne, Melbourne. [2]The Bionic Ear Institute, Melbourne.

Purpose: Studies of neural responses to electrical stimulation are often complicated by the presence of stimulus artefact within the recorded signal. This is particularly evident when investigating short latency neural activity in response to high-rate electrical stimulation. As current techniques (i.e. artefact template subtraction and hardware sample-and-hold circuitry) are unsuitable for such tasks, we developed and evaluated a technique for the efficient removal of stimulus artefact from electrophysiological recordings. **Methods:** Pulsatile electrical stimulation was presented at rates of up to 5000 pulses/s via an intra-cochlea electrode array. The response of single auditory nerve fibres were recorded using standard glass micro-electrode recording techniques, digitised and stored for off-line analysis. Stimulus artefact was removed from these recordings using our newly developed sample-and-interpolate artefact rejection technique. **Results:** The sample-and-interpolate artefact rejection technique has been successfully used to remove electrical stimulus artefact from over one hundred auditory nerve fibre recordings (n=134). The new technique out-performs traditional techniques such as filtering, artefact subtraction and sample-and-hold circuitry; thus enabling the analysis of rapid neural responses that were previously inaccessible. **Conclusion:** We have demonstrated that this computationally efficient sample-and-interpolate technique removes the stimulus artefact while causing minimal distortion of the action potential waveform. We suggest that this technique may have potential applications in a range of electrophysiological recording systems.