EVALUATION OF IMPLANTED EPIRETINAL MICROCONTACTS IN THE MAMMALIAN RETINA*

((N.Peixoto[1], S.Straßburger[1], R.Hornig[1], P.Walter[2], P.Szurman[2], R.Eckmiller[1])) 1) Dept. Computer Science VI, University Bonn; 2) Dept. Ophtalmology, Univ. Cologne, F.R. Germany.

Purpose. To explore the optimal electrical stimulation parameters for physiologically acceptable elicitation of neural responses from retinal ganglion cells. **Methods.** We developed a programmable stimulus pattern generator (PSPG) for generation of single- or multi-channel constant current pulses with variable biphasic shapes, pulse train duration, repetition rate, and varying degrees of synchronicity in case of multi-channel stimulation. Electrically evoked potentials (EEPs) from the cortex of anesthetized rabbits were recorded (see: Walter et al., ARVO, 1998). **Results.** Thresholds for EEPs were lower for trains of 5 to 10 biphasic pulses applied to several adjacent microcontacts simultaneously. Whereas single electrode stimulation required 40 to 50µA per phase at threshold, a measurably smaller amplitude was sufficient for simultaneous stimulation of 2 or 3 adjacent electrodes. A comparative analysis of EEP amplitudes revealed that biphasic stimulation with pulse trains even at the unphysiologically high level of 200µA did not damage the retinal tissue, whereas this is clearly the case for monophasic stimulation. **Conclusions.** Our constant current PSPG is a powerful and adequate device for stimulus parameter optimization in conjunction with implanted epiretinal microcontacts. EEP thresholds in the physiologically acceptable range far below 100µA can be achieved even with the non-penetrating microcontacts, which were developed by our partners (FhG-IBMT, FhG-IMS). Threshold reduction by means of simultaneous stimulation of several electrodes supports the hypothesis that supra-threshold EEPs represent inputs from a larger number of retinal ganglion cells and that accordingly the threshold for single ganglion cell stimulation is even lower.
For details of the retina implant project see: http://www.nero.uni-bonn.de/ri/retina-en.html
* Supported by the German Research Ministry (BMBF) grants 01IN501A and K. None.