Department für Neurowissenschaften

INSTITUT FÜR BIOLOGIE
UND UMWELTWISSENSCHAFTEN

Einladung zum Vortrag
im Rahmen des gemeinsamen Kolloquiums des Instituts für Biologie und Umweltwissenschaften und des Departments für Neurowissenschaften

Dr. Nicole Roßkothen-Kuhl

Universitäts-HNO-Klinikum Freiburg

Hearing with cochlear implant(s): Molecular plasticity and sound localization of the deafened auditory system

Cochlear implants (CIs) restore a degree of functional hearing in many patients suffering from severe or profound hearing loss. These devices are often highly effective at enabling users to understand speech. But they nevertheless fail to restore normal or near-normal hearing capabilities in a number of respects, including the ability to use fine interaural time differences (ITDs) for spatial hearing. To derive maximum benefit from CIs, further research is needed in animal models to understand how parameters such as interaural synchronization influence the binaural processing in central auditory hubs of CI patients.

We used the neonatally deafened Wistar rat as a model to study molecular, electrophysiological, and behavioral changes of the central auditory system under monaural or binaural CI stimulation. Rats received CIs in young adulthood and were either actively stimulated during two-alternative forced choice stimulus lateralization task training, or they were passively stimulated with or without simultaneous recordings of ITD tuning in their inferior colliculus (IC).

As a result, we found for neonatally deafened, adult CI-implanted rats: first, a massive neuron-glia co-activation in the IC due to chronic CI stimulation. No comparable response was observed in hearing experienced CI-stimulated rats. Second, deaf CI-rats have microsecond ITD sensitivity when provided with precise ITD cues right from the start of stimulation. Third, they can also be trained to localize ITD stimuli with behavioral thresholds in the order of 50 µs. This ITD performance compares well with that achieved by normal hearing rats.

We established a new animal model to study binaural hearing in bilateral CI users. By this, we demonstrated that even a hearing inexperienced auditory system can develop ITD sensitivity if using CI stimulation with appropriate binaural parameters. These results have important clinical implications as they suggest that it should in principle be possible to incorporate ITD coding into future CI designs.

27.11.2018, 16 Uhr s.t., W04 1-162

Gastgeber: Prof. Dr. Jannis Hildebrandt
Gäste aller Institute sind herzlich willkommen