Cochlear implant as a sensor

The cochlear implant (CI) is the most successful neural prosthesis worldwide. Thanks to direct stimulation of the auditory nerve, it enables more than half a million people worldwide to hear, even though those affected were born deaf or deafened.

In close collaboration, researchers from the Faculty of Medicine and the Faculty of Engineering at the University of Freiburg have developed a method to convert the stimulation electrodes of common CIs into electrochemical sensors. With the help of this novel sensor function, the functionality of cochlear implants could be monitored directly in the inner ear in the long term. The researchers published their results on December 9, 2021 in the journal *Biosensors and Bioelectronics*.

"For the first time, specific sensor protocols allow the classic stimulation electrodes of the cochlear implant to be used as highly sensitive and accurate microsensors," explains Dr. Andreas Weltin, group leader at the Department of Microsystems Engineering (IMTEK) at the University of Freiburg. "This sensor function is the basis for smarter implants that could monitor the implant's condition and its environment directly in the inner ear."

It has already been possible to measure the oxygen content of the implant environment reliably and without affecting auditory nerve stimulation in animal models. The next step will now be to verify how consistent the sensor properties in the animal model are over a longer period of time. "If we also achieve positive results here, it could be an important milestone on the way to permanent sensor-based monitoring of cochlear implants," says Dr. Nicole Roßkothen-Kuhl, Medical Faculty of the University of Freiburg and head of the Neurobiological Research Laboratory in the Department of Otolaryngology at the University Medical Center Freiburg. Implant recipients would benefit greatly from such on-site monitoring. "The more precise the information we receive about possible changes, the better implants can be developed to enable perfect hearing for as long as possible."

Publication:

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