New Optical Nanosensor Improves Brain Mapping Accuracy, Opens Way for Broader Range of Applications

A paper published in the current edition of the journal Neurophotonics describes a new nanosensor design that enables more accurate mapping of the brain and shows the way forward for future sensors and a broader range of applications. The journal is published by SPIE, the international society for optics and photonics.

BELLINGHAM, Washington, USA, and CARDIFF, UK (PRWEB) March 01, 2017 -- A new optical nanosensor enabling more accurate measurement and spatiotemporal mapping of the brain also shows the way forward for design of future multimodal sensors and a broader range of applications, say researchers in an article published in the current issue of Neurophotonics. The journal is published by SPIE, the international society for optics and photonics.

Neuronal activity results in the release of ionized potassium into extracellular space. Under active physiological and pathological conditions, elevated levels of potassium need to be quickly regulated to enable subsequent activity. This involves diffusion of potassium across extracellular space as well as re-uptake by neurons and astrocytes.

Measuring levels of potassium released during neural activity has involved potassium-sensitive microelectrodes, and to date has provided only single-point measurement and undefined spatial resolution in the extracellular space.

With a fluorescence-imaging-based ionized-potassium-sensitive nanosensor design, a research team from the University of Lausanne was able to overcome challenges such as sensitivity to small movements or drift and diffusion of dyes within the studied region, improving accuracy and enabling access to previously inaccessible areas of the brain.

The work by Joel Wellbourne-Wood, Theresa Rimmele, and Jean-Yves Chatton is reported in “Imaging extracellular potassium dynamics in brain tissue using a potassium-sensitive nanosensor.” The article is freely available for download.

“This is a technological breakthrough that promises to shed new light — both literally and figuratively — on understanding brain homeostasis,” said Neurophotonics associate editor George Augustine, of Duke University. “It not only is much less invasive than previous methods, but it adds a crucial spatial dimension to studies of the role of potassium ions in brain function.”

This potassium-sensitive nanosensor is likely to aid future investigations of chemical mechanisms and their interactions within the brain, the authors note. The spatiotemporal imaging created by collected data will also allow for investigation into the possible existence of potassium micro-domains around activated neurons and the spatial extent of these domains. The study confirms the practicality of the nanosensor for imaging in the extracellular space, and also highlights the range of possible extensions and applications of the nanosensor strategy.

David Boas of Massachusetts General Hospital, Harvard Medical School, is the editor-in-chief of Neurophotonics. Launched in 2014, Neurophotonics is published digitally in the SPIE Digital Library and in
print. The journal covers advances in optical technology applicable to the study of the brain and their impact on basic and clinical neuroscience applications.

The SPIE Digital Library contains more than 458,000 articles from SPIE journals, proceedings, and books, with approximately 18,000 new research papers added each year. Abstracts are freely searchable, and a number of journal articles are published with open access.

About SPIE

SPIE, the international society for optics and photonics, is an educational not-for-profit organization founded in 1955 to advance light-based science, engineering and technology. The Society serves nearly 264,000 constituents from approximately 166 countries, offering conferences and their published proceedings, continuing education, books, journals, and the SPIE Digital Library. In 2016, SPIE provided $4 million in support of education and outreach programs. www.spie.org
Contact Information
Amy Nelson, Public Relations Manager
SPIE
+1 (360) 685-5478

Online Web 2.0 Version
You can read the online version of this press release here.