BioSpectrum
the business of Bio & Health Sciences
ASIA EDITION

Korea reports nanosensor to detect epileptic seizures

24 February 2020 | News

The new nanosensor is created with porous silica nanoparticles shielded by an ultrathin potassium-permeable membrane that is very similar to the potassium channel in brain cells

Researchers at the *Center for Nanoparticle Research*, within the *Institute for Basic Science* (IBS, South Korea) in collaboration with collaborators at Zhejiang University, China, have reported a highly sensitive and specific nanosensor that can monitor dynamic changes of potassium ion in mice undergoing epileptic seizures, indicating their intensity and origin in the brain.

One of the main investigation targets is potassium (K^+) ion. This ion affects the difference in electric potential between the interior and exterior membrane of the neurons, and impacts the neuronal intrinsic excitability and synaptic transmission. Despite the significant efforts to improve the selectivity of K^+ sensors, they are still far from satisfactory because currently available optical reporters are not capable of detecting small changes in potassium ion, in particular, in freely moving animals.

The new nanosensor is created with porous silica nanoparticles shielded by an ultrathin potassium-permeable membrane that is very similar to the potassium channel in brain cells. The size of the pores allows only K^+ to diffuse in and out, reaching a detection limit as low as 1.3 micromolar. This allows the specific readout of sub-millimolar variations of extracellular K^+ and the spatial mapping of this ion in the brain.

This study successfully demonstrated that K^+-permeable membrane filter on the nanosensor is effective at filtering out other cations and capturing K^+ ions exclusively. Such a nanosensor construction strategy would contribute not only to scientific discoveries and breakthroughs in neuroscience research, but also to the development of other selective ion sensors.