Bioluminescent Ion Indicator Proteins

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Technology description

Market Summary

Neuronal chloride (Cl^-) is involved in many normal neurophysiological activities, including synaptic inhibition, pH and volume regulation. Changes in Cl^- have been implicated in mechanisms underlying neurological diseases such as stroke, pain and epilepsy. Various indicator proteins have been developed, enabling functional imaging for active intracellular molecules. When combined with modern genetic techniques, these genetic biomarkers can be used with cell-type specificity, but face limitations. With versatile fluorescence imaging, all fluorophores need excitation light. When used for in in vivo imaging, a craniotomy is often performed so that a light microscope is in close proximity to the desired structures. Also, although an activity-dependent luciferase exists, its usage in the mammalian brain is not common. A non-invasive method for chloride readout inside living cells is needed.

Technical Summary

Emory University researchers have developed a fusion protein which provides convenient and non-invasive readouts for chloride inside living cells. The researchers designed and engineered a bioluminescent probe, based on Gaussia luciferase, which changes emission according to intracellular chloride concentration. Bioluminescence imaging can be conducted in intact, whole animals and provides a high signal-to-noise ratio. The reagent enables reporting of neural activity in the mammalian brain without requiring a surgical operation. This newly engineered, bright activity-dependent luciferase allows large-scale, non-invasive functional imaging based on bioluminescence.

Application area

Fusion protein for non-invasive assessment of chloride fluctuations in neuronal processes.

Advantages

Enables a non-invasive method of imaging chloride in animals.
Offers high signal-to-noise ratio compared to fluorescent light.

Institution

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