

BioNanoScience 2017 vol.7 N2, pages 345-348

Selective Extracellular Stimulation of Pharmacologically Distinct CCK/CB1R Positive Interneuron to Pyramidal Cell Perisomatic Inhibitory Synapses

Valiullina F., Jappy D., Rozov A.

Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

© 2016, Springer Science+Business Media New York. During prolonged whole cell recording, the intracellular contents are progressively dialyzed with the pipette solution; this often leads to significant changes in synaptic efficacy. To overcome this problem, we developed an approach allowing reliable extracellular stimulation of perisomatic synapses formed by CCK+/CB1+ interneurons onto CA1 pyramidal cells. Functional identification of this input was based on the unique features of CCK+/CB1+ terminals: long-lasting asynchronous transmitter release following high-frequency stimulation and exclusive expression of CB1R. Asynchronous release was used as an indication of proper positioning of the theta glass stimulation pipettes. We found that all extracellularly stimulated inputs with characteristic asynchronous release undergo robust DSI in response to 5-s depolarization and could also be almost entirely blocked by application of the CB1R agonist CP55940, which were similar to the data obtained with paired recordings from connected CB1+ and CA1 pyramidal cells. Thus, we have developed an approach allowing the selective and reliable extracellular stimulation of a subtype of hippocampal perisomatic inhibitory synapses.

<http://dx.doi.org/10.1007/s12668-016-0310-1>

Keywords

CCK, Extracellular stimulation, Method, Perisomatic inhibition

References

- [1] Apostolides, P. F., & Trussell, L. O. (2013). Rapid, activity-independent turnover of vesicular transmitter content at a mixed glycine/GABA synapse. *Journal of Neuroscience*, 33, 4768–4781.
- [2] Diana, M. A., & Marty, A. (2003). Characterization of depolarization-induced suppression of inhibition using paired interneuron—Purkinje cell recordings. *Journal of Neuroscience*, 23, 5906–5918.
- [3] Wang, L., Tu, P., Bonet, L., Aubrey, K. R., Supplisson, S. (2013). Cytosolic transmitter concentration regulates vesicle cycling at hippocampal GABAergic terminals. *Neuron*, 80, 143–158.
- [4] Dugue, G. P., Dumoulin, A., Triller, A., Dieudonne, S. (2005). Target-dependent use of co-released inhibitory transmitters at central synapses. *Journal of Neuroscience*, 25, 6490–6498.
- [5] Jappy, D., Valiullina, F., Draguhn, A., Rozov, A. (2016). GABABR-dependent long-term depression at hippocampal synapses between CB1-positive interneurons and CA1 pyramidal cells. *Frontiers in Cellular Neuroscience*, 10, 4.