Lőrincz *et al.: Intrinsic Activity*, 2016; **4**(Suppl.3):A4.11
http://www.intrinsicactivity.org/2016/4/S3/A4.11
published online: 5 September 2016

22nd Scientific Symposium of the Austrian Pharmacological Society: Joint Meeting with the Hungarian Society for Experimental and Clinical Pharmacology

Vienna, 8–10 September 2016

MEETING ABSTRACT

A4.11

Ca^{2+} transients measured in different hippocampal GABAergic interneurons using two-photon laser scanning microscopy

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Background: Althoug the morphology and physiology of different GABAergic interneurons (INs) have been extensively investigated, much less is known about their axonal properties. In particular, Ca^{2+} dynamics at individual bouton level have not been studied in anatomically indentified GABAergic INs, although it is known that the invasion of action potential (AP) transiently opens voltage-dependent Ca^{2+} channels resulting in transmitter release.

Methods: We combined patch-clamp recording in whole-cell mode with two-photon scanning microscopy to record Ca^{2+} signaling of dendrites and boutons of INs in response to somatic stimulation [1]. Through a patch pipette, INs were filled with high- or low-affinity Ca^{2+}-sensitive dyes (OGB-1, OGB-6F) and were labelled by biocytin for the purpose of *post hoc* anatomical identification. Grouping of INs occured due to their localization, axon distribution and firing properties.

Results: Based on their electrophysiologycal and morphologycal properties, INs were classified into three subgroups which were as follows: non-fast-spiking INs (NFS), dendritic-fast-spiking INs (DFS) and perisomatic-fast-spiking INs (PFS). Our results revealed a significant difference in the amplitude and the time course of Ca^{2+} transients between dendrite and *en passant* boutons of NFS INs; the amplitude of Ca^{2+} transients was much higher and the time course was faster in boutons. The same properties of boutonal Ca^{2+} transients were also significantly different in distinct IN types. The unperturbated values of $\Delta[Ca^{2+}]$ evoked by a single AP were 565, 214 and 147 nM in NFS, DFS and PFS INs, respectively (in more detail: [2]) and the collapse of the transients was sharper in DFS and PFS cells. It was also determined that the APs invade through the whole axonal arbor whithout being stuck in branching points, and lead to elevations in $[Ca^{2+}]$ in almost all *en passant* boutons.

Discussion: GABAeric INs play a pivotal role in controlling the activity of pyramidal cells, which are the major players in mutiple central nervous system disorders. Any drug that is able to boost the function of these INs could hold preventive or curative promises for a great variety of disorders.

References

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