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CILIA

Customized Intelligent Life-Inspired Arrays

Integrated Project

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S Y N A P T I C T R A N S M I S S I O N

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EXECUTIVE SUMMARY

Two-photon-fluorescence calcium (Ca^{2+}) imaging with Fluo-4/AM was applied to cultured neurons isolated from the terminal ganglion of crickets (*Gryllus bimaculatus*) to estimate the synaptic interconnectivity and improve the significance of the results obtained by electrophysiological methods. Ca^{2+} -imaging data should correspond well to synaptic currents and voltage changes.

Under resting conditions, superfusion of the cultured cells with cricket standard ringer the intracellular Ca^{2+} -concentration ($[\text{Ca}^{2+}]_i$) was constant. To depolarise the cells, the extracellular K^+ -concentration ($[\text{K}^+]_o$) was elevated from 4 to 50 mM. This pulse of high $[\text{K}^+]_o$ -solution triggered a pronounced, reversible increase in $[\text{Ca}^{2+}]_i$, and the corresponding value of fluorescence intensity was used as reference for the subsequent neurotransmitter receptor screening.

The cells were superfused with acetylcholine, dopamine, octopamine, glutamate, 5HT, and GABA in concentration, varying from 10 μM to 1 mM. The changes in $[\text{Ca}^{2+}]_i$ were recorded and expressed as a fraction of the 50 mM $[\text{K}^+]_o$ -induced $[\text{Ca}^{2+}]_i$ -increase. The positive response amplitudes ranged from 10 to 120 % of the high $[\text{K}^+]_o$ -response.

Acetylcholine was revealed to be the most important neurotransmitter to which most of the cells (75%) responded and it evoked also the largest $[\text{Ca}^{2+}]_i$ -peaks. The cells also expressed functional receptors for dopamine, octopamine, glutamate, 5HT, and GABA, and most cells were equipped with at least 2 types of neurotransmitter receptors.