Insight Medical Publishing

Der Pharmacia Sinica

ISSN 0976-8688

2020

Vol.11 No.4

Use of Randomized Submaximal Glutamate Stimulus to Interpret Glial Effects on Neuronal Potassium Dynamics a pilot study

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Abstract

Glutamate (GLU) binding to neurons can cause dynamic changes in intracellular calcium. We tested effects of a 3-group submaximal glutamate stimulus (250, 500 and 750 nanomolar GLU in randomized orders) on neurons in culture, and measured intracellular calcium dynamics in cultures high and low in glia at 8 and 9 days in vitro. Glia depleted cultures responded to increasing GLU with synchronized dynamics, leading to a greater "area under the curve" (AUC) for intracellular calcium over time. The AUC determined if the neuron would respond dynamically to the next addition of glutamate. This observation was not displayed within cultures high in glia, where AUC returned to baseline with every GLU addition, regardless of order of addition. Furthermore, the 3-group stimulus resulted in decreasing average AUC, regardless of order. In contrast, for cultures depleted of glia, the deciding factor of a responding cell to dynamically respond to GLU additions depended on the ability of the cell to distribute the calcium load (AUC) of the prior addition. Determining how neurons respond and behave such as in the presence of functional or dysfunctional glia, may help our understanding of signal processing in the brain.

Speaker Publications:

1. "Implications of ethnic nationalism: The Niger delta region of Nigeria as a case study"; International Journal of Peace and Development Studies, 2016, 7(7):69-75.

12th World Congress on Neuropharmacology; Webinar; June 29-30, 2020.

Abstract Citation:

Olayinka Sulaiman, Use of Randomized Submaximal Glutamate Stimulus to Interpret Glial Effects on Neuronal Potassium Dynamics a pilot study, Euro Neuropharmacology 2020, 12th World Congress on Neuropharmacology; Webinar; June 29-30, 2020.

(https://neuro.pharmaceuticalconferences.com/europe/abstract/2020/use-of-randomized-submaximal-glutamate-stimulus-to-interpret-glial-effects-on-neuronal-potasium-dynamics-a-pilot-study)