Quantitative Biology > Neurons and Cognition

A Mathematical model for Astrocytes mediated LTP at Single Hippocampal Synapses

Shivendra Tewari, Kaushik Majumdar

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Many contemporary studies have shown that astrocytes play a significant role in modulating both short and long form of synaptic plasticity. There are very few experimental models which elucidate the role of astrocyte over Long-term Potentiation (LTP). Recently, Perea & Araque (2007) demonstrated a role of astrocytes in induction of LTP at single hippocampal synapses. They suggested a purely pre-synaptic basis for induction of this N-methyl-D- Aspartate (NMDA) Receptor-independent LTP. Also, the mechanisms underlying this pre-synaptic induction were not investigated. Here, in this article, we propose a mathematical model for astrocyte modulated LTP which successfully emulates the experimental findings of Perea & Araque (2007). Our study suggests the role of retrograde messengers, possibly Nitric Oxide (NO), for this pre-synaptically modulated LTP.

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