

1 **Nitric Oxide Modulates NMDA Receptor Through a Negative Feedback Mechanism and**  
2 **Regulates the Dynamical Behavior of Neuronal Postsynaptic Components**

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5 **Abstract**

6 Nitric oxide (NO) is known to be an important regulator of neurological processes in the central  
7 nervous system which acts directly on the presynaptic neuron and enhances the release of  
8 neurotransmitters like glutamate into the synaptic cleft. Calcium influx activates a cascade of  
9 biochemical reactions to influence the production of nitric oxide in the postsynaptic neuron.  
10 This has been modeled in the present work as a system of ordinary differential equations, to  
11 explore the dynamics of the interacting components and predict the dynamical behavior of the  
12 postsynaptic neuron. It has been hypothesized that nitric oxide modulates the NMDA receptor  
13 *via* a feedback mechanism and regulates the dynamic behavior of postsynaptic components.  
14 Results obtained by numerical analyses indicate that the biochemical system is stimulus-  
15 dependent and shows oscillations of calcium and other components within a limited range of  
16 concentration. Some of the parameters such as stimulus strength, extracellular calcium  
17 concentration, and rate of nitric oxide feedback are crucial for the dynamics of the components  
18 in the postsynaptic neuron.

19 **Keywords**

20 Synaptic plasticity; Biochemical oscillations; Limit cycle; Nitric oxide; Feedback; Calcium  
21 oscillations; Homeostasis

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