

Synaptic Plasticity II

Lecture #5

Expression of Long Term Plasticity

$$S \propto N_s \cdot p_r \cdot q$$

$$q \propto N_{ch} \cdot \gamma (V - V_r) \cdot p_o (NT)$$

$$[Ca] \propto p_o (NMDAR)$$

- Presynaptic Mechanisms – The concentration of transmitters in synaptic cleft
 - probability of release
 - filling of vesicle
 - diffusion of transmitters in synaptic cleft
 - Retrograde Messages
 1. NO, CO, Neurotrophins
- Postsynaptic Mechanisms – The number and properties of postsynaptic receptors
 - insertion of new receptor
 - gating of existing receptor
- Number of Synapses
 - Synapse formation or elimination

Signal Transduction Pathways that Transfer Local Ca⁺⁺ Influx into Long-Term Synaptic Modification

- Protein Kinases and Phosphatases
- Regulation of gene expression

Mechanisms of Protein Synthesis-Dependent Long Term Synaptic Plasticity

- Long-term expression of synaptic plasticity requires protein synthesis
- How to achieve input specificity?

Background Reading

(Engert et al., 2002; Lichtman and Colman, 2000; Malinow and Malenka, 2002; Martin et al., 2000; Poo, 2001; Renger et al., 2001; Trachtenberg et al., 2002)

Paper for discussion 1:

(Lee et al., 2002)

(Renger et al., 2001)

Paper for discussion 2:

(Markram et al., 1997)

(Liao et al., 1995)

Paper for discussion 3:

(Trachtenberg et al., 2002)

(Engert et al., 2002)

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