

Patterns of neurotransmitter receptor distributions following cortical spreading depression

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Abstract

Spreading depression (SD), a self-propagating depolarization of neurons and glia, is believed to play a role in different neurological disorders including migraine aura and acute brain ischaemia. Initiation and propagation of SD modulate excitability of neuronal network. A brief period of excitation heralds SD which is immediately followed first by prolonged nerve cell depression and later by an excitatory phase. The aim of the present study was to characterize local and remote transmitter receptor changes after propagation of cortical SD. Quantitative receptor autoradiography was used to assess 16 transmitter receptor types in combined striatum/hippocampus-cortex slices of the rat 1 h after induction of cortical SD. In neocortical tissues, local increases of glutamate NMDA, AMPA, and kainate receptor binding sites were observed. In addition to up-regulation of ionotropic glutamate receptors, receptor binding sites of GABA_A, muscarinic M₁ and M₂, adrenergic α₁ and α₂, and serotonergic 5-HT₁ receptors were increased in the hippocampus. Cortical SD also upregulated NMDA, AMPA, kainate, GABA_A, serotonergic 5-HT₁, adrenergic α₁ and dopaminergic D₁ receptor binding sites in the striatum. These findings indicate selective changes in several receptors binding sites both in cortical and subcortical regions by SD which may explain delayed excitatory phase after SD. Mapping of receptor changes by cortical SD increases our understanding of the mechanism of SD action in associated neurological disorders. © 2009 IBRO.

Reaxys Database Information

Author keywords

Autoradiography; Epilepsy; Migraine headache; Stroke; Transmitter density

Indexed Keywords

EMTREE drug terms: ε aminobutyric acid A receptor; ε aminobutyric acid B receptor; adenosine A₁ receptor; alpha₁ adrenergic receptor; alpha₂ adrenergic receptor; AMPA receptor; dopamine₁ receptor; dopamine₂ receptor; glutamate receptor; ionotropic receptor; kainic acid receptor; muscarinic M₁ receptor; muscarinic M₂ receptor; muscarinic M₃ receptor; n methyl dextro aspartic acid receptor; neurotransmitter receptor; nicotinic receptor; serotonin_{1A} receptor; serotonin_{1B} receptor

EMTREE medical terms: animal tissue; article; autoradiography; binding site; brain cortex; brain region; brain slice; controlled study; corpus striatum; hippocampus; neocortex; nonhuman; priority journal; protein localization; quantitative analysis; rat; receptor binding; receptor upregulation; spreading cortical depression; subcortex

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