epileptogenic process by counteracting the SE-induced alteration of sodium channel properties. Thus, the suppression of thrombin receptor activity after primary damage to the central nervous system can serve as a powerful mechanism for preventing the occurrence of acute seizures as well as the development of chronic epilepsy later in life.

Keywords: epilepsy, seizure, thrombin, protease-activated receptor 1, blood-brain barrier, sodium channel

EFFECT OF MILD ACIDIFICATION ON GABAERGIC SYNAPTIC TRANSMISSION IN HIPPOCAMPAL CELL CULTURE

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Acidification of extracellular medium affects multiple molecular targets, in particular, it activates and consequently desensitizes ASICs. Thus, it may be expected that there are some similarities between effects of a prolonged acidification and blockers of ASICs (given that the latter are specific). We have recently reported that several blockers of ASICs affect GABAergic synaptic transmission in hippocampal cell cultures, to further verify specificity of the effects, in our present work we studied effects of mild (to pH 6.7) and prolonged (tens of seconds) acidification, which should not strongly affect other molecular targets because of it mildness, but does desensitize ASIC1A channels. We found that similarly to the effects of blockers of ASICs, mild acidification differentially affects GABAergic currents, recorded below their reversal potential as inward currents, and recorded above their reversal potential as outward ones. Thus, these results further confirm the specificity of the blockers of ASICs on GABAergic synaptic transmission.

Keywords: acidification, GABAergic, ASICs

TEMPERATURE-DEPENDENT EFFECTS OF TRP-TYPE CONDUCTIVITY ON OSCILLATORY ELECTRICAL PROCESSES IN ISOLATED DENDRITIC COMPARTMENT OF HIPPOCAMPALCA3 PYRAMIDAL NEURON

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Dendrites of hippocampal CA3 pyramidal cells (PCs) contain voltage-dependent ion channels of different type significantly influencing patterns of the action potentials (APs). Roles of particular type channels in generation of CA3 PCs output signal were explored in experimental and simulation studies. However, unexplored remains the role of non-specific cationic current-conducting TRP-type channels recently found in hippocampal neurons. This simulation study performed in NEURON simulation environment aimed at defining temperature-dependent effects of TRP-channels on electrical processes in the dendritic membrane of CA3 PCs. The aim is justified by characteristic thermosensitivity of the TRP-channels found in the hippocampus. The object of study was a single-compartment model of the dendritic membrane with ion

channels of the same types as in earlier CA3 PC models (Migliore et al.,1995) and TRP-channels present in a hippocampal granule neuron model (Korogod & Demianenko, 2016). Intrinsic oscillations of the membrane potential (periodical depolarization spikes) were induced by steady depolarizing currents or by introducing constant excitatory synaptic conductivity. The oscillations frequency was defined at different TRP-conductivity values (expression of TRP-channels) and synaptic conductivity (intensity of tonic synaptic excitation) for the temperatures ranging from 37 C° (normothermia) to 20 C° (deep focal therapeutic hypothermia used to suppress drug-resistant epileptic foci often located in the hippocampus). The oscillations frequency increased with increasing synaptic and/or TRP-conductivityat given temperatures and decreased with cooling for any combination of the conductivities. Similar to low-temperature effects on simulated granule cell firing (Korogod & Demianenko, 2016) the most prominent suppression of the oscillatory activity of CA3 PC dendritic compartmentwas observed in the range of temperatures, in which the low-temperature deactivation of TRP-channels took place. In view of such dendritic membrane properties, temperature effects on AP firing patterns in CA3 PCs supplemented with TRP-channels deserve systematic detailed studies.

Keywords: computational neuroscience, CA3 pyramidal neuron, single compartment model, TRP-type conductivity

ARGININE-RICH PEPTIDES INHIBIT NMDA RECEPTORS- AND ASIC1A - MEDIATED CURRENTS: POSSIBLE ROLE IN NEUROPROTECTION

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Modern trends of neuroprotective therapeutic drug development for traumatic brain injury consider arginine-rich peptides as a new and promising class of neuroprotective agents (Meloni B.P., 2016). Arginine-rich peptides, particularly poly-arginine peptides, have been shown to have highly potent neuroprotective effects in various in vitro and in vivo models of ischaemic stroke. However, the molecular mechanisms involved in neuroprotection are still poorly highlighted. In this study, we focus on the main ionotropic receptor/ion channel subtypes implicated in excitotoxic cell death – NMDA receptors and ASIC1a which are highly permeable to Ca^{2+}.Whole-cell patch clamp technique was used to study the effect of basic peptides on NMDA receptors in acutely isolated CA1 hippocampal neurons and hASIC1a expressed at HEK293 cells. In the present study we were testing a set of peptides: TAT47–58, poly-arginine peptides (R9 and R13) which have highly neuroprotective effect and alternative basic peptides H9 and K9 with minimal neuroprotection in excitotoxicity models. We found that exogenous peptide R9 effective blocked NMDA receptor-mediated current in a concentration-dependent manner: IC50=9.6±0.7nM. At the same time, H9 or K9 (in concentration up to 100nM) do not inhibit NMDA receptors. We show that an increase in the number of arginine amino acid residues in the peptide chain (R13) potentiates the inhibition of NMDA receptor-mediated current. The other widely studied arginine-rich peptide, TAT47-58, also reduces NMDA receptor current but with less potency than