DIFFERENT ROLE OF NMDA RECEPTORS IN THE ROSTRAL AND CAUDAL PART OF THALAMIC RETICULAR NUCLEUS IN A RAT MODEL OF ABSENCE EPILEPSY, THE WAG/RIJ RAT

Citraro Rita[1], Marra R[2]., Scicchitano F[1]., Russo E[1]., Ferreri Ibbadu G[1]., De Sarro G[1].

[1]Section of Pharmacology, Department of Experimental and Clinical Medicine, Faculty of Medicine and Surgery, University of Catanzaro, Italy, [2]ISBAF CNR, Department of Pharmacology, Faculty of Pharmacy, University of Catanzaro, Catanzaro, Italy.

Oscillations in the cortico-thalamic circuit, involving the somatosensory cortex and the reticular thalamic nucleus (NRT) interconnected with thalamic relay nuclei, are considered to underlie the generation and maintenance of absence epileptic activity(1). The NRT nucleus is not homogeneous but organized into separate sectors that have functionally distinct afferent and efferent connections with thalamic nuclei and cortical areas. The caudal parts of the NRT (cNRT) have connections with the somatosensory cortex and the thalamic ventrobasal nucleus, whereas the rostral part (rNRT) is connected to motor and limbic areas of cortex and thalamus(2). The aim of the present study was to investigate the effect of focal injections of NMDA and the NMDA receptor antagonist, 3,3-(2-carboxypiperazine-4-yl)-propyl-1-phosphonate (CPP), into the rNRT and cNRT, on spike-and-wave discharges (SWDs) in genetic absence epilepsy rats (WAG/Rij). Animals were equipped with frontoparietal cortical electrodes and bilateral guide cannulae in order to evaluate the effects of both drugs on the number and duration of spike-wave discharges (SWDs) on the electrocorticogram (EEG)(3). The EEG quantification of absence seizures was based on the number and the duration of SWDs, as previously described(3). Microinjections of NMDA (0.2-1nmol/0.5µl) into the rNRT induced a significant ($P<0.01$) decrease in the number and duration of SWDs (at all doses up to 60-120 min) and the appearance of single SWD with decreased duration and behavioral hyperactivity were observed, whereas administration of the same doses of NMDA into the cNRT significantly ($P<0.05$) decreased the number of SWDs but increased their duration at 30-60 min after administration (at all doses). Injection of CPP (5-20 pmol/0.5µl) into both the rNRT and cNRT, induced a significant reduction ($P<0.05$) in the number and duration of SWDs only at the doses of 10 and 20 pmol. In conclusion, injections of NMDA and CPP into the rNRT and cNRT induced typical EEG effects. In particular, appearance of single SWD and decrease in duration of SWDs were detected after administration of NMDA into the rNRT but not into the caudal part. Our data also show that NMDA neurotransmission may play an important role in the control of genetically determinate absence seizures in the Wag/Rij rat depending on the area of the NRT considered.

[1]Meeren H., van Luijtelaar G., Lopes da Silva F. et al. (2005). Arch. Neurol. 62:371-376.
[2]Aker RG, Özyurta HB, Yananli HR., Çakmakb YÖ. et al. (2006). Brain Res. 1111:213-221.
[3]Russo E., Constanti A., Ferreri G., Citraro R., De Sarro G. (2004). Neuropharm. 46:865-78.