HOMOCYSTEINE INDUCED AN INCREASE OF ABSENCE SEIZURES IN THE ELECTROCOGRAPHIC PATTERN OF WAG/RIJ RAT

Ferreri Ibbadu Guido[1], Citraro R[1]., Marra R[2]., Siniscalchi A[1,3]., Russo E[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, [3]Depatment of Neuroscience, Annunziata Hospital, Cosenza, Italy.

Homocysteine, a naturally occurring amino acid, has been shown to induce seizures in adult[(1-2)] as well as in immature experimental animals[(3)] but its mechanism of action is not yet clear. In immature rats, the seizures induced by homocysteine can be attenuated or completely prevented both by NMDA and non-NMDA receptor antagonist[(4)], thus, suggesting interaction of homocysteine with NMDA [(5)] or glutamate(AMPA) receptors[(6).]

In our experiment, we used adult rats Wag/Rij, a genetic animal model of absence epilepsy, and non-epileptic ACI rats. WAG/Rij rats exhibit strong and frequent spike-wave discharges (SWDs), 3–4 Hz, at the electrocorticogram (EEG) recording, making them suitable and well established animal models for studies on human absence epilepsy [(7).] The ACI strain was used as a control: rats of this strain have no or only very few SWD and, in all cases, much less than WAG/Rij rats of the same age. Therefore, they are commonly used as control of absence epileptic WAG/Rij rats [(8)].

In order to evalutate the effects of homocysteine thiolactone (HTL) on the number and duration of SWDs in the EEG, rats of both strains were implanted, under chloral hydrate anaesthesia (400 mg/kg i.p.; Carlo Erba, Milan, Italy), using a Kopf stereotaxic instrument, with cortical electrodes for the EEG recording and guide cannulae for intracerebroventricular (i.c.v.) administration. Rats were observed for a period of 5-h EEG recording; during each session rats received i.c.v. either vehicle (0.9% NaCl) or drug (HTL; 200, 100 and 50nM/1µl) after a 60 min baseline recording. The i.c.v microinjection of HTL, at all doses, was able to dose-dependently increase the number and duration of SWDs in WAG/Rij rat in comparison to baseline recording. Whereas the microinjection of similar doses of HTL in ACI rat did not induce significant changes in comparison to baseline recording.

We suggest that the icv microinjection of HTL was able to increase in a dose-dependent manner both number and duration of SWDs in WAG/Rij strain only whereas analogous treatment was unable to significantly modify EEG activity in ACI rats.

1. Freed WJ. 1985. Selective inhibition of homocysteine-induced seizures by glutamic acid diethyl ester and other glutamate esters. Epilepsia. Jan-Feb;26(1):30-6.
2. Sprince H, Parker CM, Josephs JA Jr. 1969. Homocysteine-induced convulsions in the rat: protection by homoserine, serine, betaine, glycine and glucose. Agents Actions. Jul;1(1):9-13. No abstract available.
3. Kubova H, Folbergrova J, Mares P. 1995. Seizures induced by homocysteine in rats during ontogenesis. Epilepsia. Aug;36(8):750-6.
4. Folbergrova J.Life Sci. 1997. Anticonvulsant action of both NMDA and non-NMDA receptor antagonists against seizures induced by homocysteine in immature rats. Exp Neurol. Jun;145(2 Pt 1):442-50.
5. Folbergrova J. 1994. NMDA and not non-NMDA receptor antagonists are protective against seizures induced by homocysteine in neonatal rats. Exp Neurol. Dec;130(2):344-50.
6. Wuerthele SE, Yasuda RP, Freed WJ, Hoffer BJ. 1982. The effect of local application of homocysteine on neuronal activity in the central nervous system of the rat. Dec 13;31(24):2683-91.
7. Coenen, A.M., van Luijtelaar, E.L., 2003. Genetic animal models for absence epilepsy: a review of the WAG/Rij strain of rats. Behavior Genetics 33, 635-655.
8. Inoue, M., Peeters, B.W., van Luijtelaar, E.L., Vossen, J.M., Coenen, A.M., 1990. Spontaneous occurrence of spikeewave discharges in five inbred strains of rats. Physiology and Behaviour 48, 199-201.