Neuroprotection of Guanosine in mitochondrial samples of hippocampus and córtex subjected to a traumatic brain injury

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INTRODUCTION: Traumatic brain injury (TBI) is caused by a blow or jolt to the head or a penetrating head injury that disrupts the normal function of the brain. Thus, mitochondria appear to play a critical role in the secondary injury that occurs after TBI, and mitochondrial dysfunction has been shown to be involved in excitatory amino acid (EAA)-induced neurotoxicity (Jiang, et al., 2001; Finkel, 2001). Guanosine and guanine nucleotides have been implicated in neuroprotection by modulation of glutamatergic system. The objective of the study was to evaluate whether treatment with guanosine was able to avoid the damage of mitochondrial brain regions undergoing a TBI. MATERIAL AND METHODS: The animals were anesthetized, the cannula was placed over the craniotomy with dental cement and the TBI were realized (D’Ambrosio et al. 2004). The treatment with Guanosine (GUO) 7,5mg/Kg injected intraperitoneally began 15 min after TBI. The animals were sacrificed, the brain was removed and the structures (hippocampus and cerebral cortex) were separated. Slices and mitochondria preparation (Sims, et al., 1990) were performed on isolated structures. The evaluation of glutamate uptake (Frizzo, et al., 2002), mitochondrial swelling (Votyakova & Reynolds, 2005) and glutathione levels (GSH/GSSG) (Hissin & Hilf, 1976) were carried out. DISCUSSION AND RESULTS: TBI group demonstrated a significant decrease in glutamate uptake and GSH/GSSG levels and a significant increase of mitochondrial swelling. However, the GUO treatment shows a complete recovery of the parameters analyzed in the hippocampus and partially in the cortex as compared to control group. CONCLUSION: In conclusion, we can observe that guanosine was able to prevent oxidative damage in mitochondrial of hippocampus and partially in the cortex. Furthermore, it prevented the decrease of glutamate uptake and the swelling in the hippocampus and cortex, probably because of the characteristic property of guanosine to modulate the glutamate uptake by astrocytes.

Keywords: brain mitochondria, traumatic brain injury, guanosine, glutamatergic system
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