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CHARACTERIZATION OF INTERNEURON POPULATIONS IN PILOCARPINE-INDUCED TEMPORAL LOBE EPILEPSY

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Background: Epileptic seizures are clinical manifestations of neuronal discharges produced by the hyperexcitation and/or excessive synchronization of neurons in the central nervous system. The causes of the morphological changes, as well as their timing are only partially described. The aim of the study is to detect the underlining neuronal loss in the hippocampus, with emphasis on the identification of interneuron populations involved in hyperexcitability during seizures; we also aim to quantify the changes that may appear in the perisomatic and dendritic inhibitory interneuron populations. **Material and methods:** In order to study the morphofunctional changes in rat hippocampus we used a model of drug induced epilepsy. First, scopolamine was administered to juvenile male Wistar rats, in order to reduce the peripheral effects of the muscarinic agonist. Then we injected pilocarpine, which induced status epilepticus. Later the seizures were stopped with Diazepam in an attempt to reduce the mortality rate. The surviving animals were monitored continuously using a motion-detection video system. We focused on detection of spontaneous recurrent seizures (SRS), which are characteristic to the model. After the appearance of the SRS animals were sacrificed, the removed brain was sectioned and we used Nissl staining as well as triple immunohistochemical labeling to differentiate the interneuron subtypes based on their neurochemical content. **Results:** Layer thickness and length of stratum oriens and radiatum-lacunosum-moleculare decreased significantly (50%, $p < 0.01$). Perisomatic interneurons and axo-axonic cells did not show any change. We observed a significant loss of oriens-lacunosum moleculare (O-LM) interneurons. The bistratified interneurons were not affected. Neither of these interneuron cell deaths showed any correlation with spontaneous seizure frequency. **Conclusions:** The significant loss of O-LM cells may increase hyperexcitability. Preserved perisomatic inhibition coupled with modified dendritic inhibition can be observed leading to large scale synchronization and propagation of excitation to the neocortex with consecutive SRS.

Keywords: hippocampus, pilocarpine, epilepsy, rat, interneuron