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Enhanced Excitability of the Neonatal Rat Hippocampus After Acute Exposure to Ethanol

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Abstract

© 2016, Springer Science+Business Media New York.Enhanced excitability manifested by seizures and epilepsy is one of the characteristic features of the fetal alcohol spectrum disorders (FASD). Here, we examined network excitability using a high-potassium model in the hippocampal slices prepared from the postnatal days of P7–9 rats treated with ethanol. Ethanol was administered at 6 g/kg intraperitoneally 12 h before the slice preparation. The extracellular field potential recordings from the hippocampal slices using multishank silicon probes placed along CA3-CA1 axis were performed in the interface chamber. We found that elevation of the extracellular potassium from 3.5 to 6 mM evoked seizure-like clonic or tonic-clonic discharges in 77 % of the slices from the ethanol-treated animals and only in 15 % of the slices from the control animals. Further elevation of the extracellular potassium to 8.5 mM evoked epileptiform activity in 92 and 69 % of the slices from the ethanol-treated and the control animals, respectively. The current source density profile and the multiple unit activity analysis pointed on the CA3 hippocampal region as a generator of the epileptiform activity. Thus, the hippocampal slices from the ethanol-treated neonatal rats display enhanced excitability and could serve as a FASD model to study the early epileptiform transformations following exposure to ethanol.

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Keywords

Alcoholism, Fetal alcohol syndrome, Hippocampus, Neonate, Seizure

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