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PERINATAL EXPOSURE TO ALCOHOL DISTURBS SPATIAL LEARNING AND GLUTAMATERGIC NEUROTRANSMISSION IN THE HIPPOCAMPUS

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Introduction: Perinatal exposure to alcohol (PEA) induces general developmental and specific neuropsychiatric disturbances in association with disturbed synaptic plasticity and functions of the amino acid neurotransmitter glutamate.

Objective: We were interested in effects of ethanol during the terminal neurodevelopmental differentiation on glutamatergic neurotransmission.

Aims: To establish an animal model based on vapor chamber exposure and to assess the expression of vGluT1, EAAT1 to 4, NMDA receptor (NR) subunits 1, 2A to D and NR binding with 3H-labeled MK 801.

Methods: After delivery, female Wistar Han outbred rats (N=4) and their pups were exposed until postnatal day 8 (P8). At the age of 5 months, the animals were behaviorally characterized. Both, at P8 and after the testing we performed in situ-hybridizations receptor binding assays.

Results: PEA-pubs showed a pronounced and highly significant retardation of body weight and length. Behavioral testing revealed no differences in locomotion and anxiety (open field and elevated plus maze) as well as T-maze-learning, but significantly impaired hippocampus-dependent spatial learning (MWM). We observed significant inductions of vGluT1, EAAT1, EAAT3, NR2A, 2B, 2C and 2D, as well as trends of increased NR1 mRNA. NR binding was found increased in hippocampus (P8) and parietal cortex (P8 and 5M).

Conclusions: The observed inductions of glial glutamate transporters validate previous in vitro data. Altered glutamatergic neurotransmission in general might be considered a molecular correlate of the learning deficit in our PEA model. This further supports the glutamatergic theory of PEA and suggests new targets for therapeutic interventions.

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