

NMR-based metabonomic in hippocampus, nucleus accumbens and prefrontal cortex of methamphetamine-sensitized rats

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¹H NMR spectroscopy was applied to investigate the changes of cerebral metabolites in brain hippocampus, nucleus accumbens (NAC) and prefrontal cortex (PFC) of the rats subjected to subcutaneous twice-daily injections of 2.5 mg/kg methamphetamine (MAP) for 7 days. The results indicated that MAP exposure induced significant behavioral sensitization and altered cerebral metabolites in rats. The neurotransmitters glutamate, glutamine and GABA significantly decreased in hippocampus, NAC and PFC. Specifically, increased succinic acid semialdehyde, a metabolism product of GABA, was observed in hippocampus. Additionally, decreased serotonin was observed in both NAC and PFC, whereas decreased dopamine was only observed in NAC after repeated MAP treatment. Glutathione obviously decreased in above brain regions, whereas acetylcystein declined in hippocampus and NAC and taurine declined in NAC and PFC. Homocysteic acid was elevated in hippocampus and NAC by repeated MAP administration. Membrane ingredients like phosphocholine elevated in response to MAP administration in NAC and PFC. N-Acetyl-aspartate, a marker of neuronal viability, decreased in the three regions; however, myo-inositol, a glial cell marker, increased in hippocampus and PFC. Tricarboxylic acid cycle intermediate products, such as α -ketoglutarate, succinate, citrate and the methionine significantly decreased in above three brain regions after MAP administration; however, ADP decreased in hippocampus. These results indicate that repeated MAP treatment causes neurotransmitters disturbance, imbalance between oxidative stress and antioxidants, and gliosis in hippocampus, NAC and PFC of brain. Profound metabolic changes detected across brain regions provide the first evidence of metabonomic changes in MAP-induced sensitized rats.

Biography

Lei Lv is pursuing his Ph.D degree in State Key Lab of Biotherapy, Sichuan University. His research interest is psychopharmacology and safety evaluation of drugs.

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