

Abstract

Introduction: Pyrethroids' pesticides which effect on brain functions such as anxiety and memory have been demonstrated. However, cypermethrin (CYP) effect on cognition and related molecular mechanisms are not clearly understood. Here, we examined the CYP effects on anxiety-like behaviors, memory impairment, and alternations of oxidative stress factors, inflammation, expression of brain derived neurotrophic factor (BDNF), and cholinesterase activity (ChE) in the hippocampus and plasma in CYP exposed rats.

Materials and methods: Twenty-four male Wistar rats were randomly divided into three groups (N=8 in each group) including control, CYP (2mg/kg/day), and CYP (4mg/kg/day) in which CYP was administrated orally based on weight changes for 30 days. The elevated plus maze (EPM), open field Maze (OFM) and novel object recognition memory (NORM) tests were conducted. Then, at the end of the behavioral tests, we evaluated glycogen synthase kinase-3 beta (GSK-3 β), malondialdehyde (MDA) and carbonyl levels as oxidative stress factors, nuclear factor kappa B (NF- κ B), interleukin-1 β (IL-1 β), tumor necrosis factor- α (TNF- α), ChE activity, and BDNF levels on both hippocampus and plasma.

Results: CYP (4mg/kg/day) increased anxiety like behavior in the EPM and OFM tests ($P \leq 0.001$, $P \leq 0.05$), while CYP (2mg/kg/day) did not have any significant effect. Also, CYP (4mg/kg/day) impaired the cognitive memory in NORM test and there was a decrease in discrimination ratio. ($P \leq 0.01$). Finally, we found that TBARS and GSK-3 β levels increased in CYP (4mg/kg/day) compared to control rats. In contrast carbonyl did not alter in the CYP treated groups significantly. CYP (4mg/kg/day) significantly increased IL-1 β and TNF- α ($P \leq 0.01$), whereas both doses of CYP significantly increased NF- κ B in comparison control group ($P \leq 0.01$, $P \leq 0.001$ respectively). Furthermore, CYP (4mg/kg/day) affected BDNF levels in both plasma and hippocampus and that was significant ($P \leq 0.05$).

Conclusion: In conclusion, CYP impaired learning and memory through provoking the oxidative stress, inflammation, and caused mental disorders. It is worth noting that these disorders were visible in both doses 2 and 4 mg/kg/day. But, the dose of 4 mg/kg was more dangerous.

Key words: Cypermethrin, Neurotoxicity, Oxidative Stress