Neonatal exposure to single PTZ induced enhancement of proliferation of neural progenitors in hippocampus and anxiety-like behavior

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Abstract: Objective The dentate gyrus (DG) of the hippocampus is one of a few regions occurred ongoing neurogenesis in the adult mammalian brain including human beings. Aberrant adult DG neurogenesis has been identified in pentylenetetrazol (PTZ) kindling epilepsy model, is implicated in behavioral and cognitive deficits. Hippocampus is extremely susceptible to neurotoxic chemicals exposure particularly during the critical phase of DG development. However, data on acute PTZ exposure during early postnatal life on the hippocampal neurogenesis and long-lasting behavior are scarce. Methods Mice were treated with acute PTZ on postnatal day 7 to evaluate its effects on proliferation of neural progenitors in DG at P8, dendrite development of granule cells in DG at P14 and behavioral functions in the adults. Results Acute PTZ treatment in neonates induced abnormal hippocampus neurogenesis, characterized by increased the proliferation of neural progenitors in the hilus. Furthermore, acute PTZ exposure resulted in a reduction in total dendritic spines on the granular neurons of the DG, due to a significant decrease in densities of mushroom and stubby spine. Behavioral assay showed that acute PTZ exposure in neonates resulted in anxiety-like behavior accompanied with slight cognitive deficits in adults. Conclusion Aberrant hippocampal neurogenesis plays a major role in associated anxiety-like behavior on mice suffered from early-life exposure to PTZ.

Key words: pentylenetetrazol; seizure; hippocampus; neurogenesis; anxiety