

The effects of vitamin D (calcitriol) on learning, memory, Pain threshold and brain derived neurotrophic factor (BDNF) expression in hippocampal formation following chemotherapy with cisplatin in adult rats

Abstract

Background: Chemotherapy-induced cognitive impairment such as memory impairment and concentration problems is now extensively recognized as side effects of chemotherapy. These problems reduce the quality of life in patients.

Aim: the present study aims to examine the neuroprotective effects of calcitriol supplementation on cognitive impairment, behavioral deficits, and hippocampal brain-derived neurotrophic factor (BDNF) changes in cisplatin-exposed rats.

Materials & Methods: The neuroprotective effect of calcitriol (100ng/kg/day for 5 weeks) was examined for its neuroprotective influences through the changes in BDNF level, passive avoidance, and recognition memory tasks in cisplatin-treated rats. We also determined the impact of cisplatin (5 mg/kg/week for 5 consecutive weeks) and calcitriol administration on reaction time against the thermal stimulus.

Results: Our findings showed that treatment of rats with cisplatin impaired performance in the passive avoidance and novel object recognition tasks which are indicating cognitive deficits. Co-administration of calcitriol prevented these cisplatin-induced cognitive impairments.

Cisplatin exposure also resulted in enhanced reaction time to the thermal stimulus. Besides, hippocampal BDNF levels were reduced in cisplatin-treated rats; however, calcitriol alleviated these effects of cisplatin and up-regulated BDNF mRNA in the hippocampus. In addition, calcitriol alone indicated a significant change in BDNF level compared to the control group.

Conclusion: We conclude that increased hippocampal BDNF mediates the protective effects of calcitriol against neurotoxicity in cisplatin-exposed rats. However, further studies are required to explore the other mechanisms that mediate the protective effect of calcitriol.

Keywords: Cisplatin, Calcitriol (Vitamin D), Cognitive impairment, Pain threshold , BDNF