Vitamin D Administration Improves Brain Redox Status in Rats

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INTRODUCTION: Although vitamin D is classically connected to regulation of plasma calcium, recently it has been related to brain health, being considered a neurosteroid. The enzymes required to synthesize calcitriol and the nuclear receptor (VDR) are present in the brain. Our objective was to determine the redox status of cerebral cortex and hippocampus from rats subjected to vitamin D administration.

MATERIAL AND METHODS: During 21 days, vitamin D3 (5,000 or 30,000IU) was administered to male adult Wistar rats, by gavage. Twelve hours after the last administration, animals were sacrificed, and cerebral cortex and hippocampus were dissected. Samples were used to determine oxidation of dichlorofluorescein, thiobarbituric acid reactive substances, carbonyl content, reduced glutathione, and the activities of superoxide-dismutase, glutathione-peroxidase, and catalase. Project was approved by ethics committee (Nº20613).

RESULTS AND DISCUSSION: Results in cerebral cortex demonstrated reduced production of reactive species in animals treated with vitamin (30,000IU). Rat cerebral cortex and hippocampus presented a reduction on lipid peroxidation and carbonyl content in both groups (vitamin 5,000 and 30,000 IU). In addition, hippocampus presented an increment in superoxide-dismutase activity, although the ratio superoxide-dismutase/catalase + glutathione-peroxidase was not altered. In cerebral cortex we verified an increase in glutathione levels, and a reduction on catalase and glutathione-peroxidase activities, without unbalancing the ratio of antioxidant enzymes in rats treated with 30,000IU. Our data indicated that vitamin D modulated antioxidant enzymes, and reduced lipid and protein oxidation, even in high doses as 30,000IU. On the other hand, administration of 5,000IU protects the tissue from reactive species damage, without affect antioxidant parameters.

CONCLUSIONS: Vitamin D alters the brain redox state, in a dose-dependent manner, where 5,000IU appear to protect the brain, while 30,000IU may unbalance antioxidant defenses, at least in cerebral cortex. Our data reinforce the importance of control vitamin D supplementation increasingly widespread among healthy population.

Keywords: Antioxidant, Redox, Vitamin.

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