



Methylphenidate Hydrochloride Overdose Induces Liver Damage in Rats: The Evaluation of Histopathology and Some Antioxidant Enzymes Biomarkers

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Abstract | Background: The drug of choice for the treatment of attention deficit hyperactivity disorder is Methylphenidate hydrochloride (MPH) or Ritalin (the commercial name). **Objective:** The effects of MPH on adult male rats have been evaluated in this study. **Materials and methods:** receiving an oral dose (2 daily MPH doses), represented by Group 1 (5 mg/kg/day in a 5% glucose solution), Group 2 received daily dosages of methylphenidate in escalating amounts (5, 8, 12, and 16 mg/kg/day in a 5% of sucrose solution), as well as Group 3 as control animals (5% glucose solution). Group 1 resembled the therapeutic doses administered to humans, while Group 2 simulated the wrong use of some of the human addicts. 30 days after the last Ritalin dose administration, the rats were all sacrificed, and blood and liver tissues were collected for biochemical and histological analysis. **Results:** Comparison to the Control Group, the ratio of ALT in the blood serum significantly increased in groups 1 and 2 of MPH-treated rats, meanwhile, the ratio of AST remained unchanged significantly in Group 1. In the liver, MDA and GSH-PX rates were significantly increased ($P \leq 0.05$) in 1 and 2 groups compared to the 3 groups (the control), while SOD level significantly rises only in Group 2, also did not appear MPO values any Significant alteration throughout the experiment. While, the histology alterations revealed different levels of significant damage in the liver, represented in group 1 by slight damage, mainly, congestion of the central vein, hepatocytes degeneration, nuclei pyknotic, sinusoids dilation, and slight inflammation, while group 2 revealed severe damage mainly, lost the typical polymeric shape, hepatocytes alteration, hepatocytes vacuoles, necrotic foci, inflammation cells aggregation, sever dilated and congestion of sinusoids and nucleus pyknotic. **Conclusion:** These findings demonstrated that the MPH overdose induced free radical-mediated oxidative stress, through an increase of antioxidant enzymes and histological alterations in the liver.

Keywords | Methylphenidate hydrochloride, Liver Damage, Rats, Histopathology, Antioxidant Enzymes

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INTRODUCTION

Anxiolytics, opioid analgesics, and stimulants such as methylphenidate hydrochloride and alprazolam in particular have seen a considerable rise in abuse over the

past ten years, around the globe, although the European Medicines Agency's Committee for Medicinal Products concluded in 2009 that there was a lack of information regarding methylphenidate hydrochloride side effects in long-term overdoses EMA, (2009). However, these drugs