Original Article

Amelioration Effect of Zinc and Iron Supplementation on Selected Oxidative Stress Enzymes in Liver and Kidney of Cadmium-Treated Male Albino Rat

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ABSTRACT

Cadmium (Cd) is a highly toxic, nonessential heavy metal with many industrial uses that can contribute to a well-defined spectrum of diseases in animals as well as in humans. The present study examines the effect of zinc (Zn) and iron (Fe) supplementation on oxidative stress enzymes in Cd-treated rats. Wistar strain male albino rats were treated with cadmium chloride ($CdCl_2$) at a dose of $1/10^{th}$ LD_{50}/48 h, that is, 22.5 mg/kg body weight for 7, 15, and 30 days (d) time intervals. The 15d Cd-treated rats were divided into three groups. The first group received Zn (12 mg/kg), second group Fe (40 mg/kg) alone, and third group supplemented with both Zn and Fe and observed for 7, 15, and 30d. After the specific time intervals, rats were decapitated and oxidative stress enzymes like catalase (CAT), superoxide dismutase (SOD), glutathione peroxidase (GPx) and glutathione S-transferase (GST) were assayed in liver and kidney. Simultaneously lipid peroxidation (LPO) levels were also measured. A significant elevation in LPO levels with decreased activity levels of CAT, SOD, GPx, and GST were observed during Cd intoxication. With Zn and/or Fe supplementation, a significant reversal in the oxidative stress enzymes was observed. Our study reveals that combination of Zn and Fe supplementation is effective in detoxifying the Cd body burden from the test tissues.

Key words: Cadmium, kidney, liver, oxidative stress, rat, trace elements supplementation

INTRODUCTION

Cadmium (Cd) is one of the most dangerous occupational and environmental pollutants, arising primarily from battery, electroplating, pigment, plastics, fertilizer industries, and cigarette smoke. It is an earth's crust natural element and found in drinking water, atmospheric air, and even in food (Moulis and Thevenod, 2010; Obaiah *et al.*, 2013). Cd exposure has been recognized to result in a wide variety of cellular responses, oxidative stress, and body weight loss. Over the past 2 centuries, anthropogenic and industrial activities have led to high emissions of Cd into the environment at concentrations significantly exceeding those originating from natural sources (Jarup and Akesson, 2009; Cuypers *et al.*, 2010; Dzugan *et al.*, 2011; Nakamura *et al.*, 2012). It has a

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