Research Article

Antioxidant Effect of Alpha Lipoic Acid on Hepatotoxicity Induced by Aluminium Chloride in Rats

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ABSTRACT

The present study was planned to investigate the ameliorative effects of α-lipoic acid (α-LA) supplementation against aluminium chloride ($AlCl_3$) induced hepatotoxicity in rats. The results showed that rats consuming diets with $AlCl_3$ added had poor growth performance, and most serum hematological indexes were significantly altered compared to the control. Biochemical results showed that lipid peroxidation increased significantly in Al-treated rats, as evidenced by high liver malondialdehyde (MDA) levels. Alteration of the antioxidant system in treated group was confirmed by the significant decline of superoxide dismutase (SOD), catalase (CAT), glutathione peroxidase (GPx) activities and reduced glutathione (GSH) content in liver. Moreover, $AlCl_3$ exposure induced an increase in the activities of the aspartate transaminase (AST), alanine transaminase (ALT), lactate deshydrogenase (LDH) and bilirubin levels, while albumin and total protein were significantly decreased. These results strongly suggest that aluminium affected antioxidant defence system and both haematological and biochemical parameters, co-administration of α-lipoic acid exerted a protective effect against aluminium induced oxidative stress.

Keywords: Aluminium chloride, Alpha-lipoic acid, Biochemical studies, Liver, Oxidative stress, Rat.

INTRODUCTION

Aluminium is very abundant metal in the earth's crust which constitutes 8.13%. It is a constituent of cooking utensils, medicines such as antacids, cosmetics such as deodorants, and food additives. Also it can be found in food especially corn, yellow cheese, salt, herbs, spices and tea. In addition, aluminium salts are widely used as flocculants in the treatment of drinking water for purification purposes.[1,2] Considering the large utilisation of aluminium in different fields, many available data reported that aluminium exposure increased recently, which have allowed its easy access into the body via gastrointestinal tract and lung tissue.[3] A several authors indicate that an excessive and prolonged aluminium exposure affects directly haematological and biochemical parameters, disturbs lipid peroxidation and attenuate the activities of the antioxidant enzymes in plasma and tissues of animals models especially rats and rabbits.[2,4,5] This impairment of the physiological prooxidant/antioxidant balance causes oxidative stress.

Lipoic acid (1, 2-dithiolane-3-pentanoic acid, LA) has been known for a long time as a cofactor of α-ketoacid dehydrogenases.[6,7] This compound is found naturally in our diets but it is synthesized in human cells. In vivo lipoic acid is rapidly converted into its reduced form, dihydrolipoic acid (DHLA).[8,10] Recent studies demonstrated that LA and dihydrolipoic acid can act as potent antioxidants. They can scavenge a number of free radicals both in hydrophilic and lipophilic phases of cell.[11,12] In addition, they were found to be capable of regenerating endogenous antioxidants in the body including Vitamin C, Vitamin E and intracellular reduced glutathione, therefore it has been proposed that both LA and dihydrolipoic acid are a therapeutic agents in the prevention or treatment of pathological conditions mediated via oxidative stress.[13,14] Because of the health problems induced by many environmental pollutants, much effort has been expended in evaluating the relative antioxidant potency of α-LA. Consequently, this study aimed to evaluate (i) the influence whether $AlCl_3$ induced hematological and biochemical perturbations in rats and (ii) the protective role of α-LA in alleviating the detrimental effect of $AlCl_3$ induced toxicity.

MATERIALS AND METHODS

Chemicals

All chemicals used in this study were purchased from Sigma chemical co. (USA).

Animals and experimental procedure

12 rats weighing around 235 ± 10 g were obtained from Pasteur institute (Algiers, Algeria). Animals were acclimated for 2 weeks under the same laboratory conditions of photoperiod (12-h light: 12-h dark cycle), a minimum relative humidity of 40% and room temperature 23±2°C. Food (standard diet, supplied by the "ONAB, El-Harrouch", Algeria) and water were available *ad libitum*. The animals were randomized into three groups of 6 animals each.

- Group **(A, Control group):** served as control rats which received standard diet.

- Group **(B, $AlCl_3$-treated group):** received only $AlCl_3$ (34 mg/kg bw administered in the diet).