Tetrahydrocurcumin Alleviates Lead and Cadmium-Induced Vascular Dysfunction and Oxidative Stress in Rats

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Introduction and Objective: Toxic metal-induced oxidative stress, vascular dysfunction and subsequently hypertension have been associated with cardiovascular mortality. Chronic exposure to low-level of lead (Pb) and/or cadmium (Cd) causes adverse health effects. Tetrahydrocurcumin (THU) appears to be, useful for scavenging of reactive oxygen species and exerting the vasculoprotective effects. Since there is lack of information about the effect of THU on vascular protection in heavy metal-intoxicated condition, the present study was designed to evaluate whether supplementation of THU could alleviate oxidative stress and improve vascular function in rats exposed to low level of Pb and/or Cd.

Methods: Low dose of lead acetate (100 mg/L) and/or cadmium chloride (10 mg/L) were administered via drinking water to male Sprague-Dawley rats for sixteen weeks (n=8/group). THU at dose of 50 mg/kg/day was intragastrically administered for the last four weeks of experiments. After sixteen weeks, blood pressure, vascular responsiveness, aortic superoxide anion, oxidative stress markers, eNOS, iNOS and p47phox protein expressions were measured.

Results: Pb and/or Cd induced hypertension and vascular dysfunction in rats by increasing arterial blood pressure and attenuating vascular responses to vasoactive agents. A down-regulation of endothelial nitric oxide synthase (eNOS) and up-regulation of inducible nitric oxide synthase (iNOS) and phagocyte NADPH oxidase (p47phox) were also found in rats exposed to these toxic metals ($p<0.05$). Moreover, Pb and/or Cd increased vascular superoxide production and lipid peroxidation concurrent with a reduction in GSH. Interestingly, THU at tested dose reduced blood pressure, improved vascular responsiveness and decreased oxidative stress in rats exposed to metals. These ameliorating effects of THU are concomitant with a restoration of eNOS, iNOS and p47phox expressions.

Conclusion: Results of this study suggest that supplementation with THU effectively improved vascular function and attenuated oxidative stress in rats exposed to lead and/or cadmium.

Keywords: Tetrahydrocurcumin, Vascular dysfunction, Oxidative stress, Lead, Cadmium