Protective effects of early administration of alpha-lipoic acid against lipopolysaccharide-induced plasma lipid peroxidation

Beata Skibska, Grażyna Józefowicz-Okonkwo, Anna Gorąca

Chair of Experimental and Clinical Physiology, Department of Cardiovascular Physiology, Medical University of Łódź, Mazowiecka 6/8, PL 90-215 Łódź, Poland

Correspondence: Anna Gorąca, e-mail: agoraca@zdr.am.umed.lodz.pl

Abstract:
Lipopolysaccharide (LPS), called endotoxin, is a major component of Gram-negative bacteria cell wall. LPS stimulates the synthesis and release of several metabolites from mammalian phagocytes which leads to fulminant systemic inflammation (endotoxic shock). Among LPS-induced metabolites, reactive oxygen species are considered to play crucial role in the pathogenesis of endotoxic shock via oxidative stress generation. In this study, the effect of early administration of antioxidant α-lipoic acid (LA) on plasma lipid peroxidation and total antioxidant blood capacity was evaluated in endotoxic shock in rats. Lipid peroxidation was measured as plasma thiobarbituric acid reactive substances (TBARS) levels, while total blood antioxidant capacity was assessed as ferric reducing ability of plasma (FRAP). The endotoxic shock was induced by administration of LPS (Escherichia coli 026:B6, 30 mg/kg, iv) in anesthetized rats. Then, 30 min later, animals were treated intravenously (iv) with LA at 60 mg/kg. After 5 h observation animals were killed and blood from heart was taken for TBARS and FRAP measurements. LPS injected to saline-pretreated animals resulted in development of oxidative stress indicated by significant increases in plasma TBARS and significant decrease in total antioxidant capacity of plasma. Conversely, LA injected to saline pretreated animals caused an increase in FRAP values and the decrease in TBARS levels. The administration of LA 0.5 h after LPS challenge resulted in an increase in FRAP values and decrease in plasma lipid peroxidation as compared to LPS group. Moreover, the levels of TBARS and FRAP in LPS + LA group were similar to those observed in LA group.
In conclusion, our present study demonstrates that early treatment with LA significantly protects against endotoxin-induced oxidative stress in rats.

Key words:
oxidative stress, lipoic acid, lipopolysaccharide