Putative anti-inflammatory, antioxidant, and anti-apoptotic roles of the natural tissue guardian methyl palmitate against isoproterenol-induced myocardial injury in rats

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Abstract

Background: Myocardial injury is considered as a worldwide main cause of morbidity and mortality. The present
study aimed to investigate the probable cardioprotective activity of the naturally occurring endogenous fatty acid
ester methyl palmitate (MP) against isoproterenol (ISO)-induced myocardial injury in rats and the possible
underlying molecular mechanisms. The study was carried out in two consecutive sets of experiments; the first set
screened the cardioprotective dose of MP in ISO-intoxicated rats. In the second set, forty male Sprague Dawley rats
received either MP (150 mg/kg, p.o) three times/week for 2 weeks and/or 2 consecutive doses of ISO separated by
24 h (85 mg/kg, s.c) on the 13th and 14th days. Different cardiotoxicity and oxidative stress markers were assessed.
Furthermore, endothelial nitric oxide synthase (eNOS) levels were determined. For detection of apoptosis, Bax, Bcl-2,
and caspase 3 were estimated. To assess inflammation, toll-like receptor 4 (TLR-4) and tumor necrosis factor-alpha
(TNF-Ů) were measured using ELISA. Meanwhile, nuclear factor kappa B (NF-kB) and cyclooxygenase-2 (COX-2) were
detected immunohistochemically.
Results: Pretreatment with MP significantly ameliorated the cardiotoxicity and oxidative stress markers. It also
markedly elevated eNOS content, decreased apoptotic marker expression, and mitigated TLR-4 activation and other
inflammatory markers. Electrocardiography and histopathological examination also confirmed the cardioprotective
effect of MP.
Conclusion: The findings of this study indicated that MP possesses a potent cardioprotective activity against ISOinduced
myocardial injury through its significant antioxidant, anti-apoptotic, anti-inflammatory, and vasodilatation
activities.
Keywords: Myocardial injury, Methyl palmitate, ISO, Oxidative stress, eNOS, Apoptosis, TLR-4, Inflammation