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Physiological and Histological Impact of Alpha-Lipoic Acid on Myocardial Ischemia Induced by Salbutamol in Rats

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Abstract | The current study focused on whether alpha-lipoic acid affected cardiac markers and the lipid profile of myocardial ischemia brought by salbutamol. Three groups of eighteen adult rats were randomly assigned. Oral gavage was used to provide treatments; the heart ischemia was induced with 80 mg/kg salbutamol for two days. Animals in the positive control received salbutamol, or received salbutamol (80 mg/kg orally) for 2 consecutive days and then received ALA (20 mg/kg orally) for 28 days. Then rats were sacrificed for cardiac markers, lipid profiles, and ALT and AST analyses were evaluated. According to the experiment's findings, alpha-lipoic acid supplementation significantly reduced cardiac troponin I, creatine kinase-MB, lipid profile (TC, TG, LDL, VLDL) and ALT and AST. Interestingly, a significant increase in HDL level was observed. Additionally, it significantly improves the histological changes in the heart muscle caused by salbutamol. The study concluded that alpha-lipoic acid has ameliorative effects against salbutamol-induced myocardial ischemia in experimental animals.

Keywords | Alpha-lipoic acid, Salbutamol, Myocardial ischemia, Cardiac markers, Rat

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INTRODUCTION

Cardiovascular disease (CVD) is a major cause of death and morbidity rates and remains a major global health concern. The conditions that fall under the category of CVD are hypertension, arrhythmia, ischemic heart disease (IHD), congestive heart disease, valvular heart disease, heart failure, and stroke. An imbalance between coronary perfusion and oxygen demand causes IHD, a significant form of CVD, which frequently results in myocardial infarction (MI) from prolonged oxygen deprivation. IHD, as a consequence of which myocardial tissue and contractile force are lost, is among the most frequent reasons for cardiac failure (Schwinger, 2021).

Animal models play a vital role in developing novel medications for controlling and treating a wide range of illnesses. An established standard model to investigate the beneficial effects of medicinal herbs on heart dysfunction is chemically induced myocardial ischemia in rats (Janssen and Elnakish, 2019). Catecholamines are a powerful inducer of cardiac contractility in animal models and can cause ischemia, hypoxia, myocardial hyperactivity, and coronary hypertension when administered at high doses (Ahsan *et al.*, 2020). To induce myocardial ischemia in the animal model, Salbutamol has been used. Salbutamol is a synthetic catecholamine; its structural resemblance to isoproterenol and its manner of action cause significant oxidative stress in the heart, leading to severe myocardial