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Assessment of benzene induced oxidative impairment in rat isolated pancreatic islets and effect on insulin secretion

Haji Bahadar^a, Faheem Maqbool^a, Sara Mostafalou^b, Maryam Baeri^a, Mahban Rahimifard^c, Mona Navaei-Nigjeh^c, Mohammad Abdollahi^{a,c,*}

^a Pharmaceutical Sciences Research Center, Tehran University of Medical Sciences, International Campus, Tehran, Iran

^b School of Pharmacy, Ardebil University of Medical Sciences, Ardebil, Iran

^c Department of Toxicology and Pharmacology, Faculty of Pharmacy, Tehran University of Medical Sciences, Tehran, Iran

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ABSTRACT

Benzene (C₆H₆) is an organic compound used in petrochemicals and numerous other industries. It is abundantly released to our environment as a chemical pollutant causing widespread human exposure. This study mainly focused on benzene induced toxicity on rat pancreatic islets with respect to oxidative damage, insulin secretion and glucokinase (GK) activity. Benzene was dissolved in corn oil and administered orally at doses 200, 400 and 800 mg/kg/day, for 4 weeks. In rats, benzene significantly raised the concentration of plasma insulin. Also the effect of benzene on the release of glucose-induced insulin was pronounced in isolated islets. Benzene caused oxidative DNA damage and lipid peroxidation, and also reduced the cell viability and total thiols groups, in the islets of exposed rats.

In conclusion, the current study revealed that pancreatic glucose metabolism is susceptible to benzene toxicity and the resultant oxidative stress could lead to functional abnormalities in the pancreas.

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1. Introduction

Benzene (C₆H₆) is an organic compound, used as an industrial solvent and a component of petrochemicals. It is one of the environmental contaminants released from various sources affecting human life. Refined petroleum products generally contain benzene 2–3% by volume. But in certain regions of the world, the use of benzene in petrochemicals has reached to more than 5% by volume (Verma and Tombe, 2002; Karakitsios

et al., 2007). Release of benzene in our environment takes place from industrial wastes, combustion of petrochemicals, and cigarette smoke. Its absorption takes place from all natural routes and rapidly metabolized in the liver and bone marrow. And the resultant toxic metabolites and free radicals cause various lethal effects on the body (Travis et al., 1990; Bahadar et al., 2014a).

Free radicals and reactive oxygen species (ROS) have been thought as important physiological mediators playing an

* Corresponding author at: Department of Toxicology and Pharmacology, Faculty of Pharmacy and Pharmaceutical Sciences Research Center, Tehran University of Medical Sciences, Tehran 1417614411, Iran. Tel./fax: +98 21 66959104.

E-mail addresses: Mohammad.Abdollahi@UToronto.Ca, Mohammad@TUMS.Ac.Ir (M. Abdollahi).

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