

**The Protective and Preventive Role of Coenzyme
Q10 on the Hepatotoxicity Induced by Exposure to
Radiation and Paracetamol in Experimental
Animals**

Thesis

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Abstract

The present study was designed to illustrate the protective and therapeutic effect of coenzyme Q10 (40 mg/kg b.wt day other day for one week) in male rats treated with repeated doses of acetaminophen (200 mg / kg b.wt) daily for 14 days and/or exposed to fractionated doses of γ -irradiation (2Gy day other day up to 6 Gy).

Such effect was evaluated by measuring the activities of the most important free radical scavengers of the antioxidant defense system including reduced glutathione (GSH) in blood, glutathione-S-transferase (GST), superoxide dismutase (SOD), nitric oxide (NO) as well as malondialdehyde content (MDA) as an indicator of lipid peroxidation, in plasma.

Hepatocellular damage was evaluated by aspartate aminotransferase (AST), alanine aminotransferase (ALT) and lactate dehydrogenase (LDH). DNA fragmentation was determined in liver tissue homogenate of all groups, besides the histological and histochemical analyses.

The results of the present study revealed that AAP and γ -irradiation (individually or cooperated) have shown increases in ALT and AST activities, as well as NO and

MDA levels and decreases in antioxidants SOD and GSH in addition to GST. Moreover, γ -radiation alone or together with AAP represented some increase in LDH activity, while a reduction in LDH activity was noticed with AAP alone. DNA fragmentation showed mild increase with AAP and γ -radiation (alone or combined), the histological and histochemical analyses confirmed the biochemical results.

Pre and post treatments with CoQ10 ameliorated most of the investigated biochemical parameters and showed development in liver structure and even normal appearance of liver tissue sections histologically.

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LIST OF ABBREVIATIONS

AAP	Acetaminophen(paracetamol)
ADP	Adenosin diphosphate
AIDS	Acquired immune deficiency disease
ALT	Alanine transaminase
AST	Aspartate transaminase
As	Absorbance of the standard sample
At	Absorbance of the test sample
ATP	Adenosin tri-phosphate
b.Wt.	Body weight
Ca ⁺²	Calcium ion
CDNB	1-chloro-2,4-dinitrobenzen
CoQ10	Coenzyme Q10 (Ubiquinone)
CoQ10H	Semiquinone (ubisemiquinone)
CoQ10H2	Ubiquinol
CuZnSOD	Copper zinc superoxide dismutase
DNA	Deoxyribonucleic acid
DNPH	Dinitrophenyl hydrazine
DSBs	Double-strand breaks
DTNB	5, 5'-dithio- bis (2-nitrobenzoic acid)
e ⁻	Electron
EDTA	Ethylene diamine tetra acetic acid
ETC	Electron transport chain
FDA	Food and Drug Administration of USA
FeSOD	Iron superoxide dismutase
GIT	Gastrointestinal tract
GSH	Reduced glutathione
GS	Glutathione synthase
GSSG	Oxidized glutathione
GST	Glutathione-S-transferase

Gy	Gray (unit of radiation)
H ⁺	Proton
H ₂ O ₂	Hydrogen peroxide
HC	Hyperchromatisation
HCL	Hydrochloric acid
HMG-COA	3 Hydroxy-methyl glutaryl coenzyme
IgG	Immunoglobulin G
IL-10	Interleukin 10
IL-1 β	Interleukin 1 beta.
INF-gamma	Interferon gamma
iNOS	Inducible nitric oxide synthase
I.P	Interperitoneal
IR	Irradiated group
LDH	Lactate dehydrogenase
LDL	Low density lipoprotein
LP	Lipid peroxidation
MDA	Malondialdehyde
Mg ²	Magnesium ion
MnSOD	Manganese superoxide dismutase
MPT	mitochondrial permeability transition
NAD	Nicotinamide adenine dinucleotide
NADH	Nicotinamide adenine dinucleotide (reduced form)
NADPH	Nicotinamide adenine dinucleotide phosphate
NAPQI	N-acetyl-p-benzoquinone imine
NE	Nuclear enlargement
NBT	nitroblue tetrazolium
NF-κB	Nuclear factor –kappa B

NO	Nitric oxide
NO _x	nitrite /nitrate
O ₂ ^{•-}	Superoxide
OH [•]	Hydroxyl radical
ONOO ⁻	Peroxynitrite
O.D.	Optical density
Pi	Phosphate
RBCs	Red blood corpuscles
RILD	Radiation-induced-liver-disease
RNA	Ribonucleic acid
ROS	Reactive oxygen species
r.p.m	Rotation per minute
-SH	Sulfhydryl group
SOD	Superoxide dismutase
SSBs	Single strand breaks
TBA	Thiobarbituric acid
TCA	Trichloroacetic acid
TNF- α	Tumor necrosis factor alpha
TQ10	Total Q10
VCL ₃	Vanadium trichloride
VLDL	Very low density lipoproteins
DPN	Diphenyl amine

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