بسم الله الرحمن الرحيم

MONA MAGHRABY

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

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شبكة المعلومات الجامعية

التوثيق الإلكتروني والميكروفيلم

جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

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MONA MAGHRABY

The Protective Role of Chitosan Nanoparticles Against Hepatic Inflammation Induced in Rats

Thesis Submitted by

Enas Abdel Moniem Mohamed
(M.Sc. in Biochemistry, 2016)

For the Award of the Degree of Doctor of Philosophy in Biochemistry

Under Supervision of

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2021


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Approval sheet

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Declaration

This thesis has not been submitted for a degree at this or any other university.

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ACKNOWLEDGEMENTs

First of all, cordial thankfulness to ***"Allah"*** who enabled me to finish this piece of work appropriately.

I would like to express my deep appreciation and gratitude to ***Prof. Dr. Ahmed M. Salem***, Professor of Biochemistry, Faculty of Science, Ain Shams University, for his consistent supervision, constructive suggestions and meticulous scientific help.

My deepest appreciation and thanks are offered to ***Dr. Mahmoud M. Said***, Professor of Biochemistry, Faculty of Science, Ain Shams University, for his great support, helpful advice, valuable technical assistance and fruitful comments.

Words are not enough and fail to express my deep thanks and gratitude to ***Dr. Nashwa K. Ibrahim***, Professor of Biochemistry, Atomic Energy Authority, for her valuable encouragement, sincere guidance and wholehearted support throughout this work.

I take this opportunity to express my profound gratitude to ***Dr. Ahmed Mohamed Elbarbary,*** Assistant Prof., Polymer Chemistry Department, National Center for Radiation Research and Technology, Atomic Energy Authority, for the preparation of nanostructured oligochitosan.

Also thanks are due to ***Dr. Nashat M. M. Abd Alaty,*** Lecturer of Medicinal Chemistry, Nuclear Materials Authority**,** for his support during this work.

Finally, I would like to express my deep thanks to ***Prof. Dr. Adel Baker Kolosy,*** Professor of Pathology, Faculty of Veterinary Medicine, Cairo University, for conducting histopathological examination.

The Protective Role of Chitosan Nanoparticles Against Hepatic Inflammation Induced in Rats

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ABSTRACT

The current study was undertaken to investigate the hepatoprotective potential of nanostructured oligochitosan (NOC) against the synergistic toxic effects of γ-irradiation exposure and carbon tetrachloride (CCl_4) intoxication in male rats. A total of 64 adult male Sprague-Dawley rats were equally allocated into eight groups; control, NOC-administered, γ-irradiated, CCl_4-intoxicated, NOC-pretreated γ-irradiated, NOC-pretreated CCl_4-intoxicated, γ-irradiated and CCl_4-intoxicated, NOC-pretreated CCl_4-intoxicated and γ-irradiated. Dynamic light scattering (DLS) and transmission electron microscopy (TEM) results demonstrated that the oligochitosan prepared by exposure to gamma irradiation was in the range of nanoparticles. A synergistic hepatotoxic effect was demonstrated following the exposure of rats to γ-irradiation and CCl_4 intoxication, along with the induction of oxidative stress, inflammation and apoptosis. NOC was able to protect the hepatocytes from the combined toxic insult through suppressing lipid and protein oxidations, maintaining hepatic functions, downregulating the expression of some inflammatory genes, including nuclear factor kappa B (NF-κB) and interleukin 1 beta (IL-1β), as well as enhancing the expression of the antiapoptotic Bcl2 gene as well as suppressing the proapoptotic Bax gene expression. Histological findings of

liver tissues verified the biochemical and molecular data. The study clarified some of the molecular mechanisms by which NOC protects the liver against the synergistic toxic effect of γ-irradiation and CCl_4.

KEYWORDS: Oligochitosan, nanostructures, γ-irradiation, CCl_4, rats, liver

CONTENTS

LIST of ABBREVIATIONS

Abbreviation		Full name
ALB	:	Albumin
ALP	:	Alkaline phosphatase
ALT	:	Alanine aminotransferase
ANOVA	:	one-way analysis of variance
AST	:	Aspartate aminotransferase
ATP	:	Adenosine triphosphate
BAK	:	Bcl2 homologous antagonist killer
Bax	:	Bcl2-associated X protein
Bcl2	:	B-cell lymphoma-2 protein family
BH3	:	Proteins inhibit the antiapoptotic Bcl2
CCl_4	:	Carbon tetrachloride
$CCl_3^{\bullet}$	:	Trichloromethyl
$Cl_3COO^{\bullet}$	:	Trichloromethyl peroxide radicals
COX-2	:	Cyclooxygenase-2
DB	:	Direct bilirubin
DLS	:	Dynamic light scattering
DNA	:	Deoxyribonucleic acid
DNPH	:	2,4-dinitrophenylhydrazine
DPPH	:	2,2-diphenyl-1-picrylhydrazyl hydrate
ECM	:	Extracellular matrix
FDA	:	The United States Food and Drug Administration
FT-IR	:	Fourier-transform infrared
GGT	:	Gamma glutamyl transferase
GLO	:	Globulin
H_2O_2	:	Hydrogen peroxide
$HO\cdot$	:	Hydroxyl radicals
$HO_2^{\bullet}$	:	Hydroperoxyl radical
HCC	:	Hepatocellular carcinoma
HSC	:	Hepatic stellate cells