



شبكة المعلومات الجامعية
التوثيق الإلكتروني والميكروفيلم

بسم الله الرحمن الرحيم



MONA MAGHRABY



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شبكة المعلومات الجامعية التوثيق الإلكتروني والميكروفيلم



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جامعة عين شمس

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

Thesis Submitted by
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(M.Sc. in Biochemistry, 2016)

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

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2021





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

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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- κ B) and interleukin 1 beta (IL-1 β), 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

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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 ·	: Trichloromethyl
Cl ₃ COO·	: 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 ₂ O ₂	: Hydrogen peroxide
HO·	: Hydroxyl radicals
HO ₂ ·	: Hydroperoxyl radical
HCC	: Hepatocellular carcinoma
HSC	: Hepatic stellate cells