



بسم الله الرحمن الرحيم

∞∞∞∞

تم رفع هذه الرسالة بواسطة / سلوي محمود عقل

بقسم التوثيق الإلكتروني بمركز الشبكات وتكنولوجيا المعلومات دون أدنى

مسئولية عن محتوى هذه الرسالة.

ملاحظات: لا يوجد





Faculty of Women for Arts,
Science & Education
Department of Zoology

The Potential Role of Mesenchymal Stem Cells and *Beta vulgaris* (Beetroot) in the Treatment of Cisplatin-Induced Nephrotoxicity in Adult Male Rats.

A thesis submitted for the degree of Ph.D. in Zoology
(Histology and Histochemistry)

By

Wafaa Ahmed Mohammed Morsy

Assistant Lecturer in Zoology Department
Faculty of Women for Arts, Science & Education,
Ain Shams University.

Under Supervision of

Prof. Dr. Shadia Mohamed Kadry

Professor of Histology and Histochemistry.
Zoology Department, Faculty of Women for Arts, Science and
Education, Ain Shams University.

Dr. Bosy Azmy Abd El Motelp

Assist.Prof. of Physiology.
Zoology Department, Faculty of Women for Arts, Science and
Education, Ain Shams University.

Dr. Marwa Tarek Ibrahim Hassen

Lecturer of Histology and Histochemistry.
Zoology Department, Faculty of Women for Arts, Science and
Education, Ain Shams University.

2022

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

يَرْفَعُ اللَّهُ الَّذِينَ آمَنُوا
مِنْكُمْ وَالَّذِينَ أُوتُوا الْعِلْمَ
دَرَجَاتٍ وَاللَّهُ بِمَا تَعْمَلُونَ
خَبِيرٌ
صَدَقَ اللَّهُ الْعَظِيمُ

سورة المجادلة

الآية 11



Faculty of Women for Arts,
Science & Education
Department of Zoology

QUALIFICATIONS

Name: Wafaa Ahmed Mohammed Morsy

Scientific Degree: M. Sc. of Science in Zoology.

Department: Zoology

College: Faculty of Women for Arts, Science & Education

University: Ain Shams University

B. Sc. Graduation year: 2013

M. Sc. Graduation year: 2018



Faculty of Women for Arts,
Science & Education
Department of Zoology

APPROVAL SHEET

Name: Wafaa Ahmed Mohammed Morsy

Title: The Potential Role of Mesenchymal Stem Cells and *Beta vulgaris* (Beetroot) in the Treatment of Cisplatin-Induced Nephrotoxicity in Adult Male Rats.

Scientific Degree: Ph.D. in Zoology (Histology and Histochemistry).

Board of Scientific Supervisors

Prof.Dr. Shadia Mohamed Kadry

Prof. of Histology and Histochemistry,
Zoology Department, Faculty of Women
for Arts, Science and Education,
Ain Shams University.

Dr. Bosy Azmy Abd El Motelp

Assist. Prof. of Physiology, Zoology
Department, Faculty of Women for Arts,
Science and Education,
Ain Shams University.

Dr. Marwa Tarek Ibrahim

Lecturer of Histology and Histochemistry,
Zoology Department, Faculty of Women
for Arts, Science and Education,
Ain Shams University.

ACKNOWLEDGEMENT

Thanks is directed first and always to *ALLAH*, who gave me strength and provided me with power to present this work in acceptable form and introduced me to the best people who helped in initiating and completing this work.

I would like to express my sincere gratitude and grateful acknowledgement to **Prof. Dr. Shadia Mohamed Kadry**, prof. of Histology and Histochemistry- Zoology department- Faculty of women for Arts, Science and Education- Ain Shams University for her patience, thoughtfulness, guidance, close supervision, helpful and fruitful advice, encouragement during the preparation of this work. For that, I am eternally grateful for her sincere guidance.

I am especially indebted to **Dr. Bosy Azmy Abd El Motelep**, Assist. prof. of physiology- Zoology department- Faculty of women for Arts, Science and Education- Ain Shams University for her great support, honest guiding, encouragement during this work and reading and revising this thesis.

It is my pleasure to express my great thanks and deepest to **Dr. Marwa tarek**, Histology and Histochemistry- Zoology department- Faculty of women for Arts, Science and Education- Ain Shams University for her good management of any problem, sincere help in the practical part and following me step by step till finishing this work.

Let me also express my indeed thanks to all the staff members of Zoology Department, Women ` College- Ain Shams University for providing me with a good atmosphere to work.

Finally, this thesis is dedicated to my family for their invaluable helps, continual encouragements, and molar support. Many thanks for helping me.

ABSTRACT

Abstract

Cisplatin (Cis) is the most effective antineoplastic therapy however, its common adverse effect is nephrotoxicity. Mesenchymal stem cells (MSCs) have the ability to home to damaged tissue sites, differentiate into tissue-specific cells and producing growth factors. MSCs have immunomodulatory properties and regard as antiapoptotic and anti-inflammatory. *Beta vulgaris* or beetroot (Br) is used as an antioxidant, anti-inflammatory therefore, it presents protection against the oxidative stress and inflammation. The current study was established to investigate whether MSCs and Br, either alone or in combination, could alleviate Cis- induced nephrotoxicity in adult male rats.

Sixty male albino rats were divided into six groups. Group 1 (control): Rats received orally 0.9% saline for 6 weeks. Group 2 (Br): Rats received Br (500 mg/kg b.wt./day) orally for 6 weeks by oral intubation. Group 3 (Cis): Rats received Cis (7 mg/kg b.wt.) intraperitoneally once a week for two weeks. Group 4 (Cis + Br): Rats received Cis then treated with Br (500 mg/kg b.wt./ day). Group 5 (Cis + MSCs): Rats received Cis then treated with a single intravenous injection of MSCs (1×10^6 cell in PBS). Group 6 (Cis + MSCs + Br): Rats received Cis then treated with both MSCs and Br at the same manner and dosage as mentioned before.

The results of the present study revealed that Cis decreased the mean final body weight, CAT, SOD, GSH, Bcl2, EGF, VEGF and increased creat, UA, urea, BUN and MDA.

The histological studies showed that the Cis administration induced deleterious alterations in the renal tissue as Bowman's space enlargement, shrinkage of glomeruli with vascular congestion and brush border loss in the proximal tubular cells. Necrotic area was encountered in different regions in the tubular cells, karyolysis, karyorrhexis and inflammatory cell infiltration. Vacuolated cytoplasm and hyaline cast in the tubules.

The histochemical studies revealed that Cis decreased the total protein content in the tissue. On the other hand, the results of immune-histochemical studies showed that Cis increased the rate of inflammation and apoptosis while, the rate of the cell division and anti-inflammation decreased. Such results were detected by TNF- α , TUNEL, PCNA and IL-10 staining, respectively.

In contrast, the results showed that the Cis group treated with MSCs alone or in combination with Br resulted in an increase in body weight. The biochemical analysis showed significant improvement in creat, UA, urea, BUN, SOD, GSH, CAT, MDA, Bcl2, EGF and VEGF levels.

The histological and histochemical studies showed that treatment with MSCs or/and Br results in an improvement of the tissue of the kidney and total protein content as well as, the results of immune-histochemical