Women's College for Arts,
Science and Education
Zoology Department

Histological Alterations and Physiological Regulation of Coenzyme Q10 and Alpha Lipoic acid on Heart-FABP and Cardiac Membrane Bounding ATP-ase Activities in Obese Hypertensive Rats

A Thesis submitted
In partial fulfillment for the requirement of the degree
of M.Sc. in Zoology

By
Mona Fathy Shawky Nasr
Demonstrator in Zoology Department
Women's College for Arts, Science and Education
Ain Shams University

Under
Supervision of

***Prof*. Dr. Sanaa M. Rifaat Wahba**
Professor of Histology & Histochemistry
Zoology Department
Women's College for Arts, Science and Education
Ain Shams University

***Prof*. Dr. Mohamed Islam Heibashy**
Professor of Physiology & Biochemistry
Chairman of Radioisotopes Applications Division
Nuclear Research Center
Atomic Energy Authority

(2019)

Women's College for Arts,
Science and Education
Zoology Department

APPROVAL SHEET

Name **:** Mona Fathy Shawky Nasr
Scientific Degree **:** M.Sc. Degree in Zoology
Title : Histological Alterations and Physiological Regulation of Coenzyme Q10 and Alpha Lipoic acid on Heart-FABP and Cardiac Membrane Bounding ATP-ase Activities in Obese Hypertensive Rats

Supervisors

***Prof*. Dr. Sanaa M. Rifaat Wahba**
Professor of Histology and Histochemistry
Zoology Department
Women's College for Arts, Science and Education
Ain Shams University

***Prof*. Dr. Mohamed Islam Heibashy**
Professor of Physiology & Biochemistry
Chairman of Radioisotopes Applications Division
Nuclear Research Center
Atomic Energy Authority

(2019)

QUALIFICATIONS

Name : **Mona Fathy Shawky Nasr**

Scientific Degree : **B.Sc. of Science.**

Department : **Zoology**

College : **Women's College for Arts, Science and Education**

University : **Ain Shams University**

Graduation Year : **2015**

The studied courses

Courses studied by the candidate in partial fulfillment for the requirement of M.Sc. degree in Zoology:

1. **Advanced Histology.**
2. **Advanced Physiology.**
3. **Histology (Structure and Function).**
4. **Enzyme Histochemistry.**
5. **Molecular Biology.**
6. **Ultra Structure.**
7. **Writing Scientific Research.**
8. **Ethics of Scientific Research.**

ACKNOWLEDGEMENT

*First of all, I am extremely indebted to "**ALLAH**" who gave me strength and introduced me to the best people who helped in initiating and completing this work.*

*There are no words sufficient to express my deepest gratitude to **Prof. Dr. Sanaa Mohamed Rifaat Wahba**; Professor of Histology and Histochemistry, Women's College for Arts, Science& Education, Ain Shames University for her genuine guidance, support, instructive criticism, and precious advice.*

*It is also a great pleasure to record my deep thanks to **Prof. Dr. Mohamed Islam Heibashy**; Professor of Physiology and Biochemistry, Chairman of Radioisotopes Applications Division, Nuclear Research Center, Atomic Energy Authority for her advice, deep guidance and continuous monitoring the fulfillment of thesis.*

Finally, thanks to my friends and anyone else who has been part of this journey.

Mona fathy

Dedication

To my mother,

To my sisters

And

My father

Wishing them all the best

ABSTRACT

The present study is an attempt to investigate the beneficial effect of coenzyme Q10 or/and alpha lipoic acid on some histological studies and physiological parameters of heart tissue on induced obese/hypertensive male albino rats.

Results were obtained from treated rat groups and compared with the corresponding normal control animal groups.

The present findings were then discussed in view of relevant available literature in similar fields of studies.

The following parameters were estimated:

Heart enzymes profile, cardiac biochemical markers, lipid profile and cardiac membrane bounding ATP-ase enzymes activity.

Heart albino rats were chosen for histological investigations to elucidate the impact of obesity and hypertension on heart tissue and the ameliorating effects of CoQ10 or/and ALA.

In the light of obtained results, conclusions were deducted and suggestions for further studies were introduced.

LIST OF CONTENTS

LIST OF ABBREVIATIONS

Code	Name
ACC	acetyl-CoA carboxylase
AD	Alzheimer Disease
ADMA	Asymmetric dimethyl arginine
Akt	Protein Kinase-B activity
ALA	Alpha Lipoic Acid
AMPK	Adenosine monophosphate Stimulated Protein kinase
AST	Aspartate Aminotransferase
ATGL	Adipose Triacylglycerol Lipase
ATP-ase	Adenosine triphosphate-ase
BP	Blood Pressure
Ca^{+2} ATP-ase	Calcium adenosine triphosphate enzyme activity
CHF	Congestive Heart Failure
CK	Creatine Kinase
CK_{MB}	Creatine Kinase-MB
CoQ	Ubiquinol
CoQ10	Coenzyme Q10
CPK	Creatine phosphokinase
cTn	cardiac Troponin T
CVD	Cardiovascular Disease
DALYS	disability adjusted life years
DBP	Diastolic Blood Pressure
DHLA	Dihydrolipoic Acid
DHLA	Dihydrolipoic acid
ELISA	Enzyme Linked Immunosorbent Assay
ER	Endoplasmic Reticulum
ET-1	Endothelin-1
FAS	Fatty Acid Synthase
FDA	Food and Drug Administration
GSH	Glutathione
H&E	Haematoxylin Eosin
HbA1C	Glycosylated haemoglobin

Code	Name
HDL	High Density Lipoprotein
HDL-Ch	Serum High Density Lipoprotein-Cholesterol
HF	Heart Failure
H-FABP	heart-fatty acid binding protein
HFD	High Fat Diet
HL	High lipid
HMG-CoA	3-Hydroxy-Methylglutaryl Coenzyme A
HPTA	Hypothalamus-Pituitary-Thyroid Axis
hr	hours
I.P	Intraperitonial
IBL	Immuno-Biological Laboratories
IL-6	Interlokin-6
IL-β	Interlokin-β
iNOS	Inducible Nitric Oxide Synthase
KDa	Kilodalton
LCAT	Lecithin Cholesterol Acyl Transferase
LD	Low degree of toxicity
LDH	Lactate Dehydrogenase
LDL-Ch	Serum Low Density Lipoprotein-Cholesterol
MAPK	Mitogen activated Protein Kinases
MDH	Malate Dehydrogenase
Mg^{+2}ATP-ase	Magnesium adenosine triphosphate enzyme activity
mRNA	Messenger ribonucleic acid
MS	Metabolic Syndrome
Na^{+}/K^{+}ATP-ase	Sodium potassium adenosine triphosphate enzyme activity
NaCl	Sodium Chloride
NADH	Nicotinamide Adinine Dinucleotide
NADPH	Nicotinamide Adinine Dinucleotide phosphate
NO	Nitric Oxide
NOS	Nitric Oxide Synthase
NOX	NADPH Oxidase 1
NOX1	NADPH Oxidase 1
OD	Optical Density

Code	Name
P-407	Poloxamer-407
PDC	Pyruvate Dehydrogenase Complex
PI3K	Phosphoinosotide-3 kinase
PKA	Protein Kinase A
PKB	Protein Kinase B
PKC	Protein Kinase C
PKG	Protein Kinase G
RNS	Reactive Nitrogen Species
RONS	Reactive Oxygen and Reactive Nitrogen Species
ROS	Reactive Oxygen Species
SBP	Systolic Blood Pressure
SPSS	Statistical Package for Social Science
SR-B1	Scavenger Receptor Class-B Member-1
T Ch	Serum Total Cholesterol Levels
TG	Triglycerides
TGFβ	Transforming Growth Factor β
TMB	Tetra Methyl Benzidine
TNF-α	Tumor Necrosis Factor-α
TNO	Total Nitric Oxide
VLDL	Very Low Density Lipoprotein-Cholesterol
WHO	World Health Organization

LIST OF TABLES