

## 127, 17 27, 17 (20) 77, 17 (20









### جامعة عين شمس

التوثيق الالكتروني والميكروفيلم



نقسم بللله العظيم أن المادة التي تم توثيقها وتسجيلها علي هذه الأفلام قد اعدت دون آية تغيرات



#### يجب أن

تحفظ هذه الأفلام بعيداً عن الغبار

في درجة حرارة من 15-20 مئوية ورطوبة نسبية من 20-40 %

To be kept away from dust in dry cool place of 15 – 25c and relative humidity 20-40 %



ثبكة المعلومات الجامعية





Information Netw. " Shams Children Sha شبكة المعلومات الجامعية @ ASUNET بالرسالة صفحات لم ترد بالأص

## EFFECT OF LEAD POISONING ON SOME BIOCHEMICAL PARAMETERS IN HUMAN AND RAT ERYTHROCYTES AND THE PREVENTIVE AND CURATIVE EFFECT OF Fe AND VITAMIN C

Thesis

Submitted to the

Medical Research Institute

University of Alexandria

for the requirement of

The Degree of Ph.D. of

Applied Medical Chemistry

By

#### **Amal Soliman Mohamed**

Assistant Lecturer in Biochemistry Department

Medical Research Institute Universty of Alexandria

B

1995

#### SUPERVISORS

#### Prof. Dr. Shehata M. El-Sewedy

Professor of Biochemistry

Dean of Medical Research Institute

Alexandria University

#### Prof. Dr. Mohamed I. Ramadan

Professor of Anesthesia Medical Research Institute Alexandria University

#### Prof. Dr. Mohamedain M. Mahfouz

Professor of Biochemistry Medical Research Institute Alexandria University

#### Prof. Dr. Nayer M. Abou Rawash

Professor of Biochemistry Medical Research Institute Alexandria University To my Parence
and
My Family

### acknowledgement

Thanks first and last to Allah Master of the Universe who enabled me completing this thesis.

I would like to express my deepest thanks and gratitude to professor Dr. Shehata M. El-Sewedy, professor of Biochemistry, and Dean of Medical Research Institute, Alexandria University, who devoted his valuable time, effort and care to help and supervise me going through this work and also for his extreme unlimited effort during this study.

I very much appreciate and thank deeply professor Dr. Mohamed I. Ramadan, Professor of Anesthesia, Medical Research Institute, Alexandria University, for his continuous help, encouragment, criticism and guidance throughout the whole work.

I also devote my deepest thanks and gratitude to professor Dr. Mohamedain M. Mahfouz, professor of Biochemistry, Medical Research Institude, Alexandria University, for proposing the subject of this study and for his continuous helps, precious remarks and useful detailed discussions.

I would also like to express my utmost appreciation and deepest gratitude to my professor Dr. Nayer M. Abou Rawash, professor of

Biochemistry, Medical Research Institute, Alexandria University, who have been a continuous source of help, encouragement and support at all times and gave me the chance to fully work under his supervision. I also acknowledge his helpful discussions and valuable comments on the manuscript.

I greatly acknowledge Dr. Soraya M. Dawaud, Assistant Professor of Biochemistry, Medical Reséarch Institute, Alexandria University for her help and encouragement.

I wish to express my great thanks to all staff members of Biochemistry and Applied Medical Chemistry Departments, Medical Research Institute, Alexandria University, for their kind help and cooperation.

Lastly, I like to thanks all members of my family for being to my back for years until this work has been completed.

#### CONTENTS

	i age
INTRODUCTION	
- Occupational exposure to lead.	1
- Red blood cell.	11
- Erythrocyte membrane sodium- potassium adenosine	
triphosphate (Na+/K+ ATPase).	24
- Erythrocyte membrane calcium-magnesium adenosine	÷
triphosphate ( $Ca^{2+} + Mg^{2+}$ ATPase).	30
- Lipid peroxidation.	39
- Antioxidant defense mechanism.	46
- Effects of lead on erythrocytes membrane.	53
- Effects of lead on antioxidant and lipid peroxidation.	56
- Treatment of lead poisoning.	57
AIM OF THE WORK	62
MATERIAL AND METHODS	63
- Determination of blood lead concentration.	66
- Extraction of erythrocyte lipid.	67
- Removal of non-lipid contaminants from extracts.	68
- Preparation of erythrocyte membrane.	69
- Determination of erythrocyte membrane protein.	70
- Determination of erythrocyte membrane	
total phospholipids.	72
- Determination of erythrocyte membrane ( $Ca^{2+} + Mg^{2+}$ )	+
(Na+/K+) adenosine triphosphatase activities.	75
- Separation, characterization and quantitiative	

estimation of erythrocyte phospholipids.	77
- Fatty acid analysis of erythrocyte membrane lipids.	81
- Determination of blood glutathione content.	83
- Determination of erythrocyte glutathione peroxidase	
activity.	86
- The estimation of red cell superoxide dismutase activity.	88
- Determination of lipid peroxide levels in red cell	
membrane.	. 90
RESULTS	94
DISCUSSION	171
SUMMARY AND CONCLUSION	203
REFERENCES	211
ARARIC SIIMMARY	

•

#### **ABBREVIATIONS**

**Pb:** Lead

**B**-Pb: Blood Lead

CNS: Centeral Nervous System

**IV:** Intravenous

Ca: Calcium

H<sub>2</sub>O<sub>2</sub>: Hydrogen peroxide

**GSH:** Reduced glutathione

GSSG: Oxidized glutathione

NADPH: Nicotin-amide adenine dinucleotide phosphate

NADP: Nicotin-amide adenine dinucleotide

**ATP:** adenasine triphosphate

**ADP:** adenasine diphosphate

**PUFA:** Polyunsaturated fatty acids

MDA: malonyldialdhyde

LCAT: Lecithin cholesterol acyl transferase

EDTA: ethylene diamine tetra acitic acid

BAL: Britich anti-lewisite

**GST:** glutathione transferase

# Introduction

#### INTRODUCTION

Inorganic lead is an environmental and occupational contaminant which has been a persistent source of toxicological concern in the past and continues to be at the present time. (1)

Lead (Pb) has been used for thousands of years and its toxicity has been recognized for centuries. It was only in the nineteenth century when the hazard of lead to health become well recognized e.g. in printing and pottery industries. (2) Burton, in 1840 described "The Burtonian line", a blue line on the gums, as a sign of lead absorption, and chemical methods for the detection of lead in blood or urine were further developed.

#### Occupational exposure to lead:

The highest and most prolonged exposures to Pb have been found among workers who come into contact with lead during melting, refining and, manufacturing industries.

Cable industries, chemical industry and the manufacture of electric storage batteries are responsible for the largest consumption of Pb. This industry uses both metallic Pb in the form of lead oxides and lead antimony alloy in about equal proportions. (3)

Concerning the general population, the major anthropogenic sources of Pb have been referred to canned food and auto emissions.