



faculty of Science  
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# **Physiological and Molecular Studies on the Protective Effect of Vitamin (E) and Selenium against the Toxicity of Certain Heavy Metals in Male Rabbits**

A Thesis

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By

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**بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ**

**﴿قَالُوا سُبْحَانَكَ لَا عِلْمَ لَنَا إِلَّا مَا عَلَّمْتَنَا﴾**

**﴿إِنَّكَ أَنْتَ الْعَلِيمُ الْحَكِيمُ﴾**

**صدق الله العظيم**

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## List of Abbreviations

<b>4-AP</b>	4-aminophenazone
<b>AOS</b>	Antioxidant defense system
<b>ASA</b>	American standard association
<b>A<sub>sample</sub></b>	Absorbance of sample
<b>A<sub>standard</sub></b>	Absorbance of standard
<b>ATP</b>	Adenosine triphosphate
<b>ATPase</b>	Adenosine triphosphatase
<b>b.m.</b>	body mass
<b>bw</b>	body weight
<b>bp</b>	base pair
<b>Ca</b>	Calcium
<b>cAMP</b>	cyclic adenosine monophosphate
<b>CAT</b>	Catalase
<b>Cd</b>	Cadmium
<b>CdMT</b>	Cadmium-metallothionein
<b>Cd-Se</b>	Cadmium-selenium
<b>conc</b>	concentration
<b>Cu<sup>+2</sup></b>	Copper
<b>DAD</b>	Diode array detector
<b>DDW</b>	Deionized distilled water
<b>DHBS</b>	3,5-Dichloro-2-hydroxybenzene sulfonic acid
<b>dist. H<sub>2</sub>O</b>	distilled water
<b>dl</b>	decilitre
<b>DNA</b>	Deoxyribonucleic acid
<b>DSB</b>	Double strand breaks
<b>DTNB</b>	5,5'-dithiobis (2-nitrobenzoic acid)
<b>EDTA</b>	Ethylenediaminetetraacetic acid

<b>Fe<sup>+2</sup></b>	Iron
<b>GI</b>	Gastrointestinal
<b>GPx</b>	Glutathione peroxidase
<b>GR</b>	Glutathione reductase
<b>GSH</b>	Reduced glutathione
<b>GSSG</b>	Oxidized glutathione
<b>GST</b>	Glutathione S-transferase
<b>G6PD</b>	Glucose-6-phosphate dehydrogenase
<b>HCL</b>	Hydrochloric acid
<b>HD</b>	High dose
<b>HDL-cho.</b>	High-density lipoprotein cholesterol
<b>HMG-CoA</b>	3-hydroxy-3-methylglutaryl-coenzyme A
<b>HP</b>	Hewlett Packard
<b>HPLC-DAD</b>	High-Performance Liquid Chromatography with Diode-Array Detection
<b>HRP</b>	Horseradish peroxidase
<b>hr</b>	hour
<b>ID</b>	Internal diameter
<b>IDD</b>	Iodothyronine deiodinases
<b>IL-1<math>\beta</math></b>	Interleukin-1 beta
<b>inj vol</b>	injection volume
<b>i.m.</b>	intramuscular
<b>i.p.</b>	intraperitoneal
<b>i.v.</b>	intravenous
<b>IU</b>	International unit
<b>K</b>	Potassium
<b>LA</b>	Lead acetate
<b>LDL-cho.</b>	Low-density lipoprotein cholesterol
<b>LH</b>	Lutenizing hormone

<b>LP</b>	Lipid peroxidation
<b>LPL</b>	Lipoprotein lipase
<b>LPO</b>	Lipid peroxidation
<b>LPP</b>	Lipid peroxidation potential
<b>M</b>	Molar
<b>MW</b>	Molecular weight
<b>MDA</b>	Malondialdehyde
<b>min</b>	minute
<b>mM</b>	millimolar
<b>mmol</b>	millimole
<b>mRNA</b>	messenger ribonucleic acid
<b>MT</b>	Metallothionein
<b>Na</b>	Sodium
<b>NADP</b>	Nicotinamide adenine dinucleotide phosphate
<b>NADPH</b>	Nicotinamide adenine dinucleotide phosphate hydrogen
<b>Na<sub>2</sub>EDTA</b>	Disodium ethylenediaminetetraacetate
<b>NDI</b>	Nuclear division index
<b>ng</b>	nanogram
<b>nm</b>	nanometer
<b>nmol</b>	nanomole
<b>NO</b>	Nitric oxide
<b>ODS</b>	Official document system
<b>OH·</b>	Hydroxyl anion radicals
<b>O<sub>2</sub></b>	Oxygen
<b>O<sub>2</sub>·</b>	Superoxide anion radicals
<b>Pb</b>	Lead
<b>PbB</b>	Blood lead levels
<b>PBS</b>	Phosphate buffer saline

<b>PCR</b>	Polymerase chain reaction
<b>per os</b>	By mouth
<b>pH</b>	Potential of Hydrogen
<b>PKC</b>	Protein Kinase C
<b>pmol</b>	picomole
<b>ppm</b>	part per million
<b>P-value</b>	The probability of obtaining
<b>P450scc</b>	Cholesterol side-chain cleavage enzyme
<b>RAPD</b>	random amplified polymorphic DNA
<b>RAPD-PCR</b>	Random amplified polymorphic DNA-polymerase chain reaction
<b>ROIs</b>	Reactive oxygen intermediates
<b>ROMs</b>	Reactive oxygen metabolites
<b>ROS</b>	Reactive oxygen species
<b>rpm</b>	round per minute
<b>s.c.</b>	subcutaneous
<b>SDH</b>	Synchronous Digital Hierarchy
<b>SDS</b>	Sodium dodecyl sulfate
<b>Se</b>	Selenium
<b>Se-Cys</b>	Selenocysteine
<b>Se-GPx</b>	<i>Selenium-dependent glutathione</i> peroxidase
<b>SEM</b>	Standard error of mean
<b>SH</b>	Sulfhydryl
<b>SOD</b>	Superoxide dismutase
<b>SPSS</b>	Statistical Package for Social Science
<b>SSB</b>	Single strand breaks
<b>StAR</b>	Steroidogenic acute regulatory protein
<b>T</b>	Testosterone
<b>TBA</b>	Thiobarbituric acid



<b>TBARS</b>	Thiobarbituric acid reactive substances
<b>TBE buffer</b>	Tris-borate EDTA
<b>T.chol.</b>	Total cholesterol
<b>TE buffer</b>	Tris-EDTA
<b>TFA</b>	Trifluoro acetic acid
<b>TG</b>	Triglycerides
<b>TNF-<math>\alpha</math></b>	Tumor necrosis factor-alpha
<b>TP</b>	Total protein
<b>TR</b>	Thioredoxin reductase
<b>TUNEL</b>	terminal dUTP nick-end labeling
<b>U</b>	Unit
<b>UPGMA</b>	Uvisoft program for gel documentation and analysis
<b>UV</b>	Ultraviolet
<b>Vit. E</b>	Vitamin E
<b>VLDL</b>	Very low-density lipoprotein
<b>v/v</b>	volume/volume
<b>w/v</b>	weight/volume
<b>XDB</b>	Extra dense bonding
<b>Zn<sup>2+</sup></b>	Zinc
<b><math>\alpha</math>-globulin</b>	Alpha-globulin
<b><math>\alpha</math>-tocopherol</b>	Alpha-tocopherol
<b><math>\beta</math>-globulin</b>	Beta-globulin
<b>3<math>\beta</math>-HSD</b>	3 Beta-hydroxysteroid dehydrogenase
<b>17<math>\beta</math>-HSD</b>	17 Beta-hydroxy steroid dehydrogenase
<b>5'D-I</b>	type-I iodothyronine 5'-monodeiodinase
<b><math>\delta</math>-ALA</b>	Delta-amino levulinic acid
<b><math>\delta</math>-ALAD</b>	Delta-amino levulinic acid dehydratase
<b><math>\gamma</math>-globulin</b>	Gamma-globulin



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