

Oxidative Stress and Microvascular Complications in Type I Diabetes

Thesis

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

﴿قَالُوا سِحْرَانِكَ لَا عِلْمَ لَنَا إِلَّا هَا

عَلِمْتْنَا إِنَّكَ أَنْتَ الْعَلِيمُ الْحَكِيمُ﴾

صدق الله العظيم

Declaration

I declare that, this thesis has been composed by myself and it has not been submitted for a degree at this or any other university.

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List of abbreviations

ACE	Angiotensin converting enzyme
ADP	Adenosine diphosphate
AGEs	Advanced glycation end products
AIDS	Acquired immune deficiency syndrome
AOPP	Advanced oxidation protein products
ATP	Adenosine triphosphate
ATPase	Adenosine triphosphatase
AUC	Area under the curve
BCG	Bacillus calmette-guérin
BD	Behcet's disease
BMI	Body mass index
$C_2H_2H=N\cdot$	Phenyldiazine radical
Ca^{++}	Calcium ion
CAT	Catalase
$CCl_3\cdot$	Trichloromethyl radical
CCl_4	Tetrachloromethyl
CT	Chloramines-T
Cu^{2+}	Cupric ion
DAG	Diacylglycerol
DKA	Diabetic ketoacidosis
DM	Diabetes mellitus
DM 1	Type 1 diabetes mellitus
DN	Diabetic nephropathy
DNA	Deoxyribonucleic acid
DOD	Duration of diabetes
EDTA	Ethylenediaminetetraacetic acid
ELISA	Enzyme-linked immunosorbent assay
eNOS	Endothelial nitric oxide
Fe^{2+}	Ferrus ion
Fe^{3+}	Ferric ion
FN	False negative
FP	False positive

FPG	Fasting plasma glucose
GAD	Glutamic acid decarboxylase
GK	Glycerolkinase
GOD	Glucose oxidase
GOP	Glycerol-3-phosphate-oxidase
GPx	Glutathione peroxidase
GR	Glutathione reductase
GSH	Rreduced glutathione
GSSG	Oxidized glutathione
H	Hydrogen atom
H ₂ O ₂	Hydrogen peroxide
HbA1c	Glycosylated hemoglobin
HbAo	Non glycosylated hemoglobin
HDL	High density lipoprotein
HIV	Human immunodeficiency virus
HLA	Human leukocyte antigen
HNE	4-hydroxynonenal
HNF	Hepatocyte nuclear transcription factor
HO·	Hydroxyl radical
HOCl	Hypochlorous acid
HPLC	High performance liquid chromatography
IA-2	Insulinoma associated antigen-2
IAA _s	Autoantibodies to insulin
ICA	Islet cell autoantibodies
ICA512	Islet cell antigen 512
ICAM-1	Inter-cellular adhesion molecule 1
IDDM	Insulin-dependent diabetes mellitus
IFG	Impaired fasting glucose
IGF1	Insulin-like growth factor-1
IgG	Immunoglobulin G
IGT	Impaired glucose tolerance
IL-1	Interleukin-1
LADA	Latent autoimmune diabetes of the adult
LDL	Low density lipoprotein
LO·	Alkoxy radicals

LOO.	Peroxy radicals
LOOH	Lipid hydroperoxides
LPL	Lipoprotein lipase
LPO	lipid peroxidation
MDA	Malondialdehyde
MMR	Measles, mumps and rubella
MODY	Maturity-onset diabetes of the young
MPO	Myeloperoxidase
MVC	Microvascular complications
NADP	Nicotinamide adenine dinucleotide phosphate
NIDDM	Non insulin dependent diabetes mellitus
NO	Nitric oxide
NO ₂ ⁻	Nitrogen dioxide
O ₂ ⁻	Superoxide anion
ODFR	Oxygen derived free radicals
ODS	Octadecylsilanol
OGTT	Oral glucose tolerance test
ONOO ⁻	Peroxynitrite
Oxi-HSA	Oxidized human serum albumin
PDGF	platelet-derived growth factor
PKC	protein kinase C
POD	Peroxidase
PUFA	Polyunsaturated fatty acid
r	Correlation coefficient
RAGE	Receptor for advanced glycation end products
ROC	Receiver operating characteristics
ROS	Reactive oxygen species
R-S [·]	Thiyl radical
SD	Standard deviation
Se	Selenium
SMBG	Self-monitoring of blood glucose
SOD	Superoxide dismutase
SPSS	Statistical package for the social science
STDBUF	Standard dilution buffer

T1DM	Type 1 diabetes mellitus
TAS	Total antioxidant status
TBA	Thiobarbituric acid
TBARS	Thiobarbituric acid reacting substances
TGF- β	Transforming growth factor- β
Ti	Titanium
TMB	3, 3', 5,5'- tetramethyl- benzidine
TN	True negative
TNF	Tumor necrosis factor
TP	True positive
UK	United Kingdom
VCAM-1	Vascular cell adhesion molecule-1
VLDL	Very Low density lipoprotein

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