Circulating Endothelial Progenitor Cells and Aortic Wall Changes in Male Wistar Rat Exposed to Chronic Mild Stress and High Fat Diet with the Possible Role of Pentoxifylline. Histological, Immunohistochemical and Flowcytometric Study

Thesis

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Jolly Mounir William Labib

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List of Abbreviations

AGE	Advanced glycation end products
BBB	Blood brain barrier
bFGF	Basic fibroblast growth factor
BWG	Body weight gain
CCT diet	4% cholesterol, 0.5% cholic acid , and 0.2% thiouracil
CD133	Cluster of differentiation 133
CD31	Cluster of differentiation 31
CD34	Cluster of differentiation 34
CEPCs	Circulating endothelial progenitor cells
CHF	Congestive heart failure
CMS	Chronic mild stress
CVD	Cardiovascular diseases
DSM-IV	Diagnostic and statistical manual of mental disorders 4^{th} edition
DSM-IV	Diagnostic and statistical manual of mental disorders, 4th ed.
FITC	Fluorescein isothiocyanate
FST	Forced swim test
G-CSF	Granulocyte-Colony Stimulating Factor
HGF	Hepatocyte growth factor
ICAM-1	Intercellular adhesion molecule 1
IEL	Internal elastic lamina
IFN-α	Interferon alpha
IFN-γ	interferon gamma
IGF-1	Insulin-like Growth Factor 1
IL-1	Interleukin-1
IL-10	Interleukin-10
IL-12	Interleukin-12
IL-13	Interleukin-13
IL-2	Interleukin-2
IL-4	Interleukin-4
IL-6	Interleukin-6

IL-8	Interleukin-8
IMI	Imipramine
IMR	Intima-media ratio
iNOS	inducible Nitric Oxide Synthase
LDL	Low Density Lipoproteins
MAOI	Monoamine oxidase inhibitor
MDD	Major depressive Disorder
MMPs	Matrix metalloproteinases
NK cells	Natural killer cells
NO	Nitric Oxide
OFT	Open field test
oxLDL	Oxidized Low Density Lipoproteins
PBS	Phosphate buffered saline
PDGF	Platelet-derived growth factor
PE	Phycoerythrin
PECAM	Platelet endothelial cell adhesion molecule
PTX	Pentoxifylline
RAGE	Receptor of advanced glycation end products
ROS	Reactive oxygen species
SDF-1α	Stromal-derived factor 1 alpha
SEM	Standard Error of Mean
SIT	Social interaction test
SP	Sucrose preference
SPT	Sucrose preference test
SSRIs	Selective serotonin reuptake inhibitors
Tie-1	Tyrosine kinase receptor 1
Tie-2	Tyrosine kinase receptor 2
TIMP	Tissue inhibitors of metalloproteinases
TNF-α	Tumour necrosis factor alpha
TNF-β	Tumour necrosis factor beta
VCAM-1	Vascular adhesion molecule 1
VE-cadherin	Vascular endothelial cadherin
VEGF	Vascular endothelial growth factor
VEGFR-2	Vascular endothelial cell growth-factor receptor 2
VLA-4	Very-late-antigen 4
vWF	von Willebrand factor

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Introduction

Both neuropsychiatric disorders and cardiovascular diseases (CVD) constituted a huge burden on our society. According to World Health Organization (WHO) statistics, the three leading causes of mortality by the year 2030 were predicted to be acquired immunodeficiency syndrome, depressive disorders and ischemic heart disease ***(Mathers and Loncar, 2005).***

A substantial body of literature provided strong evidence that a bidirectional association between mood disorders and cardiovascular diseases existed in humans, though the precise neurobiological mechanisms that underlie this association were not fully understood ***(Grippo, 2009; Joynt et al., 2003).***

Joynt et al. (2003) reported that coronary artery disease, myocardial infarction and congestive heart failure (CHF) were associated with altered mood states and depressive syndromes and were considered to be risk factors for cardiac morbidity and mortality.

On the other hand, seasonal mood changes have been correlated with seasonal variation in coronary heart disease, as ***Sher (2001)*** found that winter depression contributed to winter increase in incidence and mortality of cardiovascular disease. Patients with depression had more than two folds higher risk of developing heart failure and repeated hospital admissions as reported by ***Pasic et al. (2003). Penninx et al. (2001)*** showed that major depressive disorder (MDD) was associated with increased risk of cardiac mortality and the more severe the depression the greater the risk for subsequent cardiac mortality. Whereas, ***Zellweger et al. (2004)*** considered depression as a risk factor for cardiac events in patients with