Study of the Possible Mechanisms for the Role of Mesenchymal Stem Cells in Treating Acute Kidney Injury in a Rat Model

A Thesis

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Abbreviations

ACE	Angiotensin converting enzyme
AD	Alzheimer's disease
AD-MSCs	Adipose tissue-derived mesenchymal stem cells
ADQI	Acute Dialysis Quality Initiative
AF	Amniotic fluid
AIF	Apoptosis-inducing factor
AII	Angiotensin II
AKI	Acute kidney injury
AKIN	Acute Kidney Injury Network
Akt	Protein Kinase B
ANOVA	Analysis of variance
ANP	Atrial natiuretic peptide
ARF	Acute renal failure
Asp	Aspartate
Bak	Bcl-2-antagonist/killer
Bax	Bcl-2-associated X protein
Bcl-2	B cell lymphoma-2
Bcl-xl	B-cell lymphoma-extra large
Bcl-xs	B-cell lymphoma-extra small
bFGF	Basic fibroblast growth factor
BM-MSCs	Bone marrow-derived mesenchymal stem cells
BMPs	Bone morphogenetic proteins
CAT	Catalase
CCAAT/EBPs	(cytosine-cytosine-adenosine-adenosine-thymidine)-enhancer-binding proteins
CD	Cluster of differentiation
CDDP	Cisplatin (cis- diamine di-chloro platinum)
CKD	Chronic kidney diseases
COX-2	Cyclooxygenase-2
CRRT	Continuous renal replacement therapy
Crry	Complement receptor 1-related protein y
CTL-A4	Cytotoxic T-lymphocyte-associated protein 4
CXCL-2	(C-X-C motif) ligand 2
Cys C	Cystatin C
Cyt.*c*	Cytochrome *c*
DAMP	Damage-associated molecular pattern
DEPC	Diethylpyrocarbonate
Dkk1	Dickkopf-1
DMEM	Dulbecco's Modified Eagle's Medium

eCCL	Estimated creatinine clearance
EDTA	Ethylene diamine tetra acetic acid
EGF	Epidermal growth factor
eNOS	Endothelial nitric oxide synthase
EPO	Erythropoietin
ER	Endoplasmic reticulum
ERK	Extracellular signal-regulated kinase
ESRD	End stage renal diseases
FBS	Fetal bovine serum
FENa	Fractional excretion of sodium
FGF-2	Fibroblast growth factor -2
FoxP3	Forkhead box P3
Frzb-1	Frizzled b-1
FSP-1	Fibroblast-specific protein-1
G-CSF	Granulocyte colony stimulating factor
GFR	Glomerular filtration rate
GM-CSF	Granulocyte-macrophage colony-stimulating factor
GPx	Glutathione peroxidase
GSH	Reduced glutathione
GSH-Rx	Glutathione reductase
GSSG	Oxidized glutathione
GVHD	Graft-versus-host disease
H_2O_2	Hydrogen peroxide
HD	Huntington's disease
HGF	Hepatocyte growth factor
HIF	Hypoxia-inducible factor
His	Histidine
HLA-DR	Human leukocyte antigen – DR isotype
HLA-G5	Human leukocyte antigen-G5 isotype
HO-1	Heme oxygenase-1
HRP	Horseradish peroxidase
ICAM-1	Intercellular adhesion molecule-1
ICU	Intensive care unit
IFN -γ	Interferon- gamma
IGF-1	Insulin-like growth factor-1
IHD	Intermittent hemodialysis
IL-18	Interleukin- 18
IL-6	Interleukin-6
Ile	Isoleucine
iNOS	Inducible nitric oxide synthase
IP3R	Inositol trisphosphate receptor
IPSC	Induced pluripotent stem cell

IR	Ischemia-reperfusion
IRF-1	Interferon regulatory factor-1
KDIGO	Kidney Disease Improving Global Outcomes
KIM-1	Kidney injury molecule-1
L-FABP	Liver fatty acid-binding protein
LIF	Leukemia inhibitory factor
MAPK	Mitogen-activated protein kinase
MCP-1	Monocyte chemoattractant protein-1
MDA	Malondialdehyde
MIP-2	Macrophage inflammatory protein-2
MKK4	Mitogen activated protein kinase kinase 4
MMPs	Matrix metalloproteinases
MnTMPyP	Manganese (III) tetrakis (1-methyl-4-pyridyl) porphyrin
MPO	Myeloperoxidase
MSCs	Mesenchymal stem cells
NAC	*N*-acetylcysteine
NADPH	Nicotinamide adenine dinucleotide phosphate
NAG	*N*-acetyl-β-D-glucosaminidase
NF-κB	Nuclear factor- kappa B
NGAL	Neutrophil gelatinase-associated lipocalin
NGF-β	Nerve Growth Factor- β
NKT	Natural killer T cells
NO	Nitric oxide
NQO-1	NADPH quinone oxidoreductase- 1
Nrf2	Nuclear factor erythroid 2–related factor 2
O^-_2	Superoxide anion
$^{\bullet}OH$	Hydroxyl radical
Oct-3/4	Octamer-binding transcription factor- 3/4
$ONOO^-$	Peroxynitrite
OS	Oxidative stress
PAMP	Pathogen-associated molecular patterns
PBS	Phosphate-buffered saline
PDGF	Platelet-derived growth factor
PDL-1	Programmed death-ligand-1
PGE-2	Prostaglandin E2
PI3K	Phosphatidylinositol-3-kinase
PIGF	Placental growth factor
PKH-26	Paul Karl Horan-26
PPAR	Peroxisome proliferator-activated receptor
pRIFLE	Pediatric RIFLE
RAS	Renin– angiotensin system

RBF	Renal blood flow
rex-1	Reduced expression-1
RIFLE	Risk, injury, failure, loss of function and end-stage renal failure
RNS	Reactive nitrogen species
ROS	Reactive oxygen species
RRT	Renal replacement therapy
Runx-2	Runt-related transcription factor-2
SCr	Serum creatinine
sFRP1	secreted frizzled related protein 1
Sirt1	Sirtuin-1
Smad7	Mothers against decapentaplegic homolog7
SOD	Superoxide dismutase
TAE	Tris-acetate-EDTA
TGF-*β*	Transforming growth factor- beta
TIM-1	T cell immunoglobulin mucin-1
TLR	Toll like receptor
TMB	3,3′,5,5′-Tetramethylbenzidine
TNF-*α*	Tumor necrosis factor-alpha
Tregs	Regulatory T cells
TSG-6	TNFα-stimulated gene-6
TUNEL	Terminal deoxynucleotidyl transferase dUTP nick end labeling
Tyr	Tyrosine
UC	Umbilical cord
UTs	Urea transporters
VCAM-1	Vascular cell adhesion molecule-1
VEGF	Vascular endothelial growth factor
Wnt	Wingless-related integration site
α-SMA	Alpha-smooth muscle actin
CMJ	Cortico-medullary junction
DAI	DNA-dependent activator of IFN-regulatory factor
MPT	Mitochondrial permeability transition pore
RIPK3	Receptor-interacting serine-protein kinase 3

List of contents