



# **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**

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

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

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

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<b>RBF</b>	Renal blood flow
<b>rex-1</b>	Reduced expression-1
<b>RIFLE</b>	Risk, injury, failure, loss of function and end-stage renal failure
<b>RNS</b>	Reactive nitrogen species
<b>ROS</b>	Reactive oxygen species
<b>RRT</b>	Renal replacement therapy
<b>Runx-2</b>	Runt-related transcription factor-2
<b>SCr</b>	Serum creatinine
<b>sFRP1</b>	secreted frizzled related protein 1
<b>Sirt1</b>	Sirtuin-1
<b>Smad7</b>	Mothers against decapentaplegic homolog7
<b>SOD</b>	Superoxide dismutase
<b>TAE</b>	Tris-acetate-EDTA
<b>TGF-<math>\beta</math></b>	Transforming growth factor- beta
<b>TIM-1</b>	T cell immunoglobulin mucin-1
<b>TLR</b>	Toll like receptor
<b>TMB</b>	3,3',5,5'-Tetramethylbenzidine
<b>TNF-<math>\alpha</math></b>	Tumor necrosis factor-alpha
<b>Tregs</b>	Regulatory T cells
<b>TSG-6</b>	TNF $\alpha$ -stimulated gene-6
<b>TUNEL</b>	Terminal deoxynucleotidyl transferase dUTP nick end labeling
<b>Tyr</b>	Tyrosine
<b>UC</b>	Umbilical cord
<b>UTs</b>	Urea transporters
<b>VCAM-1</b>	Vascular cell adhesion molecule-1
<b>VEGF</b>	Vascular endothelial growth factor
<b>Wnt</b>	Wingless-related integration site
<b><math>\alpha</math>-SMA</b>	Alpha-smooth muscle actin
<b>CMJ</b>	Cortico-medullary junction
<b>DAI</b>	DNA-dependent activator of IFN-regulatory factor
<b>MPT</b>	Mitochondrial permeability transition pore
<b>RIPK3</b>	Receptor-interacting serine-protein kinase 3

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