

CONTENTS

Subject	Page
List of Abbreviations	I
List of Figures and Tables	IV
Introduction	1
Aim of the Work	4
Methods	5
Part I: Overview	6
Anatomical overview of the kidney.....	6
Functional overview of the kidney.....	7
Kidney development.....	11
Molecular Regulation of Kidney Development.....	14
Pathophysiology of AKI.....	18
Pathophysiology of CKD.....	22
Part II : Renal Replacement Therapy	31
Types of Renal Replacement Therapies.....	31
Technological advances in renal replacement therapy.....	37
Human nephron filter.....	37
Silicon nanopore membranes.....	41
Bio artificial kidney.....	42
Wearable kidney.....	47
Part III: Stem Cells	51
Endogenous stem cells.....	53
Exogenous stem cells.....	55
Stem Cell Therapy.....	57
Bone marrow derived stem cells.....	57
Stem cells derived from kidneys of adult subjects.....	62
Embryonic stem cells.....	65
Fetal Renal Stem Cells.....	67
Part IV: Tissue Engineering	70
Ex novo kidney reconstruction.....	70
In vitro renal differentiation.....	73
Embryonic Culture.....	75
Microfluidic Cell Culture Models.....	76
Building the foundations (Scaffolds).....	80
Extra Cellular Matrix.....	82
Principles and Methods of Decellularisation.....	84
Principles and Methods of Recellularisation.....	84
Scaffolds free cell delivery.....	86
Single Cells.....	86
Improving Cell Engraftment.....	88
Cell Sheets.....	90
Adding The Bricks : Cells.....	91

Subject	Page
Part V: Gene therapy	93
Monogenic hereditary renal diseases.....	95
Gene therapy for AKI.....	100
Gene therapy for CKD.....	104
Ex vivo gene therapy.....	111
Part VI: Nanotechnology	115
Definition.....	115
Nano vectors.....	116
Regenerative medicine& Nanotechnology.....	117
Stem cells.....	118
Biomaterials.....	119
Nanotechnology& tissue engineering.....	121
1.Benefits of nanotechnology and nanomaterials.....	121
2.Nano Structured Scaffolds.....	122
3.Nanopatterning of surfaces of devices.....	124
4.Nanoparticles.....	126
Summary	128
Conclusions	134
References	136
الملخص العربي	i