

CONTENTS

	PAGE
ABSTRACT.....	(1)
ACKNOWLEDGEMENTS.....	(3)
LIST OF TABLES.....	(8)
LIST OF FIGURES.....	(9)
LIST OF ABBREVIATIONS AND SYMBOLS.....	(11)
CHAPTER	
1. INTRODUCTION	
Introduction.....	1
Objectives.....	3
2. REVIEW OF LITERATURE	
Introduction	4
Definition of Stem cells.....	4
Properties of stem cells.....	4
Potency of stem cells.....	4
Types of stem cells.....	5
Embryonic stem cells.....	6
Adult stem cells.....	6
Hematopoietic stem cells (HSCs).....	8
Source of HSCs.....	9
Morphological characteristics of HSCs....	9
Physical characteristics of HSCs.....	9
Specific marker of HSCs.....	9

CONTENTS (continued)

Mesenchymal stem cells (MSCs).....	10
Source of MSCs.....	10
Morphological characteristics of MSCs....	11
Cell surface markers of MSCs.....	12
Biology and function of MSCs.....	14
Growth and expansion of MSCs.....	16
Differentiation potential of MSCs.....	18
Clinical application of MSCs.....	22
Umbilical cord.....	29
Wharton’s jelly.....	31
Placenta.....	31
Amnion.....	33
Bone marrow transplantation.....	34
Graft types.....	35
Bone marrow collection.....	37
Alternative sources of stem cells for	
allogeneic HSCT.....	37
Conditioning regimens of HSCT.....	38
Complications and side effect of HSCT.....	39
Types of GvHD.....	41
Prevention of GvHD.....	41
Treatment of GvHD.....	42
MSCs and GvHD.....	42

CONTENTS (continued)

3. METHODOLOGY	
Collection of human specimen.....	47
Isolation and culture of MSCs from bone marrow..	47
Isolation and culture of MSCs from umbilical cord	49
Isolation and culture of MSCs from Wharton’s jelly	51
Isolation and culture of MSCs from placenta.....	53
Isolation and culture of MSCs from amnion.....	55
Immunophenotyping of culture cells.....	57
Proliferation studies.....	57
Adipogenic differentiation testing.....	58
Osteogenic differentiation testing.....	58
Mixed lymphocyte reaction assays (MLR assays)..	59
Statistical analysis.....	61
4. FINDING AND RESULTS	
Subject Characteristics.....	62
The characteristics of culture of MSCs.....	62
The proliferation characteristics of MSCs.....	70
Cell surface marker characteristics of MSCs	76
Osteogenic differentiation potential of MSCs	87
Adipogenic differentiation potential of MSCs	87
Immunomodulatory effect of UC-MSCs, WJ-MSCs, PL-MSCs, AM-MSCs in comparison to BM-MSCs..	90
5. CONCLUSIONS AND RECOMMENDATIONS.....	99
REFERENCES.....	103

CONTENTS (continued)

APPENDIX

A	Ethical Approval Documents (Thai).....	115
B	Patient Information Sheet (Thai).....	117
C	Informed Consent From (Thai).....	120
D	Reagents and Instrumentation.....	123
E	Experimental Procedures.....	130
VITA.....		142