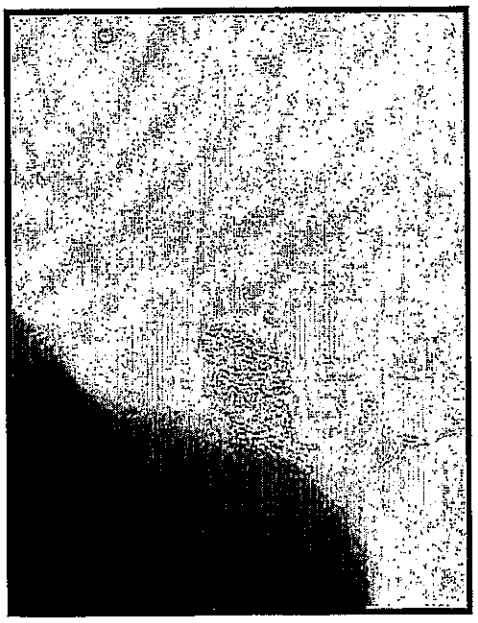
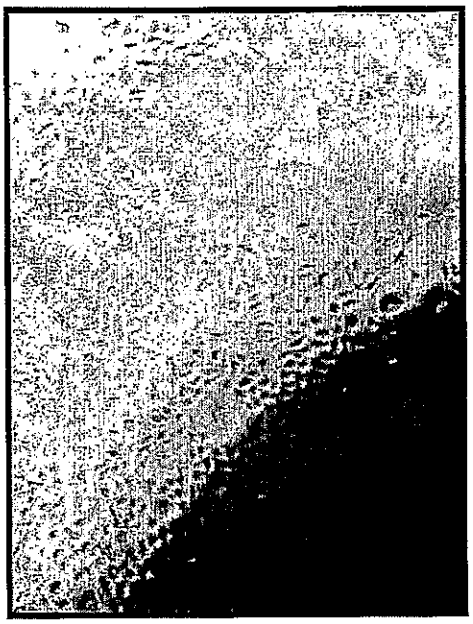
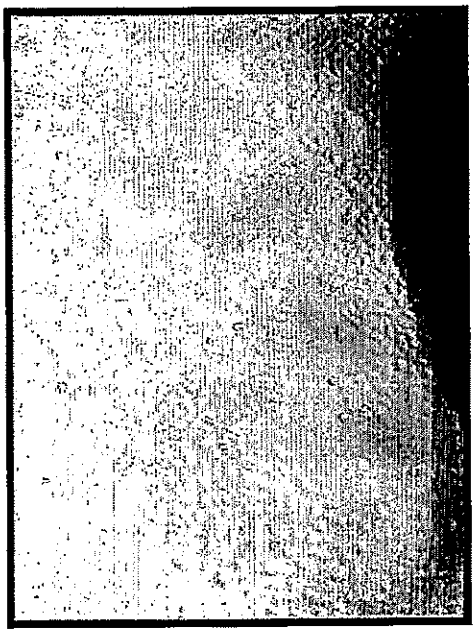


A



C



B

FIGURE 1

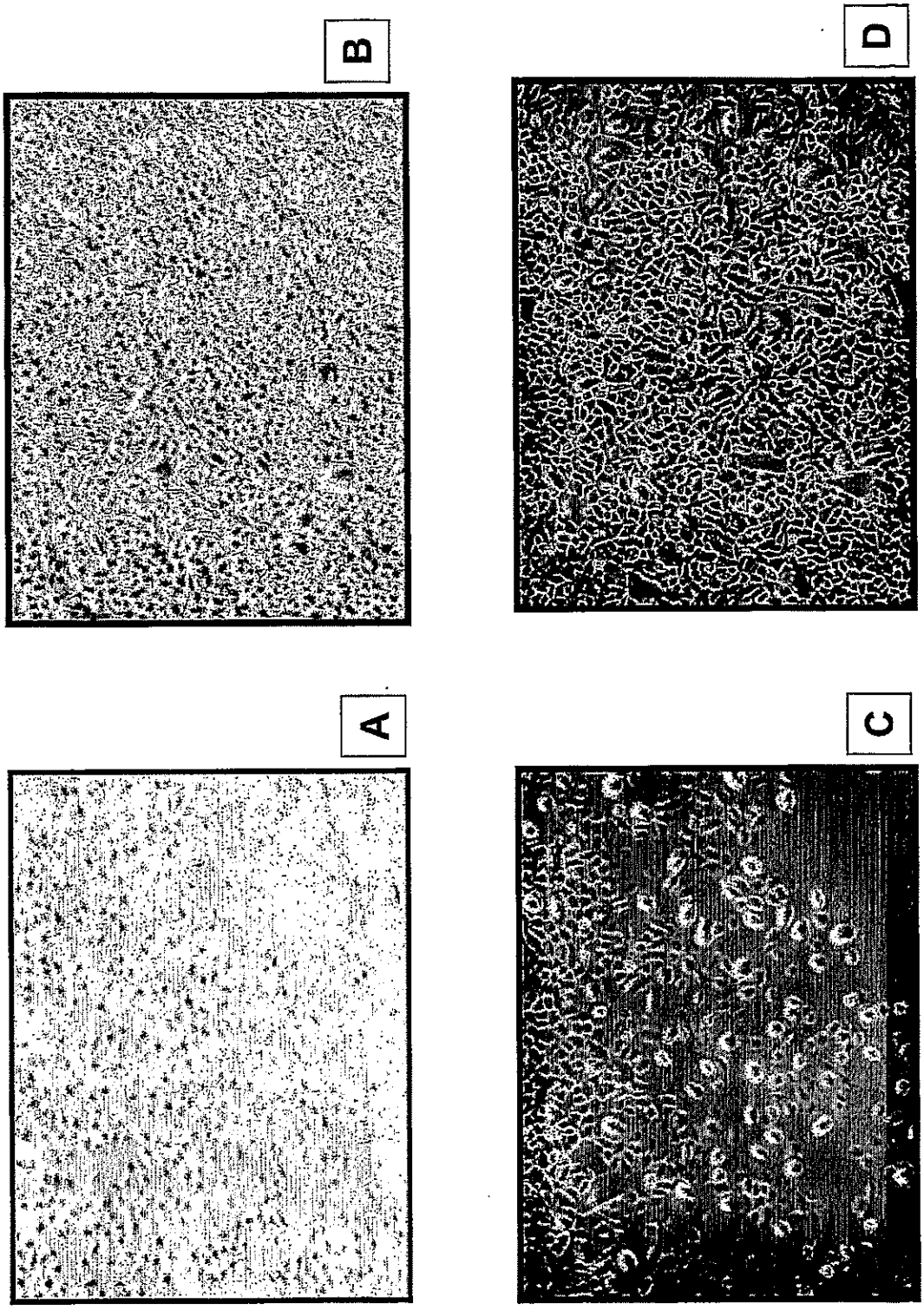


FIGURE 2

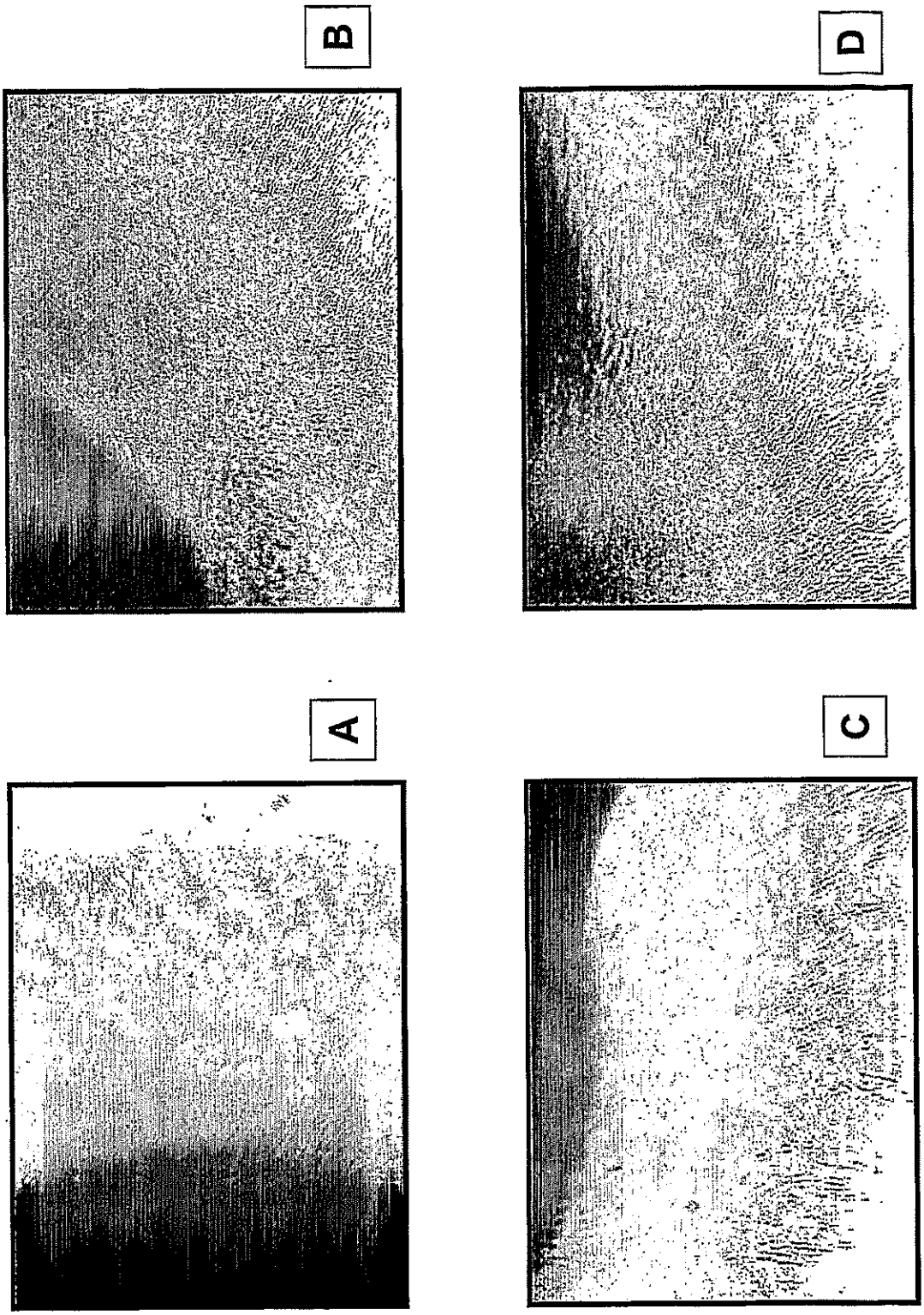
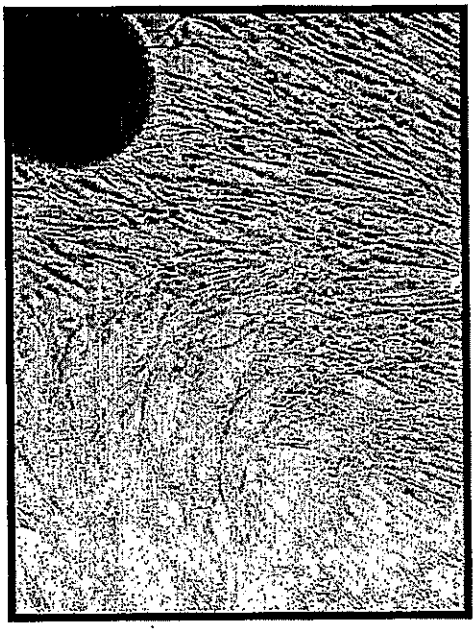


FIGURE 3



B



A

FIGURE 4

Figure 5: Morphology of normal dermal fibroblasts (NF) and adipose-derived mesenchymal cells (ADMC) or umbilical cord mesenchymal stem cells (UCMC) in serum-free (DMEM) and serum medium (DMEM/10%FCS)

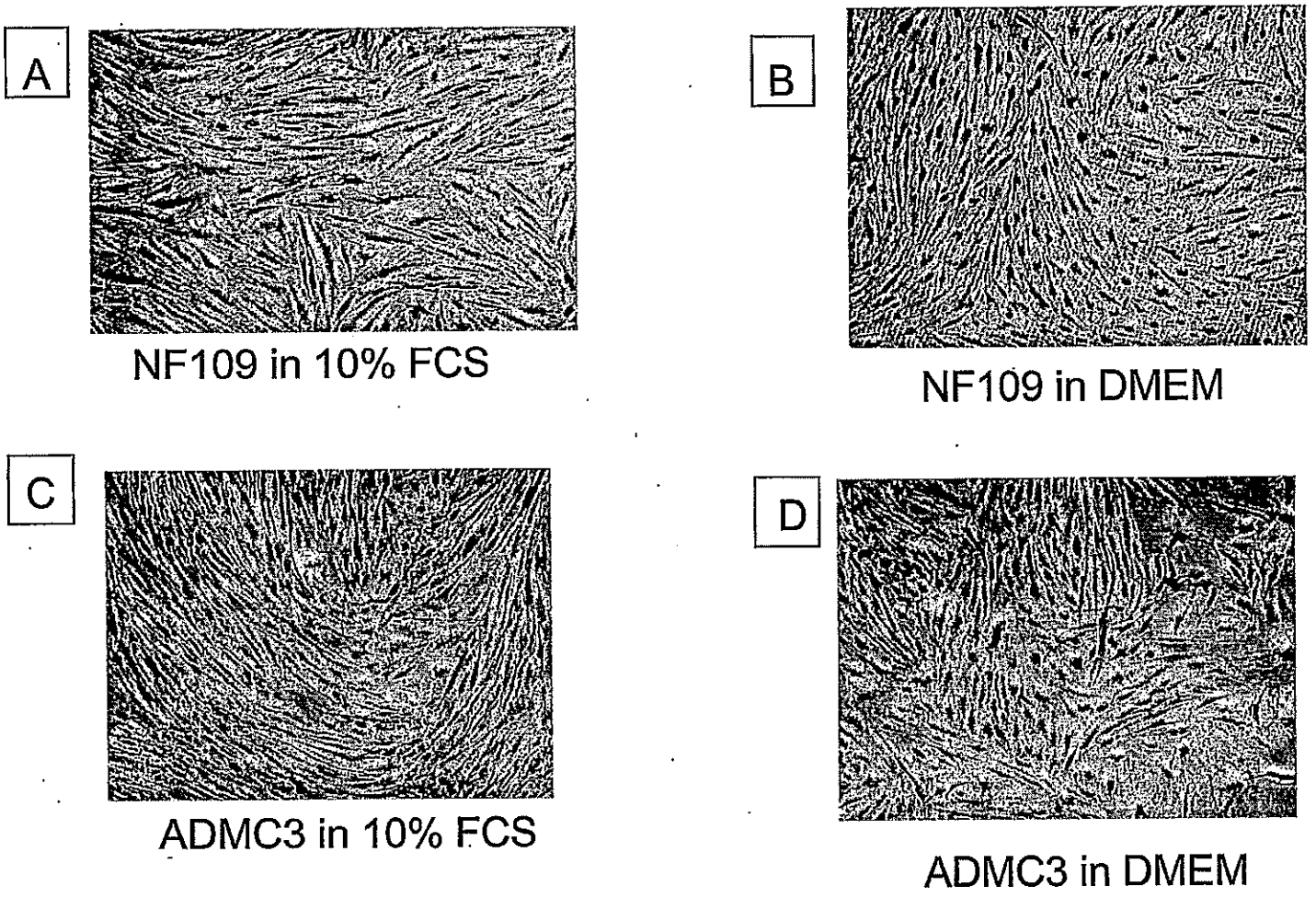
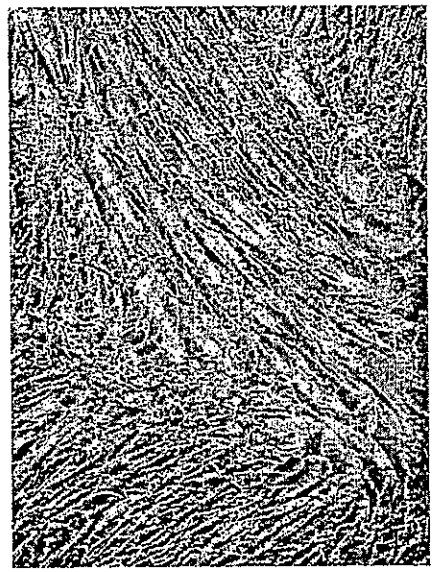
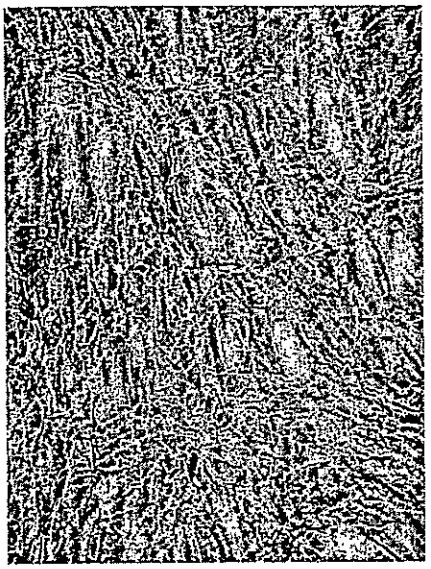


Figure 5: continued...



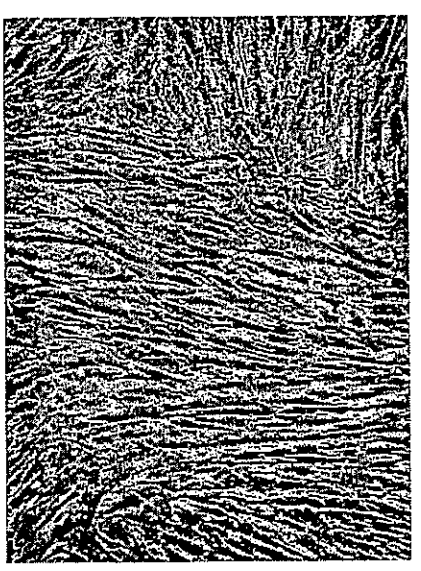
E

UCMC3 in DMEM/10%FCS



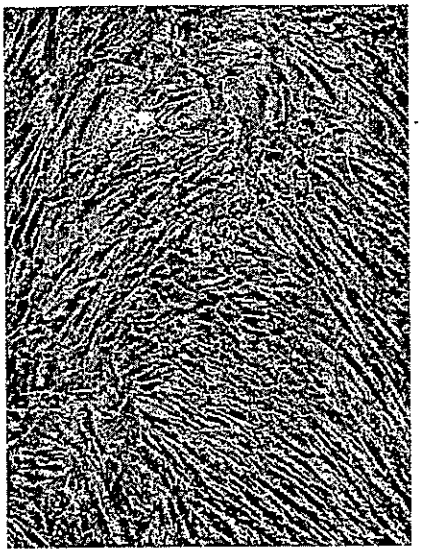
F

UCMC3 in DMEM



G

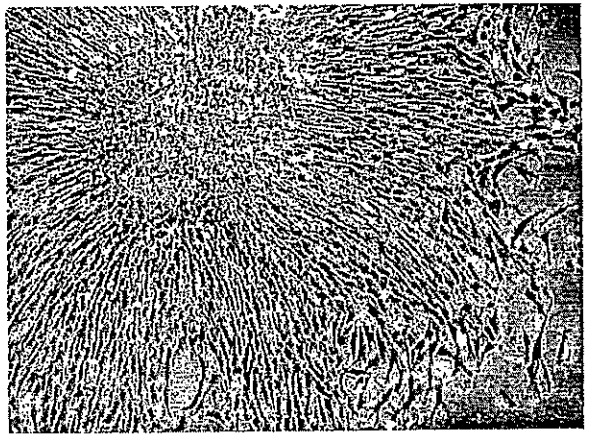
UCMC4 in DMEM/10%FCS



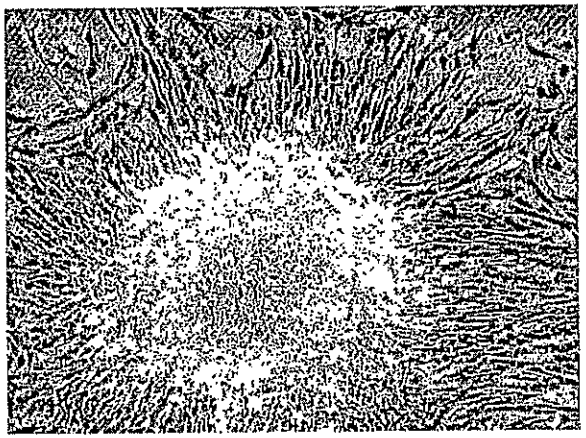
H

UCMC4 in DMEM

Figure 6: Colony formation of umbilical cord mesenchymal stem cells cultured in non-feeder layer condition in DMEM/10%FCS



Day 3



Day 7

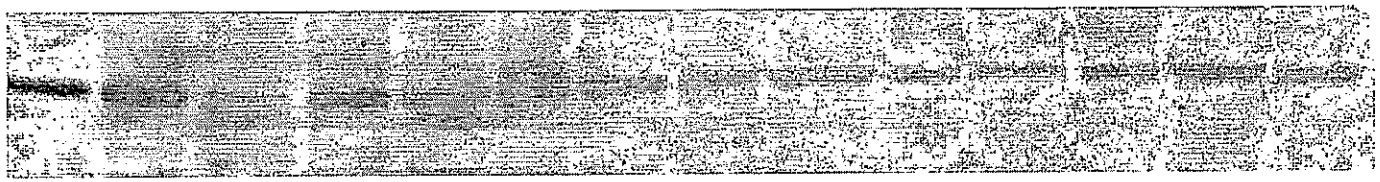
Figure 7: Colony formation of umbilical cord epithelial stem cells cultured in feeder layer condition in Green's medium

Day 3

Day 7

Figure 8: Colony formation of umbilical cord mesenchymal stem cells cultured on feeder layer condition in Green's medium

FIGURE 9-1: Expression of Oct-4 in Umbilical Cord Epithelial Cells and Mesenchymal Cells



1 2 3 4 5 6 7 8 9 10 11 12 13 14

1 UCEC-3
2 UCEC-3
3 UCEC-4
4 UCEC-6
5 UCMC-2
6 UCMC-2
7 UCMC-3
8 UCMC-3
9 UCMC-6
10 UCMC-6
11 UCMC 16
12 UCMC 16
13 UCMC-12
14 UCMC-12

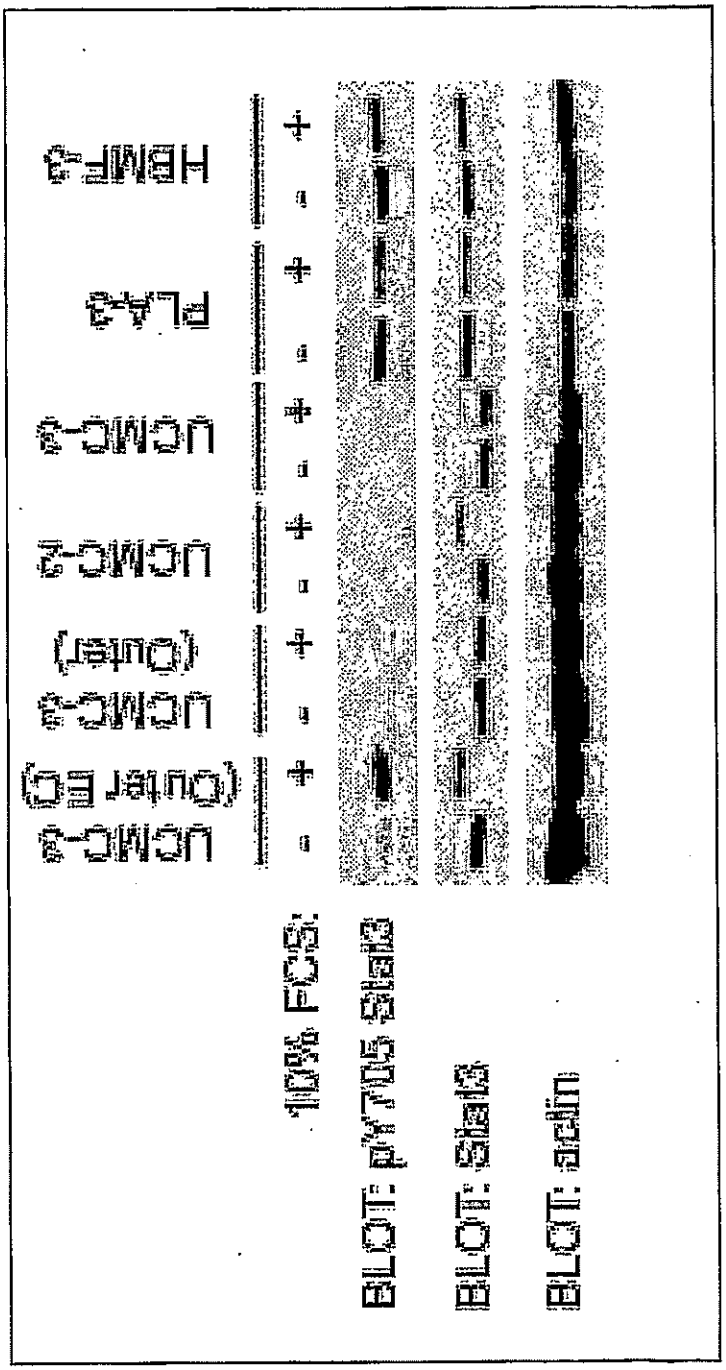


FIGURE 9-2: Expression of STAT3 in Umbilical Cord Mesenchymal Stem Cells (UCMC)

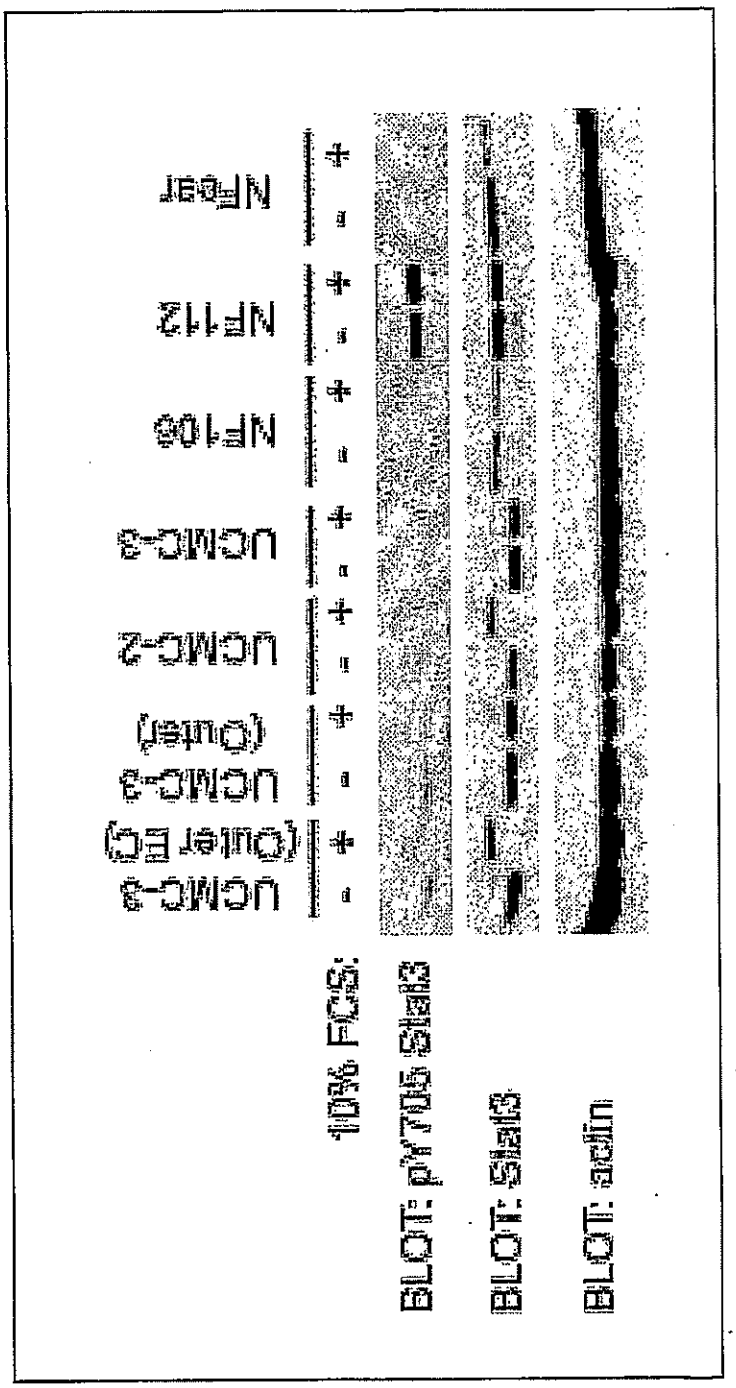


FIGURE 9-3: Expression of STAT3 in Umbilical Cord Mesenchymal Stem Cells (UCMC)

FIGURE 9-4: Expression of Placental Growth Factor (PLGF) in Umbilical Cord Mesenchymal Stem Cells (UCMC)



1 2 3 4 5 6 7 8 9 10

1 UCMC-3
2 UCMC-3
3 UCMC-4
4 UCMC-4

5 hBMSC-1
6 hBMSC-1
7 ADMC
8 ADMC
9 hBMSC-3
10 hBMSC-3

FIGURE 9-5: Expression of Placental Growth Factor (PLGF) in Umbilical Cord Mesenchymal Stem Cells (UCMC)



1 2 3 4 5 6 7 8 9 10 11 12

1 UCMC-3
2 UCMC-3
3 UCMC-2
4 UCMC-2
5 UCMC-3
6 UCMC-3
7 UCMC-4
8 UCMC-4
9 NF 111
10 NF 111
11 NF 113
12 NF 113

FIGURE 9-6: Expression of Connective Tissue Growth Factor (CTGF) in Umbilical Cord Mesenchymal Stem Cells (UCMC)

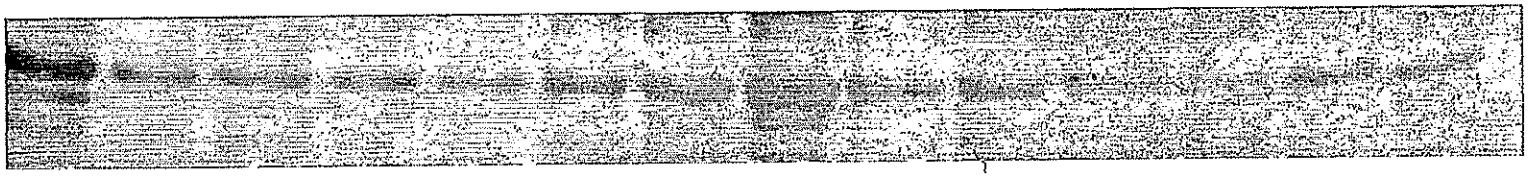


1 2 3 4 5 6 7 8 9 10

1 UCMC-3
2 UCMC-3
3 UCMC-4
4 UCMC-4

5 NF 106
6 NF 106
7 NF 112
8 NF 112
9 NF 101
10 NF 101

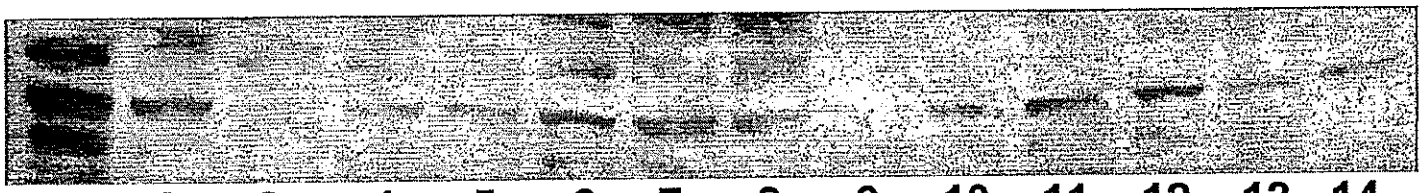
FIGURE 9-7: Expression of Connective Tissue Growth Factor (CTGF) in Umbilical Cord Mesenchymal Stem Cells (UCMC)



1 2 3 4 5 6 7 8 9 10 11 12 13 14

1 UCMC-3
2 UCMC-3
3 UCMC-3
4 UCMC-3
5 UCMC-2
6 UCMC-2
7 UCMC-3
8 UCMC-3
9 hBMSC-1
10 hBMSC-1
11 ADMC
12 ADMC
13 hBMSC-3
14 hBMSC-3

FIGURE 9-8: Expression of Platelet Derived Growth Factor (PDGF) in Umbilical Cord Mesenchymal Stem Cells (UCMC)



1 UCMC-3
2 UCMC-3
3 UCMC-3
4 UCMC-3
5 UCMC-2
6 UCMC-2
7 UCMC-3
8 UCMC-3
9 hBMSC-1
10 hBMSC-1
11 ADMC
12 ADMC
13 hBMSC-3
14 hBMSC-3

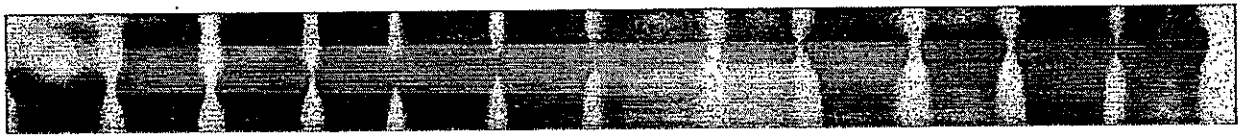
FIGURE 9-9: Expression of Platelet Derived Growth Factor (PDGF) in Umbilical Cord Mesenchymal Stem Cells (UCMC)



1 2 3 4 5 6 7 8 9 10 11 12 13 14

1 UCMC-3
2 UCMC-3
3 UCMC-3
4 UCMC-3
5 UCMC-2
6 UCMC-2
7 UCMC-3
8 UCMC-3
9 NF (ear)
10 NF (ear)
11 NF 106
12 NF 106
13 NF 112
14 NF 112

FIGURE 9-10: Expression of Vascular Endothelial Growth Factor (VEGF) in Umbilical Cord Mesenchymal Stem Cells (UCMC)



1 2 3 4 5 6 7 8 9 10 11 12

1 UCMC-3
2 UCMC-3
3 UCMC-2
4 UCMC-2
5 UCMC-3
6 UCMC-3
7 NF (ear)
8 NF (ear)
9 NF 106
10 NF 106
11 NF 112
12 NF 112

FIGURE 9-11: Expression of Vascular Endothelial Growth Factor (VEGF) in Umbilical Cord Mesenchymal Stem Cells (UCMC)



1 2 3 4 5 6 7 8 9 10

1 UCMC-3
2 UCMC-3
3 UCMC-4
4 UCMC-4

5 hBMSC-1
6 hBMSC-1
7 ADMC
8 ADMC
9 hBMSC-3
10 hBMSC-3

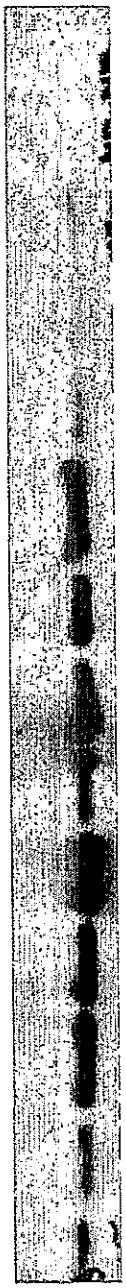
FIGURE 9-12: Expression of Fibroblast Growth Factor-2 (FGF-2) in Umbilical Cord Mesenchymal Stem Cells (UCMC)



1 2 3 4 5 6 7 8 9 10 11 12 13 14

1 UCMC-3
2 UCMC-3
3 UCMC-3
4 UCMC-3
5 UCMC-2
6 UCMC-2
7 UCMC-3
8 UCMC-3
9 hBMSC-1
10 hBMSC-1
11 ADMC
12 ADMC
13 hBMSC-3
14 hBMSC-3

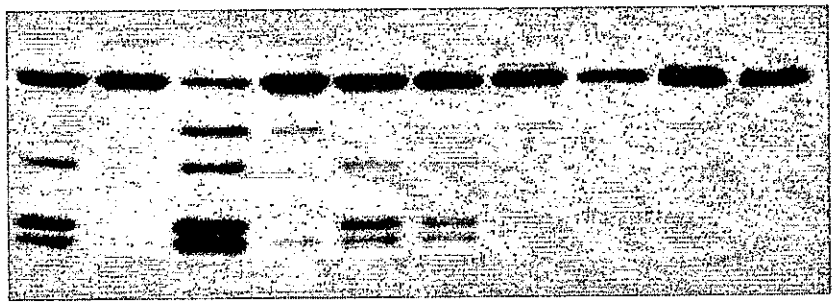
FIGURE 9-13: Expression of Fibroblast Growth Factor-2 (FGF-2) in Umbilical Cord Mesenchymal Stem Cells (UCMC)



1 2 3 4 5 6 7 8 9 10 11 12 13 14

1 UCMC-3
2 UCMC-3
3 UCMC-3
4 UCMC-3
5 UCMC-2
6 UCMC-2
7 UCMC-3
8 UCMC-3
9 NF (ear)
10 NF (ear)
11 NF 106
12 NF 106
13 NF 112
14 NF 112

FIGURE 9-14: Expression of Hepatoma Derived Growth Factor (HDGF) in Umbilical Cord Mesenchymal Stem Cells (UCMC)

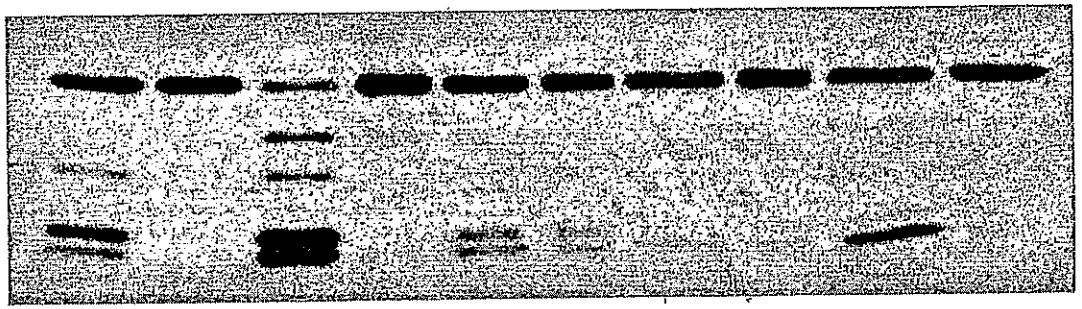


1 2 3 4 5 6 7 8 9 10

1: UCMC-3
2: UCMC-3
3: UCMC-2
4: UCMC-2
5: UCMC-3
6: UCMC-3

7: ADMC-3
8: ADMC-3
9: hBMSC-3
10: hBMSC-3

FIGURE 9-15: Expression of Hepatoma Derived Growth Factor (HDGF) in Umbilical Cord Mesenchymal Stem Cells (UCMC)

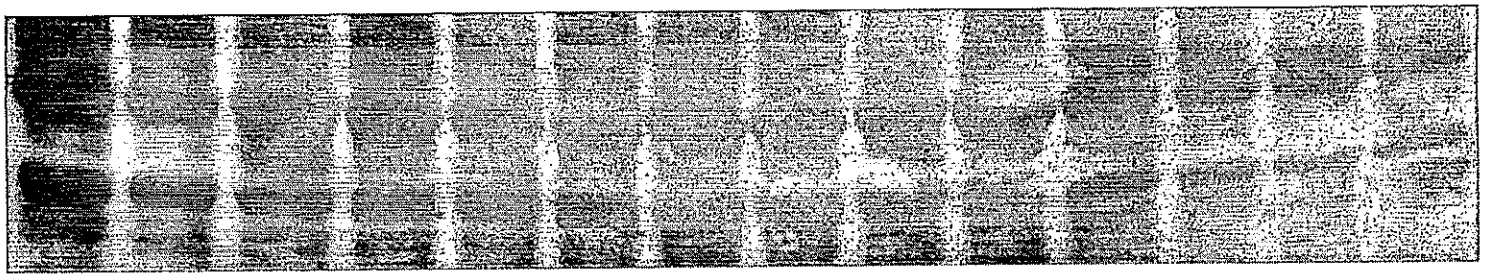


1 2 3 4 5 6 7 8 9 10

1: UCMC-3
2: UCMC-3
3: UCMC-2
4: UCMC-2
5: UCMC-3
6: UCMC-3

7: NF-111
8: NF-111
9: NF-105
10: NF-105

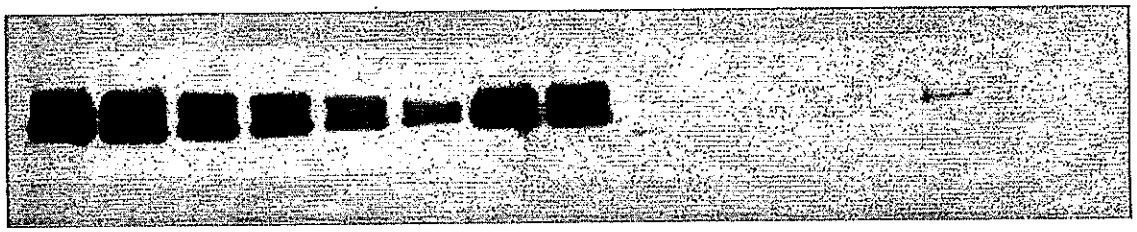
FIGURE 9-16: Expression of Stem Cell Growth Factor (SCF) in Umbilical Cord Mesenchymal Stem Cells (UCMC)



1 2 3 4 5 6 7 8 9 10 11 12 13 14

1 UCMC-3
2 UCMC-3
3 UCMC-3
4 UCMC-3
5 UCMC-2
6 UCMC-2
7 UCMC-3
8 UCMC-3
9 hBMSC-1
10 hBMSC-1
11 ADMC
12 ADMC
13 hBMSC-3
14 hBMSC-3

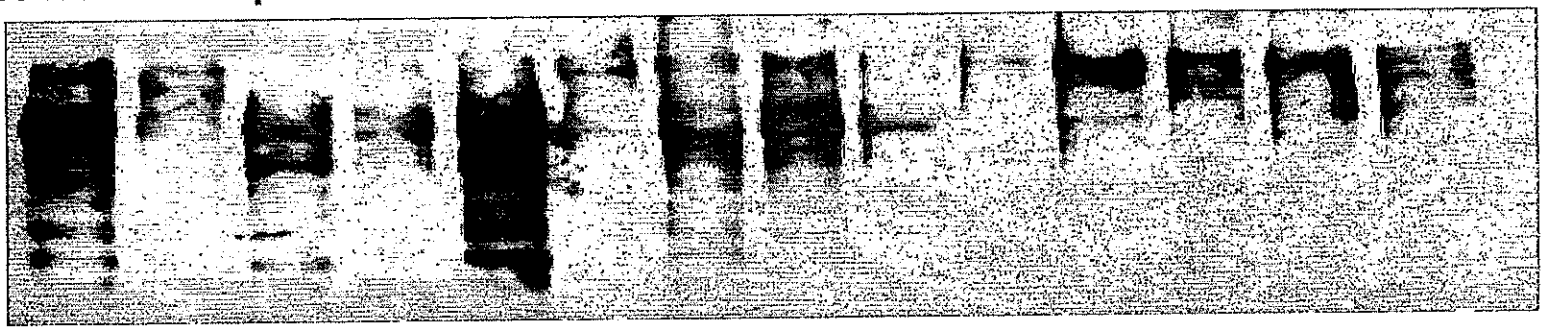
FIGURE 9-17: Expression of alpha-Smooth Muscle Actin (α-SMA) in Umbilical Cord Mesenchymal Stem Cells (UCMC)



1 2 3 4 5 6 7 8 9 10 11 12 13 14

1. UCMC4
2. UCMC4
3. UCMC7
4. UCMC7
5. CBMC4
6. CBMC4
7. CBMC12
8. CBMC12
9. UCEC10
10. NK(ar)
11. NF mix
12. NF mix
13. NF6
14. NF6

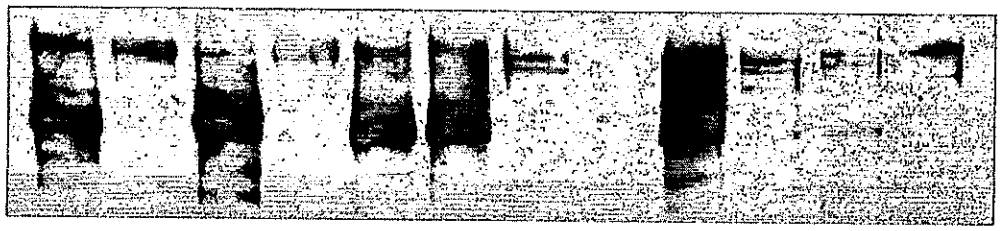
FIGURE 9-18: Expression of Fibronectin in Umbilical Cord Mesenchymal Stem Cells (UCMC)



1 2 3 4 5 6 7 8 9 10 11 12 13 14

1 UCMC-3
2 UCMC-3
3 UCMC-3
4 UCMC-3
5 UCMC-2
6 UCMC-2
7 UCMC-3
8 UCMC-3
9 hBMSC-1
10 hBMSC-1
11 ADMC
12 ADMC
13 hBMSC-3
14 hBMSC-3

FIGURE 9-19: Expression of Fibronectin in Umbilical Cord Mesenchymal Stem Cells (UCMC)

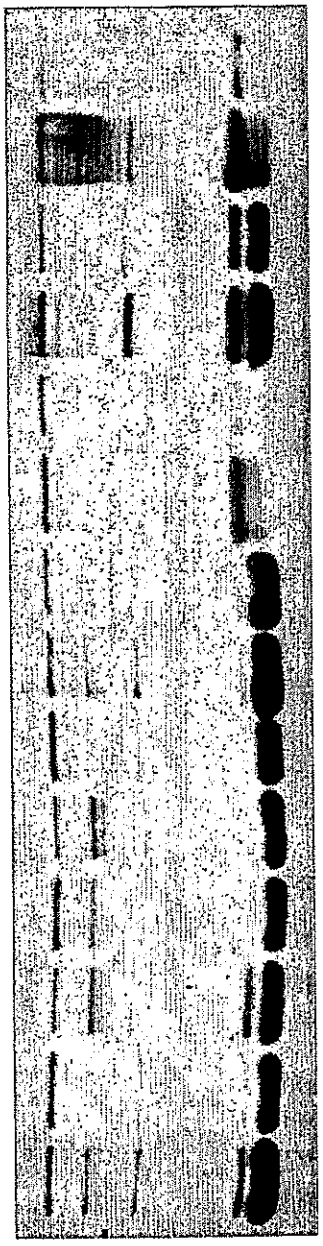


1 2 3 4 5 6 7 8 9 10 11 12

1 UCMC-3
2 UCMC-3
3 UCMC-2
4 UCMC-2
5 UCMC-3
6 UCMC-3

7 NF (ear)
8 NF (ear)
9 NF 106
10 NF 106
11 NF 112
12 NF 112

FIGURE 9-20: Expression of Decorin in Umbilical Cord Mesenchymal Stem Cells (UCMC)

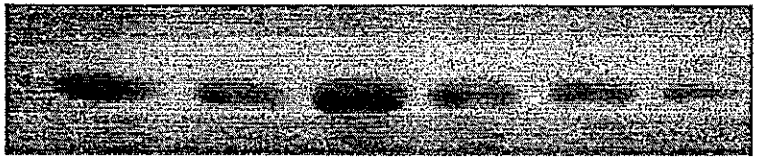


1 2 3 4 5 6 7 8 9 10 11 12 13 14

1 UCMC-3
2 UCMC-3
3 UCMC-3
4 UCMC-3
5 UCMC-2
6 UCMC-2
7 UCMC-3
8 UCMC-3

9 NF (ear)
10 NF (ear)
11 NF 106
12 NF 106
13 NF 112
14 NF 112

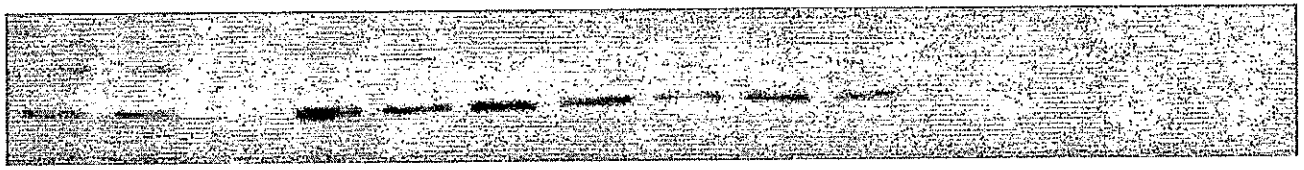
FIGURE 9-21: Expression of Syndecan-1 in Umbilical Cord Mesenchymal Stem Cells (UCMC)



1 2 3 4 5 6

1 UCMC-3
2 UCMC-3
3 UCMC-3
4 UCMC-3
5 UCMC-2
6 UCMC-2

FIGURE 9-22: Expression of Syndecan-2 in Umbilical Cord Mesenchymal Stem Cells (UCMC)



1 2 3 4 5 6 7 8 9 10 11 12 13 14

1 UCMC-1
2 UCMC-1
3 UCMC-3
4 UCMC-3
5 UCMC-2
6 UCMC-2
7 UCMC-4
8 UCMC-4
9 UCMC-5
10 UCMC-5
11 NF 106
12 NF 106
13 NF 112
14 NF 112

FIGURE 9-23: Expression of Syndecan-2 in Umbilical Cord Mesenchymal Stem Cells (UCMC)

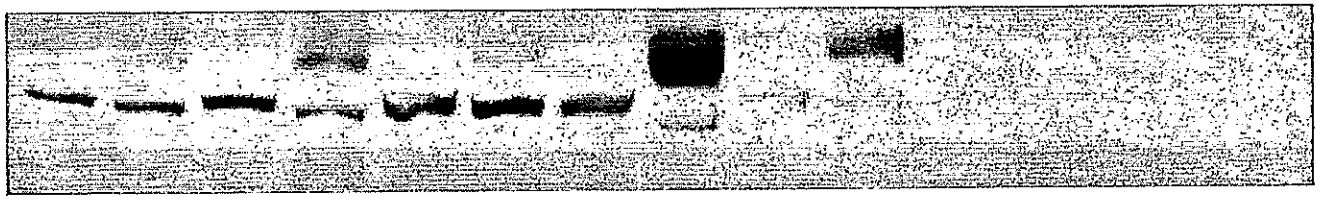


1 2 3 4 5 6 7 8 9 10 11 12 13 14

1 UCMC-1
2 UCMC-1
3 UCMC-3
4 UCMC-3
5 UCMC-2
6 UCMC-2
7 UCMC-4
8 UCMC-4

9 UCMC-5
10 UCMC-5
11 NF 106
12 NF 106
13 NF 112
14 NF 112

FIGURE 9-24: Expression of Syndecan-3 in Umbilical Cord Mesenchymal Stem Cells (UCMC)



1 2 3 4 5 6 7 8 9 10 11 12 13 14

1 UCMC-3
2 UCMC-3
3 UCMC-3
4 UCMC-3
5 UCMC-2
6 UCMC-2
7 UCMC-3
8 UCMC-3
9 hBMSC-1
10 hBMSC-1
11 ADMC
12 ADMC
13 hBMSC-3
14 hBMSC-3

FIGURE 9-25: Expression of Syndecan-3 in Umbilical Cord Mesenchymal Stem Cells (UCMC)



1 2 3 4 5 6 7 8 9 10 11 12 13 14

1 UCMC-3
2 UCMC-3
3 UCMC-3
4 UCMC-3
5 UCMC-2
6 UCMC-2
7 UCMC-3
8 UCMC-3
9 NF (ear)
10 NF (ear)
11 NF 106
12 NF 106
13 NF 112
14 NF 112

FIGURE 9-26: Expression of Syndecan-4 in Umbilical Cord Mesenchymal Stem Cells (UCMC)



1 2 3 4 5 6 7 8 9 10 11 12 13 14

1 UCMC-1
2 UCMC-1
3 UCMC-3
4 UCMC-3
5 UCMC-2
6 UCMC-2
7 UCMC-4
8 UCMC-4

9 UCMC-5
10 UCMC-5
11 NF 106
12 NF 106
13 NF 112
14 NF 112

FIGURE 10-1: Expression of Cytokeratins in Umbilical Cord Epithelial Cells

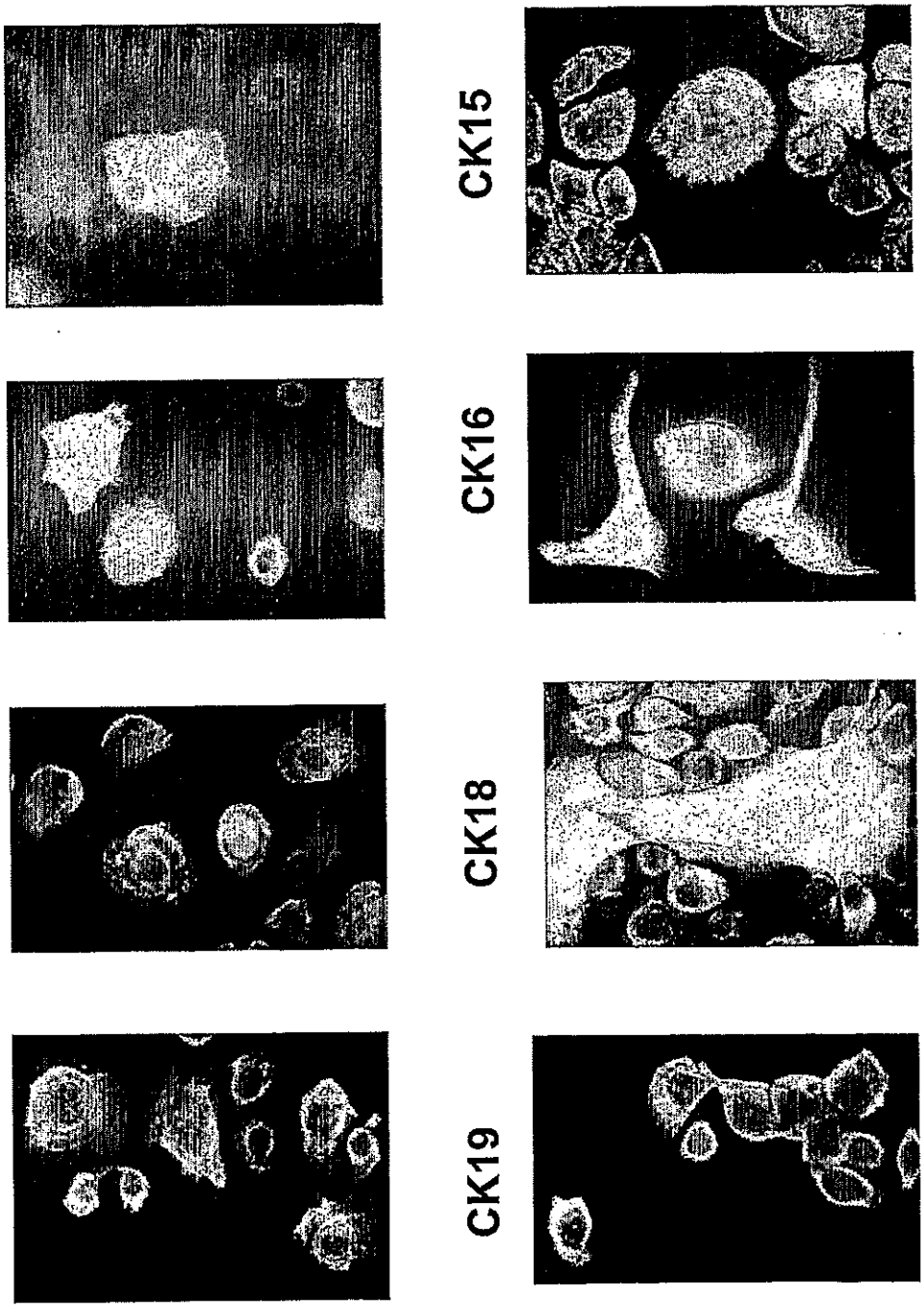


FIGURE 10-2: Expression of Hemidesmosome and Desmosome in Umbilical Cord Epithelial Cells

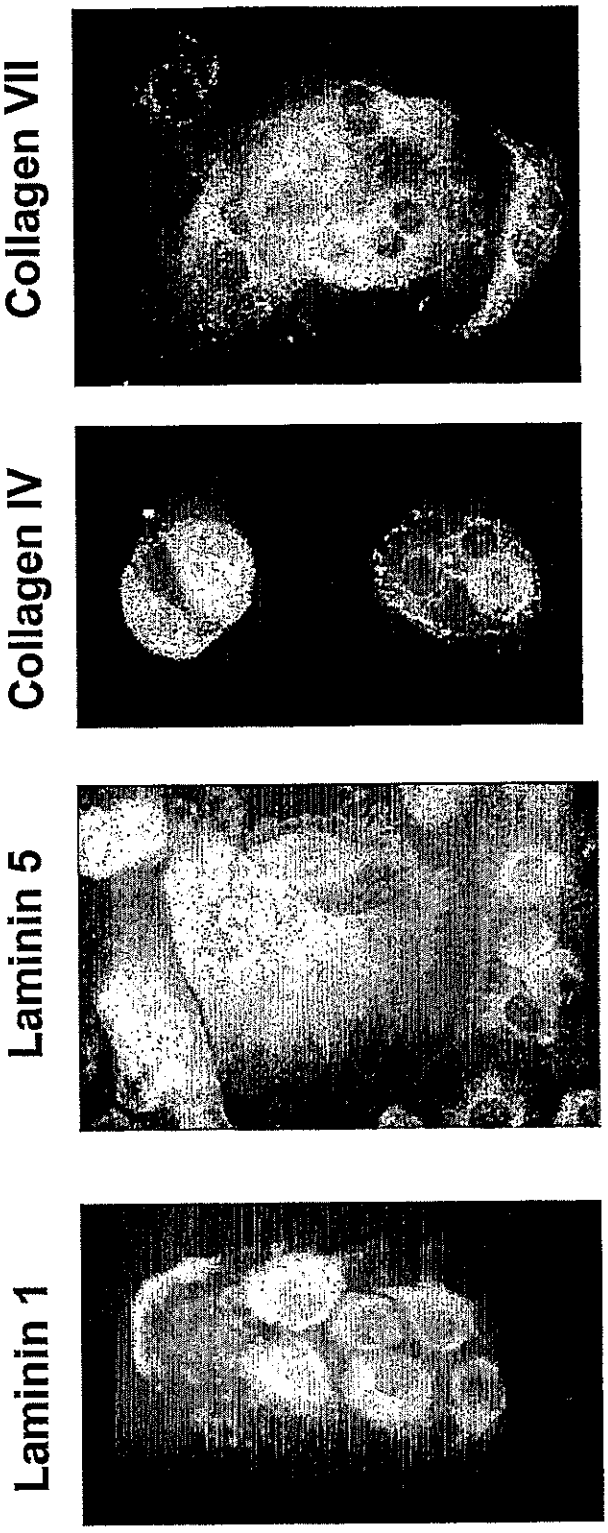


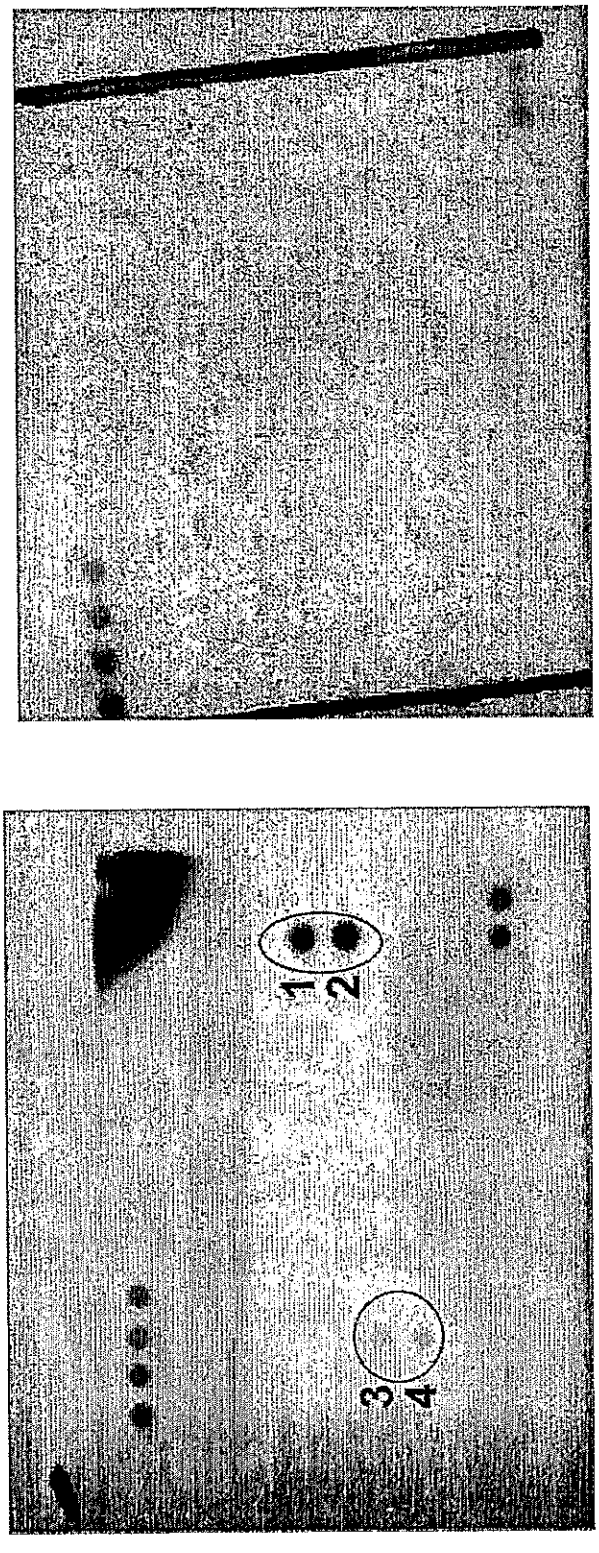
FIGURE 10-3: Expression of Basement Membrane Proteins in Umbilical Cord Epithelial Cells

FIGURE 10-4: Expression of Integrin-β1 and Fibronectin in Umbilical Cord Epithelial Cells

Fibronectin

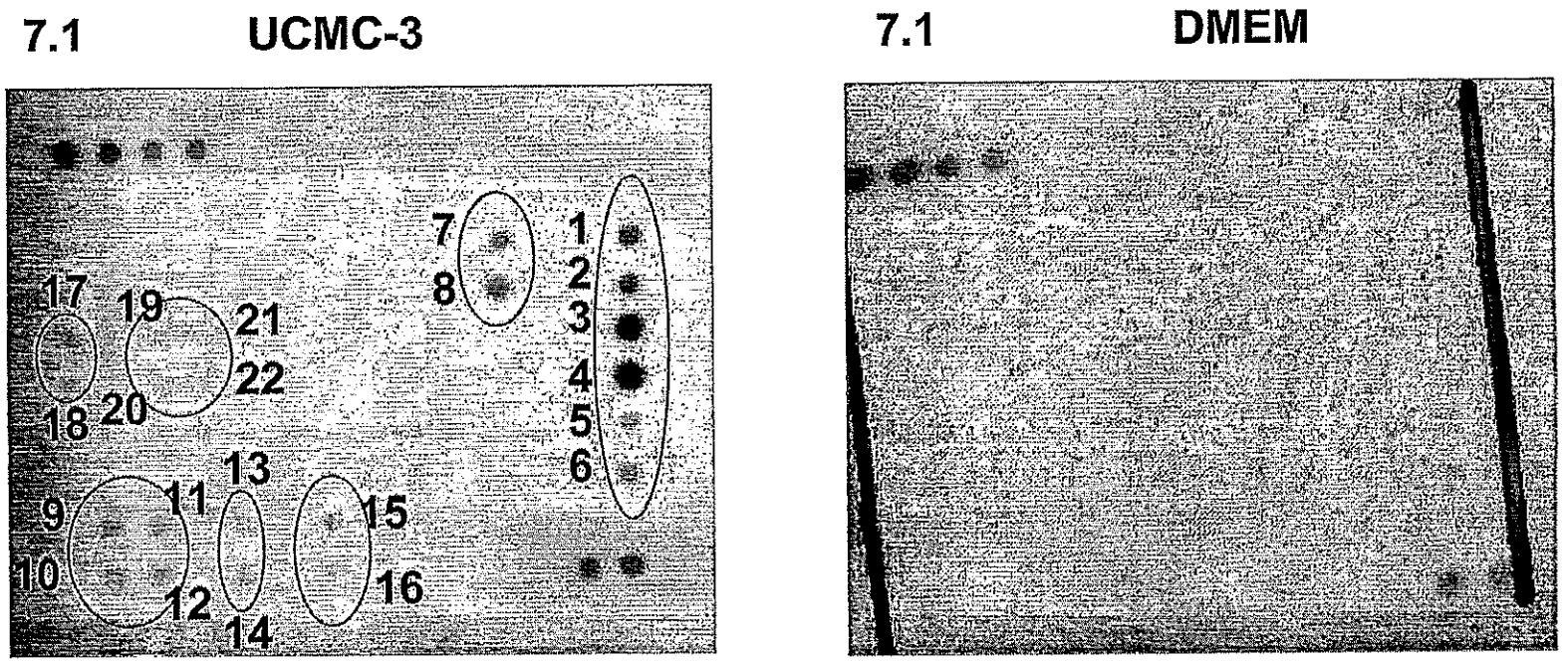
Integrin β1

FIGURE 11: Expression Profile of Secreted Cytokines and Growth Factors by Umbilical Cord Mesenchymal Cells



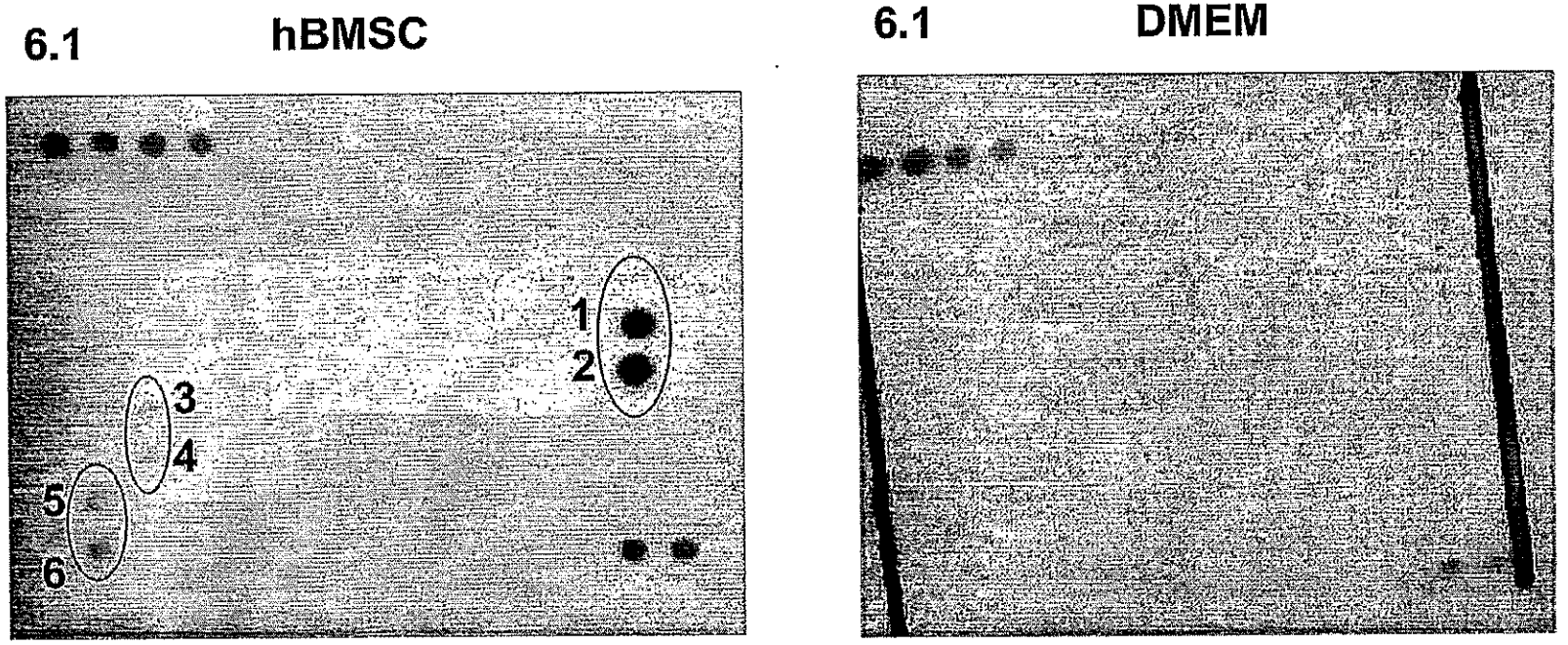
1,2-IL6
3,4-MCP1

FIGURE 11: Expression Profile of Secreted Cytokines and Growth Factors by Umbilical Cord Mesenchymal Cells



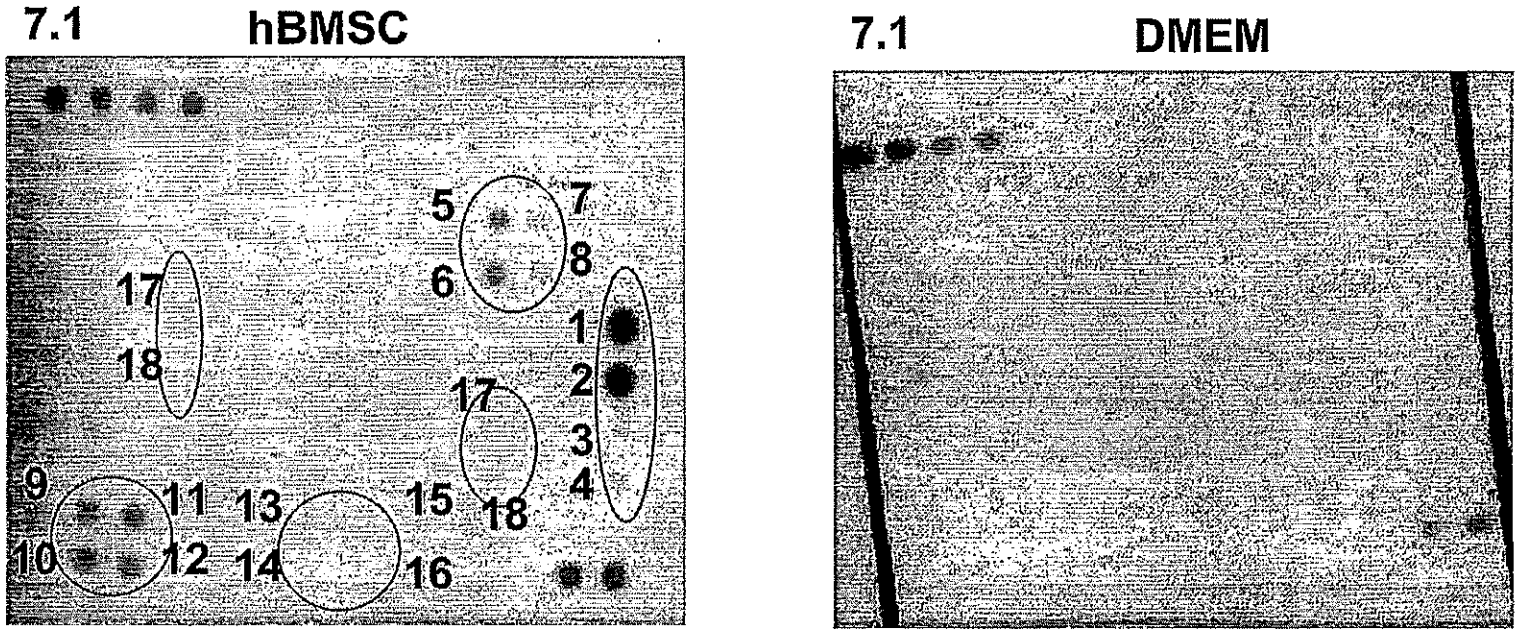
1,2-HGF; 3,4-IL8; 5,6-sTNFR1; 7,8-GRO; 9,10-TIMP1; 11,12-TIMP2
13,14-TRAILR3; 15,16-uPAR; 17,18-ICAM1; 19,20-IGFBP3; 21,22-IGFBP6

FIGURE 11: Expression Profile of Secreted Cytokines and Growth Factors by Bone Marrow Mesenchymal Cells



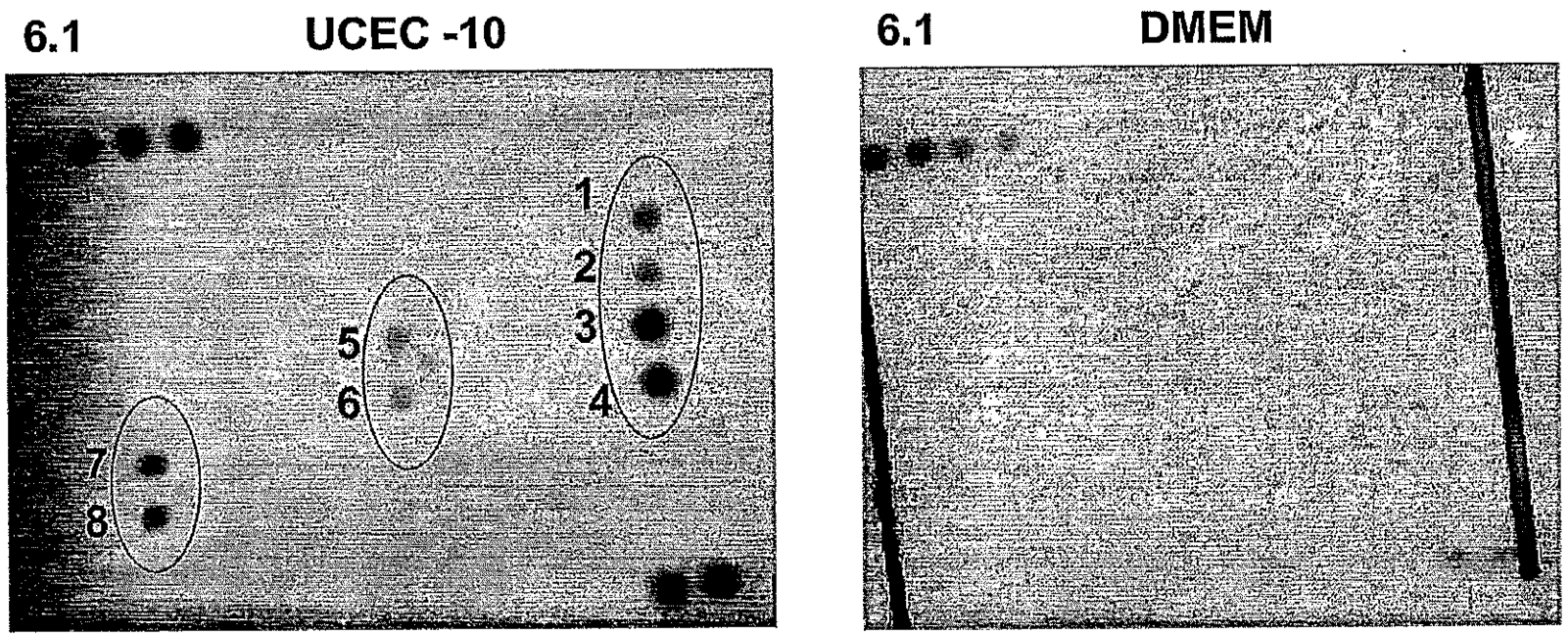
1,2-IL6; 3,4-MCP1; 5,6-RANTES

FIGURE 11: Expression Profile of Secreted Cytokines and Growth Factors by Bone Marrow Mesenchymal Cells



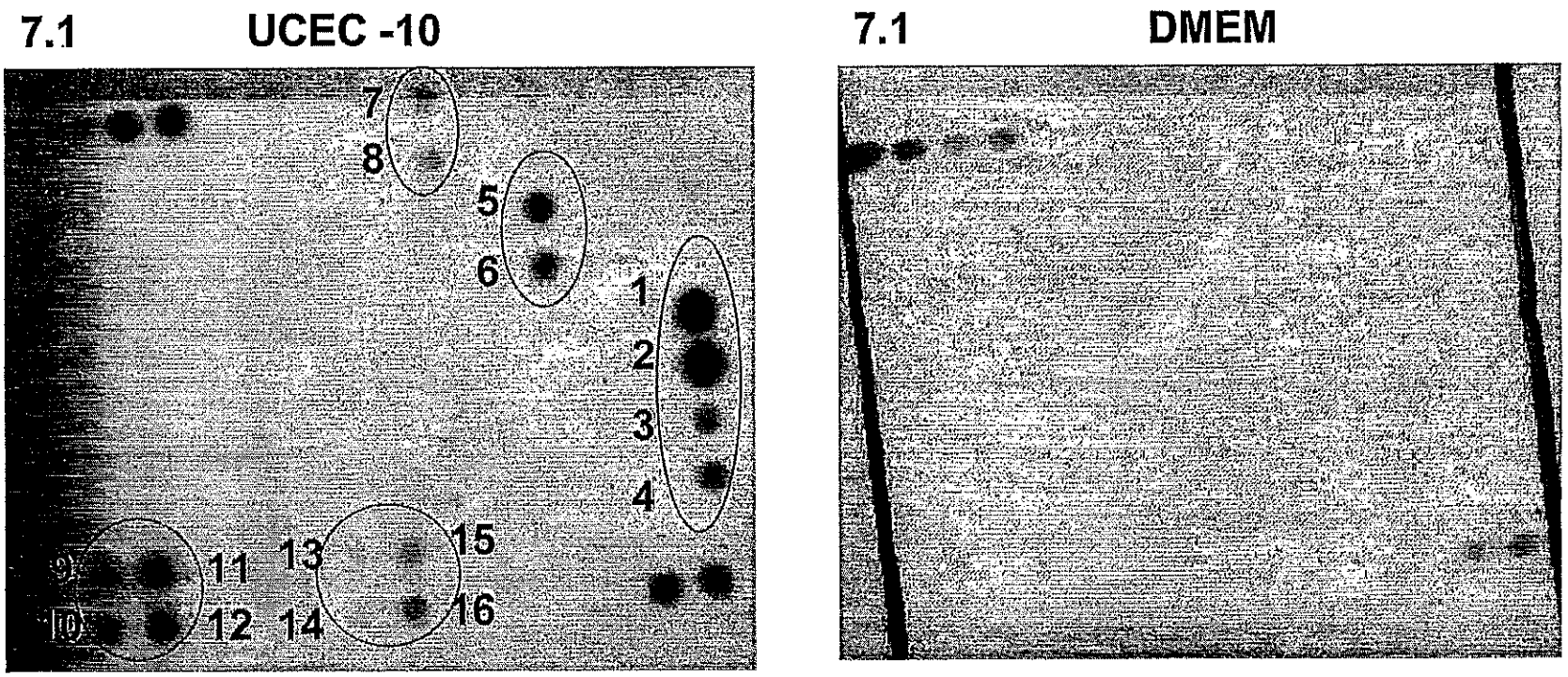
1,2-IL8; 3,4-sTNFR1; 5,6-GRO; 7,8-GRO-a; 9,10-TIMP1; 11,12-TIMP2 13,14-uPAR;15,16-VEGF;17,18-PIGF

FIGURE 12: Expression Profile of Secreted Cytokines and Growth Factors by Umbilical Cord Epithelial Cells



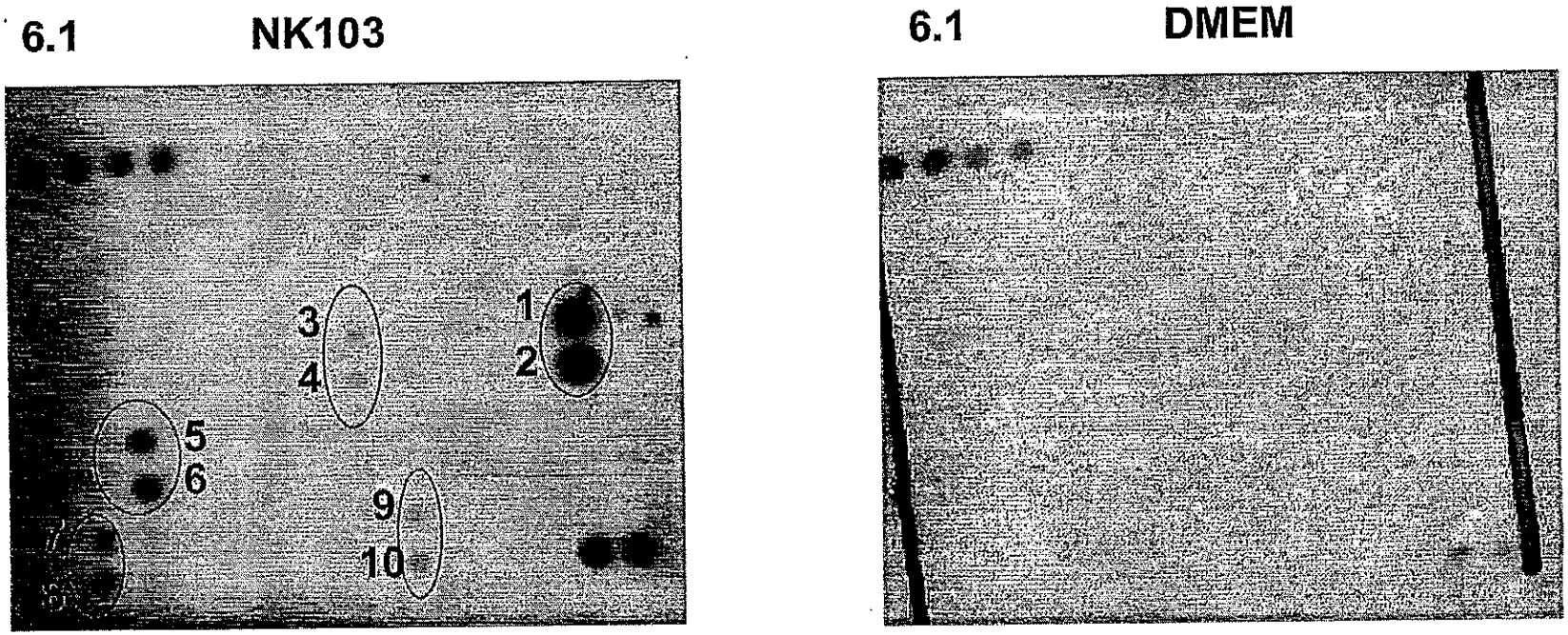
1,2-IGFBP-2; 3,4-IL6; 5,6-IL1Rα; 7,8-MCP-1

FIGURE 12: Expression Profile of Secreted Cytokines and Growth Factors by Umbilical Cord Epithelial Cells



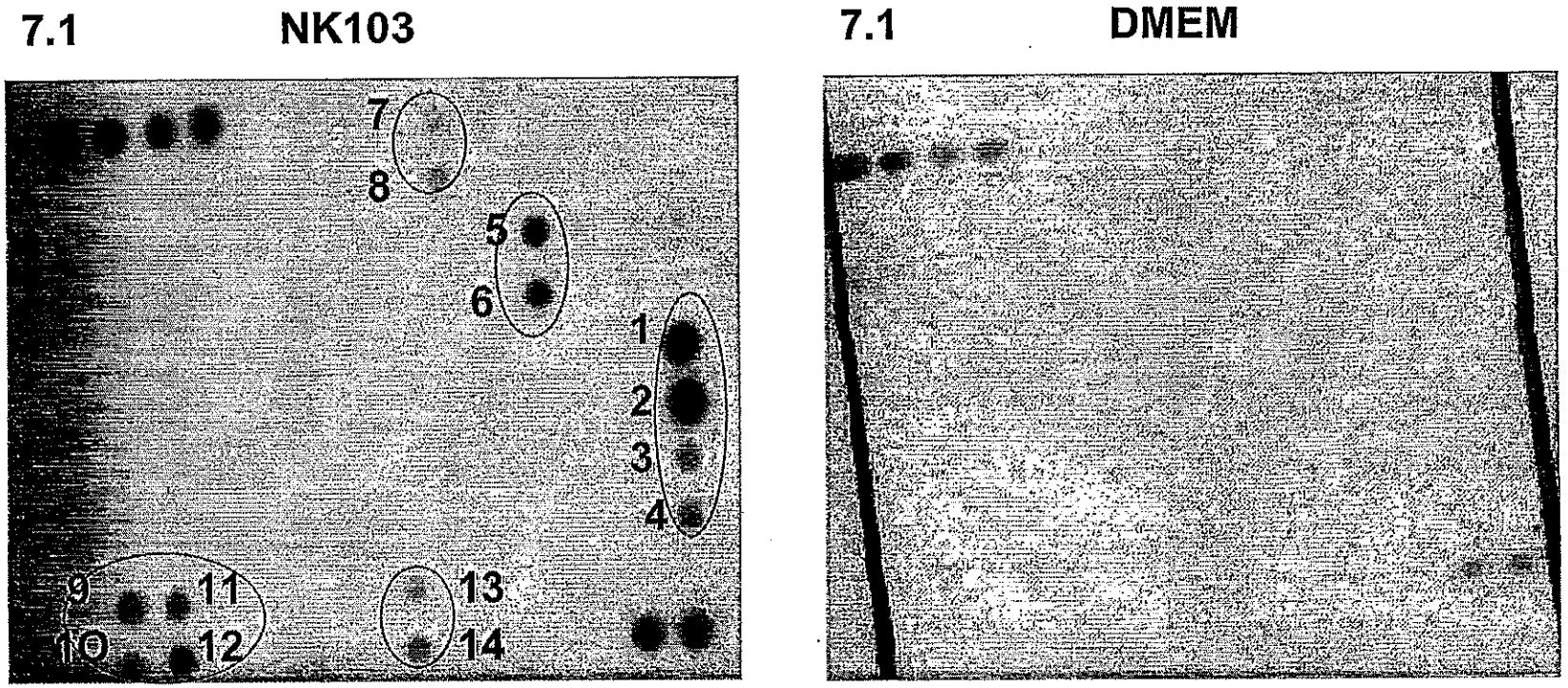
1,2-IL8; 3,4-sTNFR; 5,6-GRO; 7,8-Amphiregulin; 9,10-TIMP1; 11,12-TIMP2; 13,14-uPAR;15,16-VEGF

FIGURE 12: Expression Profile of Secreted Cytokines and Growth Factors by Human Epidermal Keratinocytes



1,2-IL6; 3,4-IL1Rα; 5,6-MCP-1; 7,8-RANTES; 9,10-TNFβ

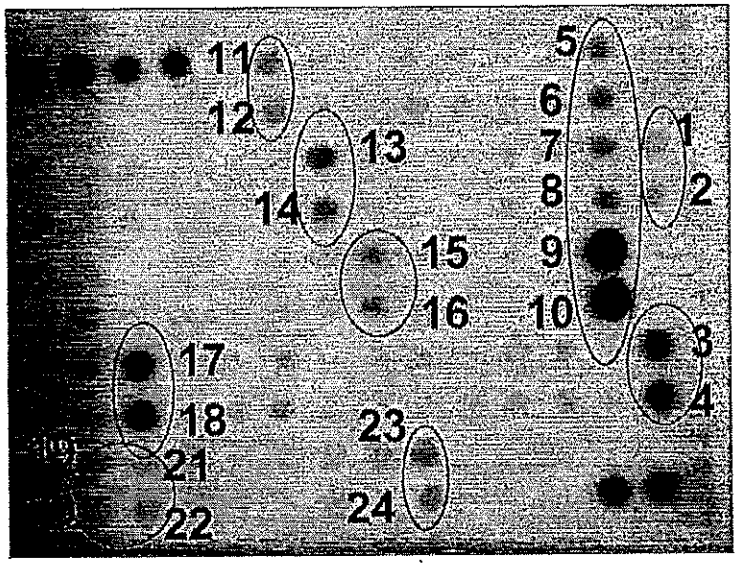
FIGURE 12: Expression Profile of Secreted Cytokines and Growth Factors by Human Epidermal Keratinocytes



1,2-IL8; 3,4-sTNFR; 5,6-GRO; 7,8-Amphiregulin; 9,10-TIMP-1; 11,12-TIMP2; 13,14-VEGF

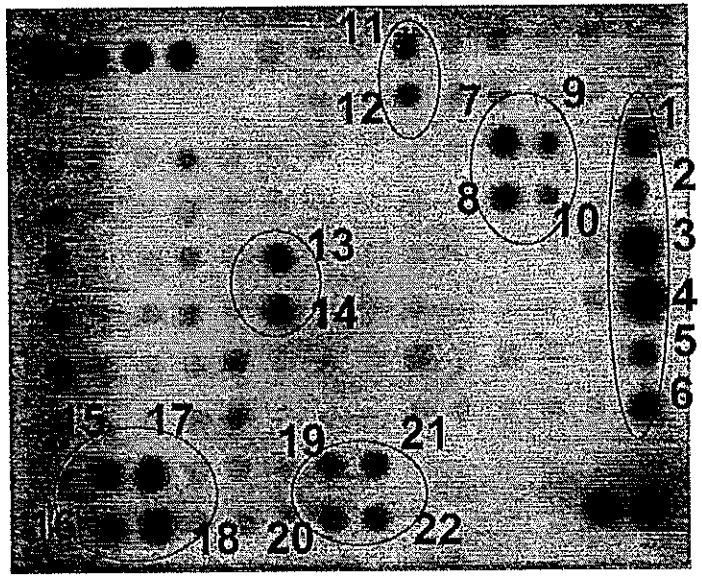
FIGURE 12: Expression Profile of Secreted Cytokines and Growth Factors by Umbilical Cord Epithelial Cells

6.1 UCEC-12



1,2-IGFBP-4; 3,4-PARC; 5,6-EGF;
7,8-IGFBP-2; 9,10-IL-6; 11,12-Angiogenin;
13,14-GCP-2; 15,16-IL1Rα; 17,18-MCP-1;
19-20-RANTES; 21,22-SCF; 23,24-TNFβ

7.1 UCEC-12



1,2-HGF; 3,4-IL8; 5,6-sTNFR; 7,8-GRO;
9,10-GROα; 11,12-Amphiregulin;
13,14-IL-1R4/ST2; 15,16-TIMP1;
17,18-TIMP2; 19,20-uPAR; 21,22-VEGF

Fig.12
Spotting of Chip used for Cytokine Array (6.1)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	POS	POS	POS	POS	Blank	Angiogenin	BDNF	BLC	BMP-4	BMP-6	CK b 8-1	CNTF	EGF	Eotaxin
2	NEG	NEG	NEG	NEG	Blank	Angiogenin	BDNF	BLC	BMP-4	BMP-6	CK b 8-1	CNTF	EGF	Eotaxin
3	Eotaxin-2	Eotaxin-3	FGF-6	FGF-7	Fit-3 Ligand	Fractalkine	GCP-2	GDNF	GM-CSF	I-309	IFN-g	IGFBP-1	IGFBP-2	IGFBP-4
4	Eotaxin-2	Eotaxin-3	FGF-6	FGF-7	Fit-3 Ligand	Fractalkine	GCP-2	GDNF	GM-CSF	I-309	IFN-g	IGFBP-1	IGFBP-2	IGFBP-4
5	IGF-I	IL-10	IL-13	IL-15	IL-16	IL-1a	IL-1b	IL-1ra	IL-2	IL-3	IL-4	IL-5	IL-6	IL-7
6	IGF-I	IL-10	IL-13	IL-15	IL-16	IL-1a	IL-1b	IL-1ra	IL-2	IL-3	IL-4	IL-5	IL-6	IL-7
7	Leptin	LIGHT	MCP-1	MCP-2	MCP-3	MCP-4	M-CSF	MDC	MIG	MIP-1 d	MIP-3a	NAP-2	NT-3	PARC
8	Leptin	LIGHT	MCP-1	MCP-2	MCP-3	MCP-4	M-CSF	MDC	MIG	MIP-1 d	MIP-3a	NAP-2	NT-3	PARC
9	PDGF-BB	RANTES	SCF	SDF-1	TARC	TGF-b1	TGF-b 3	TNF-a	TNF-b	Blank	Blank	Blank	Blank	Blank
10	PDGF-BB	RANTES	SCF	SDF-1	TARC	TGF-b1	TGF-b 3	TNF-a	TNF-b	Blank	Blank	Blank	POS	POS

Fig.12
Spotting of Chip used for Cytokine Array (7.1)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	POS	POS	POS	POS	Blank	Acrp30	AgRP	Angiopoietin-2	Amphiregulin	Axl	bFGF	b-NGF	BTC	CCL-28
2	NEG	NEG	NEG	NEG	Blank	Acrp30	AgRP	Angiopoietin-2	Amphiregulin	Axl	bFGF	b-NGF	BTC	CCL-28
3	CTACK	Dtk	EGF-R	ENA-78	Fas	FGF-4	FGF-9	GCSF	GITR-Ligand	GITR	GRO	GRO-a	HCC-4	HGF
4	CTACK	Dtk	EGF-R	ENA-78	Fas	FGF-4	FGF-9	GCSF	GITR-Ligand	GITR	GRO	GRO-a	HCC-4	HGF
5	ICAM-1	ICAM-3	IGFBP-3	IGFBP-6	IGF-ISR	IL-1R4/ST2	IL-1RI	IL-11	IL-12 p40	IL-12 p70	IL-17	IL-2Ra	IL-6R	IL-8
6	ICAM-1	ICAM-3	IGFBP-3	IGFBP-6	IGF-ISR	IL-1R4/ST2	IL-1RI	IL-11	IL-12 p40	IL-12 p70	IL-17	IL-2Ra	IL-6R	IL-8
7	I-TAC	Lymphotactin	MIF	MIP-1a	MIP-1b	MIP-3b	MSP-a	NT-4	Osteoprotegerin	Oncostatin M	PIGF	sgp130	sTNFRII	sTNF-RI
8	I-TAC	Lymphotactin	MIF	MIP-1a	MIP-1b	MIP-3b	MSP-a	NT-4	Osteoprotegerin	Oncostatin M	PIGF	sgp130	sTNFRII	sTNF-RI
9	TECK	TIMP-1	TIMP-2	Thrombopoietin	TRAILR3	TRAILR4	uPAR	VEGF	VEGF-D	Blank	Blank	Blank	Blank	Blank
10	TECK	TIMP-1	TIMP-2	Thrombopoietin	TRAILR3	TRAILR4	uPAR	VEGF	VEGF-D	Blank	Blank	Blank	POS	POS

FIGURE 13-1: UCMC-16 cultured in DMEM/10%FCS, at day 10

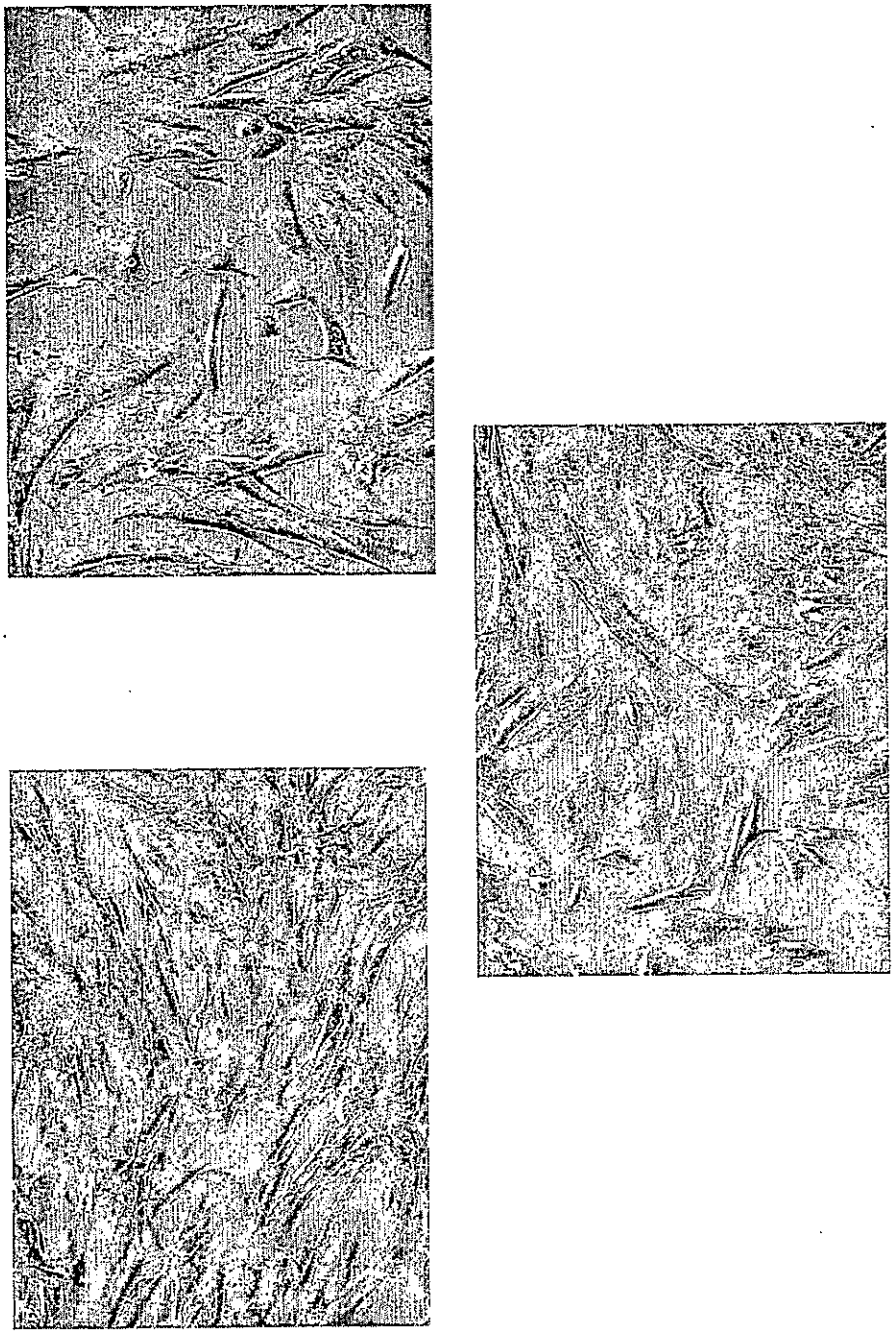


FIGURE 13-2: UCMC-15 cultured in PTT-1 medium, day 4

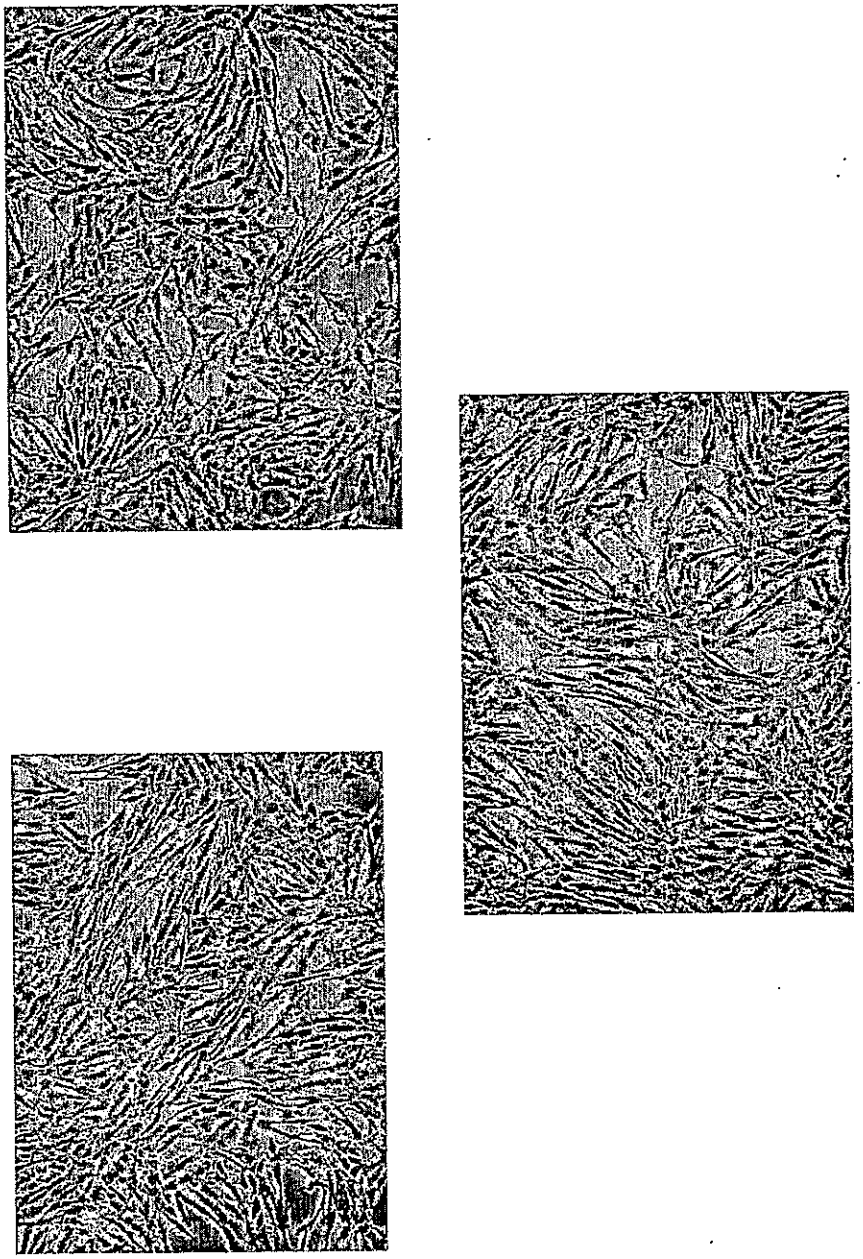


FIGURE 13-3: UCMC-16 cultured in PTT-1 at day 10

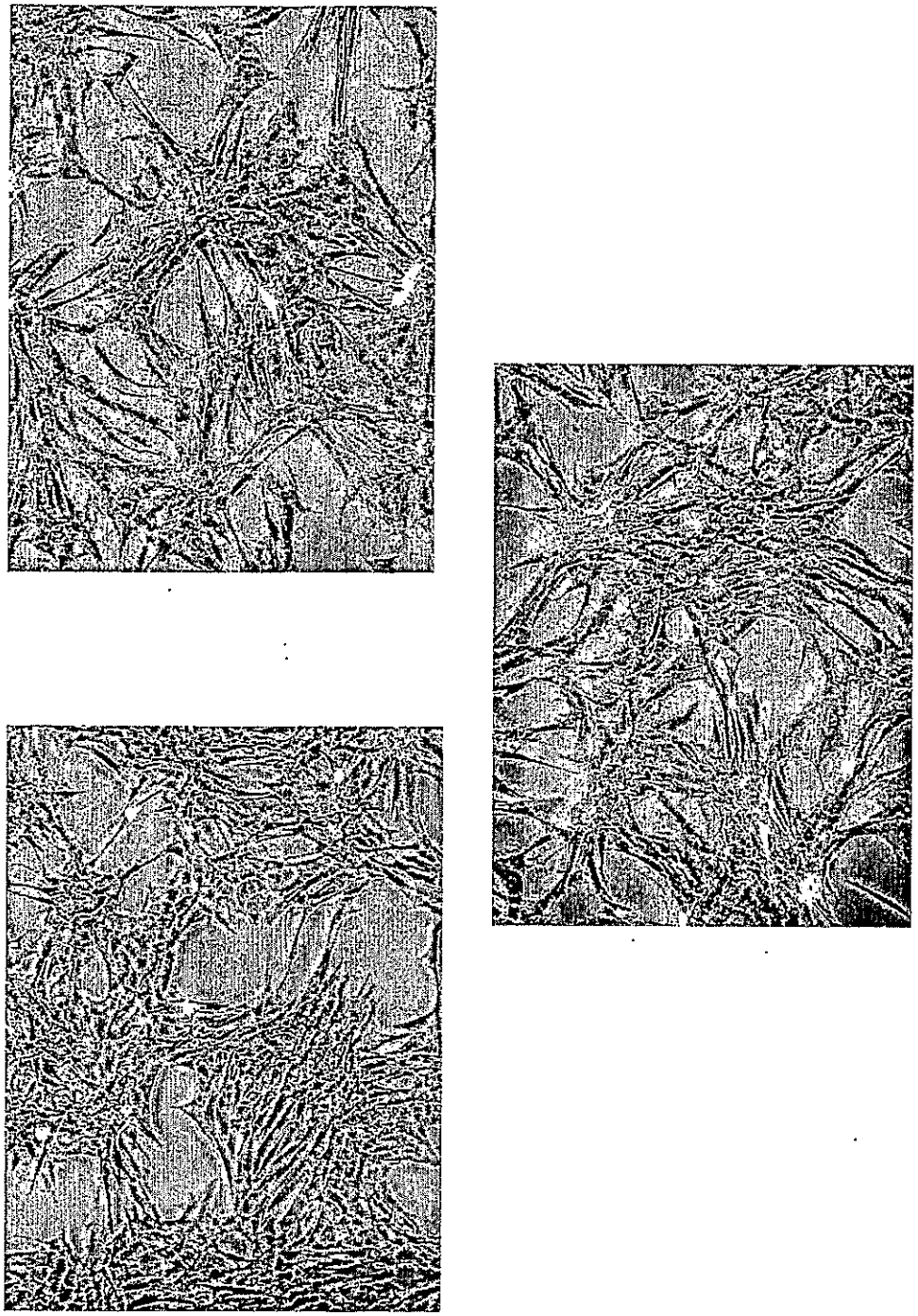
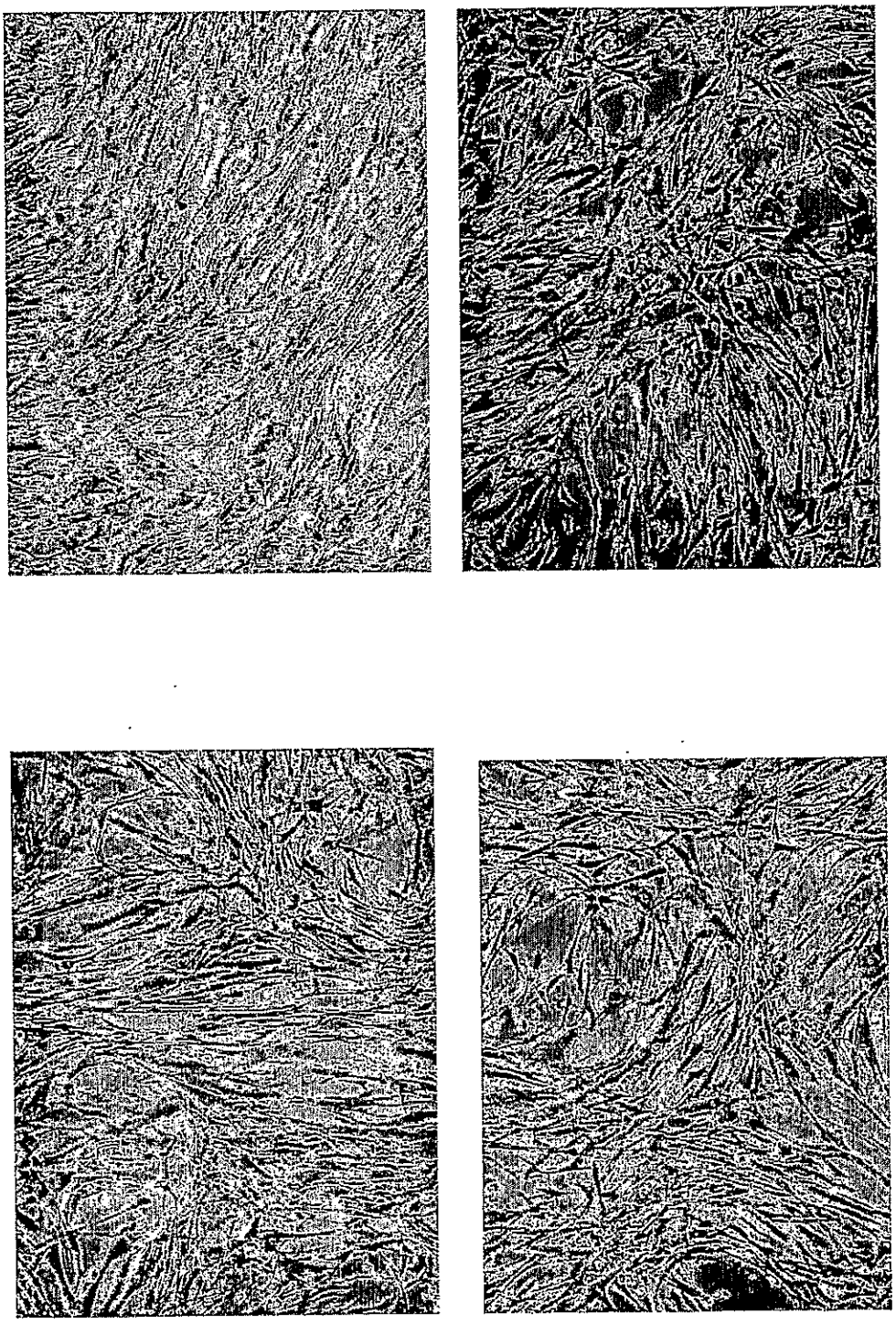


FIGURE 13-4: UCMC-16 cultured in PTT-2 at day 10



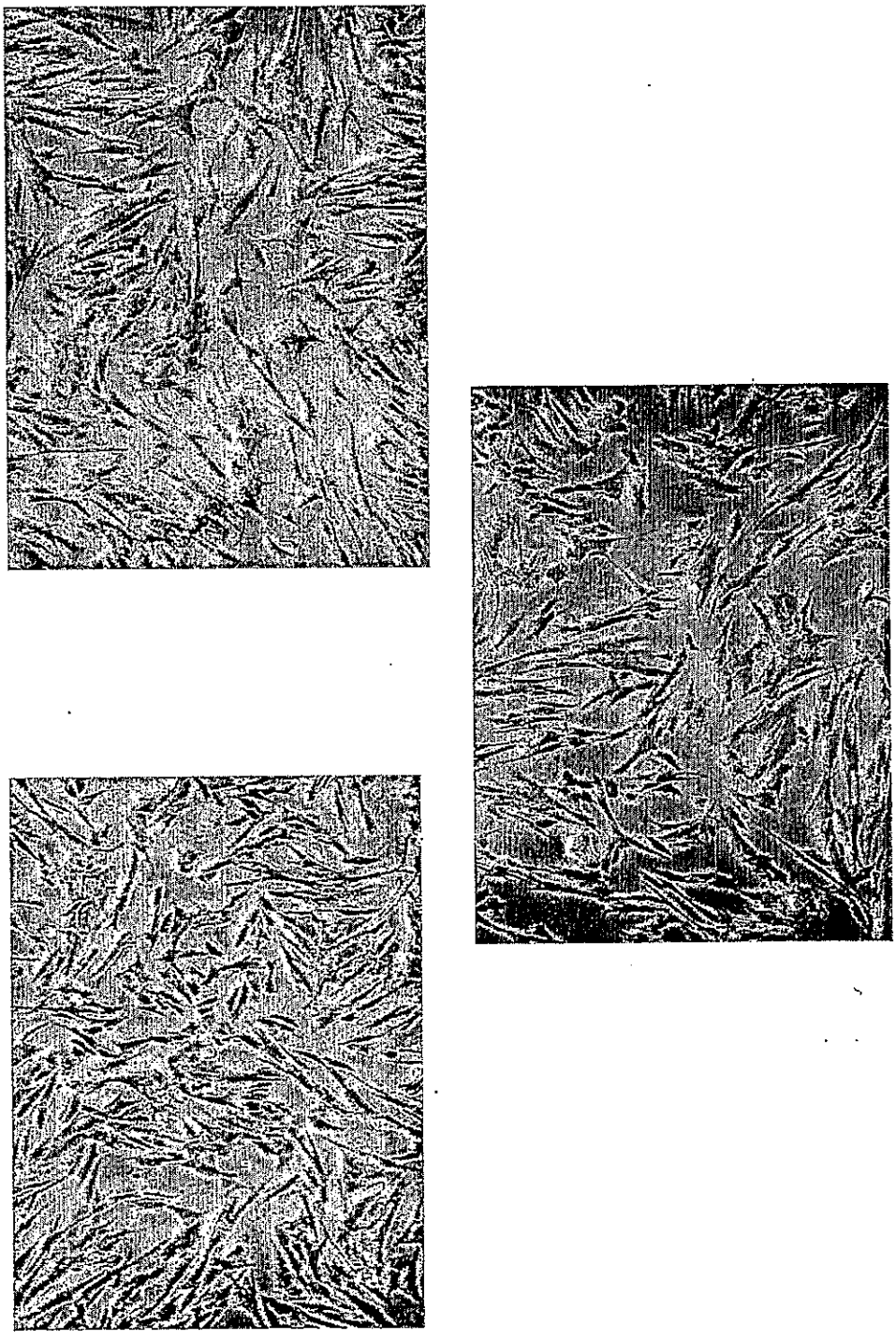
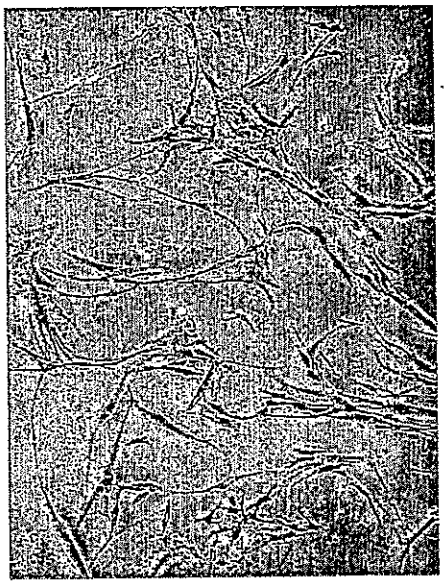
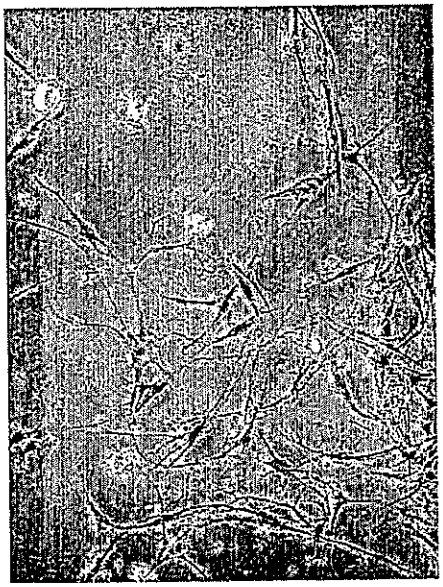


FIGURE 13-5: UCMC-16 cultured in PTT-3 at day 10

FIGURE 13-6: Adipose-derived stromal cells cultured in PTT-3 at day 10. Cells did not grow well in serum free medium





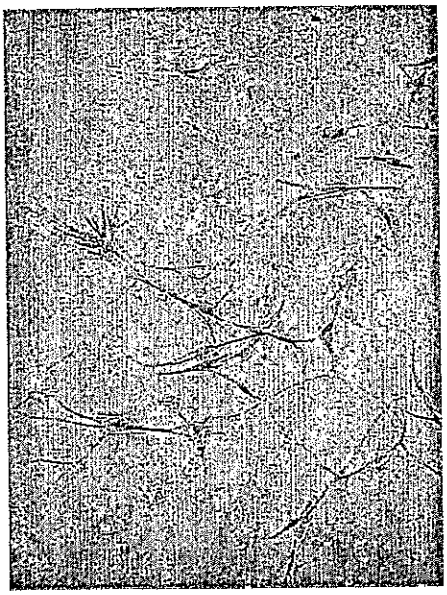
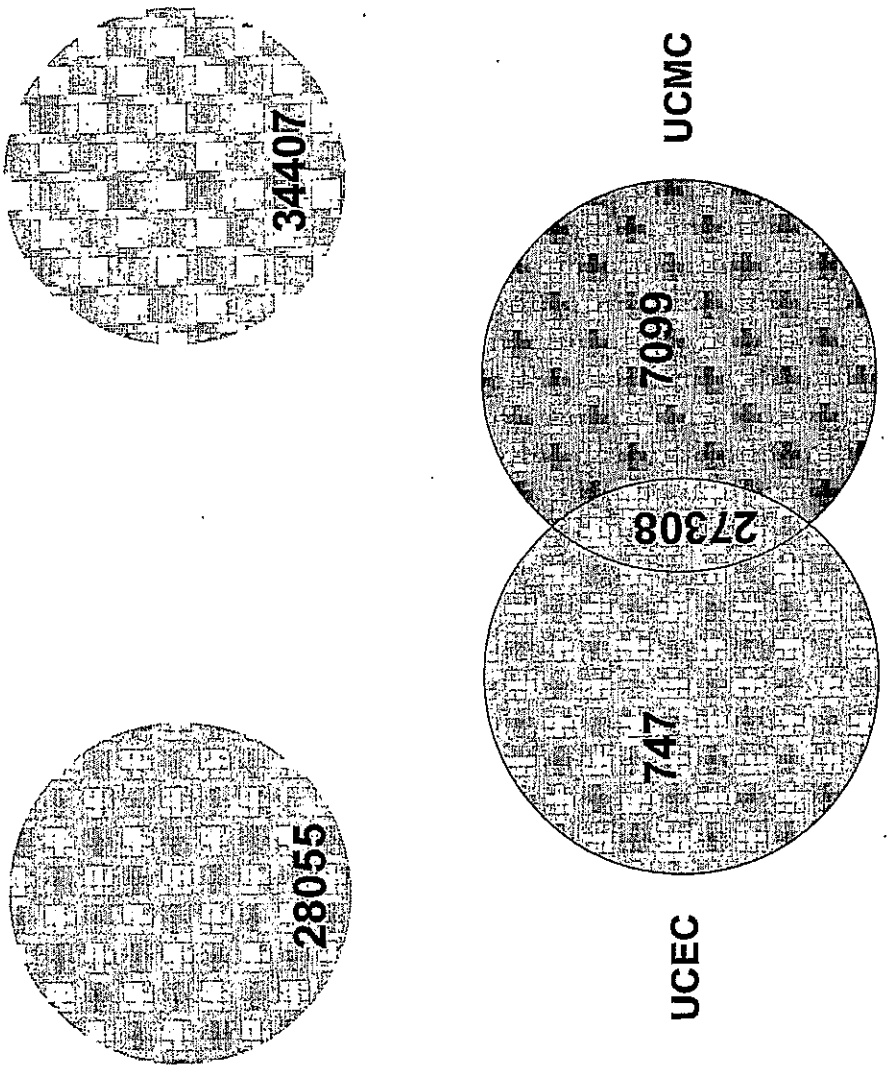


FIGURE 13-7: Bone marrow-derived stromal cells cultured in PTT-3 (MeE) at day 10. Cells did not grow well in serum free medium

FIGURE 14: Global gene expression in Umbilical Cord Epithelial and Mesenchymal Stem Cells



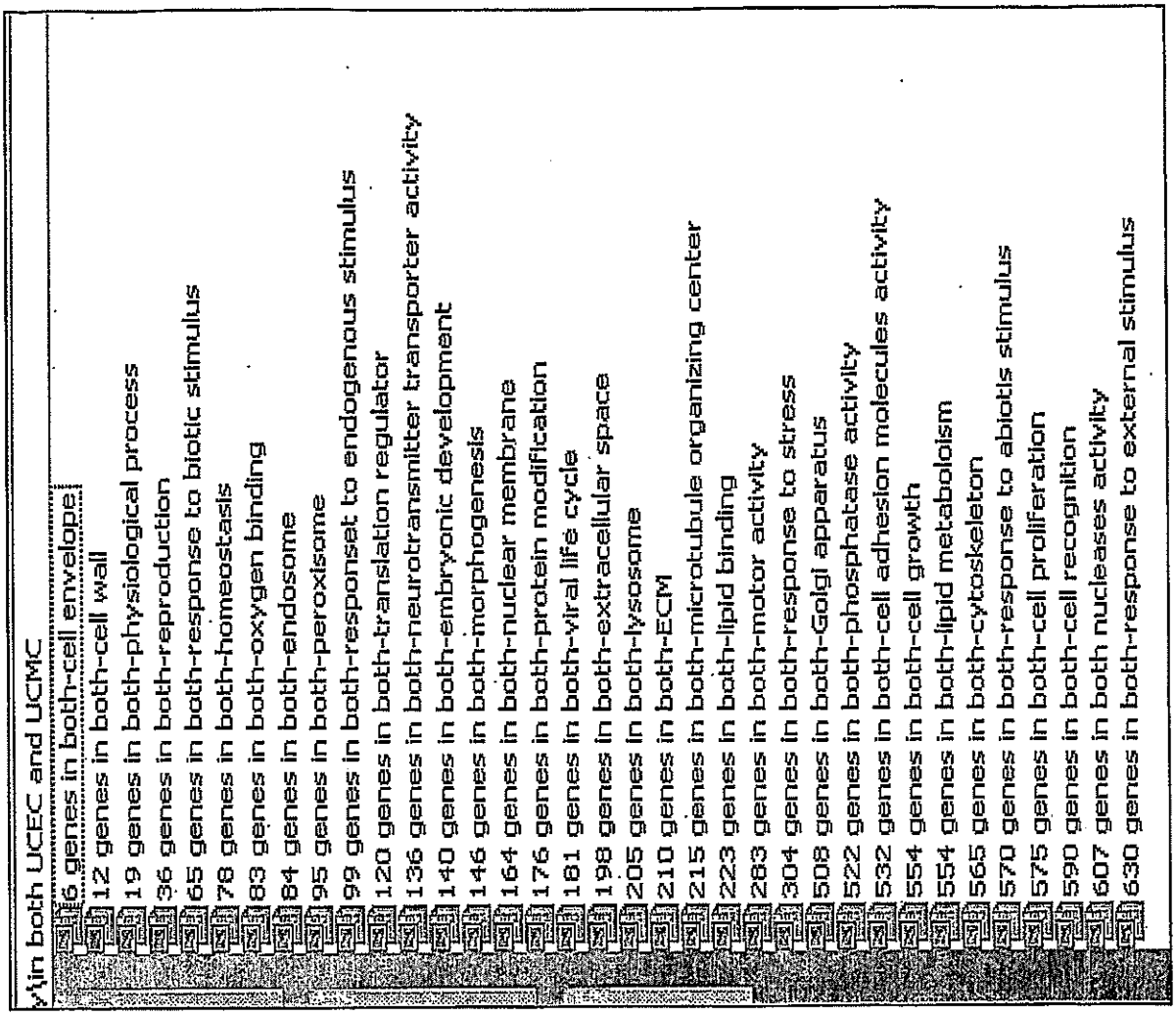


FIGURE 14: Gene expression present in BOTH, Umbilical Cord Epithelial and Mesenchymal Stem Cells

FIGURE 14: Gene expression present in BOTH, Umbilical Cord Epithelial and Mesenchymal Stem Cells

FIGURE 14: Gene expression present in BOTH, Umbilical Cord Epithelial and Mesenchymal Stem Cells

FIGURE 14: Gene expression present UNIQUELY in Umbilical Cord Epithelial Stem Cells (UCEC)

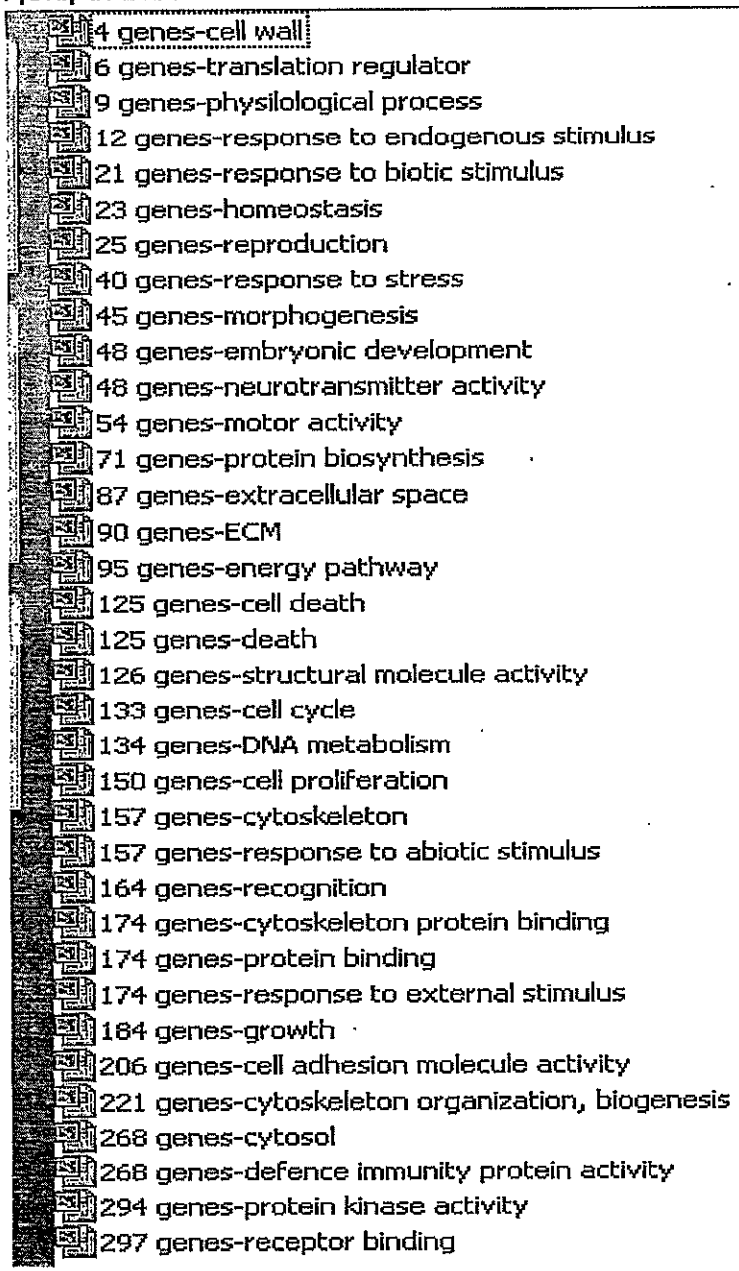


FIGURE 14: Gene expression present UNIQUELY in Umbilical Cord Mesenchymal Stem Cells (UCMC)

Figure 15

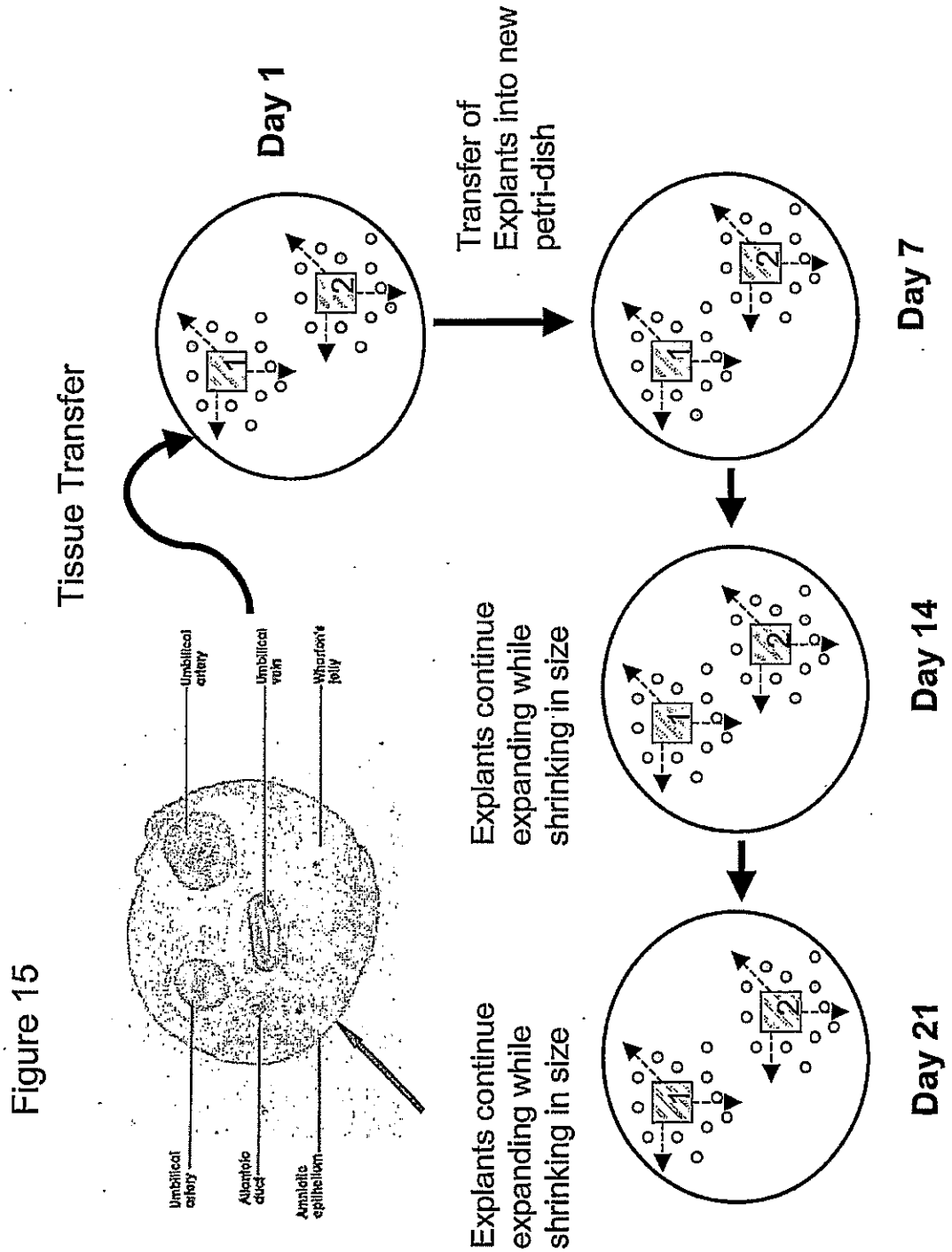

Tissue Transfer
Day 1
Transfer of Explants into new petri-dish
Day 7
Explants continue expanding while shrinking in size
Day 14
Explants continue expanding while shrinking in size
Day 21
Umbilical artery
Umbilical vein
Wharton's jelly
Allantoic duct
Amniotic epithelium
1
2

FIGURE 16: Histology of normal umbilical cord

