Supplementary Table 1: Correlation in Expression of Different Marker Genes in Differentiating MSCs

Timepoint/Gene Pair	r^2	Pearson's correlation coefficient	p-value
Day 1 aggrecan - osteopontin	0.24	0.49	1.0e-07
Day 21 aggrecan - osteopontin	.11	.34	.0019
Day 1 aggrecan-LPL	7.5e-5	.0087	.92
Day 21 aggrecan-LPL	.0022	.047	.67
Day 1 osteopontin-LPL	1.9e-5	.0044	.96
Day 21 osteopontin-LPL	.04	.21	.059

Supplementary Table 2: Coefficient of Variation of RNA Count in Small MSC Colonies

Colony	A	B	C	D
Aggrecan CV	1.71	1.34	1.07	0.91
GAPDH CV	0.32	0.35	0.31	0.20

Supplementary Table 3
P-values for Figure 1E:
Aggrecan RNA Count,
MSCs with Differentiation

Comparison	Adjusted P-value
-TGFB vs +TGFB, Day 01	0.0067
-TGFB vs +TGFB, Day 04	0.0043
-TGFB vs +TGFB, Day 07	0.0020
-TGFB vs +TGFB, Day 14	0.0017
-TGFB vs +TGFB, Day 21	0.0031
+TGFB, Day 1 vs Day 4	0.0006
+TGFB, Day 1 vs Day 7	0.0002
+TGFB, Day 1 vs Day 14	0.0047
+TGFB, Day 1 vs Day 21	0.0002
+TGFB, Day 4 vs Day 7	0.0004
+TGFB, Day 4 vs Day 14	0.0021
+TGFB, Day 4 vs Day 21	0.0002
+TGFB, Day 7 vs Day 14	0.0002
+TGFB, Day 7 vs Day 21	<.0001
+TGFB, Day 14 vs Day 21	0.0002

Supplementary Table 4
P-values for Figure S1B:
GAPDH RNA Count ,
MSCs with Differentiation

Comparison	Adjusted P-value
-TGFB vs +TGFB, Day 01	0.3572
-TGFB vs +TGFB, Day 04	0.0827
-TGFB vs +TGFB, Day 07	0.0361
-TGFB vs +TGFB, Day 14	0.9479
-TGFB vs +TGFB, Day 21	0.9980
+TGFB, Day 1 vs Day 4	0.0022
+TGFB, Day 1 vs Day 7	0.4637
+TGFB, Day 1 vs Day 14	<.0001
+TGFB, Day 1 vs Day 21	0.0002
+TGFB, Day 4 vs Day 7	0.0019
+TGFB, Day 4 vs Day 14	0.0002
+TGFB, Day 4 vs Day 21	0.0009
+TGFB, Day 7 vs Day 14	<.0001
+TGFB, Day 7 vs Day 21	0.0002
+TGFB, Day 14 vs Day 21	0.0016

Supplementary Table 5 P-values for Figure S3: Aggrecan Difference Between Sister Cells		
Comparison		**Adjusted P-value**
< 12 hrs	[12-23 hrs]	<.0001
< 12 hrs	[24-35 hrs]	<.0001
< 12 hrs	[36-47 hrs]	<.0001
< 12 hrs	> 47 hrs	<.0001
[12-23 hrs]	[24-35 hrs]	0.8759
[12-23 hrs]	[36-47 hrs]	0.7564
[12-23 hrs]	> 47 hrs	0.9997
[24-35 hrs]	[36-47 hrs]	<.0001
[24-35 hrs]	> 47 hrs	<.0001
[36-47 hrs]	> 47 hrs	<.0001

Supplementary Table 6 P-values for Figure S3: GAPDH Difference Between Sister Cells		
Comparison		**Adjusted P-value**
< 12 hrs	[12-23 hrs]	0.1649
< 12 hrs	[24-35 hrs]	0.6435
< 12 hrs	[36-47 hrs]	<.0001
< 12 hrs	> 47 hrs	<.0001
[12-23 hrs]	[24-35 hrs]	0.0173
[12-23 hrs]	[36-47 hrs]	<.0001
[12-23 hrs]	> 47 hrs	<.0001
[24-35 hrs]	[36-47 hrs]	<.0001
[24-35 hrs]	> 47 hrs	<.0001
[36-47 hrs]	> 47 hrs	<.0001

Supplementary Table7
P-values for Figure 4B-D
Chondrocyte Gene Expression During Dedifferentiation

Passage Comparison		Aggrecan/GAPDH (Pooled Population) Adjusted P-value	Aggrecan per Cell Adjusted P-value	GAPDH per Cell Adjusted P-value
0	1	0.0079	0.2108	0.0006
0	3	0.0004	0.9342	0.0006
0	5	0.0002	0.9999	0.0008
0	7	0.0002	1.0000	0.0008
0	9	0.0011	0.9984	0.0025
1	3	0.7036	0.6621	1.0000
1	5	0.5040	0.2891	0.9945
1	7	0.4593	0.1658	0.9929
1	9	0.9377	0.3623	0.7026
3	5	0.9993	0.9783	0.9981
3	7	0.9982	0.8850	0.9972
3	9	0.9944	0.9934	0.7784
5	7	1.0000	0.9988	1.0000
5	9	0.9510	0.9999	0.9343
7	9	0.9309	0.9941	0.9431

Supplementary Table 8
P-values for Figure 4H-J
Chondrocyte RNA Count During Redifferentiation

Comparison	Aggrecan per Cell Adjusted P-value	GAPDH per Cell Adjusted P-value	Aggrecan/GAPDH per Cell Adjusted P-value
Day 1, P0 vs P5	0.0016	0.0406	0.9983
P0, Day 1 vs 14	0.0897	0.0006	0.0176
Day 14, P0 vs P5	0.0002	0.6714	0.0588
P5, Day 1 vs 14	<.0001	<.0001	0.1982

Supplementary Table 9: RNA-FISH probe sequences.			
Aggrecan	**GAPDH**	**Osteopontin**	**Lipoprotein Lipase**
gtccttgtctccatagcaac	agaattaaaagcagccctgg	cccaagaggcagaagcaaat	ggagtcctgagagcaaattt
acacgtcataggtttcgttg	tcattgatggcgacgatgtc	gtttaactggaagggcggag	caggaatgaggtggcaagtg
cttggaaggtgaacttctcc	agaccatgtagtgaaggtca	tacagcatctgggtatttgt	tgctgtggttgaagtgacag
tttctgggatgtccacaaag	ttgactgtgccgttgaactt	aagtctgcttctgagatggg	caactctcatacattcctgt
cccttacttcagggacaaac	ctttccattgatgacgagct	gacacagaattctgtggtgc	gacactggataatgctgctg
actgatgtcctctactccag	gatctcgctcctggaagatg	gggtattttgtttgttgtca	ataaacttggccacatcctg
gcagagatttctggaccttc	tctccatggtagtgaagacc	ggctttcattggacttactt	agttaaattcatccgccatc
actgatgtcctctactccag	agagatgatgaccctcttgg	gtcatctagatcgtctgttt	atcccaagagatgcacattg
aaggtcctctactccagaag	ttgttatacttctcgtggtt	cgtcggagtcattagagttg	ttcttattggtcagacttcc
agaaggaagtccactaaggt	gaggcattgctgacaatctt	aatggtcagggtcatcagtg	catactcgaagttaggtcca
agtctgctgagatcctctac	ccaaagtggtcatggatgac	tcagaatggtgagactcgtc	caggagaaaggcgacttgga
tctactccagaagcagagac	aagcagggatgatattctgg	gcgattgttggaatatcagt	ccctggtgaatgtgtgtaaa
actgatgtcctctactccag	ttgagctcagggatgacctt	ccgtagggataaacggagtg	ttctggattccgatacttcg
caccagaaggaagaacactg	gtcagatccacaacagacac	tcttgacttcagtccgtaag	cgttagggtaaatgtccaca
actgatgtcctctactccag	catacttggcaggtttctcc	ttagatcggcggaacttctt	caatgttacatcctggttgg
actgatgtcctctactccag	gtcctcagtgtagcctagaa	tgtggcatctggactctgaa	ctctgcaatcacacggagag
cctccagaaggaagtctact	tgagtgtcgctgttgaagtc	ctgactcgtcttcttaggtg	taggccttacttggattttc
agaaggaagtccactaaggt	aatgagcttgacaaagtggt	tggcgtgagttctttggaaa	ggcagagacctttctcaaag
gaaggtattctgccaaggtc	ttgctgtagccgaattcatt	gaatgcttgttcttatcctt	tgaccttgttgatctcgtag
gtccactgaaatcaggaagg	tactccttggaggccatgtg	tttcctgactctcaatcaga	tacatcttgctgcttctttt
caaagagtccagaggtttcc		aattcttggctgagtttgga	gcatctgagaacgagtcttc
ccactaatgtcaggaaaccc		atgatctaggtctagcttgt	cctggttggtgtatgtatta
gtcacgccagatatttctcc		tttcaggtgtttgtcttctt	cagtgccatacagagagatc
gatttctggttgtccagagg		attgacctcagaagaggcac	aaaagggatgttctcgctct
caattgctccagaagacagt			ttgtggaaacttcaggcagg
aagttccagaatgcctgaag			aatatccacctccgtgtaaa
ccaaagatcccaaatggtct			ggaccagctgaagtaggaat
accactggattcaaaaagct			cacctttttttgagtctctc
tgggactgatgacacttcta			gataagacatttctcccgg
cagatcagcttcatggaagg			tatcacaggtgactttcctt
ggattcgatttctagacgcg			acttgtcatggcatttcaca
attgatctcgtatcggtcct			cagccagactttctattcag