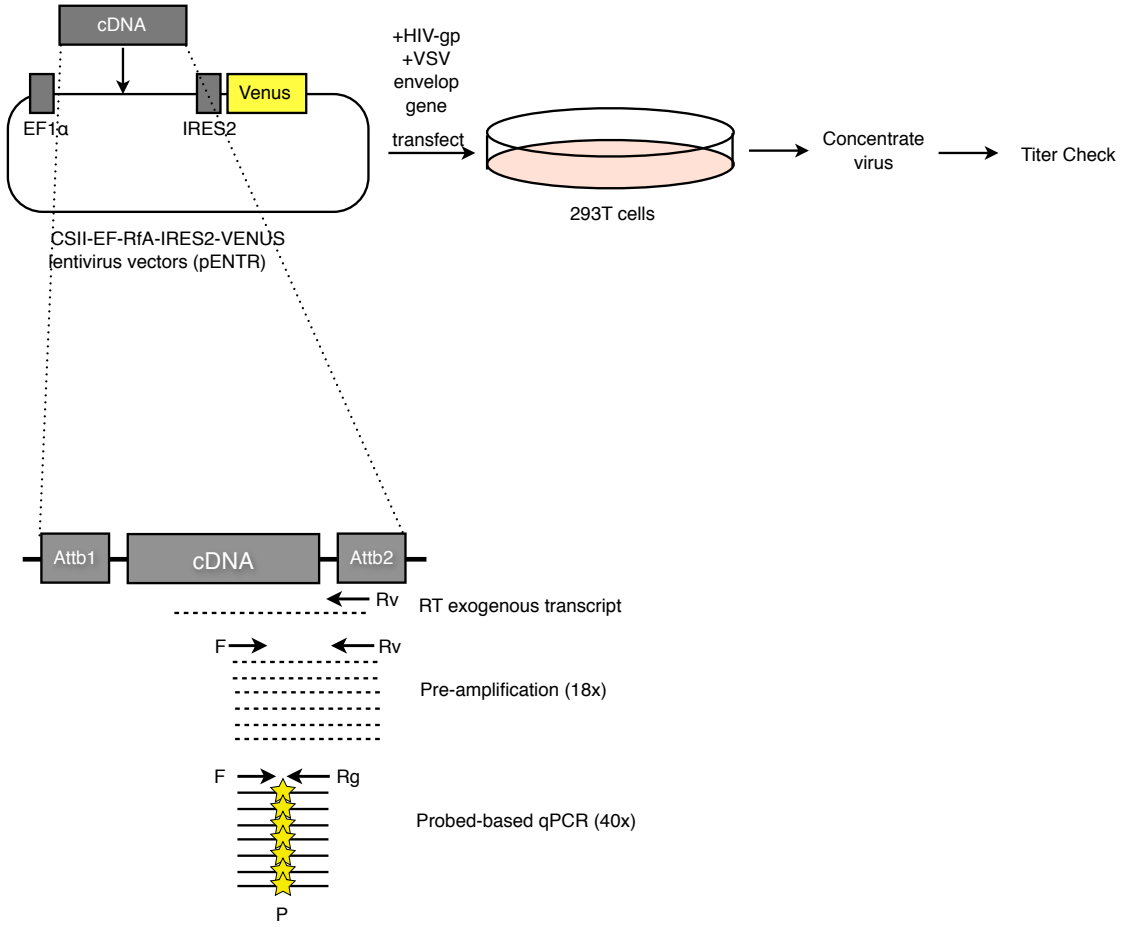
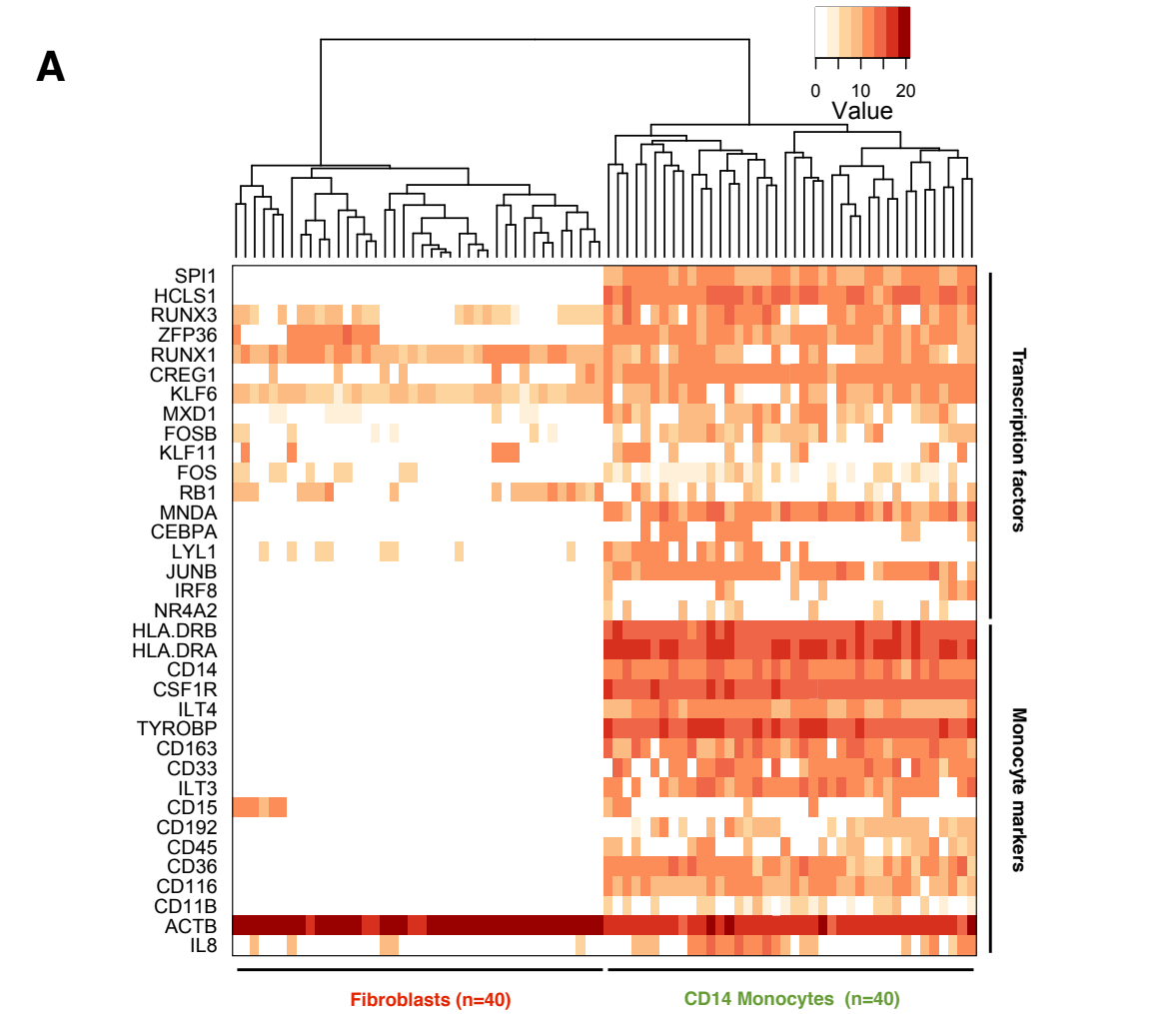
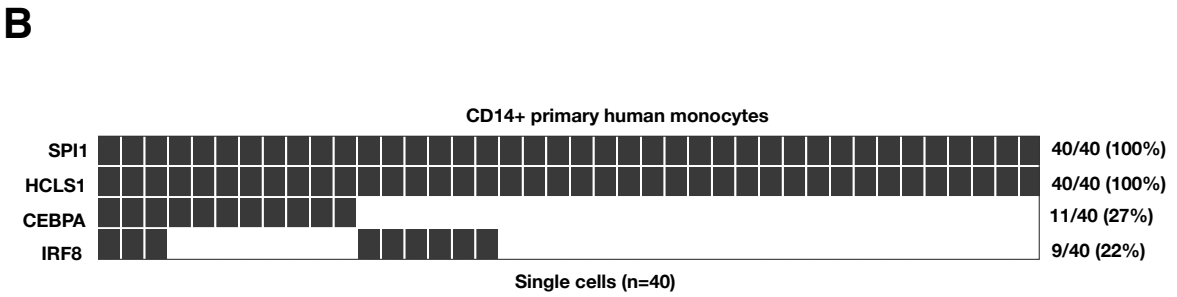
Supplementary information

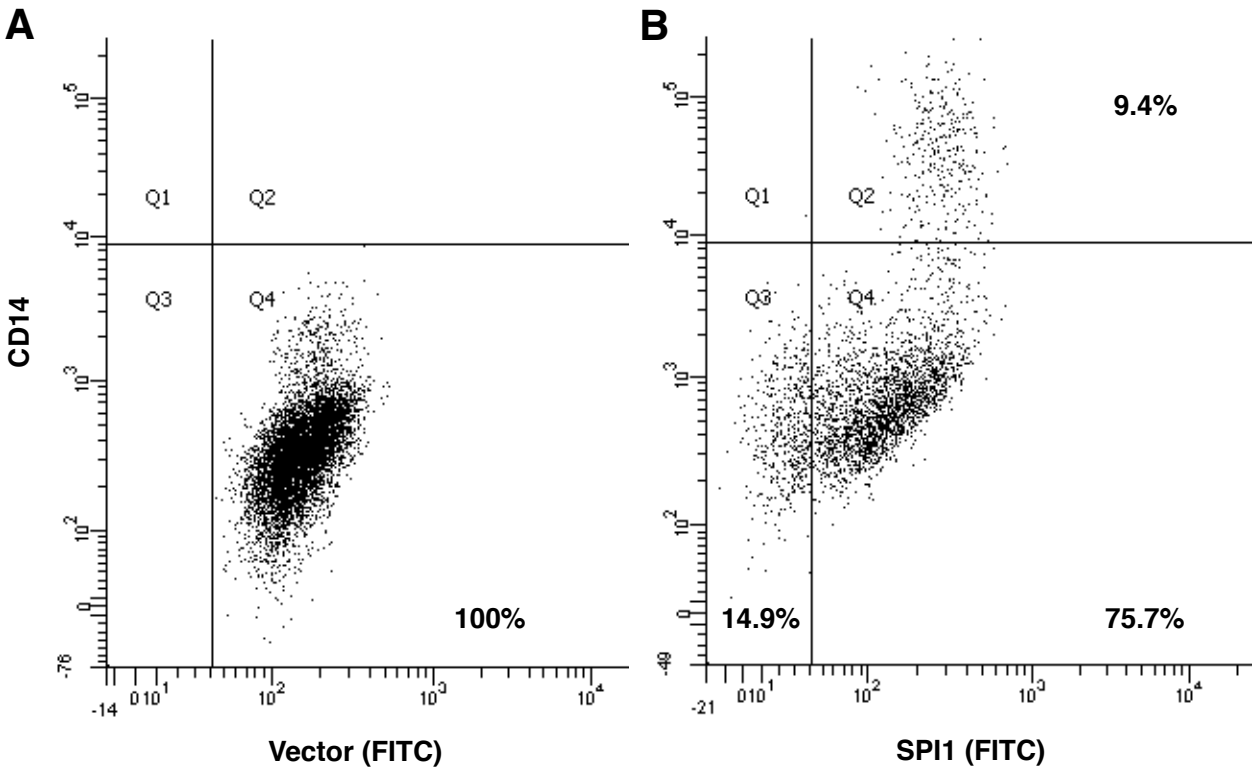


Supplementary Figure 1. Virus preparation and detection of virus-specific transcripts. (**A**) Full-length cDNA of monocyte-associated transcription factors were cloned into pENTR lentivirus vector and transfected to 293T cells in conjunction with HIV-gp and VSV envelop gene plasmids. Collecting the supernatant for a period of two days, the virus was first concentrated and the titer was calculated. (**B**) Using the Entry Clone specific-Attb2 sequence in all of the exogenous transcripts, we designed a reverse-primer (Rv) to synthesize cDNA for exogenous-specific transcripts. Then, using gene-specific forward (sense) primers (F), we pre-amplified the exogenous cDNA for 18 PCR cycles. Subsequently, the pre-amplified cDNA was dilute and loaded onto micro-fluidic single-cell qPCR platform using the gene-specific forward (sense) primer (F) and the gene-specific reverse (antisense) primer (Rg) in conjunction with the gene gene fluorescent probe (P) for specificity.

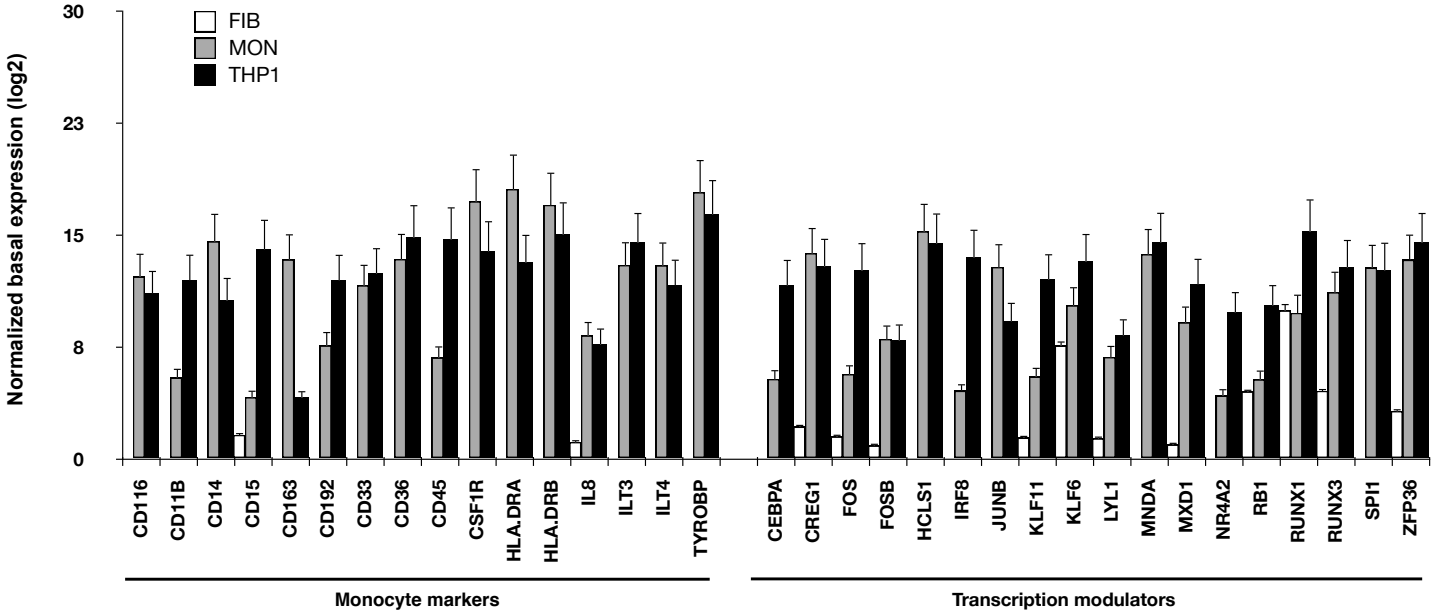




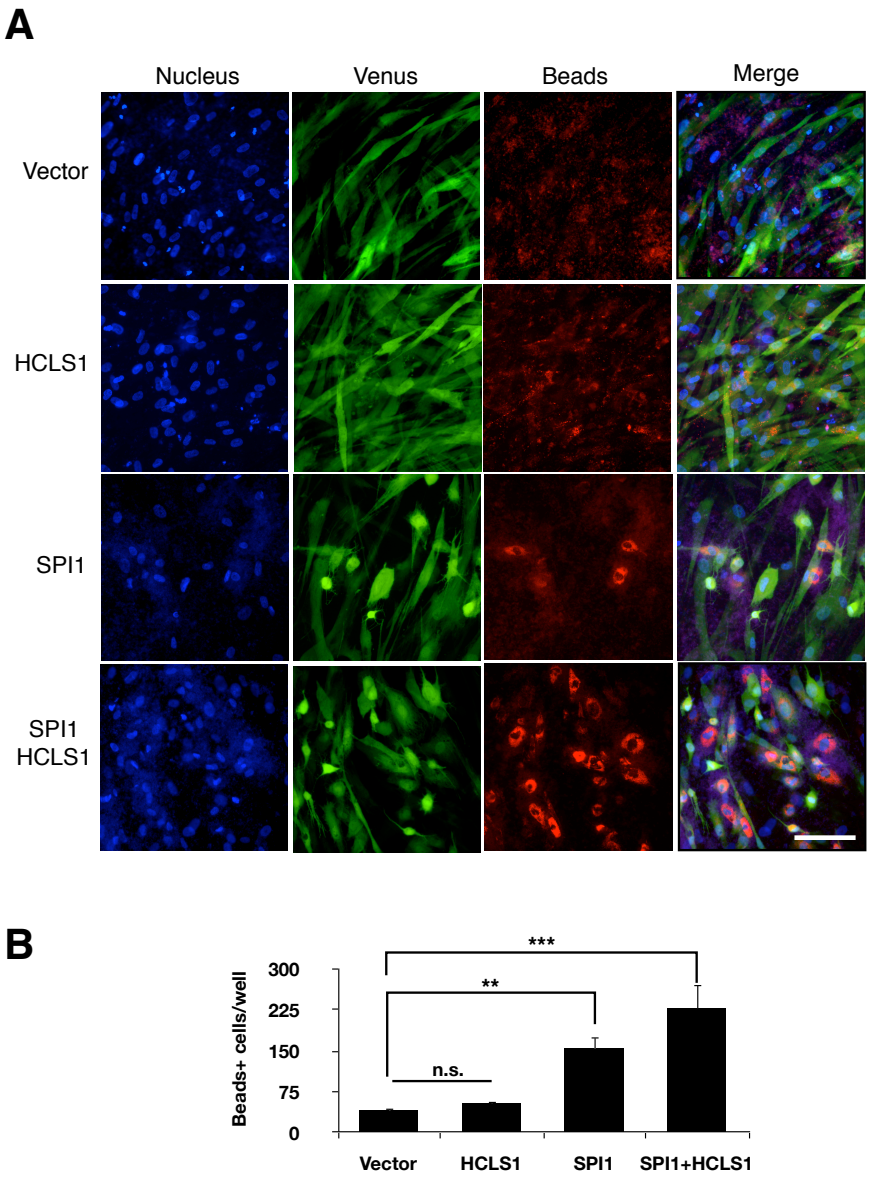
Supplementary Figure 2. Single-cell expression profiling of human dermal fibroblasts and CD14+ monocytes. Forty single-cells from human dermal fibroblasts and CD14 monocytes were isolated and profiled. The single-cell gene expression analysis of monocyte-enriched transcription factors (18) and monocyte-maker genes (16) revealed a strong enrichment in the CD14 monocytes as compared to fibroblasts. Internal house keep gene, ACTB, showed positive expression by all single-cells. (B) To compare key determinants of monocytes, we analyzed SPI1, HCLS1 transcripts to previously implicated CEBPA and IRF8 TFs. We profiled 40 $CD14^{+}$ primary monocyte single-cells and revealed that all cells detected SPI1 and HCLS1 transcripts but only 27% and 22% detection rate for CEBPA and IRF8, respectively.



Supplementary Figure 3. Detection of CD14 positive cells after ectopic expression of single SPI1 gene in dermal fibroblasts. Human dermal fibroblasts were infected with either vector control (A) or SPI1 (B) expressing Venus. Two weeks post transduction, 9.4% cells of the total cell population or 12% of SPI1+ cells expressed the CD14 cell-surface marker. Fibroblasts transduced with vector control had no CD14 expression.



Supplementary Figure 4. Basal expression of monocyte markers and transcription modulators. Total RNA from human dermal fibroblasts, primary monocytes and THP1 cells were isolated and subjected to a standard qRT-PCR gene expression analysis. The gene expression values (Ct) were normalized based on the ACTB expression and then inverted by subtracting 35 to all samples. The error bars represent standard deviation.



Supplementary Figure 5. SPI1 and HCLS1 synergistically induce phagocytosis activity in fibroblasts. (A) pHrodo™ Red E. coli BioParticles® conjugate beads which is pH-sensitive Rhodamine dye specifically express in phagosomes were added onto fibroblasts transduced with either SPI1, HCLS1 or both (Venus; green). Cells positive for Rhodamine (red) were clearly visible in both SPI1 and SPI1/HCLS1-pair, however, no detection was found in cells transduced only with HCLS1. (**B**) Using the computer-assisted image analysis, we quantified the number of cells (Hoechst, blue) and Rhodamine bead+ positive cells. The SPI1 and HCLS1 combination significantly enhanced the phagocytotic activity as compared to control and SPI1 alone. Ten images were taken per each well and 6 well replicates were performed for each assay. Scale bar = 100μm.

Supplementary Table 1.

List of entry clones used to contruct lentivirus

	Gene	Ref_Seq.	Entry clone ID	Source
1	CEBPA	NM_004364.3	W01F001A23	RIKEN
2	CREG1	NM_003851.2	OHS4559-99857135	OpenBioSystems
3	FOS	NM_005252.2	W01A062B19	RIKEN
4	FOSB	NM_006732.2	W01B007E09	RIKEN
5	HCLS1	NM_005335.4	OHS4559-99858986	OpenBioSystems
6	IRF8	NM_002163.2	W01B007E15	RIKEN
7	JUNB	NM_002229.2	W01A003N09	RIKEN
8	KLF11	NM_003597.4	W01A126A07	RIKEN
9	KLF6	NM_001300.5	W01A125A03	RIKEN
10	LYL1	NM_005583.3	W01A002L03	RIKEN
11	MNDA	NM_002432.1	W01A004O18	RIKEN
12	MXD1	NM_002357.2	IOH40302	Invitrogen
13	NR4A2	NM_173173.1	W01A006J20	RIKEN
14	RB1	NM_000321.2	OHS4559-99857768	OpenBioSystems
15	RUNX1	NM_001001890.2	W01F001A03	RIKEN
16	RUNX3	NM_001031680.2	W01A044B11	RIKEN
17	SPI1	NM_001080547.1	W01F001A07	RIKEN
18	ZFP36	NM_003407.2	W01A003I20	RIKEN

Supplementary Table 2

List of primer sequences for preamplification and qPCR

	Primer	Forward (5'->3')	Reverse (5'->3')	UPL_Probe#	Comment
1	CEBPA	tggacaagaacagcaacgag	gcggtcattgtcactggtc	#67	Monocyte factors
2	CREG1	agctctccgtgagcaacc	tgtgccaaagtcatggtcag	#2	Monocyte factors
3	FOS	ctggcgttgtgaagaccat	ttcccttcggattctccttt	#51	Monocyte factors
4	FOSB	ctgaccgaccgactccag	gcacaaactccagacgttcc	#78	Monocyte factors
5	HCLS1	cgaggtggagaagcactctt	atcaaagccgactgctgact	#89	Monocyte factors
6	IRF8	gaggtggtccaggtcttcg	cggccctggctgttatag	#20	Monocyte factors
7	JUNB	caaggtgaagacgctcaagg	tcatgaccttctgtttgagctg	#32	Monocyte factors
8	KLF11	cccatcttcgcactcacac	cgagcaaacttttatcacagc	#7	Monocyte factors
9	KLF6	gatgagttaaccaggcacttcc	agaggtgcctcttcatgtgc	#85	Monocyte factors
10	LYL1	ccactgtgagctggacctg	aggcgccgttaacgttct	#45	Monocyte factors
11	MNDA	tggcacaatatcaagtgtgaga	tttcttggccttgatgacct	#29	Monocyte factors
12	MXD1	gagcagcgacacctgaaga	ccacgtcaacgtcgatttc	#78	Monocyte factors
13	RB1	tcctgaggaggacccagag	aggttcttctgtttcttcaaactca	#34	Monocyte factors
14	RUNX1	ctccctgaaccactccactg	tggggatggttggatctg	#30	Monocyte factors
15	RUNX3	ggctcactcagcaccaca	atgggttcagttccgaggt	#66	Monocyte factors
16	SPI1	ccactggaggtgtctgacg	ctggtacaggcggatcttct	#1	Monocyte factors
17	ZFP36	gtcctccagctccttctcg	gagggtgacagtggaaggtc	#24	Monocyte factors
18	NR4A2	tcctccaacttgcagaatatga	ccactctcttgggttccttg	#37	Monocyte factors
19	CD11B (ITGAM)	ggcatccgcaaagtggta	ggatcttaaaggcattctttcg	#9	Marker
20	CD14	gttcggaagacttatcgaccat	acaaggttctggcgtggt	#74	Marker
21	CD15	cgtggacgacttcccaag	gttgcggtcgaggaaaag	#52	Marker
22	CD163	ggcagtgcccatcatctc	tccttcctgaagtcttatcttgttg	#7	Marker
23	CD33	caggaatgacacccacccta	tcagtggggccatgtaactt	#75	Marker
24	CD36	gtgcctattctttggcttaatga	ttacttgacttctgaacatgtttgc	#9	Marker
25	CD45 (PTPRC)	ccaatgcaaaactcaacccta	cctctctcctgggacatctg	#27	Marker
26	CD115 (CSF1R)	tctggtcctatggcatcctc	gatgccagggtagggattc	#14	Marker
27	CD116 (GMCSFR)	accatgaggtggaagacgag	aagacctcttcgcggtagc	#6	Marker
28	CD192 (CCR2)	tgagacaagccacaagctga	ttctgataaaccgagaacgagat	#56	Marker
29	HLA-DRA	gccctcaactgaggacgtt	gcatcaaactcccagtgctt	#45	Marker
30	HLA-DRB	ccgggctgttcatctacttc	ccttgaatgtggtcatctgc	#41	Marker
31	TYROBP	gagaccgagtcgccttatca	ctgtgtgttgaggtcgctgt	#1	Marker
32	IL8	agacagcagagcacacaagc	atggttccttccggtggt	#72	Marker
33	ILT3	gagccagagcccaaggac	ttcacggcagcacagaagt	#26	Marker
34	ILT4	tgaaggacacacagcctgaa	agctgggcgtaggtcacat	#66	Marker
35	ACTB	ccaaccgcgagaagatga	ccagaggcgtacagggatag	#64	House keeping
36	attB2		ACCACTTTGTACAAGAAAGCTGGG		For preamplification Reverse primer