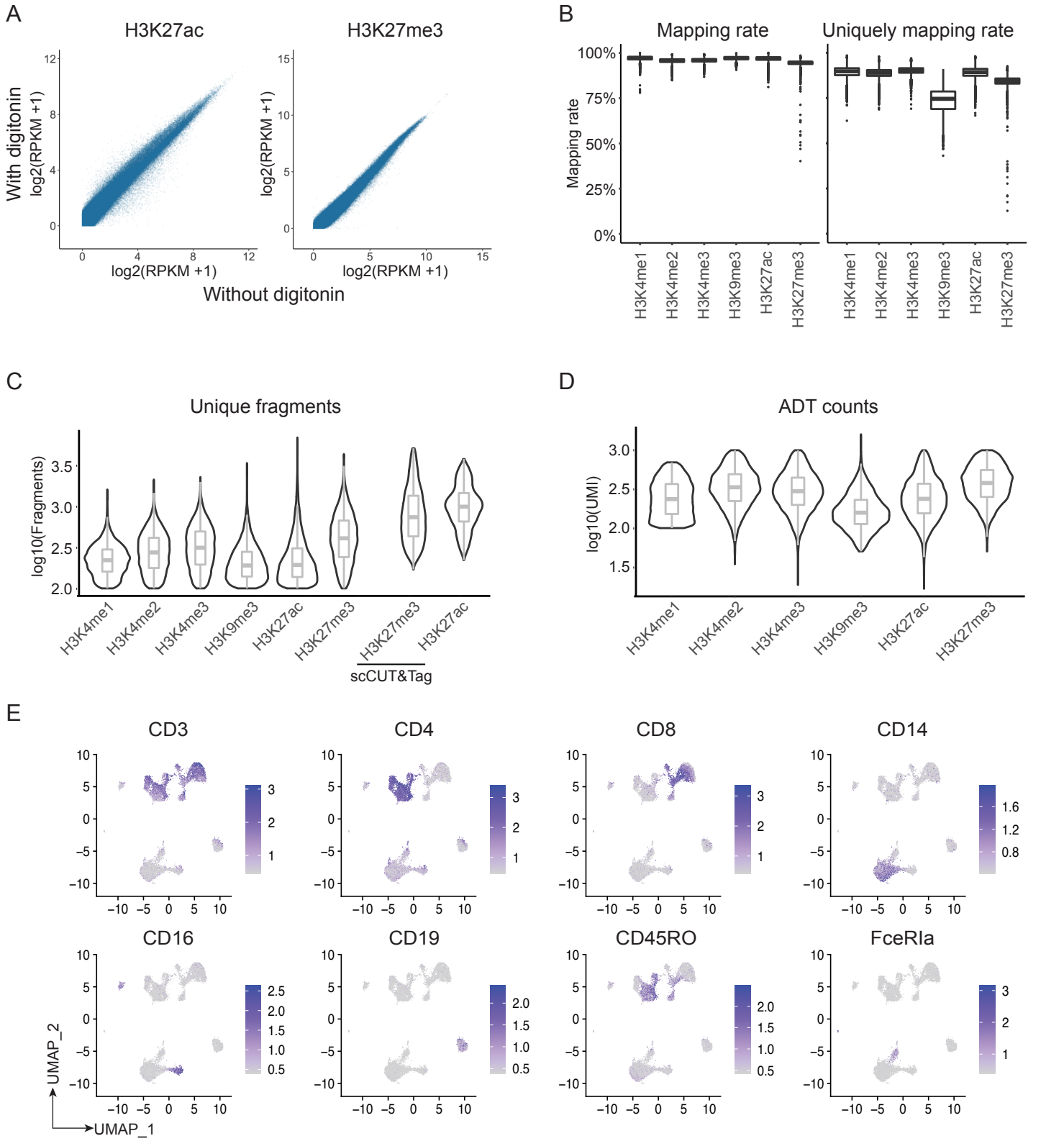
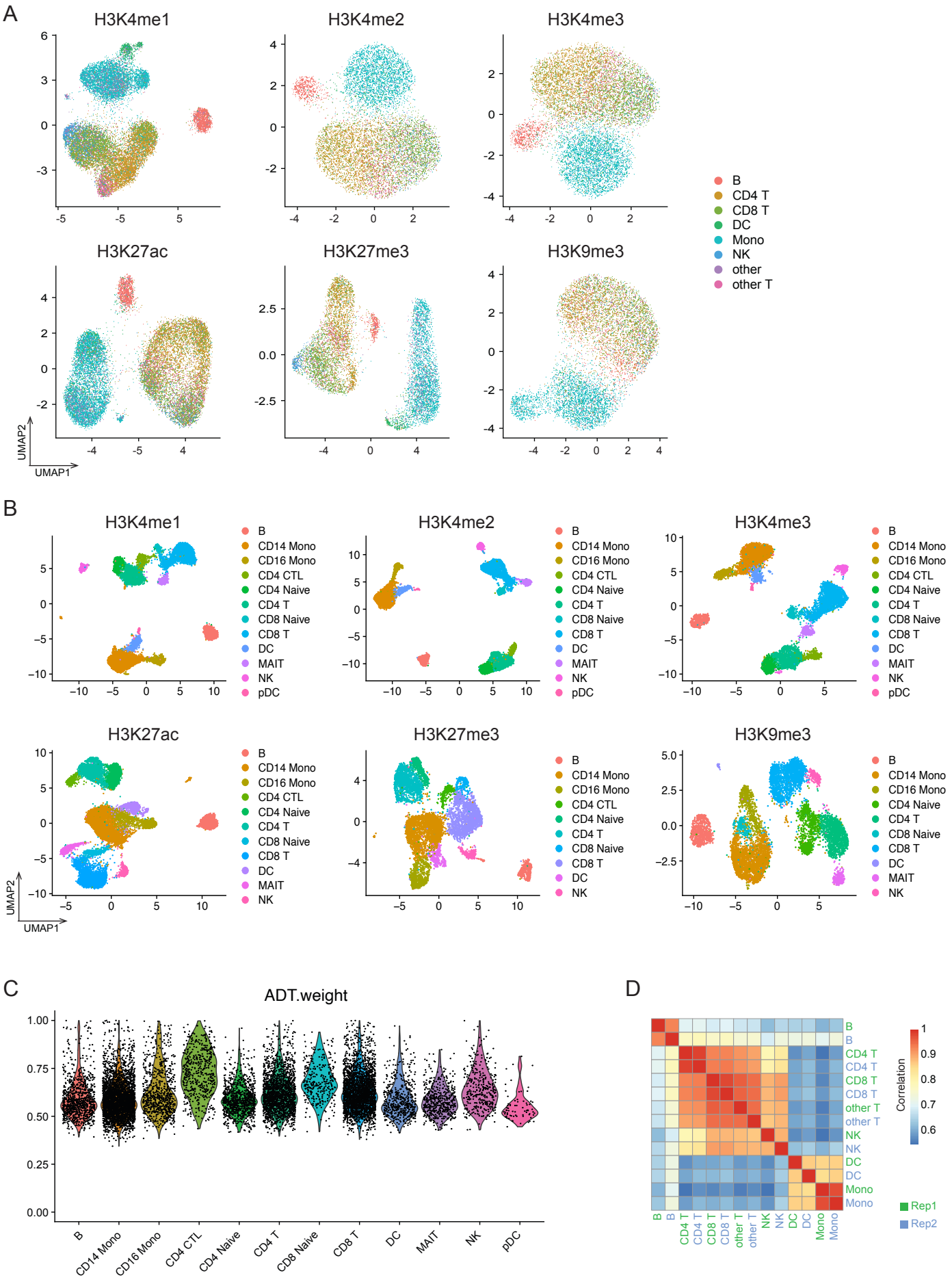
Supplementary Figure 1



Supplementary Figure 1: Quality control for scCUT&Tag-pro experiments.

(A) Scatter plots showing the H3K27ac (left) and H3K27me3 (right) enrichment levels (5-kb window) in fixed PBMC between datasets generated with and without digitonin. RPKM: Reads Per Kilobase per Million mapped reads. **(B)** Boxplot of single cell mapping rates and unique mapping rates for scCUT&Tag-pro experiments in PBMC. **(C)** Violin plots showing the number of unique fragments per cell detected in each PBMC scCUT&Tag-pro experiment, as well as from a recent publication describing scCUT&Tag in the same system (Wu et al, 2021). **(D)** Violin plots of unique antibody-derived tag (ADT) counts per cell for each experiment. **(E)** Feature plots visualizing the expression of canonical surface proteins for the H3K4me1 scCUT&Tag-pro experiment. Proteins visualized include markers of CD4 and CD8 T, CD14 and CD16 monocytes, B cells (CD19), Memory T (CD45RO), cDC2 (FceRIa), and MAIT (TCR-V-7.2) cells. Boxplots show n = 12,770 (H3K4me1), 9,575 (H3K4me2), 10,386 (H3K4me3), 8,304 (H3K9me3), 15,609 (H3K27ac) and 8,232 (H3K27me3) cells from scCUT&Tag-pro and n = 15,292 (H3K27me3), 10,458 (H3K27ac) cells from scCUT&Tag experiments (Wu et al, 2021). The center, bounds and whiskers of the boxplot show median, quartiles and data points that lie within 1.5× interquartile range of the lower and upper quartiles, respectively. Data beyond the end of the whiskers are plotted individually.

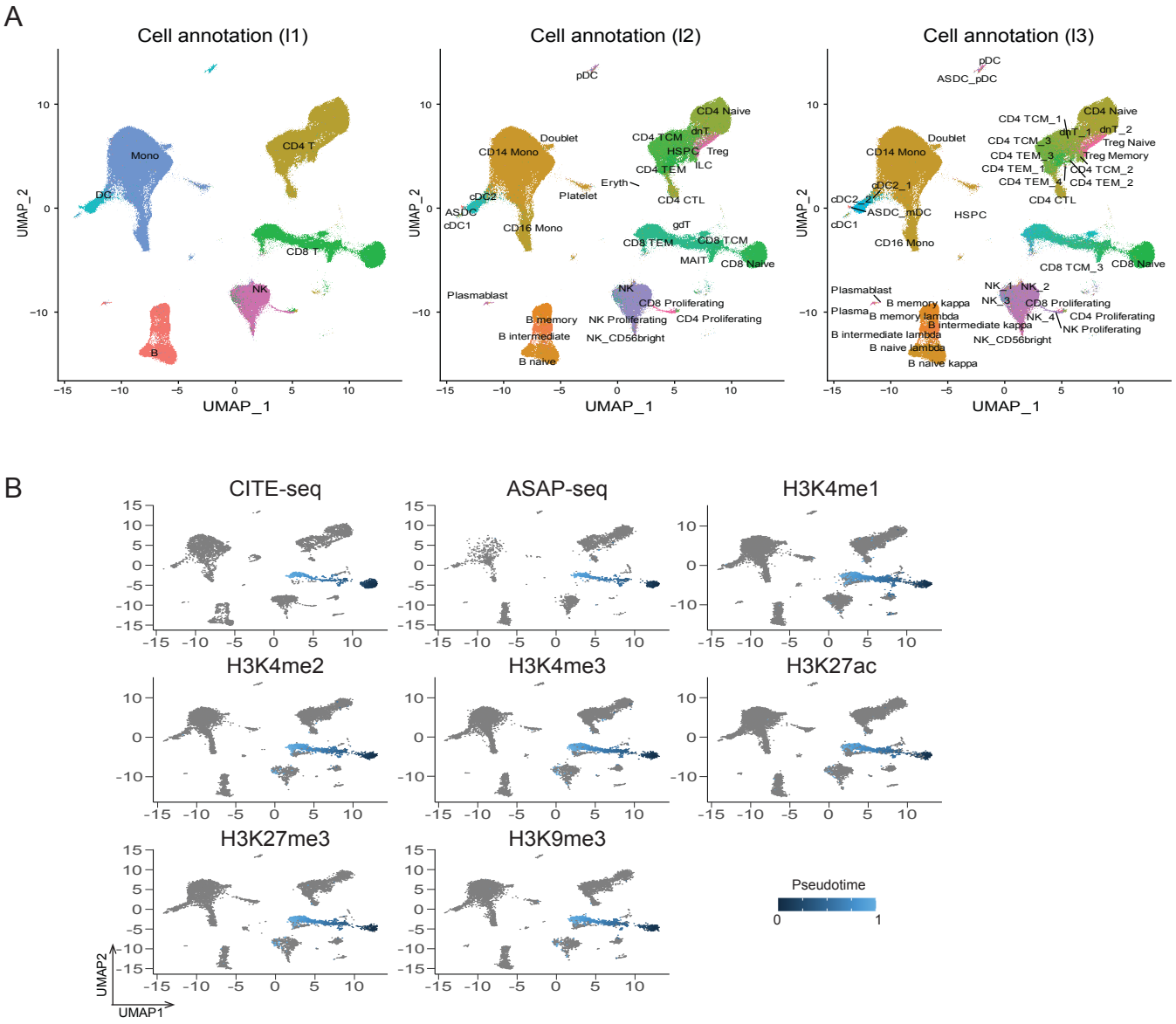
Supplementary Figure 2



Supplementary Figure 2: Multimodal analysis of scCUT&Tag-pro.

(A) UMAP visualizations of six histone modifications profiled with scCUT&Tag-pro and clustered based only on the CUT&Tag modality. **(B)** Weighted Nearest Neighbor (WNN) analysis of each of the six scCUT&Tag-pro datasets. Cells are visualized and clustered based on a weighted combination of the chromatin and cell surface protein measurements. **(C)** Violin Plots showing the WNN-assigned 'weights' for the protein modality (H3K4me1 scCUT&Tag-pro experiment). Cluster labels are derived from WNN analysis. **(D)** Correlation matrix showing Pearson correlation coefficients (5kb genomewide bins) between two biological replicates of H3K4me1 scCUT&Tag-pro in PBMC.

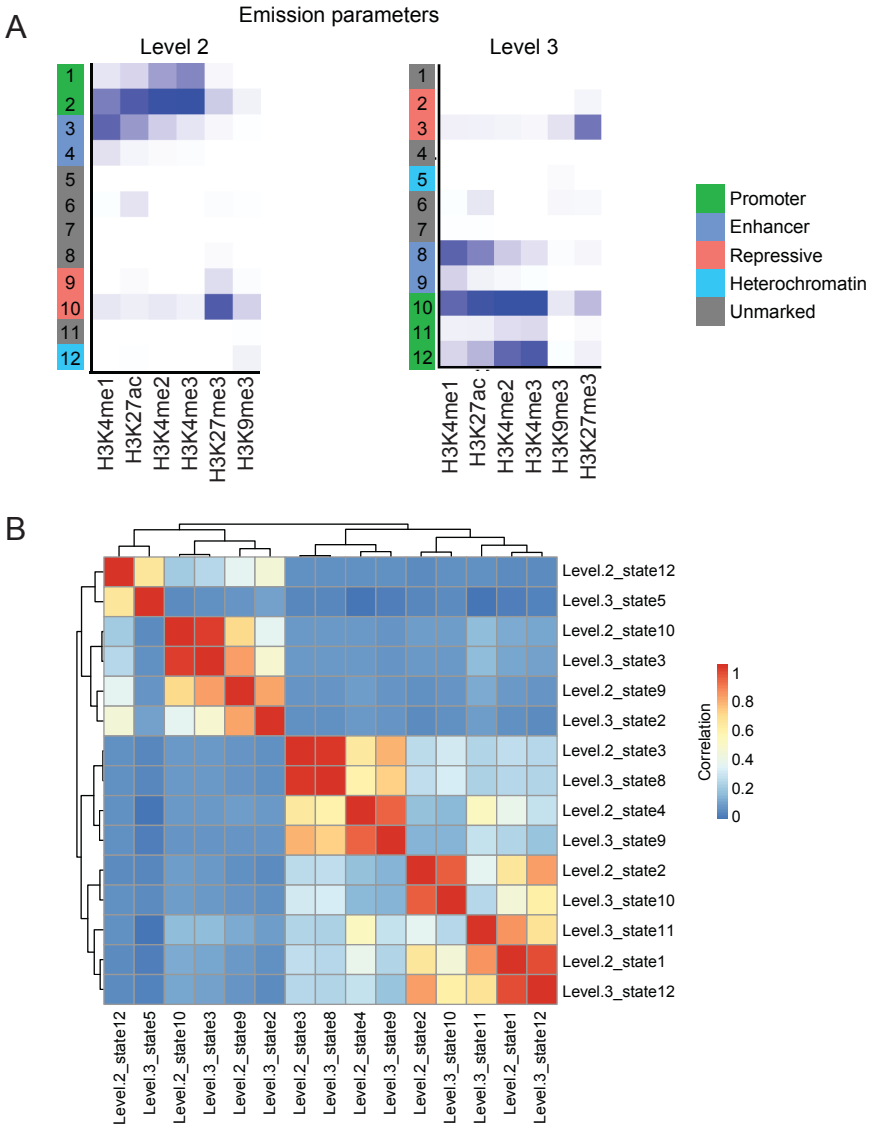
Supplementary Figure 3



Supplementary Figure 3: Multimodal and reference-based analysis of scCUT&Tag-pro

(A) Cells from all experiments were mapped onto the reference CITE-seq dataset from (Hao et al, 2021). Shown are the reference-assigned labels for all cells. Same as Figure 2B, but visualizing all three levels of resolution. **(B)** Visualization of integrated developmental trajectory for CD8 T cells across all experiments. Each panel visualizes cells from a separate experiment, and CD8 T cells are colored based on their order along the integrated developmental trajectory.

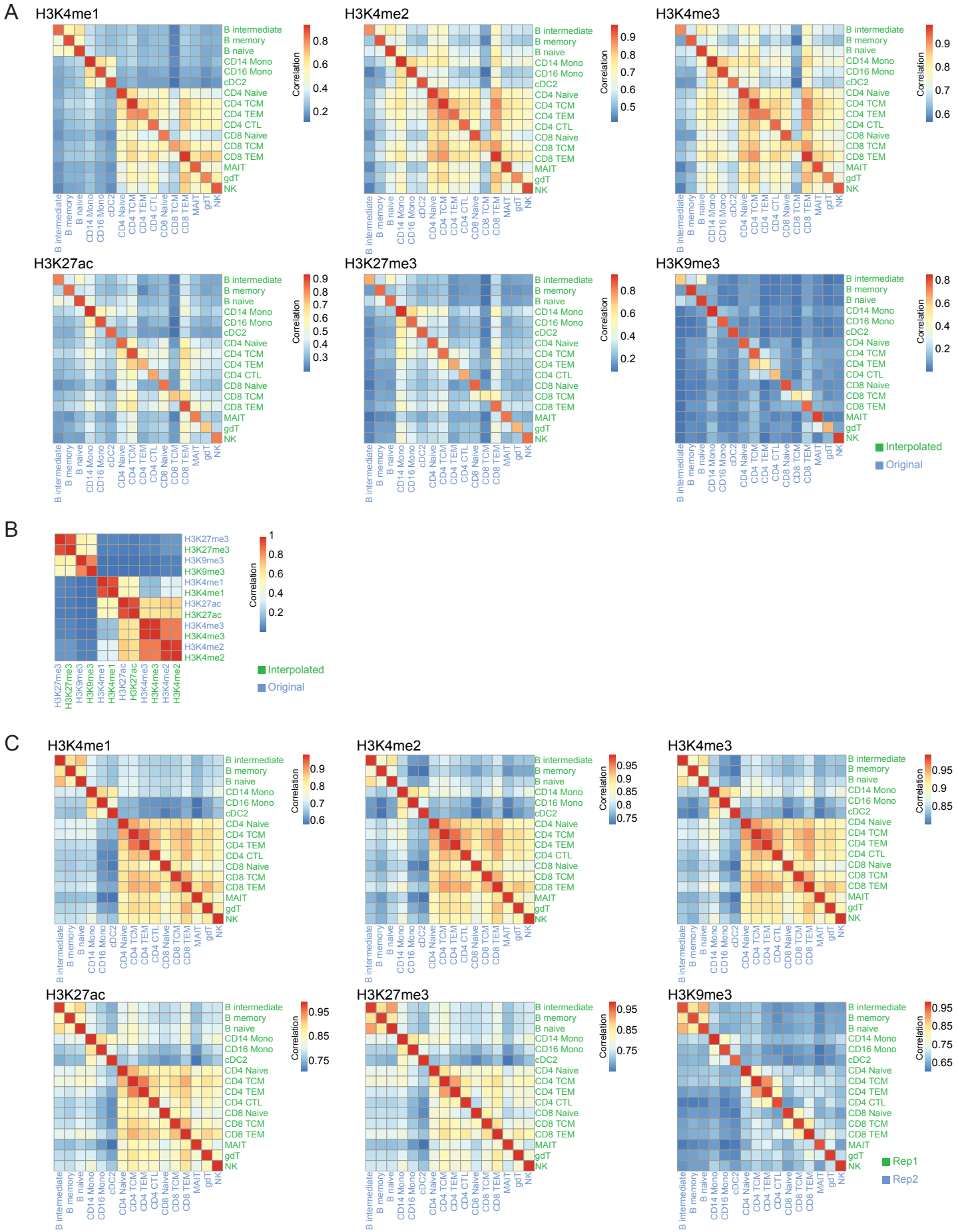
Supplementary Figure 4



Supplementary Figure 4: Comparison of ChromHMM annotated chromatin states

(A) Emission probabilities of the twelve chromatin states learned by the Baum-Welch step of ChromHMM. Results are shown for pseudobulk profiles generated from scCUT&Tag-pro experiments based on level 2 (left) and level 3 (right) cell type annotations. **(B)** Correlation matrix comparing posterior probabilities generated by scChromHMM for all 200 bp regions across chromosome 22, demonstrating a clear correspondence between states that were identified at either level 2 or level 3 resolution.

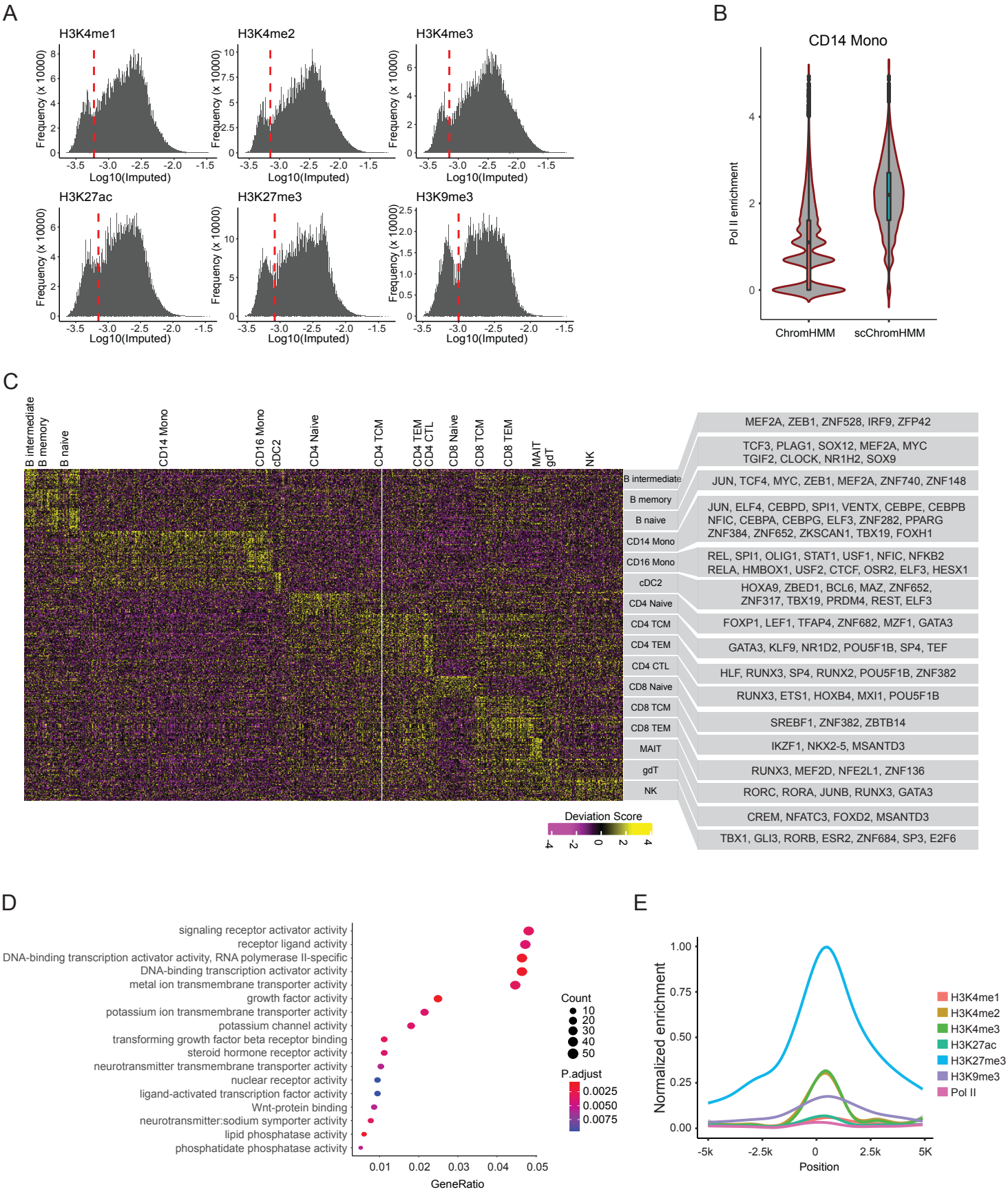
Supplementary Figure 5



Supplementary Figure 5: Accurate and robust interpolation of histone modification profiles.

(A) Correlation matrix showing the relationship between original and interpolated values across all cell types. Same as Figure 3B, but for each of the histone modifications measured by scCUT&Tag-pro. **(B)** Pearson correlation matrix for pseudobulk profiles of original and imputed measurements, across multiple chromatin marks in CD14+ monocytes. This demonstrates that the global relationship between different marks is conserved between original and interpolated profiles. **(C)** We repeated the interpolation twice, each time interpolating values into different random samples (n=20,000) of CITE-seq cells. Correlation matrix comparing the interpolated values from both replicates, demonstrating that we obtain highly concordant results.

Supplementary Figure 6



Supplementary Figure 6: Inference and annotation of chromatin state at single-cell resolution

(A) Histograms of interpolated values across single cells for each of the histone modifications measured by scCUT&Tag-pro. In each case, we observe a bimodal distribution. Red line marks the threshold used for data discretization, as required by ChromHMM and scChromHMM. **(B)** Violin plot showing the enrichment of Ser2/Ser5-phosphorylated RNA Polymerase II at active promoters identified by ChromHMM (n = 54,149) and scChromHMM (n = 5,237) in CD14 monocytes. The center, bounds and whiskers of the boxplot show median, quartiles and data points that lie within 1.5× interquartile range of the lower and upper quartiles, respectively. Data beyond the end of the whiskers are plotted individually. **(C)** Heatmap showing heterogeneity in ChromVar deviation scores in single cells, grouped by their reference-derived annoatation. We used the scChromHMM-derived posterior probabilities (promoter state) as input to ChromVar, instead of chromatin accessibility levels. In grey boxes, we highlight each identified motif that is also differentially expressed at the transcriptional level. **(D)** Enriched GO terms for the 1,340 genes shown as blue points in Figure 4E. **(E)** Metaplot exhibiting the enrichment of histone modifications and Poll II around the promoter regions of the 1,340 genes shown as blue points in Figure 4E. Enrichments were identified specifically in CD14 monocytes.

Supplementary Table 1

Experiment	CUT&Tag primay antibody	Company	Catalog	CUT&Tag secondary antibody	Company	Catalog	ADT antibody panel	Cell number
H3K4me1 scCUT&Tag-pro	H3K4me1	Abcam	ab8895	Guinea Pig anti-Rabbit IgG (H+L)	Novus Biologicals	NBP1-72763	TotalSeq™-A Human Universal Cocktail, V1.0	12,770
H3K4me2 scCUT&Tag-pro	H3K4me2	Abcam	ab32356	Guinea Pig anti-Rabbit IgG (H+L)	Novus Biologicals	NBP1-72763	TotalSeq™-A Human Universal Cocktail, V1.0	9,575
H3K4me3 scCUT&Tag-pro	H3K4me3	Abcam	ab213224	Guinea Pig anti-Rabbit IgG (H+L)	Novus Biologicals	NBP1-72763	TotalSeq™-A Human Universal Cocktail, V1.0	10,386
H3K9me3 scCUT&Tag-pro	H3K9me3	Abcam	ab8898	Guinea Pig anti-Rabbit IgG (H+L)	Novus Biologicals	NBP1-72763	TotalSeq™-A Human Universal Cocktail, V1.0	8,304
H3K27ac scCUT&Tag-pro	H3K27ac	Abcam	ab177178	Guinea Pig anti-Rabbit IgG (H+L)	Novus Biologicals	NBP1-72763	TotalSeq™-A Human Universal Cocktail, V1.0	15,609
H3K27me3 scCUT&Tag-pro	H3K27me3	Cell Signaling Technology	9733	Guinea Pig anti-Rabbit IgG (H+L)	Novus Biologicals	NBP1-72763	TotalSeq™-A Human Universal Cocktail, V1.0	8,232
RNA Polymerase II (Ser2/Ser5) scCUT&Tag-pro	Phospho-Rpb1 CTD (Ser2/Ser5)	Cell Signaling Technology	13546	Guinea Pig anti-Rabbit IgG (H+L)	Novus Biologicals	NBP1-72763	TotalSeq™-A Human Universal Cocktail, V1.0	10,893

Supplementary Table 2

DNA_ID	Description	Clone	Barcode	Ensembl ID	Gene Name
A0006	anti-human CD86	IT2.2	GTCTTTGTCAGTGCA	ENSG00000114013	CD86
A0007	anti-human CD274 (B7-H1, PD-L1)	29E.2A3	GTTGTCCGACAATAC	ENSG00000120217	CD274
A0020	anti-human CD270 (HVEM, TR2)	122	TGATAGAAACAGACC	ENSG00000157873	TNFRSF14
A0023	anti-human CD155 (PVR)	SKII.4	ATCACATCGTTGCCA	ENSG00000073008	PVR
A0024	anti-human CD112 (Nectin-2)	TX31	AACCTTCCGTCTAAG	ENSG00000130202	NECTIN2
A0026	anti-human CD47	CC2C6	GCATTCTGTCACCTA	ENSG00000196776	CD47
A0029	anti-human CD48	BJ40	CTACGACGTAGAAGA	ENSG00000117091	CD48
A0031	anti-human CD40	5C3	CTCAGATGGAGTATG	ENSG00000101017	CD40
A0032	anti-human CD154	24-31	GCTAGATAGATGCAA	ENSG00000102245	CD40LG
A0033	anti-human CD52	HI186	CTTTGTACGAGCAAA	ENSG00000169442	CD52
A0034	anti-human CD3	UCHT1	CTCATTGTAACTCCT	ENSG00000167286	CD3D
A0046	anti-human CD8	SK1	GCGCAACTTGATGAT	ENSG00000153563	CD8A
A0047	anti-human CD56 (NCAM)	5.1H11	TCCTTTCCTGATAGG	ENSG00000149294	NCAM1
A0050	anti-human CD19	HIB19	CTGGGCAATTACTCG	ENSG00000177455	CD19
A0052	anti-human CD33	P67.6	TAACTCAGGGCCTAT	ENSG00000105383	CD33
A0053	anti-human CD11c	S-HCL-3	TACGCCTATAACTTG	ENSG00000140678	ITGAX
A0058	anti-human HLA-A,B,C	W6/32	TATGCGAGGCTTATC	ENSG00000206503	HLA-A
A0063	anti-human CD45RA	HI100	TCAATCCTTCCGCTT	ENSG00000081237	PTPRC
A0064	anti-human CD123	6H6	CTTCACTCTGTCAGG	ENSG00000185291	IL3RA
A0066	anti-human CD7	CD7-6B7	TGGATTCCCGGACTT	ENSG00000173762	CD7
A0070	anti-human/mouse CD49f	GoH3	TTCCGAGGATGATCT	ENSG00000091409	ITGA6
A0071	anti-human CD194 (CCR4)	L291H4	AGCTTACCTGCACGA	ENSG00000183813	CCR4
A0072	anti-human CD4	RPA-T4	TGTTCCCGCTCAACT	ENSG00000010610	CD4
A0073	anti-mouse/human CD44	IM7	TGGCTTCAGGTCCTA	ENSG00000026508	CD44
A0081	anti-human CD14	M5E2	TCTCAGACCTCCGTA	ENSG00000170458	CD14
A0083	anti-human CD16	3G8	AAGTTCACTCTTTGC	ENSG00000203747	FCGR3A
A0085	anti-human CD25	BC96	TTTGTCCTGTACGCC	ENSG00000134460	IL2RA
A0087	anti-human CD45RO	UCHL1	CTCCGAATCATGTTG	ENSG00000081237	PTPRC
A0088	anti-human CD279 (PD-1)	EH12.2H7	ACAGCGCCGTATTTA	ENSG00000188389	PDCD1
A0089	anti-human TIGIT (VSTM3)	A15153G	TTGCTTACCGCCAGA	ENSG00000181847	TIGIT
A0090	Mouse IgG1, κ isotype Ctrl	MOPC-21	GCCGGACGACATTAA		
A0091	Mouse IgG2a, κ isotype Ctrl	MOPC-173	CTCCTACCTAAACTG		

A0092	Mouse IgG2b, κ isotype Ctrl	MPC-11	ATATGTATCACGCGA		
A0095	Rat IgG2b, κ Isotype Ctrl	RTK4530	GATTCTTGACGACCT		
A0100	anti-human CD20	2H7	TTCTGGGTCCCTAGA	ENSG00000156738	MS4A1
A0101	anti-human CD335 (NKp46)	9E2	ACAATTTGAACAGCG	ENSG00000189430	NCR1
A0124	anti-human CD31	WM59	ACCTTTATGCCACGG	ENSG00000261371	PECAM1
A0127	anti-Human Podoplanin	NC-08	GGTTACTCGTTGTGT	ENSG00000162493	PDPN
A0134	anti-human CD146	P1H12	CCTTGGATAACATCA	ENSG00000076706	MCAM
A0136	anti-human IgM	MHM-88	TAGCGAGCCCGTATA	ENSG00000211899	IGHM
A0138	anti-human CD5	UCHT2	CATTAACGGGATGCC	ENSG00000110448	CD5
A0140	anti-human CD183 (CXCR3)	G025H7	GCGATGGTAGATTAT	ENSG00000186810	CXCR3
A0141	anti-human CD195 (CCR5)	J418F1	CCAAAGTAAGAGCCA	ENSG00000160791	CCR5
A0142	anti-human CD32	FUN-2	GCTTCCGAATTACCG	ENSG00000143226	FCGR2A
A0143	anti-human CD196 (CCR6)	G034E3	GATCCCTTTGTCACT	ENSG00000112486	CCR6
A0144	anti-human CD185 (CXCR5)	J252D4	AATTCAACCGTCGCC	ENSG00000160683	CXCR5
A0145	Hu CD103 (Integrin αE)	Ber-ACT8	GACCTCATTGTGAAT	ENSG00000083457	ITGAE
A0146	anti-human CD69	FN50	GTCTCTTGGCTTAAA	ENSG00000110848	CD69
A0147	anti-human CD62L	DREG-56	GTCCCTGCAACTTGA	ENSG00000188404	SELL
A0149	anti-human CD161	HP-3G10	GTACGCAGTCCTTCT	ENSG00000111796	KLRB1
A0151	anti-human CD152 (CTLA-4)	BNI3	ATGGTTCACGTAATC	ENSG00000163599	CTLA4
A0152	anti-human CD223 (LAG-3)	11C3C65	CATTTGTCTGCCGGT	ENSG00000089692	LAG3
A0153	anti-human KLRG1 (MAFA)	SA231A2	CTTATTTCCTGCCCT	ENSG00000139187	KLRG1
A0154	anti-human CD27	O323	GCACTCCTGCATGTA	ENSG00000139193	CD27
A0155	anti-human CD107a (LAMP-1)	H4A3	CAGCCCACTGCAATA	ENSG00000185896	LAMP1
A0156	anti-human CD95 (Fas)	DX2	CCAGCTCATTAGAGC	ENSG00000026103	FAS
A0158	anti-human CD134 (OX40)	er-ACT35 (ACT35	AACCCACCGTTGTTA	ENSG00000186827	TNFRSF4
A0159	anti-human HLA-DR	L243	AATAGCGAGCAAGTA	ENSG00000204287	HLA-DRA
A0160	anti-human CD1c	L161	GAGCTACTTCACTCG	ENSG00000158481	CD1C
A0161	anti-human CD11b	ICRF44	GACAAGTGATCTGCA	ENSG00000169896	ITGAM
A0162	anti-human CD64	10.1	AAGTATGCCCTACGA	ENSG00000150337	FCGR1A
A0163	anti-human CD141 (Thrombomodulin)	M80	GGATAACCGCGCTTT	ENSG00000178726	THBD
A0165	Hu CD314 (NKG2D)	1D11	CGTGTTTGTTCCTCA	ENSG00000213809	KLRK1
A0167	anti-human CD35	E11	ACTTCCGTCGATCTT	ENSG00000203710	CR1
A0168	anti-human CD57 Recombinant	QA17A04	AACTCCCTATGGAGG	ENSG00000109956	B3GAT1

A0170	anti-human CD272 (BTLA)	MIH26	GTTATTGGACTAAGG	ENSG00000186265	BTLA
A0171	anti-human/mouse/rat CD278 (ICOS)	C398.4A	CGCGCACCCATTAAA	ENSG00000163600	ICOS
A0172	nti-human CD275 (B7-H2, B7-RP1, ICOS	9F.8A4	GTTAGTGTTAGCTTG	ENSG00000160223	ICOSLG
A0174	anti-human CD58 (LFA-3)	TS2/9	GTTCCTATGGACGAC	ENSG00000116815	CD58
A0176	anti-human CD39	A1	TTACCTGGTATCCGT	ENSG00000138185	ENTPD1
A0179	anti-human CX3CR1	K0124E1	AGTATCGTCTCTGGG	ENSG00000168329	CX3CR1
A0180	anti-human CD24	ML5	AGATTCCTTCGTGTT	ENSG00000272398	CD24
A0181	anti-human CD21	Bu32	AACCTAGTAGTTCGG	ENSG00000117322	CR2
A0185	anti-human CD11a	TS2/4	TATATCCTTGTGAGC	ENSG00000005844	ITGAL
A0187	anti-human CD79b (Igβ)	CB3-1	ATTCTTCAACCGAAG	ENSG00000007312	CD79B
A0189	anti-human CD244 (2B4)	C1.7	TCGCTTGGATGGTAG	ENSG00000122223	CD244
A0206	nti-human CD169 (Sialoadhesin, Siglec-	7-239	TACTCAGCGTGTTTG	ENSG00000088827	SIGLEC1
A0214	anti-human/mouse integrin β7	FIB504	TCCTTGGATGTACCG	ENSG00000139626	ITGB7
A0215	anti-human CD268 (BAFF-R)	11C1	CGAAGTCGATCCGTA	ENSG00000159958	TNFRSF13C
A0216	anti-human CD42b	HIP1	TCCTAGTACCGAAGT	ENSG00000203618	GP1BB
A0217	anti-human CD54	HA58	CTGATAGACTTGAGT	ENSG00000090339	ICAM1
A0218	anti-human CD62P (P-Selectin)	AK4	CCTTCCGTATCCCTT	ENSG00000174175	SELP
A0219	anti-human CD119 (IFN-γ R α chain)	GIR-208	TGTGTATTCCCTTGT	ENSG00000027697	IFNGR1
A0224	anti-human TCR α/β	IP26	CGTAACGTAGAGCGA		
A0236	Rat IgG1, κ isotype Ctrl	RTK2071	ATCAGATGCCCTCAT		
A0237	Rat IgG1, λ Isotype Ctrl	G0114F7	GGGAGCGATTCAACT		
A0238	Rat IgG2a, κ Isotype Ctrl	RTK2758	AAGTCAGGTTCGTTT		
A0240	Rat IgG2c, κ Isotype Ctrl	RTK4174	TCCAGGCTAGTCATT		
A0241	Armenian Hamster IgG Isotype Ctrl	HTK888	CCTGTCATTAAGACT		
A0242	anti-human CD192 (CCR2)	K036C2	GAGTTCCCTTACCTG	ENSG00000121807	CCR2
A0246	anti-human CD122 (IL-2Rβ)	TU27	TCATTTCCTCCGATT	ENSG00000100385	IL2RB
A0247	anti-human CD267 (TACI)	1A1	AGTGATGGAGCGAAC	ENSG00000240505	TNFRSF13B
A0352	anti-human FcεRIα	AER-37 (CRA-1)	CTCGTTTCCGTATCG	ENSG00000179639	FCER1A
A0353	anti-human CD41	HIP8	ACGTTGTGGCCTTGT	ENSG00000005961	ITGA2B
A0355	anti-human CD137 (4-1BB)	4B4-1	CAGTAAGTTCGGGAC	ENSG00000049249	TNFRSF9
A0357	anti-human CD43	CD43-10G7	GATTAACCAGCTCAT	ENSG00000197471	SPN
A0358	anti-human CD163	GHI/61	GCTTCTCCTTCCTTA	ENSG00000177575	CD163
A0359	anti-human CD83	HB15e	CCACTCATTTCCGGT	ENSG00000112149	CD83

A0364	anti-human CD13	WM15	TTTCAACGCCCTTTC	ENSG00000166825	ANPEP
A0367	anti-human CD2	TS1/8	TACGATTTGTCAGGG	ENSG00000116824	CD2
A0368	anti-human CD226 (DNAM-1)	11A8	TCTCAGTGTTTGTGG	ENSG00000150637	CD226
A0369	anti-human CD29	TS2/16	GTATTCCCTCAGTCA	ENSG00000150093	ITGB1
A0370	anti-human CD303 (BDCA-2)	201A	GAGATGTCCGAATTT	ENSG00000198178	CLEC4C
A0371	anti-human CD49b	P1E6-C5	GCTTTCTTCAGTATG	ENSG00000164171	ITGA2
A0372	anti-human CD61	VI-PL2	AGGTTGGAGTAGACT	ENSG00000259207	ITGB3
A0373	anti-human CD81 (TAPA-1)	5A6	GTATCCTTCCTTGGC	ENSG00000110651	CD81
A0383	anti-human CD55	JS11	GCTCATTACCCATTA	ENSG00000196352	CD55
A0384	anti-human IgD	IA6-2	CAGTCTCCGTAGAGT	ENSG00000211898	IGHD
A0385	anti-human CD18	TS1/18	TATTGGGACACTTCT	ENSG00000160255	ITGB2
A0386	anti-human CD28	CD28.2	TGAGAACGACCCTAA	ENSG00000178562	CD28
A0389	anti-human CD38	HIT2	TGTACCCGCTTGTGA	ENSG00000004468	CD38
A0390	anti-human CD127 (IL-7Rα)	A019D5	GTGTGTTGTCCTATG	ENSG00000168685	IL7R
A0391	anti-human CD45	HI30	TGCAATTACCCGGAT	ENSG00000081237	PTPRC
A0393	anti-human CD22	S-HCL-1	GGGTTGTTGTCTTTG	ENSG00000012124	CD22
A0394	anti-human CD71	CY1G4	CCGTGTTCCTCATTA	ENSG00000072274	TFRC
A0396	anti-human CD26	BA5b	GGTGGCTAGATAATG	ENSG00000197635	DPP4
A0398	anti-human CD115 (CSF-1R)	9-4D2-1E4	AATCACGGTCCTTGT	ENSG00000182578	CSF1R
A0404	anti-human CD63	H5C6	GAGATGTCTGCAACT	ENSG00000135404	CD63
A0406	anti-human CD304 (Neuropilin-1)	12C2	GGACTAAGTTTCGTT	ENSG00000099250	NRP1
A0407	anti-human CD36	5-271	TTCTTTGCCTTGCCA	ENSG00000135218	CD36
A0408	anti-human CD172a (SIRPα)	15-414	CGTGTTTAACTTGAG	ENSG00000198053	SIRPA
A0419	anti-human CD72	3F3	CAGTCGTGGTAGATA	ENSG00000137101	CD72
A0420	anti-human CD158 (KIR2DL1/S1/S3/S5	HP-MA4	TATCAACCAACGCTT	ENSG00000125498	KIR2DL1
A0446	anti-human CD93	VIMD2	GCGCTACTTCCTTGA	ENSG00000125810	CD93
A0447	anti-human CD200 (OX2)	OX-104	CACGTAGACCTTTGC	ENSG00000091972	CD200
A0575	anti-human CD49a	TS2/7	ACTGATGGACTCAGA	ENSG00000213949	ITGA1
A0576	anti-human CD49d	9F10	CCATTCAACTTCCGG	ENSG00000115232	ITGA4
A0577	anti-human CD73 (Ecto-5'-nucleotidase	AD2	CAGTTCCTCAGTTCG	ENSG00000135318	NT5E
A0579	anti-human CD9	HI9a	GAGTCACCAATCTGC	ENSG00000010278	CD9
A0581	anti-human TCR Vα7.2	3C10	TACGAGCAGTATTCA		
A0582	anti-human TCR Vδ2	B6	TCAGTCAGATGGTAT		

A0586	anti-human CD354 (TREM-1)	TREM-26	TAGCCGTTTCCTTTG	ENSG00000124731	TREM1
A0590	anti-human CD305 (LAIR1)	NKTA255	ATTTCCATTCCCTGT	ENSG00000167613	LAIR1
A0591	anti-human LOX-1	15C4	ACCCTTTACCGAATA	ENSG00000173391	OLR1
A0599	anti-human CD158e1 (KIR3DL1, NKB1)	DX9	GGACGCTTTCCTTGA	ENSG00000167633	KIR3DL1
A0817	anti-human CD109	W7C5	CACTTAACTCTGGGT	ENSG00000156535	CD109
A0822	anti-human CD142	NY2	CACTGCCGTCGATTA	ENSG00000117525	F3
A0830	anti-human CD319 (CRACC)	162.1	AGTATGCCATGTCTT	ENSG00000026751	SLAMF7
A0845	anti-human CD99	3B2/TA8	ACCCGTCCCTAAGAA	ENSG00000002586	CD99
A0853	anti-human CLEC12A	50C1	CATTAGAGTCTGCCA	ENSG00000172322	CLEC12A
A0861	anti-human CD151 (PETA-3)	50-6	CTTACCTAGTCATTC	ENSG00000177697	CD151
A0864	anti-human CD352 (NTB-A)	NT-7	AGTTTCCACTCAGGC	ENSG00000162739	SLAMF6
A0866	anti-human CLEC1B (CLEC2)	AYP1	TGCCAGTATCACGTA	ENSG00000165682	CLEC1B
A0867	anti-human CD94	DX22	CTTTCCGGTCCTACA	ENSG00000134539	KLRD1
A0868	anti-human IgE	MHE-18	GGATGTACCGCGTAT	ENSG00000211891	IGHE
A0870	anti-human CD150 (SLAM)	A12 (7D4)	GTCATTGTATGTCTG	ENSG00000117090	SLAMF1
A0871	anti-human CD162	KPL-1	ATATGTCAGAGCACC	ENSG00000110876	SELPLG
A0872	anti-human CD84	CD84.1.21	CTCCCTAGTTCCTTT	ENSG00000066294	CD84
A0894	anti-human Ig light chain κ	MHK-49	AGCTCAGCCAGTATG	ENSG00000211592	IGKC
A0896	anti-human CD85j (ILT2)	GHI/75	CCTTGTGAGGCTATG	ENSG00000104972	LILRB1
A0897	anti-human CD23	EBVCS-5	TCTGTATAACCGTCT	ENSG00000104921	FCER2
A0898	anti-human Ig light chain λ	MHL-38	CAGCCAGTAAGTCAC		
A0902	anti-human CD328 (Siglec-7)	6-434	CTTAGCATTTCACTG	ENSG00000168995	SIGLEC7
A0912	anti-human GPR56	CG4	GCCTAGTTTCCGTTT	ENSG00000205336	ADGRG1
A0920	anti-human CD82	ASL-24	TCCCACTTCCGCTTT	ENSG00000085117	CD82
A0923	anti-human NKp80	5D12	TATAGTTCCTCTGTG	ENSG00000150045	KLRF1
A0931	anti-human CD131	1C1	CTGCATGAGACCAAA	ENSG00000100368	CSF2RB
A0935	anti-human CD74	LN2	CTGTAGCATTTCCCT	ENSG00000019582	CD74
A0940	anti-human CD116	4H1	ATGGACAGTTCGTGT	ENSG00000198223	CSF2RA
A0941	anti-human CD37	M-B371	ACAGTCACTGGGCAA	ENSG00000104894	CD37
A0944	anti-human CD101 (BB27)	BB27	CTACTTCCCTGTCAA	ENSG00000134256	CD101
A1018	anti-human HLA-DR, DP, DQ	Tü39	AGCTACGAGCAGTAG	ENSG00000204287	HLA-DRA
A1046	anti-human CD88 (C5aR)	S5/1	GCCGCATGAGAAACA	ENSG00000197405	C5AR1
	CD110	S16017E	TGTTGTAAGATGCCA	ENSG00000117400	

GP130	2E1B02	CACGAGAATTTCAGT	ENSG00000134352
CD337	P30-15	AAAGTCACTCTGCCG	ENSG00000204475
CD271	ME20.4	AACCGCGCTTCAGAT	ENSG00000064300
CD34	581	GCAGAAATCTCCCTT	ENSG00000174059
CD117	104D2	AGACTAATAGCTGAC	ENSG00000157404
CD1d	51.1	TCGAGTCGCTTATCA	ENSG00000158473
CD126	UV4	TGATGGGAGCTTATC	ENSG00000160712
CD307e	509f6	TCACGCAGTCCTCAA	ENSG00000143297
CD307c/FcRL3	H5/FcRL3	GCCTAGTTTGAACGC	ENSG00000160856

Supplementary Table 3

Experiment	CUT&Tag (>100)	ADT/HTO (>10 / >10)	Doublets	Filtered Set
H3K4me1	22,954	16,631	3, 861	12,770
H3K4me2	12,786	10,972	1,397	9,575
H3K4me3	14,262	12,026	1,640	10,386
H3K9me3	10,779	9,528	1,224	8,304
H3K27ac	21,900	18,651	3,042	15,609
H3K27me3	18,162	9,915	1,683	8,232