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Supplementary Information for

Cytocidal macrophages in symbiosis with CD4 and CD8 T cells cause acute diabetes following checkpoint blockade of PD-1 in NOD mice

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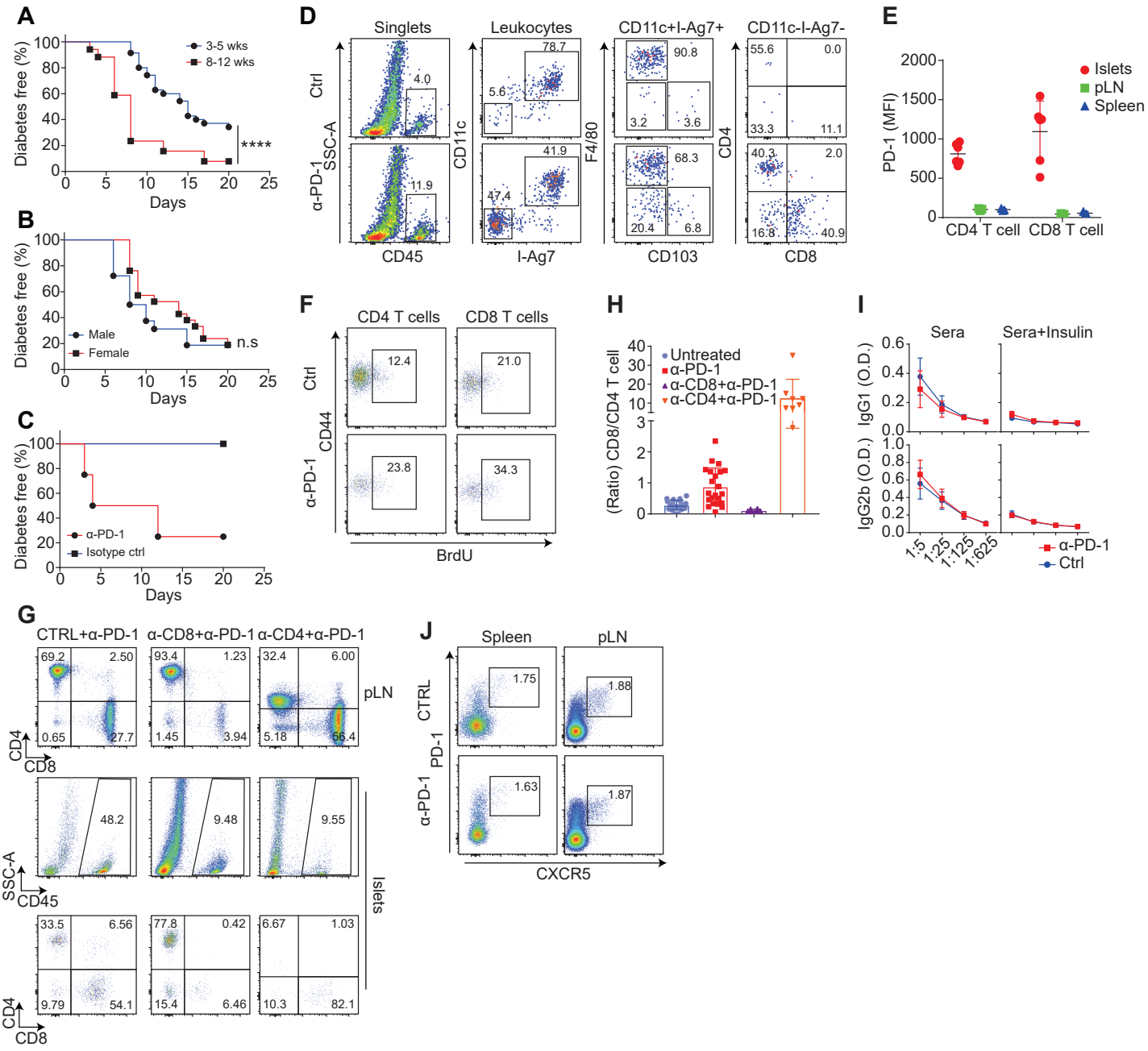

Fig. S1 Checkpoint blockade and diabetes development

Fig. S1. Checkpoint blockade and diabetes development. (A) Incidence of diabetes induced by anti-PD-1 in 3-5-week-old NOD female mice (n=35, blue) and 8-12-week-old NOD female mice (n=17, red). ****p<0.0001. Results are pooled from 3 independent experiments. (B) Incidence of diabetes induced by anti-PD-1 in NOD male mice (n=18, blue) and NOD female mice (n=21, red). Results are pooled from 3 independent experiments. (C) Incidence of diabetes induced by anti-PD-1 in >40-week-old NOD female mice. Mice were given one injection of anti-PD-1 (n=4, red) or isotype control antibody (n=4, blue). Experiment was performed one time. (D) Flow cytometry analysis of islet CD45+ leukocytes from NOD female mice treated with anti-PD-1 or isotype control antibody. (E) Mean Fluorescence Intensity of PD-1 expression in CD4 T cells and CD8 T cells from islets, pancreatic lymph nodes (pLN), and spleen of 8-week-old NOD female mice (n=5). Results are pooled from 2 independent experiments. (F) BrdU incorporation in CD4 T cells and CD8 T cells from islets of 8-week-old NOD female mice treated with or without anti-PD-1. BrdU (1mg/mouse) was administrated every day during antibody treatment for 7 days. Result is representative of n=6 mice in each group from 2 independent experiments. (G) Flow cytometry analysis of CD4 T cells and CD8 T cells in pLN and islets after antibody treatment. 8-week-old NOD female mice were treated with three injections of anti-PD-1, anti-PD-1 plus anti-CD8, or anti-PD-1 plus anti-CD4. Data are representative of n=8 mice in each group from 2 independent experiments. (H) Ratio between CD8 T cells and CD4 T cells in islets in the indicated conditions from (G). Data from untreated mice and anti-PD-1 alone treatment are also incorporated. (I) Level of insulin autoantibody, IgG1 and IgG2b, in the serum of 8-week-old NOD female mice treated with (n=6) or without (n=5) anti-PD-1 measured by ELISA. Three injections of antibodies were administrated every three days and one day after last injection the sera was collected, serially diluted, and examined by ELISA (Left). To determine the specificity one aliquot of sera was incubated with a 10-fold excess of insulin before measurement (Right). (J) Flow cytometry analysis of T follicular helper cells in spleen and pLN from 8-week-old NOD female mice treated with three injections of isotype control antibody or anti-PD-1 antibody. Result is representative of 2 independent experiments.

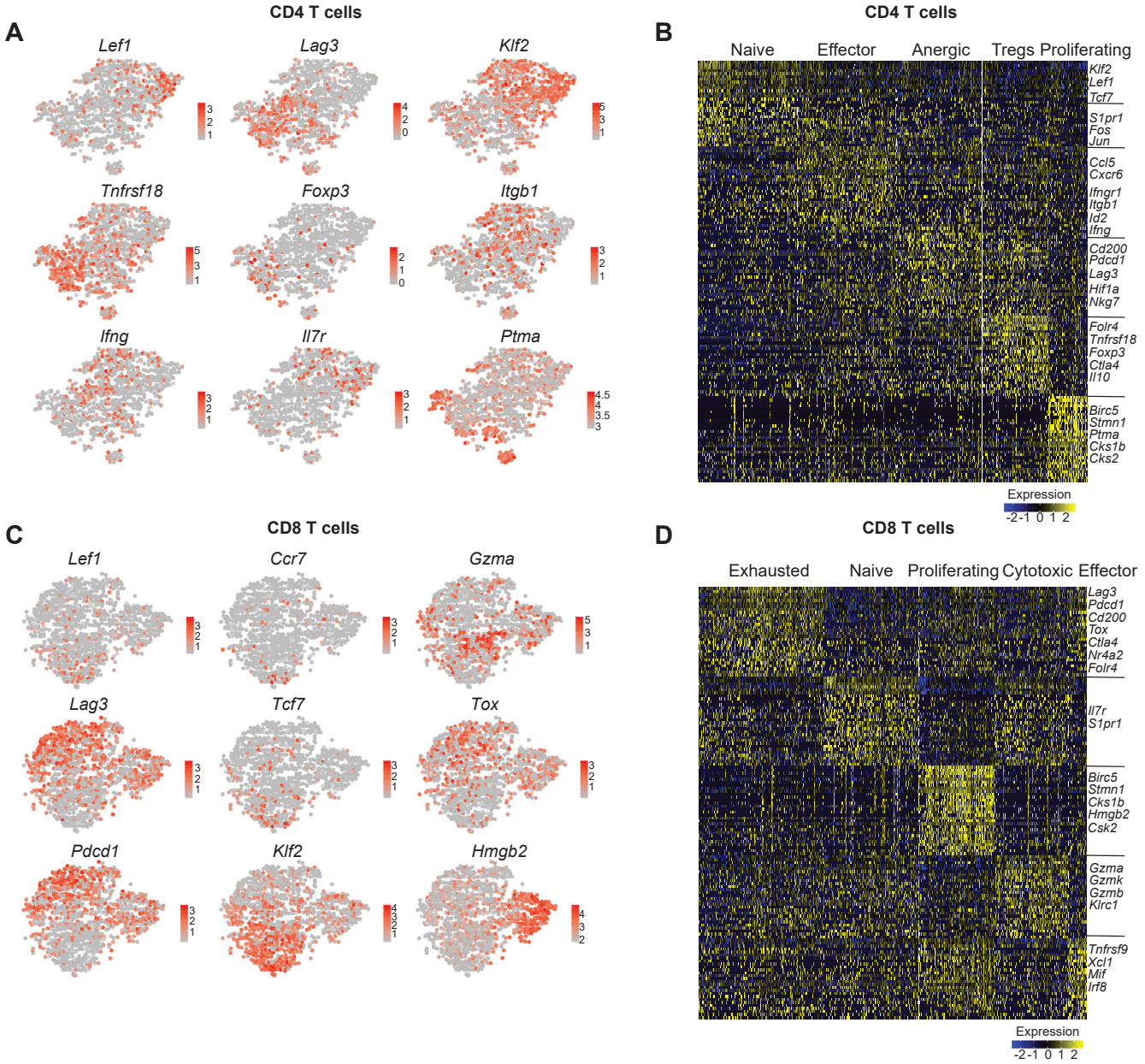

Fig. S2 Single-cell RNA-seq analysis of islet infiltrating T cells

Fig. S2. Single-cell RNA-seq analysis of islet infiltrating leukocytes. (A) Expression of marker genes in CD4 T cell clusters (see Fig. 3A). (B) Heatmap showing differentially expressed genes that characterize clusters of CD4 T cells. (C) Expression of marker genes in CD8 T cell clusters (see Fig. 3E). (D) Heatmap showing differentially expressed genes that characterize the clusters of CD8 T cells. For (B, D), differentially expressed genes with P adj. < 0.05 (Wilcoxon rank sum test) are shown. The data showed the combined cells from both anti-PD-1 and control mice.

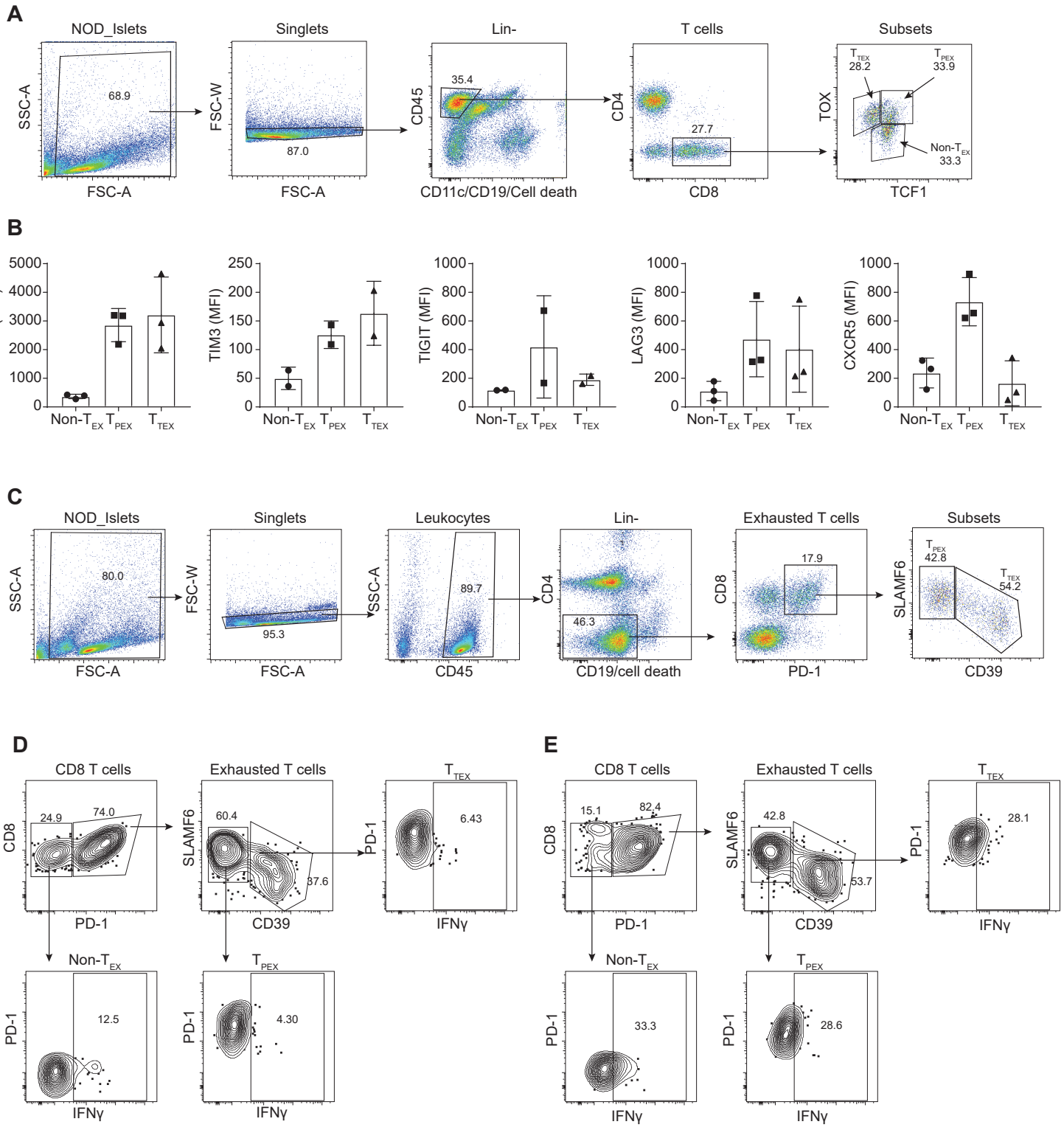

Fig. S3 Identification of two subsets of exhausted CD8 T cells in islets

Fig. S3. Identification of two subsets of exhausted CD8 T cells in islets. (A) Representative flow cytometry gating strategy to identify the two subsets of exhausted CD8 T cells based on TOX and TCF1 expression. Islets were isolated and examined from 10-week-old NOD mice. (B) Inhibitory molecules expressed by non-TEX, TPEX, and TTEX cells. Each data point indicates one experiment. (C) Representative flow cytometry gating strategy for the identification of exhausted CD8 T cells based on SLAMF6 and CD39 expression. (D) Gating strategy and expression of IFNγ in TPEX cells, TTEX cells and non-TEX cells in islets as in Fig. 4 I and N (Ctrl group). Islets were isolated and restimulated with anti-CD3 (10μg/ml), anti-CD28 (5μg/ml), and brefeldin A for 4h before flow cytometry analysis. (E) Gating strategy and expression of IFNγ in TPEX cells, TTEX cells and non-TEX cells in islets from 8-10-week-old female NOD mice treated with three injections of anti-PD-1. The islets are isolated one day after the third injection of anti-PD-1 as in Fig. 4N.

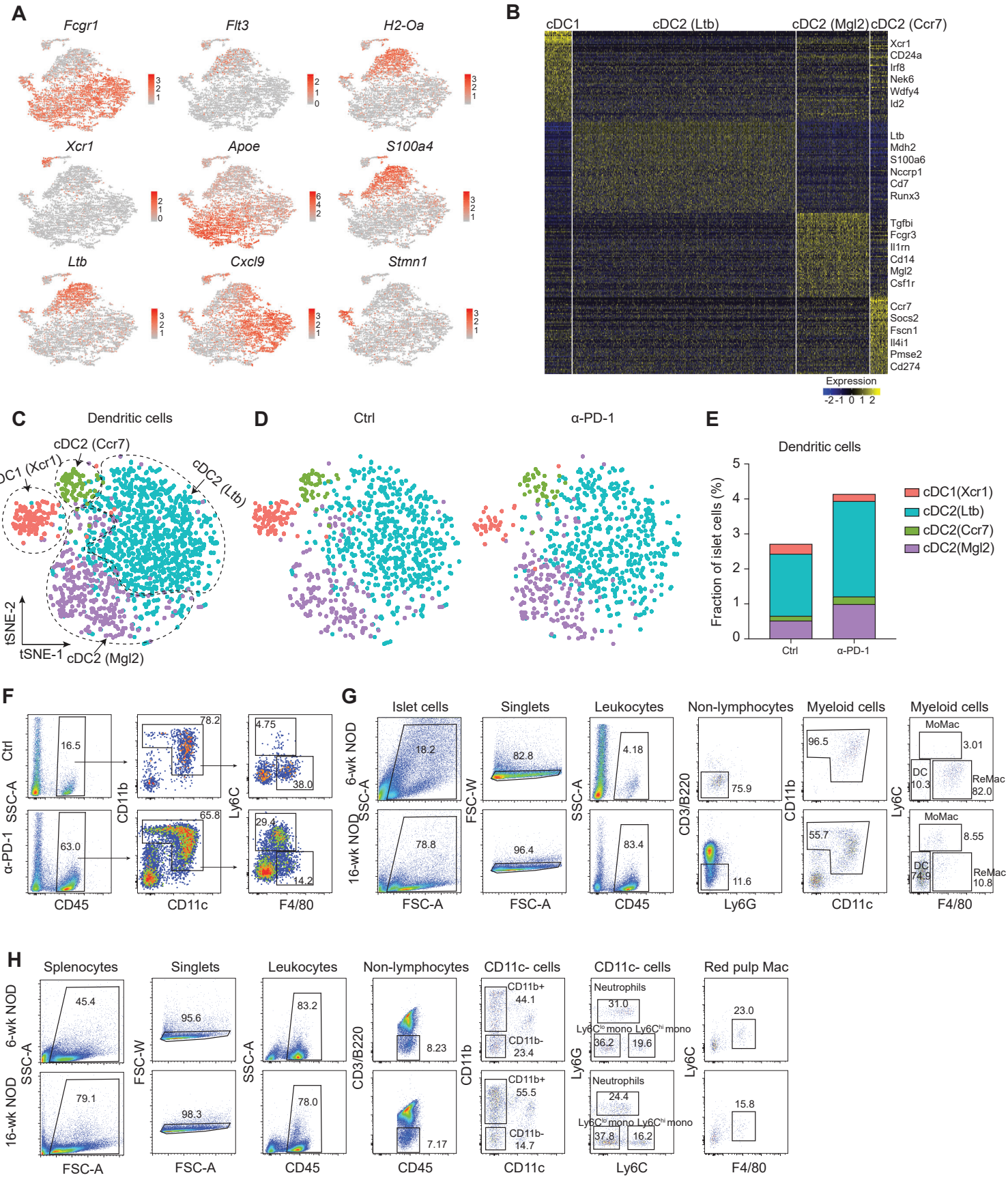

Fig. S4 Identification of monocyte derived macrophages in islets following anti-PD-1 treatment and in islets from pre-diabetic NOD mice

Fig. S4. Identification of monocyte derived macrophages in islets following anti-PD-1 treatment and in islets from pre-diabetic NOD mice. (A) t-SNE plots showing the expression of marker genes in myeloid cell clusters from Fig. 5A. (B) Heatmap showing differentially expressed genes that characterized clusters of dendritic cells (P adj. < 0.05, Wilcoxon rank sum test). (C) Combined t-SNE plot showing DCs obtained from 8-week-old untreated and anti-PD-1 treated NOD female mice, extracted from Fig. 5A. (D) t-SNE plot from panel (C) split by the two conditions. (E) Fraction of each cluster of dendritic cells relative to islet cells in the two conditions. (F) Flow cytometry gating strategy used in Fig. 5F for the identification of monocyte derived macrophages (MoMac) in islets from 8-week-old female NOD mice treated with or without three injections of anti-PD-1. (G) Representative flow cytometry procedure used for the identification of monocyte derived macrophages in islets from 6-week-old and 16-week-old NOD female mice. (H) Representative flow cytometry for the identification of different subsets of macrophages in spleen from 6-week-old and 16-week-old NOD female mice.

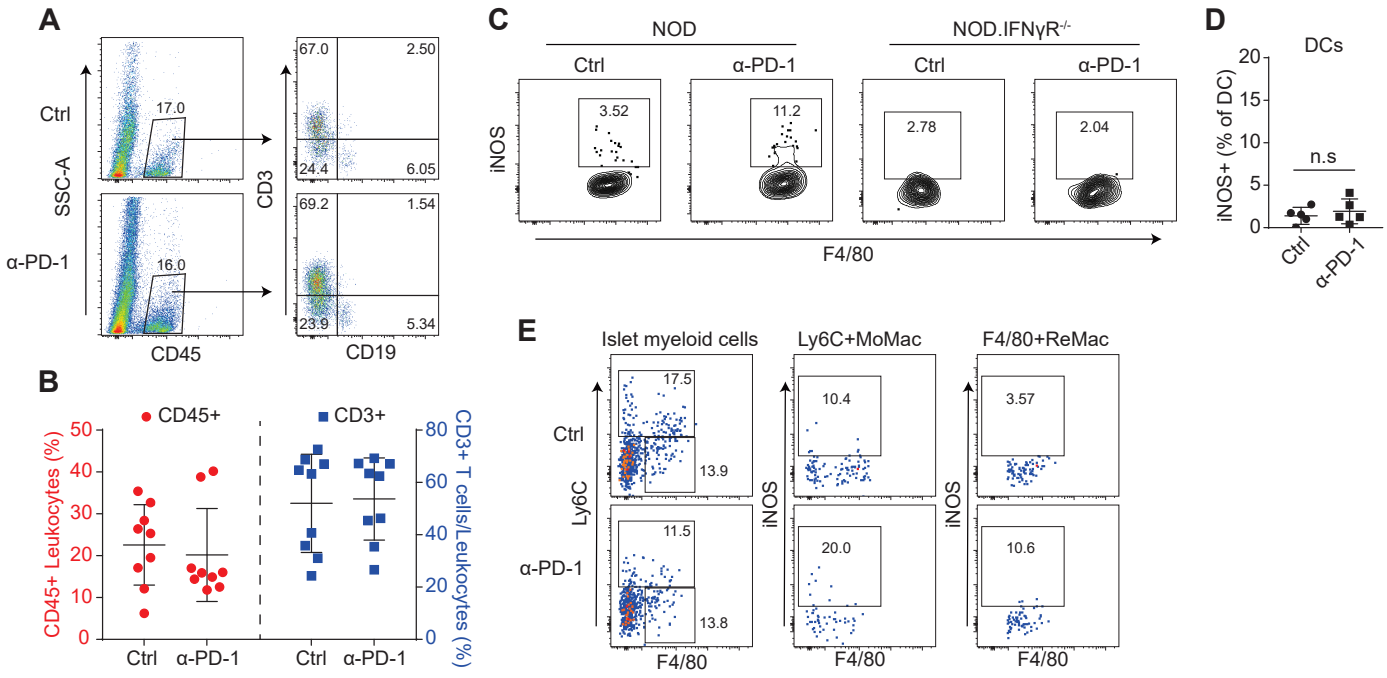

Fig. S5 Monocyte derived macrophages are more pro-inflammatory compared with islet resident macrophages

Fig. S5. Monocyte derived macrophages are more pro-inflammatory compared with islet resident macrophages. (A) Representative flow analysis showing the infiltration of the isolated islets from 10-12-week-old NOD female mice treated with or without anti-PD-1 (50μg/ml) in culture for 48h before analysis. Result is representative of 9 independent experiments. (B) Frequency of CD45+ leukocytes and CD3+ T cells in untreated or anti-PD-1 treated islets from (A). (C) Representative flow cytometry showing iNOS in islet macrophages from 10-12-week-old NOD or NOD.IFNγR–/– mice. (D) iNOS expression in DC from the untreated or anti-PD-1 treated islets. (E) Representative flow cytometry for Fig. 6 C-F.

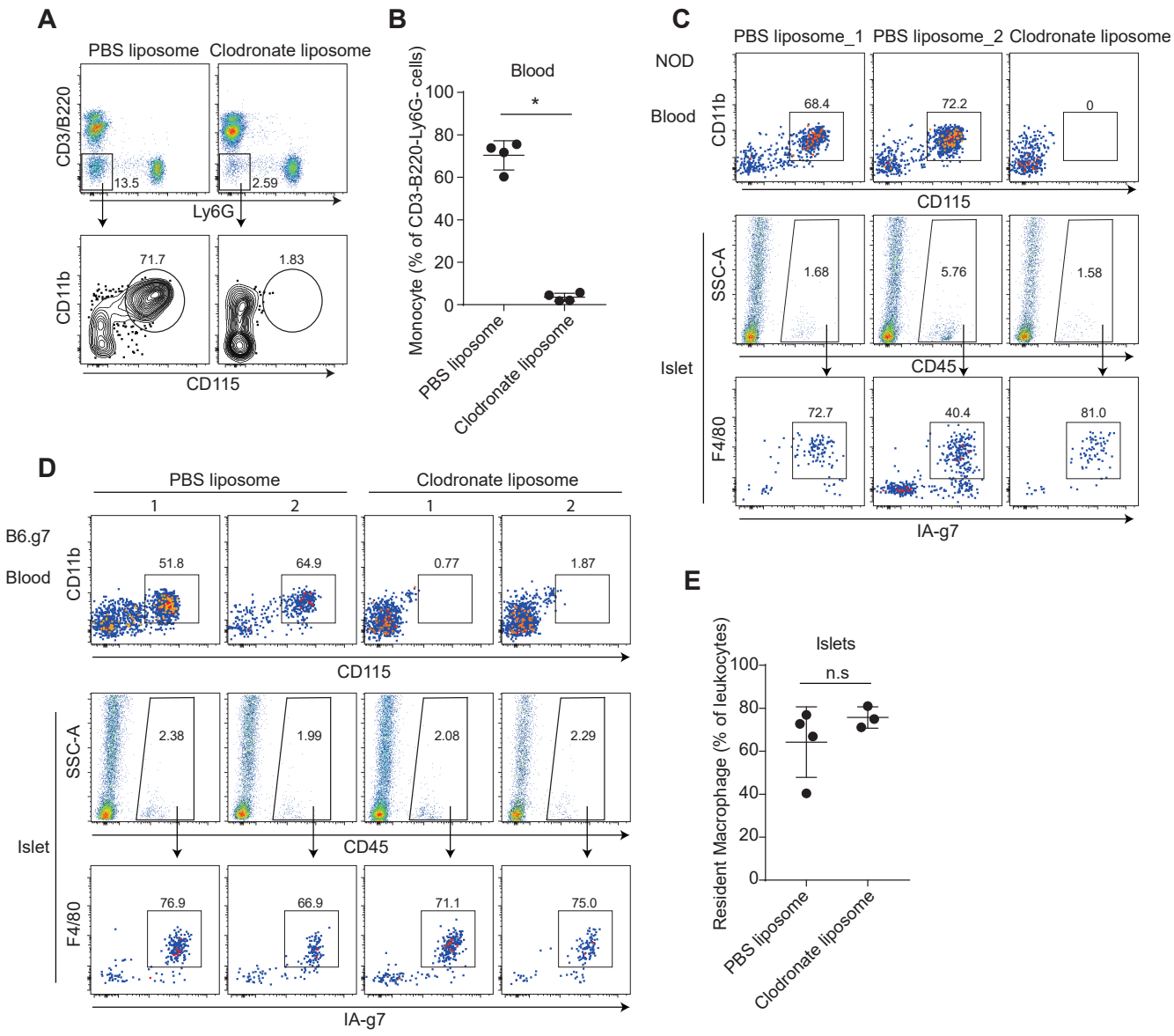

Fig. S6 Clodronate liposome depletes monocytes in the circulation but not the resident macrophages in islets

Fig. S6. Clodronate liposome depletes monocytes in the circulation but not the islet resident macrophages. (A) 8-week-old NOD mice were treated with 100µl/mouse PBS liposome (n=4) or clodronate liposome (n=4) intravenously and blood was collected one day after the injection. Graph shows the levels of monocytes in blood by flow cytometry in both conditions. (B) Percentage of blood monocytes as in (A). *p=0.0286. The experiment was performed one time with four mice in each group. (C-E) Representative flow cytometry analysis showing the percentage of monocytes in blood and resident macrophages in 6-8-week-old NOD mice (C) or the non-diabetic strain B6.g7 mice (D) treated with PBS liposomes or clodronate liposomes. The results showing the percentage of resident macrophage in islets was pooled from NOD and B6.g7 mice (E). The experiment in (C-E) was performed once with all the mice shown in the figures.

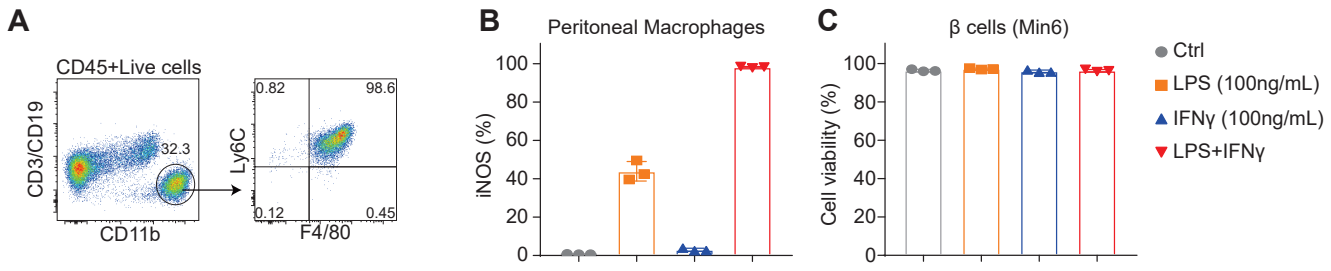

Fig. S7 Activated macrophages acquire cytocidal activity to β cells

Fig. S7. Activated macrophages acquire cytocidal activity to β cells. (A) Flow cytometry analysis of peritoneal macrophages from NOD mice. (B) Expression of iNOS (%) in macrophages treated with indicated stimuli for 18h ex vivo. Results are from n=3 mice for Fig. 8A. (C) Viability of β cell line (Min6) treated with indicated stimuli for 24h. β cell death was quantified by flow cytometry using cell viability dye.

Table S1. Gene expression signatures in CD4 T cell subsets

Gene	p_val	avg_logFC	pct.1	pct.2	p_val_adj	cluster
Rps29	6.02E-70	0.54	1.00	1.00	2.02E-65	CD4_0_Naive
Rps27	5.22E-67	0.56	1.00	0.99	1.75E-62	CD4_0_Naive
Rps27rt	4.85E-54	0.54	1.00	0.97	1.62E-49	CD4_0_Naive
Tmsb10	8.22E-54	0.57	1.00	0.96	2.75E-49	CD4_0_Naive
Klf2	6.19E-53	1.13	0.79	0.46	2.07E-48	CD4_0_Naive
Rps16	9.59E-39	0.38	1.00	0.99	3.21E-34	CD4_0_Naive
Rps28	1.30E-37	0.52	0.99	0.96	4.35E-33	CD4_0_Naive
Rps19	5.86E-35	0.37	1.00	1.00	1.96E-30	CD4_0_Naive
Rplp1	2.56E-30	0.42	0.98	0.95	8.57E-26	CD4_0_Naive
Rpl12	3.82E-29	0.51	0.92	0.85	1.28E-24	CD4_0_Naive
Rpl35a	1.08E-26	0.31	0.98	0.99	3.62E-22	CD4_0_Naive
Rplp2	1.15E-26	0.34	0.98	0.97	3.83E-22	CD4_0_Naive
Rps18	2.84E-25	0.27	0.99	0.99	9.51E-21	CD4_0_Naive
Rps24	1.60E-23	0.33	0.99	0.98	5.36E-19	CD4_0_Naive
Rpl8	3.49E-22	0.30	0.97	0.97	1.17E-17	CD4_0_Naive
Rps15	5.24E-22	0.33	0.99	0.94	1.75E-17	CD4_0_Naive
Rps27a	5.98E-21	0.26	0.99	0.97	2.00E-16	CD4_0_Naive
Lef1	3.96E-20	0.91	0.36	0.16	1.32E-15	CD4_0_Naive
Rps21	4.44E-20	0.39	0.91	0.86	1.49E-15	CD4_0_Naive
Rps7	8.78E-20	0.29	0.99	0.97	2.94E-15	CD4_0_Naive
Rpl21	2.22E-18	0.30	0.96	0.93	7.42E-14	CD4_0_Naive
Rpl14	5.00E-18	0.27	0.98	0.98	1.67E-13	CD4_0_Naive
Uba52	9.05E-18	0.26	0.98	0.96	3.03E-13	CD4_0_Naive
Rps20	3.06E-17	0.38	0.88	0.83	1.02E-12	CD4_0_Naive
Rps18-ps3	4.70E-17	0.32	0.91	0.85	1.57E-12	CD4_0_Naive
Rpl35	2.59E-16	0.29	0.99	0.96	8.67E-12	CD4_0_Naive
Rps2	3.58E-16	0.29	0.96	0.91	1.20E-11	CD4_0_Naive
Rps10	3.58E-16	0.29	0.95	0.93	1.20E-11	CD4_0_Naive
Rps25	4.82E-15	0.30	0.92	0.88	1.61E-10	CD4_0_Naive
Gm10260	2.25E-14	0.33	0.95	0.90	7.54E-10	CD4_0_Naive
Rpl23a	2.68E-14	0.28	0.96	0.90	8.96E-10	CD4_0_Naive
Tcf7	1.20E-13	0.58	0.30	0.14	4.02E-09	CD4_0_Naive
Rpl31	2.00E-13	0.31	0.88	0.86	6.68E-09	CD4_0_Naive
Vps37b	3.03E-12	0.72	0.45	0.31	1.01E-07	CD4_0_Naive
Rps8	3.84E-12	0.25	0.95	0.92	1.28E-07	CD4_0_Naive
Dusp10	8.71E-12	0.79	0.26	0.13	2.91E-07	CD4_0_Naive
Tsc22d3	9.88E-12	0.62	0.48	0.33	3.30E-07	CD4_0_Naive
Txk	6.81E-11	0.74	0.35	0.21	2.28E-06	CD4_0_Naive
Btg1	3.66E-10	0.27	0.98	0.91	1.22E-05	CD4_0_Naive
Emb	5.09E-10	0.55	0.37	0.23	1.70E-05	CD4_0_Naive
Rpl36a	5.19E-10	0.29	0.92	0.89	1.74E-05	CD4_0_Naive
Wdr89	5.87E-10	0.37	0.79	0.74	1.96E-05	CD4_0_Naive
Junb	7.76E-10	0.32	0.94	0.93	2.60E-05	CD4_0_Naive
Rpl30	1.09E-09	0.27	0.85	0.83	3.66E-05	CD4_0_Naive
Evl	5.96E-09	0.52	0.36	0.23	1.99E-04	CD4_0_Naive

Gm9844	6.69E-09	0.55	0.42	0.29	2.24E-04	CD4_0_Naive
Rpl23a-ps3	1.28E-07	0.36	0.60	0.51	4.27E-03	CD4_0_Naive
Gm11808	5.60E-07	0.35	0.71	0.67	1.87E-02	CD4_0_Naive
Eef1g	1.08E-06	0.26	0.76	0.72	3.62E-02	CD4_0_Naive
S1pr1	1.16E-06	0.44	0.29	0.19	3.87E-02	CD4_0_Naive
Ccl5	1.63E-30	1.02	0.84	0.64	5.44E-26	CD4_1_Effector
Ms4a4b	2.59E-26	0.56	0.87	0.62	8.67E-22	CD4_1_Effector
Cxcr6	3.24E-20	0.49	0.64	0.36	1.08E-15	CD4_1_Effector
Cd52	4.62E-19	0.37	0.97	0.93	1.54E-14	CD4_1_Effector
Hopx	2.09E-16	0.53	0.29	0.11	7.00E-12	CD4_1_Effector
Ctla2a	2.92E-15	0.51	0.43	0.23	9.75E-11	CD4_1_Effector
Actg1	1.56E-13	0.29	0.95	0.92	5.22E-09	CD4_1_Effector
Selplg	1.27E-12	0.44	0.62	0.41	4.26E-08	CD4_1_Effector
Ctsw	1.69E-12	0.40	0.48	0.28	5.65E-08	CD4_1_Effector
S100a10	3.19E-12	0.35	0.82	0.69	1.07E-07	CD4_1_Effector
Rgs1	6.82E-12	0.33	0.89	0.79	2.28E-07	CD4_1_Effector
Cnot6l	9.59E-12	0.38	0.30	0.14	3.21E-07	CD4_1_Effector
Lsp1	1.76E-11	0.40	0.66	0.50	5.88E-07	CD4_1_Effector
S100a4	5.29E-11	0.40	0.50	0.32	1.77E-06	CD4_1_Effector
Crip1	7.46E-11	0.28	0.90	0.80	2.50E-06	CD4_1_Effector
Gzmk	1.78E-10	0.40	0.25	0.11	5.96E-06	CD4_1_Effector
Dusp2	1.81E-10	0.47	0.52	0.34	6.05E-06	CD4_1_Effector
Ccr2	2.40E-10	0.28	0.35	0.18	8.03E-06	CD4_1_Effector
Epsti1	3.65E-10	0.42	0.34	0.18	1.22E-05	CD4_1_Effector
S1pr4	4.19E-10	0.40	0.31	0.16	1.40E-05	CD4_1_Effector
Ablim1	9.98E-10	0.37	0.43	0.26	3.34E-05	CD4_1_Effector
Gramd3	2.68E-09	0.48	0.26	0.13	8.95E-05	CD4_1_Effector
Hcst	1.49E-08	0.34	0.64	0.47	4.98E-04	CD4_1_Effector
Ifngr1	1.96E-08	0.31	0.57	0.40	6.57E-04	CD4_1_Effector
S100a6	2.19E-08	0.27	0.74	0.60	7.34E-04	CD4_1_Effector
Smad7	3.34E-08	0.33	0.31	0.18	1.12E-03	CD4_1_Effector
Runx3	6.17E-08	0.37	0.36	0.22	2.07E-03	CD4_1_Effector
Zyx	7.38E-08	0.37	0.29	0.16	2.47E-03	CD4_1_Effector
Itgb1	7.61E-08	0.37	0.43	0.28	2.55E-03	CD4_1_Effector
Sp100	1.04E-07	0.26	0.40	0.25	3.47E-03	CD4_1_Effector
Lgals3	1.23E-07	0.30	0.40	0.26	4.12E-03	CD4_1_Effector
S100a11	1.30E-07	0.33	0.41	0.27	4.34E-03	CD4_1_Effector
Ccnd3	1.74E-07	0.27	0.59	0.42	5.82E-03	CD4_1_Effector
Id2	5.76E-07	0.37	0.61	0.50	1.93E-02	CD4_1_Effector
Ifng	6.96E-07	0.35	0.32	0.19	2.33E-02	CD4_1_Effector
Cd200	1.29E-29	0.93	0.61	0.32	4.30E-25	CD4_2_Anergic
Pdcd1	9.80E-25	0.86	0.49	0.22	3.28E-20	CD4_2_Anergic
Tbc1d4	1.41E-24	0.83	0.44	0.18	4.70E-20	CD4_2_Anergic
Cd82	9.04E-11	0.45	0.55	0.38	3.02E-06	CD4_2_Anergic
2310001H17Rik	5.73E-10	0.43	0.39	0.22	1.92E-05	CD4_2_Anergic
Eea1	2.05E-09	0.52	0.27	0.13	6.87E-05	CD4_2_Anergic

Sdf4	5.59E-09	0.40	0.64	0.48	1.87E-04	CD4_2_Anergic
Gdi2	2.24E-08	0.37	0.69	0.57	7.49E-04	CD4_2_Anergic
Lag3	2.73E-08	0.43	0.47	0.32	9.14E-04	CD4_2_Anergic
Stx11	3.27E-08	0.47	0.35	0.22	1.10E-03	CD4_2_Anergic
Ramp1	6.84E-08	0.52	0.48	0.35	2.29E-03	CD4_2_Anergic
Rgs16	1.33E-07	0.47	0.46	0.33	4.44E-03	CD4_2_Anergic
Tnfrsf4	1.23E-70	1.50	0.87	0.39	4.10E-66	CD4_3_Treg
Ikzf2	1.21E-56	1.26	0.80	0.35	4.06E-52	CD4_3_Treg
Folr4	1.43E-49	1.05	0.84	0.41	4.79E-45	CD4_3_Treg
Tnfrsf18	1.55E-44	1.06	0.76	0.37	5.18E-40	CD4_3_Treg
Capg	1.90E-33	0.95	0.62	0.28	6.36E-29	CD4_3_Treg
AW112010	9.60E-33	0.58	0.99	0.92	3.21E-28	CD4_3_Treg
Arl5a	1.22E-32	0.95	0.53	0.19	4.09E-28	CD4_3_Treg
Lag3	2.48E-32	1.04	0.65	0.29	8.29E-28	CD4_3_Treg
Cd2	4.67E-32	0.77	0.85	0.54	1.56E-27	CD4_3_Treg
Sdf4	2.32E-31	0.90	0.76	0.47	7.75E-27	CD4_3_Treg
1600014C10Rik	2.42E-28	0.94	0.60	0.28	8.08E-24	CD4_3_Treg
Foxp3	2.77E-27	0.72	0.31	0.07	9.27E-23	CD4_3_Treg
Srgn	2.86E-27	0.65	0.89	0.72	9.55E-23	CD4_3_Treg
Ctla4	1.59E-26	0.71	0.68	0.36	5.30E-22	CD4_3_Treg
Il10	3.02E-25	0.88	0.35	0.10	1.01E-20	CD4_3_Treg
Maf	7.20E-23	0.65	0.62	0.32	2.41E-18	CD4_3_Treg
Tnfrsf9	2.64E-22	1.01	0.35	0.12	8.85E-18	CD4_3_Treg
Samsn1	4.35E-21	0.75	0.59	0.32	1.45E-16	CD4_3_Treg
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Crem	7.73E-20	0.72	0.43	0.18	2.59E-15	CD4_3_Treg
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Ankrd55	1.40E-16	0.73	0.30	0.11	4.69E-12	CD4_3_Treg
Cd3e	5.69E-16	0.38	0.96	0.81	1.90E-11	CD4_3_Treg
Rgs1	6.40E-15	0.43	0.95	0.79	2.14E-10	CD4_3_Treg
Glrx	1.21E-14	0.61	0.47	0.24	4.03E-10	CD4_3_Treg
Ctsb	3.34E-14	0.57	0.64	0.46	1.12E-09	CD4_3_Treg
Pim1	5.88E-14	0.69	0.69	0.47	1.97E-09	CD4_3_Treg
Gm2a	1.66E-13	0.60	0.50	0.29	5.57E-09	CD4_3_Treg
Serpina3g	4.31E-13	0.65	0.29	0.12	1.44E-08	CD4_3_Treg
Bcl2a1b	6.55E-13	0.45	0.70	0.46	2.19E-08	CD4_3_Treg
Pkp3	7.61E-13	0.57	0.52	0.30	2.55E-08	CD4_3_Treg
Peli1	2.34E-12	0.46	0.64	0.44	7.83E-08	CD4_3_Treg
Gm14005	3.87E-12	0.54	0.32	0.14	1.29E-07	CD4_3_Treg
Cmtm7	8.14E-12	0.52	0.54	0.33	2.72E-07	CD4_3_Treg
Arpc2	8.78E-12	0.35	0.89	0.79	2.94E-07	CD4_3_Treg
Ptprcap	1.03E-11	0.40	0.80	0.64	3.43E-07	CD4_3_Treg
S100a6	1.53E-11	0.44	0.79	0.60	5.13E-07	CD4_3_Treg
Irf8	1.55E-11	0.72	0.36	0.18	5.18E-07	CD4_3_Treg
Gadd45b	3.48E-11	0.59	0.41	0.22	1.16E-06	CD4_3_Treg
Tnfrsf1b	4.58E-11	0.52	0.29	0.13	1.53E-06	CD4_3_Treg
Gimap7	5.58E-11	0.53	0.48	0.28	1.87E-06	CD4_3_Treg

Cd27	1.05E-10	0.45	0.57	0.38	3.52E-06	CD4_3_Treg
Mxd1	1.73E-10	0.44	0.28	0.12	5.80E-06	CD4_3_Treg
Rap1b	1.87E-10	0.41	0.77	0.63	6.27E-06	CD4_3_Treg
Ptp4a2	2.44E-10	0.50	0.60	0.42	8.17E-06	CD4_3_Treg
Cd3g	3.09E-10	0.32	0.94	0.88	1.03E-05	CD4_3_Treg
Fxyd5	3.20E-10	0.35	0.89	0.81	1.07E-05	CD4_3_Treg
Cyba	4.20E-10	0.34	0.82	0.70	1.41E-05	CD4_3_Treg
Cst7	6.20E-10	0.57	0.33	0.17	2.07E-05	CD4_3_Treg
Ighm	8.03E-10	0.64	0.52	0.35	2.69E-05	CD4_3_Treg
Lbh	1.10E-09	0.48	0.54	0.37	3.67E-05	CD4_3_Treg
Tank	2.65E-09	0.42	0.35	0.19	8.88E-05	CD4_3_Treg
Icos	2.95E-09	0.47	0.55	0.39	9.87E-05	CD4_3_Treg
Chchd10	4.08E-09	0.57	0.36	0.22	1.36E-04	CD4_3_Treg
Timp2	7.45E-09	0.46	0.32	0.17	2.49E-04	CD4_3_Treg
Pigx	8.99E-09	0.49	0.39	0.23	3.01E-04	CD4_3_Treg
Tigit	1.14E-08	0.50	0.29	0.15	3.82E-04	CD4_3_Treg
Spcs1	1.27E-08	0.40	0.60	0.44	4.24E-04	CD4_3_Treg
Shisa5	2.07E-08	0.26	0.92	0.86	6.92E-04	CD4_3_Treg
Lgals1	2.94E-08	0.27	0.90	0.74	9.85E-04	CD4_3_Treg
Prkch	6.86E-08	0.43	0.35	0.20	2.29E-03	CD4_3_Treg
Ccr2	1.10E-07	0.49	0.34	0.20	3.68E-03	CD4_3_Treg
Cd3d	1.12E-07	0.28	0.88	0.81	3.76E-03	CD4_3_Treg
Cd53	1.16E-07	0.38	0.76	0.66	3.87E-03	CD4_3_Treg
Cd6	1.57E-07	0.44	0.46	0.32	5.24E-03	CD4_3_Treg
Rnaset2a	2.75E-07	0.31	0.69	0.58	9.18E-03	CD4_3_Treg
Cd200	3.02E-07	0.45	0.51	0.36	1.01E-02	CD4_3_Treg
Sat1	3.70E-07	0.34	0.63	0.48	1.24E-02	CD4_3_Treg
Sept7	8.24E-07	0.34	0.60	0.46	2.76E-02	CD4_3_Treg
2010111I01Rik	1.12E-06	0.37	0.28	0.15	3.76E-02	CD4_3_Treg
Itm2c	1.14E-06	0.37	0.39	0.24	3.80E-02	CD4_3_Treg
Lck	1.19E-06	0.29	0.81	0.73	3.98E-02	CD4_3_Treg
Snx2	1.36E-06	0.34	0.35	0.21	4.56E-02	CD4_3_Treg
2810417H13Rik	4.71E-113	1.99	0.84	0.11	1.58E-108	CD4_4_Proliferating
Birc5	1.08E-104	1.62	0.68	0.06	3.61E-100	CD4_4_Proliferating
Rrm2	8.08E-99	1.72	0.64	0.06	2.70E-94	CD4_4_Proliferating
Stmn1	1.05E-98	1.79	0.79	0.12	3.51E-94	CD4_4_Proliferating
Asf1b	7.90E-89	1.09	0.57	0.05	2.64E-84	CD4_4_Proliferating
Nusap1	2.13E-85	1.10	0.48	0.03	7.12E-81	CD4_4_Proliferating
Spc24	4.67E-81	1.02	0.50	0.04	1.56E-76	CD4_4_Proliferating
Ccna2	2.92E-78	1.04	0.49	0.04	9.76E-74	CD4_4_Proliferating
Smc2	3.72E-77	1.10	0.64	0.08	1.24E-72	CD4_4_Proliferating
Hist1h2ap	1.39E-75	1.84	0.57	0.07	4.66E-71	CD4_4_Proliferating
Fbxo5	2.68E-72	0.77	0.39	0.02	8.98E-68	CD4_4_Proliferating
Ube2c	6.38E-70	1.48	0.52	0.06	2.13E-65	CD4_4_Proliferating
Top2a	1.12E-69	1.16	0.64	0.09	3.74E-65	CD4_4_Proliferating
Cdca8	1.96E-66	0.83	0.46	0.04	6.57E-62	CD4_4_Proliferating
Tuba1b	9.80E-66	1.65	0.85	0.27	3.28E-61	CD4_4_Proliferating

Cks1b	4.86E-62	1.12	0.58	0.09	1.62E-57	CD4_4_Proliferating
H2afz	5.70E-62	1.30	0.98	0.76	1.91E-57	CD4_4_Proliferating
Sgol1	5.28E-60	0.56	0.30	0.01	1.77E-55	CD4_4_Proliferating
Pbk	1.13E-59	0.63	0.32	0.02	3.78E-55	CD4_4_Proliferating
Cdk1	1.85E-59	0.81	0.39	0.03	6.19E-55	CD4_4_Proliferating
Tk1	7.84E-59	0.75	0.41	0.04	2.62E-54	CD4_4_Proliferating
Aurkb	2.48E-58	0.56	0.30	0.01	8.30E-54	CD4_4_Proliferating
Cks2	7.30E-57	1.28	0.66	0.14	2.44E-52	CD4_4_Proliferating
Ptma	9.68E-57	0.95	0.99	0.93	3.24E-52	CD4_4_Proliferating
Ccnb1	6.31E-56	0.75	0.34	0.02	2.11E-51	CD4_4_Proliferating
Cenpf	8.74E-55	0.65	0.28	0.01	2.92E-50	CD4_4_Proliferating
Ccnb2	9.95E-55	0.74	0.41	0.04	3.33E-50	CD4_4_Proliferating
Spc25	6.36E-53	0.67	0.36	0.03	2.13E-48	CD4_4_Proliferating
Hmgb2	1.64E-52	1.41	0.93	0.61	5.50E-48	CD4_4_Proliferating
Mxd3	4.18E-52	0.55	0.25	0.01	1.40E-47	CD4_4_Proliferating
Tyms	7.80E-52	0.97	0.50	0.08	2.61E-47	CD4_4_Proliferating
Cdca3	9.93E-49	0.58	0.32	0.03	3.32E-44	CD4_4_Proliferating
Mki67	2.53E-48	0.71	0.35	0.03	8.48E-44	CD4_4_Proliferating
Tubb5	2.08E-46	1.43	0.87	0.48	6.96E-42	CD4_4_Proliferating
Tipin	1.07E-44	1.03	0.63	0.15	3.59E-40	CD4_4_Proliferating
Pttg1	1.48E-44	1.15	0.53	0.11	4.95E-40	CD4_4_Proliferating
Aurka	1.12E-43	0.46	0.25	0.02	3.75E-39	CD4_4_Proliferating
Cdc20	3.79E-43	0.92	0.32	0.03	1.27E-38	CD4_4_Proliferating
Tpx2	4.73E-43	0.52	0.25	0.02	1.58E-38	CD4_4_Proliferating
Dut	1.41E-42	1.04	0.69	0.19	4.71E-38	CD4_4_Proliferating
2700094K13Rik	2.94E-42	1.04	0.72	0.22	9.85E-38	CD4_4_Proliferating
1190002F15Rik	4.25E-42	0.74	0.43	0.06	1.42E-37	CD4_4_Proliferating
H2afx	1.78E-41	1.04	0.55	0.12	5.96E-37	CD4_4_Proliferating
Ran	2.43E-41	1.03	0.91	0.51	8.12E-37	CD4_4_Proliferating
Gmnn	3.14E-41	0.76	0.43	0.07	1.05E-36	CD4_4_Proliferating
Tacc3	6.41E-41	0.58	0.29	0.03	2.15E-36	CD4_4_Proliferating
Mad2l1	1.15E-40	0.57	0.40	0.06	3.84E-36	CD4_4_Proliferating
Hmgn2	1.45E-40	1.25	0.80	0.36	4.87E-36	CD4_4_Proliferating
Rad51	1.58E-40	0.43	0.29	0.03	5.30E-36	CD4_4_Proliferating
Lig1	2.43E-40	0.79	0.45	0.08	8.14E-36	CD4_4_Proliferating
Clspn	2.55E-40	0.53	0.26	0.02	8.55E-36	CD4_4_Proliferating
Cenpa	1.07E-38	1.10	0.57	0.14	3.59E-34	CD4_4_Proliferating
Cep55	3.89E-38	0.42	0.27	0.03	1.30E-33	CD4_4_Proliferating
Ppia	5.27E-38	0.62	0.99	0.96	1.76E-33	CD4_4_Proliferating
Knstrn	7.66E-38	0.60	0.29	0.03	2.56E-33	CD4_4_Proliferating
Hmgb3	3.51E-37	0.50	0.39	0.06	1.17E-32	CD4_4_Proliferating
Apitd1	1.64E-36	0.59	0.30	0.04	5.48E-32	CD4_4_Proliferating
Cenpm	1.02E-35	0.54	0.32	0.04	3.43E-31	CD4_4_Proliferating
Mcm5	1.48E-35	0.69	0.38	0.06	4.95E-31	CD4_4_Proliferating
Prc1	3.09E-35	0.45	0.27	0.03	1.03E-30	CD4_4_Proliferating
Kpna2	3.88E-35	0.78	0.34	0.05	1.30E-30	CD4_4_Proliferating
Fen1	2.23E-34	0.59	0.35	0.05	7.47E-30	CD4_4_Proliferating
Tmpo	3.38E-34	0.81	0.58	0.16	1.13E-29	CD4_4_Proliferating

Cenpw	7.06E-34	0.60	0.34	0.05	2.36E-29	CD4_4_Proliferating
Rfc5	1.13E-33	0.63	0.37	0.06	3.78E-29	CD4_4_Proliferating
Smc4	7.23E-33	0.84	0.72	0.23	2.42E-28	CD4_4_Proliferating
Ccdc34	2.07E-32	0.54	0.29	0.04	6.91E-28	CD4_4_Proliferating
Dek	8.85E-32	0.92	0.74	0.30	2.96E-27	CD4_4_Proliferating
Slbp	8.38E-30	0.92	0.72	0.29	2.80E-25	CD4_4_Proliferating
Hells	1.95E-29	0.54	0.31	0.05	6.51E-25	CD4_4_Proliferating
Mcm3	7.57E-29	0.59	0.31	0.05	2.53E-24	CD4_4_Proliferating
Siva1	7.87E-29	0.65	0.50	0.13	2.63E-24	CD4_4_Proliferating
Banf1	1.32E-28	0.74	0.56	0.16	4.43E-24	CD4_4_Proliferating
Ybx1	5.04E-28	0.74	0.92	0.67	1.69E-23	CD4_4_Proliferating
Plk4	1.84E-26	0.46	0.27	0.04	6.14E-22	CD4_4_Proliferating
Pmf1	3.29E-26	0.51	0.35	0.07	1.10E-21	CD4_4_Proliferating
Orc6	5.72E-26	0.51	0.32	0.06	1.91E-21	CD4_4_Proliferating
Gm10282	6.19E-26	0.55	0.34	0.07	2.07E-21	CD4_4_Proliferating
Prim1	7.46E-26	0.38	0.26	0.04	2.49E-21	CD4_4_Proliferating
Lsm2	8.60E-26	0.65	0.56	0.17	2.88E-21	CD4_4_Proliferating
Snrpd1	1.17E-24	0.66	0.70	0.27	3.90E-20	CD4_4_Proliferating
Cmc2	1.24E-24	0.40	0.40	0.09	4.14E-20	CD4_4_Proliferating
Erh	1.52E-24	0.77	0.88	0.50	5.07E-20	CD4_4_Proliferating
Phgdh	2.15E-24	0.64	0.39	0.09	7.21E-20	CD4_4_Proliferating
Hmgb1	3.65E-24	0.76	0.85	0.74	1.22E-19	CD4_4_Proliferating
Bub3	3.69E-24	0.68	0.63	0.22	1.23E-19	CD4_4_Proliferating
Ranbp1	4.90E-24	0.79	0.83	0.44	1.64E-19	CD4_4_Proliferating
Hnrnpab	1.09E-23	0.66	0.68	0.26	3.63E-19	CD4_4_Proliferating
Rfc4	2.21E-23	0.45	0.29	0.06	7.41E-19	CD4_4_Proliferating
Dtymk	3.01E-23	0.61	0.44	0.12	1.01E-18	CD4_4_Proliferating
Nap1l1	1.25E-22	0.75	0.69	0.30	4.18E-18	CD4_4_Proliferating
Csrp1	2.81E-22	0.47	0.41	0.11	9.42E-18	CD4_4_Proliferating
Anp32b	4.00E-22	0.76	0.75	0.41	1.34E-17	CD4_4_Proliferating
Mcm7	4.43E-22	0.50	0.34	0.08	1.48E-17	CD4_4_Proliferating
Cdkn2c	5.48E-22	0.62	0.39	0.11	1.83E-17	CD4_4_Proliferating
Pcna-ps2	6.24E-22	0.55	0.34	0.08	2.09E-17	CD4_4_Proliferating
Ezh2	1.07E-21	0.65	0.43	0.12	3.58E-17	CD4_4_Proliferating
Gins2	1.37E-21	0.42	0.25	0.04	4.57E-17	CD4_4_Proliferating
H2afv	1.44E-21	0.73	0.73	0.34	4.82E-17	CD4_4_Proliferating
Nucks1	5.07E-21	0.71	0.52	0.18	1.70E-16	CD4_4_Proliferating
Dnmt1	5.46E-21	0.44	0.29	0.06	1.83E-16	CD4_4_Proliferating
Nrm	1.40E-20	0.29	0.28	0.06	4.69E-16	CD4_4_Proliferating
Rpa3	4.07E-20	0.56	0.53	0.19	1.36E-15	CD4_4_Proliferating
Tex30	5.77E-20	0.34	0.30	0.07	1.93E-15	CD4_4_Proliferating
Lmnb1	7.01E-20	0.56	0.51	0.17	2.34E-15	CD4_4_Proliferating
Tubb4b	1.20E-19	0.68	0.43	0.13	4.00E-15	CD4_4_Proliferating
Dctpp1	1.58E-19	0.57	0.51	0.18	5.30E-15	CD4_4_Proliferating
Fkbp2	2.05E-19	0.48	0.44	0.13	6.85E-15	CD4_4_Proliferating
Pcna	6.84E-19	0.67	0.49	0.18	2.29E-14	CD4_4_Proliferating
Fxn	1.19E-18	0.32	0.28	0.06	3.97E-14	CD4_4_Proliferating
Impdh2	1.51E-18	0.46	0.43	0.13	5.06E-14	CD4_4_Proliferating

Lgals1	1.61E-18	0.66	0.92	0.75	5.39E-14	CD4_4_Proliferating
Ssb	1.70E-18	0.59	0.64	0.26	5.69E-14	CD4_4_Proliferating
Rbbp7	2.30E-18	0.56	0.58	0.23	7.69E-14	CD4_4_Proliferating
Dnajc9	5.86E-18	0.54	0.62	0.25	1.96E-13	CD4_4_Proliferating
Anapc15	7.30E-18	0.49	0.32	0.08	2.44E-13	CD4_4_Proliferating
Rbm3	7.37E-18	0.54	0.87	0.72	2.47E-13	CD4_4_Proliferating
Nasp	8.99E-18	0.36	0.36	0.10	3.01E-13	CD4_4_Proliferating
Hat1	1.05E-17	0.52	0.33	0.09	3.52E-13	CD4_4_Proliferating
Lsm5	1.87E-17	0.64	0.73	0.36	6.26E-13	CD4_4_Proliferating
Cdk4	3.61E-17	0.54	0.52	0.20	1.21E-12	CD4_4_Proliferating
Pgp	4.13E-17	0.42	0.35	0.10	1.38E-12	CD4_4_Proliferating
Txn1	5.24E-17	0.59	0.80	0.45	1.75E-12	CD4_4_Proliferating
Mis18a	6.38E-17	0.41	0.41	0.13	2.13E-12	CD4_4_Proliferating
Nudt21	1.03E-16	0.57	0.71	0.35	3.45E-12	CD4_4_Proliferating
Ly6e	1.20E-16	0.64	0.77	0.45	4.02E-12	CD4_4_Proliferating
Cisd1	1.38E-16	0.48	0.44	0.15	4.61E-12	CD4_4_Proliferating
Usp1	1.46E-16	0.35	0.39	0.12	4.88E-12	CD4_4_Proliferating
Cmtm7	1.55E-16	0.67	0.66	0.33	5.19E-12	CD4_4_Proliferating
Smc6	1.98E-16	0.53	0.58	0.25	6.62E-12	CD4_4_Proliferating
Hnrnpa3	2.26E-16	0.57	0.83	0.56	7.58E-12	CD4_4_Proliferating
Smc3	2.61E-16	0.48	0.39	0.12	8.74E-12	CD4_4_Proliferating
Actl6a	2.83E-16	0.51	0.40	0.13	9.46E-12	CD4_4_Proliferating
Hint1	3.09E-16	0.58	0.84	0.58	1.03E-11	CD4_4_Proliferating
Lsm3	4.02E-16	0.42	0.62	0.25	1.34E-11	CD4_4_Proliferating
Alyref	4.14E-16	0.45	0.54	0.21	1.39E-11	CD4_4_Proliferating
Anp32e	4.33E-16	0.56	0.48	0.18	1.45E-11	CD4_4_Proliferating
Tpi1	6.20E-16	0.47	0.37	0.12	2.08E-11	CD4_4_Proliferating
Snrpe	7.48E-16	0.55	0.81	0.51	2.50E-11	CD4_4_Proliferating
Cdkn2d	1.14E-15	0.40	0.43	0.14	3.83E-11	CD4_4_Proliferating
Dck	1.16E-15	0.34	0.26	0.06	3.88E-11	CD4_4_Proliferating
Ssrp1	1.20E-15	0.42	0.51	0.19	4.03E-11	CD4_4_Proliferating
Elof1	1.33E-15	0.52	0.46	0.16	4.43E-11	CD4_4_Proliferating
Nhp2	2.57E-15	0.52	0.56	0.22	8.59E-11	CD4_4_Proliferating
Lyar	3.17E-15	0.54	0.40	0.14	1.06E-10	CD4_4_Proliferating
Slc25a5	3.26E-15	0.57	0.88	0.59	1.09E-10	CD4_4_Proliferating
Rtn3	4.28E-15	0.50	0.52	0.20	1.43E-10	CD4_4_Proliferating
Pold2	5.95E-15	0.42	0.31	0.09	1.99E-10	CD4_4_Proliferating
Ddx39	6.12E-15	0.49	0.45	0.16	2.05E-10	CD4_4_Proliferating
Naa50	6.77E-15	0.35	0.49	0.18	2.27E-10	CD4_4_Proliferating
Ube2s	8.78E-15	0.75	0.64	0.35	2.94E-10	CD4_4_Proliferating
Rpp30	8.84E-15	0.25	0.26	0.06	2.96E-10	CD4_4_Proliferating
Psma6	9.98E-15	0.43	0.58	0.24	3.34E-10	CD4_4_Proliferating
Eif1ax	1.08E-14	0.51	0.58	0.24	3.62E-10	CD4_4_Proliferating
Lsm6	1.23E-14	0.57	0.69	0.33	4.10E-10	CD4_4_Proliferating
Eri1	1.27E-14	0.36	0.34	0.11	4.27E-10	CD4_4_Proliferating
Srsf7	1.48E-14	0.58	0.71	0.36	4.97E-10	CD4_4_Proliferating
Mif	1.59E-14	0.66	0.81	0.50	5.32E-10	CD4_4_Proliferating
Fabp5	2.03E-14	0.47	0.29	0.08	6.80E-10	CD4_4_Proliferating

Gapdh	2.11E-14	0.53	0.85	0.63	7.07E-10	CD4_4_Proliferating
Hmgn5	2.54E-14	0.28	0.26	0.07	8.49E-10	CD4_4_Proliferating
Cox5a	2.74E-14	0.56	0.83	0.53	9.17E-10	CD4_4_Proliferating
Uchl5	2.99E-14	0.37	0.39	0.13	9.99E-10	CD4_4_Proliferating
Prdx3	3.03E-14	0.31	0.43	0.15	1.01E-09	CD4_4_Proliferating
Mcm6	3.09E-14	0.29	0.43	0.15	1.03E-09	CD4_4_Proliferating
Rad21	4.54E-14	0.36	0.33	0.10	1.52E-09	CD4_4_Proliferating
Sdf2l1	4.63E-14	0.50	0.55	0.23	1.55E-09	CD4_4_Proliferating
Srsf2	4.68E-14	0.53	0.76	0.43	1.56E-09	CD4_4_Proliferating
Vdac1	5.01E-14	0.39	0.42	0.15	1.68E-09	CD4_4_Proliferating
Prdx1	5.01E-14	0.50	0.90	0.74	1.68E-09	CD4_4_Proliferating
Prdx4	5.04E-14	0.39	0.29	0.09	1.69E-09	CD4_4_Proliferating
Srsf3	8.70E-14	0.54	0.80	0.54	2.91E-09	CD4_4_Proliferating
Aars	8.78E-14	0.34	0.35	0.11	2.94E-09	CD4_4_Proliferating
Rpa2	1.18E-13	0.43	0.36	0.13	3.95E-09	CD4_4_Proliferating
Mrpl42	1.27E-13	0.44	0.57	0.25	4.26E-09	CD4_4_Proliferating
Pum2	1.45E-13	0.37	0.40	0.14	4.87E-09	CD4_4_Proliferating
Uchl3	1.51E-13	0.26	0.40	0.14	5.04E-09	CD4_4_Proliferating
Hsp90aa1	1.63E-13	0.50	0.86	0.56	5.46E-09	CD4_4_Proliferating
Rfc2	4.53E-13	0.34	0.42	0.16	1.52E-08	CD4_4_Proliferating
Ncaph2	6.65E-13	0.30	0.32	0.10	2.22E-08	CD4_4_Proliferating
Nans	1.12E-12	0.49	0.44	0.18	3.76E-08	CD4_4_Proliferating
Dbi	1.29E-12	0.45	0.57	0.25	4.31E-08	CD4_4_Proliferating
Dnajc2	1.34E-12	0.48	0.38	0.14	4.48E-08	CD4_4_Proliferating
Arl6ip6	1.57E-12	0.28	0.36	0.12	5.25E-08	CD4_4_Proliferating
Rexo2	1.71E-12	0.47	0.64	0.31	5.72E-08	CD4_4_Proliferating
Sumo2	2.01E-12	0.38	0.91	0.80	6.71E-08	CD4_4_Proliferating
Cyb5b	2.17E-12	0.37	0.34	0.12	7.27E-08	CD4_4_Proliferating
Cbx3	2.30E-12	0.49	0.67	0.37	7.71E-08	CD4_4_Proliferating
Acsl5	2.76E-12	0.27	0.34	0.12	9.25E-08	CD4_4_Proliferating
Stra13	2.81E-12	0.44	0.56	0.26	9.40E-08	CD4_4_Proliferating
Nudcd2	2.97E-12	0.38	0.40	0.15	9.93E-08	CD4_4_Proliferating
Dpy30	4.24E-12	0.47	0.50	0.22	1.42E-07	CD4_4_Proliferating
Nudt5	4.69E-12	0.47	0.34	0.12	1.57E-07	CD4_4_Proliferating
Hmgn1	4.89E-12	0.56	0.52	0.25	1.64E-07	CD4_4_Proliferating
2700029M09Rik	5.92E-12	0.31	0.44	0.18	1.98E-07	CD4_4_Proliferating
Psmc3	7.15E-12	0.34	0.49	0.20	2.39E-07	CD4_4_Proliferating
Ube2m	7.47E-12	0.34	0.36	0.13	2.50E-07	CD4_4_Proliferating
Cbx1	1.05E-11	0.35	0.44	0.18	3.50E-07	CD4_4_Proliferating
U2af1	1.16E-11	0.47	0.67	0.35	3.88E-07	CD4_4_Proliferating
Eny2	1.23E-11	0.34	0.50	0.22	4.11E-07	CD4_4_Proliferating

Table S2. Gene expression signatures in CD8 T cell subsets

gene	p_val	avg_logFC	pct.1	pct.2	p_val_adj	cluster
Lag3	2.15E-63	0.89	0.74	0.41	7.20E-59	CD8_0_Exhausted
Pdcd1	4.95E-52	0.86	0.66	0.36	1.66E-47	CD8_0_Exhausted
Cxcr6	1.57E-40	0.63	0.86	0.68	5.24E-36	CD8_0_Exhausted
Cd3g	3.43E-40	0.45	0.98	0.93	1.15E-35	CD8_0_Exhausted
Rgs16	6.01E-37	0.66	0.72	0.44	2.01E-32	CD8_0_Exhausted
Nkg7	5.27E-34	0.37	0.99	0.97	1.76E-29	CD8_0_Exhausted
Cd3e	8.15E-34	0.37	0.96	0.87	2.73E-29	CD8_0_Exhausted
Cd8a	1.65E-33	0.51	0.84	0.69	5.52E-29	CD8_0_Exhausted
Cd200	2.36E-24	0.60	0.53	0.32	7.89E-20	CD8_0_Exhausted
Tox	2.37E-23	0.55	0.52	0.32	7.92E-19	CD8_0_Exhausted
Cd3d	5.80E-21	0.28	0.95	0.88	1.94E-16	CD8_0_Exhausted
Ucp2	7.19E-21	0.36	0.78	0.64	2.40E-16	CD8_0_Exhausted
AW112010	8.21E-21	0.27	0.99	0.98	2.75E-16	CD8_0_Exhausted
Ccl4	1.28E-20	0.61	0.82	0.70	4.29E-16	CD8_0_Exhausted
Bcl2a1d	3.12E-20	0.45	0.60	0.42	1.04E-15	CD8_0_Exhausted
Ccl3	8.10E-19	0.82	0.54	0.36	2.71E-14	CD8_0_Exhausted
Batf	8.72E-19	0.51	0.55	0.38	2.92E-14	CD8_0_Exhausted
Sh2d2a	4.33E-18	0.43	0.67	0.50	1.45E-13	CD8_0_Exhausted
Bcl2a1b	8.44E-18	0.37	0.77	0.63	2.82E-13	CD8_0_Exhausted
S100a6	3.04E-16	0.34	0.86	0.73	1.02E-11	CD8_0_Exhausted
Sub1	3.22E-16	0.26	0.99	0.96	1.08E-11	CD8_0_Exhausted
Ifi27l2a	1.79E-15	0.37	0.83	0.67	6.00E-11	CD8_0_Exhausted
Trbc2	2.57E-14	0.27	0.92	0.86	8.58E-10	CD8_0_Exhausted
Cd160	6.33E-14	0.44	0.32	0.18	2.12E-09	CD8_0_Exhausted
Mxd4	1.79E-13	0.39	0.32	0.18	5.98E-09	CD8_0_Exhausted
Rbpj	2.87E-13	0.41	0.37	0.23	9.59E-09	CD8_0_Exhausted
Capg	5.13E-13	0.45	0.36	0.22	1.72E-08	CD8_0_Exhausted
Ptms	9.55E-13	0.37	0.54	0.40	3.19E-08	CD8_0_Exhausted
Ctla4	1.87E-12	0.42	0.48	0.34	6.25E-08	CD8_0_Exhausted
Samsn1	2.25E-12	0.42	0.45	0.32	7.54E-08	CD8_0_Exhausted
BC021614	3.80E-12	0.36	0.43	0.29	1.27E-07	CD8_0_Exhausted
Klrd1	4.02E-12	0.43	0.68	0.58	1.35E-07	CD8_0_Exhausted
Gdi2	8.68E-12	0.29	0.78	0.68	2.90E-07	CD8_0_Exhausted
Cst7	9.29E-12	0.36	0.49	0.37	3.11E-07	CD8_0_Exhausted
Nr4a2	9.88E-12	0.40	0.42	0.29	3.31E-07	CD8_0_Exhausted
Rap1a	2.17E-11	0.28	0.73	0.62	7.25E-07	CD8_0_Exhausted
Cd27	3.08E-11	0.26	0.63	0.50	1.03E-06	CD8_0_Exhausted
Folr4	3.36E-11	0.40	0.29	0.17	1.12E-06	CD8_0_Exhausted
Fas	5.86E-11	0.39	0.35	0.22	1.96E-06	CD8_0_Exhausted
Ciapin1	8.15E-11	0.33	0.50	0.36	2.73E-06	CD8_0_Exhausted
Ech1	9.85E-11	0.32	0.54	0.41	3.29E-06	CD8_0_Exhausted
Zap70	9.86E-11	0.34	0.51	0.39	3.30E-06	CD8_0_Exhausted
Ramp1	1.50E-10	0.36	0.29	0.18	5.03E-06	CD8_0_Exhausted
Ikzf3	2.07E-10	0.33	0.43	0.30	6.94E-06	CD8_0_Exhausted
Pold4	4.17E-10	0.28	0.36	0.24	1.40E-05	CD8_0_Exhausted

Il2rb	6.88E-10	0.30	0.47	0.35	2.30E-05	CD8_0_Exhausted
Trac	7.38E-10	0.29	0.72	0.61	2.47E-05	CD8_0_Exhausted
Elk3	9.22E-10	0.32	0.43	0.31	3.08E-05	CD8_0_Exhausted
Litaf	1.22E-09	0.37	0.37	0.25	4.09E-05	CD8_0_Exhausted
Cd7	3.57E-09	0.42	0.61	0.51	1.19E-04	CD8_0_Exhausted
Tnfrsf9	4.21E-09	0.36	0.33	0.21	1.41E-04	CD8_0_Exhausted
S100a4	1.28E-08	0.37	0.52	0.41	4.28E-04	CD8_0_Exhausted
Ctsb	1.31E-08	0.27	0.66	0.55	4.39E-04	CD8_0_Exhausted
Ppp1r16b	2.46E-08	0.30	0.43	0.32	8.23E-04	CD8_0_Exhausted
Pld3	3.09E-08	0.26	0.35	0.24	1.03E-03	CD8_0_Exhausted
Sdf4	3.67E-08	0.38	0.54	0.44	1.23E-03	CD8_0_Exhausted
Crem	4.37E-08	0.30	0.27	0.17	1.46E-03	CD8_0_Exhausted
Ndfip1	4.65E-08	0.27	0.56	0.44	1.56E-03	CD8_0_Exhausted
Id2	8.63E-08	0.27	0.80	0.74	2.89E-03	CD8_0_Exhausted
Ccl5	1.08E-07	0.29	0.99	0.97	3.61E-03	CD8_0_Exhausted
Chmp4b	4.96E-07	0.26	0.50	0.41	1.66E-02	CD8_0_Exhausted
Vamp5	1.07E-06	0.28	0.30	0.21	3.57E-02	CD8_0_Exhausted
Rps27	2.04E-92	0.53	1.00	0.99	6.81E-88	CD8_1_Naive
Rps27rt	2.19E-77	0.54	1.00	0.97	7.33E-73	CD8_1_Naive
Tmsb10	9.63E-73	0.67	1.00	0.96	3.22E-68	CD8_1_Naive
Klf2	2.30E-71	1.16	0.78	0.42	7.68E-67	CD8_1_Naive
Malat1	2.71E-48	0.42	1.00	1.00	9.07E-44	CD8_1_Naive
Rpl13a	1.41E-43	0.29	1.00	1.00	4.72E-39	CD8_1_Naive
Rps29	8.11E-42	0.31	1.00	1.00	2.71E-37	CD8_1_Naive
Rps14	1.19E-41	0.28	1.00	1.00	3.99E-37	CD8_1_Naive
Btg1	3.39E-38	0.44	0.97	0.92	1.13E-33	CD8_1_Naive
Rps24	4.51E-37	0.29	0.99	0.99	1.51E-32	CD8_1_Naive
Rps28	1.18E-30	0.34	0.99	0.98	3.94E-26	CD8_1_Naive
Il7r	2.88E-29	0.67	0.26	0.07	9.64E-25	CD8_1_Naive
Tcf7	5.21E-29	0.56	0.27	0.08	1.74E-24	CD8_1_Naive
Rpl21	6.83E-24	0.28	0.97	0.95	2.28E-19	CD8_1_Naive
Gramd3	1.98E-21	0.57	0.38	0.18	6.63E-17	CD8_1_Naive
S1pr1	1.40E-20	0.51	0.32	0.13	4.67E-16	CD8_1_Naive
Rplp1	2.20E-19	0.27	0.99	0.97	7.35E-15	CD8_1_Naive
Rpl12	2.10E-18	0.30	0.92	0.89	7.02E-14	CD8_1_Naive
Rps21	3.88E-18	0.33	0.92	0.88	1.30E-13	CD8_1_Naive
Evl	1.27E-17	0.51	0.48	0.29	4.24E-13	CD8_1_Naive
Rps18-ps3	1.71E-16	0.28	0.94	0.89	5.72E-12	CD8_1_Naive
Hcst	3.85E-13	0.35	0.71	0.61	1.29E-08	CD8_1_Naive
Gm9843	9.30E-13	0.28	0.86	0.82	3.11E-08	CD8_1_Naive
Ssh2	1.97E-12	0.41	0.31	0.17	6.59E-08	CD8_1_Naive
Dnajb1	1.99E-12	0.47	0.58	0.46	6.66E-08	CD8_1_Naive
Ly6a	1.03E-11	0.31	0.82	0.78	3.45E-07	CD8_1_Naive
Junb	1.33E-11	0.31	0.96	0.93	4.46E-07	CD8_1_Naive
Ptpn18	3.80E-11	0.34	0.70	0.63	1.27E-06	CD8_1_Naive
Tsc22d3	5.26E-11	0.50	0.45	0.32	1.76E-06	CD8_1_Naive
Gm11808	6.10E-11	0.33	0.77	0.74	2.04E-06	CD8_1_Naive

Hspa1b	2.32E-10	0.38	0.26	0.14	7.75E-06	CD8_1_Naive
Zfp36l2	8.04E-10	0.44	0.53	0.41	2.69E-05	CD8_1_Naive
Thap3	9.25E-10	0.37	0.28	0.16	3.09E-05	CD8_1_Naive
Ypel3	9.66E-10	0.27	0.64	0.53	3.23E-05	CD8_1_Naive
Cd28	2.36E-09	0.40	0.60	0.50	7.91E-05	CD8_1_Naive
Klf6	2.65E-09	0.38	0.63	0.53	8.88E-05	CD8_1_Naive
Klk8	3.41E-09	0.39	0.32	0.20	1.14E-04	CD8_1_Naive
Txk	3.74E-09	0.42	0.40	0.27	1.25E-04	CD8_1_Naive
Socs3	7.80E-09	0.45	0.36	0.25	2.61E-04	CD8_1_Naive
Ccnd3	8.07E-09	0.39	0.55	0.48	2.70E-04	CD8_1_Naive
Hmha1	2.64E-08	0.40	0.53	0.43	8.82E-04	CD8_1_Naive
Hspa1a	3.43E-08	0.37	0.44	0.33	1.15E-03	CD8_1_Naive
Sgk1	5.31E-08	0.43	0.28	0.18	1.78E-03	CD8_1_Naive
Gm9844	1.00E-07	0.46	0.29	0.19	3.35E-03	CD8_1_Naive
Emb	1.02E-07	0.40	0.35	0.25	3.40E-03	CD8_1_Naive
Irf1	1.11E-07	0.32	0.40	0.29	3.73E-03	CD8_1_Naive
Btg2	1.41E-07	0.29	0.59	0.51	4.72E-03	CD8_1_Naive
Cox7a2l	1.71E-07	0.28	0.72	0.71	5.73E-03	CD8_1_Naive
Fos	1.86E-07	0.46	0.58	0.52	6.21E-03	CD8_1_Naive
Ctsw	2.38E-07	0.34	0.63	0.58	7.95E-03	CD8_1_Naive
Ifngr1	4.13E-07	0.34	0.57	0.48	1.38E-02	CD8_1_Naive
Wdr89	4.21E-07	0.28	0.78	0.77	1.41E-02	CD8_1_Naive
Ppp1r15a	5.30E-07	0.40	0.49	0.41	1.77E-02	CD8_1_Naive
Arhgap15	1.01E-06	0.38	0.42	0.34	3.37E-02	CD8_1_Naive
Eif4a2	1.24E-06	0.30	0.61	0.57	4.14E-02	CD8_1_Naive
2810417H13Rik	6.74E-196	2.01	0.88	0.16	2.25E-191	CD8_2_Proliferating
Birc5	2.47E-175	1.54	0.75	0.09	8.27E-171	CD8_2_Proliferating
Stmn1	7.49E-172	1.74	0.86	0.18	2.50E-167	CD8_2_Proliferating
Rrm2	1.97E-159	1.68	0.68	0.08	6.59E-155	CD8_2_Proliferating
H2afz	1.00E-155	1.27	0.99	0.84	3.36E-151	CD8_2_Proliferating
Cks1b	2.58E-148	1.27	0.74	0.12	8.62E-144	CD8_2_Proliferating
Nusap1	1.92E-147	1.22	0.56	0.04	6.43E-143	CD8_2_Proliferating
Ptma	2.60E-146	1.04	1.00	0.95	8.69E-142	CD8_2_Proliferating
Hmgb2	3.72E-138	1.42	0.97	0.75	1.25E-133	CD8_2_Proliferating
Spc24	1.60E-137	0.91	0.57	0.05	5.35E-133	CD8_2_Proliferating
Asf1b	2.56E-133	1.03	0.62	0.07	8.58E-129	CD8_2_Proliferating
Ccna2	7.41E-133	1.06	0.53	0.04	2.48E-128	CD8_2_Proliferating
Hist1h2ap	9.58E-126	1.87	0.63	0.10	3.20E-121	CD8_2_Proliferating
Tuba1b	1.38E-121	1.60	0.85	0.33	4.62E-117	CD8_2_Proliferating
Cdca8	1.98E-115	0.88	0.53	0.06	6.64E-111	CD8_2_Proliferating
Top2a	2.09E-114	1.09	0.66	0.12	6.99E-110	CD8_2_Proliferating
Smc2	2.56E-107	1.01	0.65	0.12	8.57E-103	CD8_2_Proliferating
Spc25	1.22E-104	0.82	0.44	0.04	4.08E-100	CD8_2_Proliferating
Ccnb2	5.93E-104	1.01	0.50	0.06	1.98E-99	CD8_2_Proliferating
Fbxo5	4.21E-101	0.70	0.43	0.04	1.41E-96	CD8_2_Proliferating
Cdk1	1.22E-99	0.83	0.47	0.05	4.08E-95	CD8_2_Proliferating
Ppia	1.55E-95	0.61	1.00	0.97	5.19E-91	CD8_2_Proliferating

Hmgn2	3.72E-95	1.20	0.88	0.44	1.24E-90	CD8_2_Proliferating
Gmnn	2.76E-94	0.88	0.52	0.08	9.23E-90	CD8_2_Proliferating
Tacc3	2.41E-92	0.64	0.40	0.03	8.06E-88	CD8_2_Proliferating
Ran	1.23E-91	0.91	0.95	0.66	4.13E-87	CD8_2_Proliferating
Ube2c	2.26E-91	1.42	0.53	0.09	7.57E-87	CD8_2_Proliferating
Pttg1	1.26E-89	1.09	0.65	0.16	4.22E-85	CD8_2_Proliferating
Tubb5	1.42E-89	1.28	0.91	0.57	4.74E-85	CD8_2_Proliferating
Mad2l1	1.14E-88	0.67	0.49	0.07	3.83E-84	CD8_2_Proliferating
Cks2	2.01E-88	1.09	0.68	0.19	6.71E-84	CD8_2_Proliferating
Cenpa	6.96E-87	1.15	0.69	0.20	2.33E-82	CD8_2_Proliferating
Hmgb1	1.13E-86	0.88	0.92	0.79	3.78E-82	CD8_2_Proliferating
Tk1	1.51E-86	0.74	0.49	0.07	5.07E-82	CD8_2_Proliferating
Aurkb	5.81E-86	0.60	0.34	0.02	1.94E-81	CD8_2_Proliferating
Rad51	5.30E-84	0.53	0.37	0.03	1.77E-79	CD8_2_Proliferating
Cep55	6.29E-83	0.60	0.36	0.03	2.10E-78	CD8_2_Proliferating
2700094K13Rik	2.11E-82	0.95	0.81	0.32	7.05E-78	CD8_2_Proliferating
Ccnb1	2.59E-82	0.81	0.38	0.04	8.67E-78	CD8_2_Proliferating
Dut	1.32E-81	0.95	0.78	0.28	4.43E-77	CD8_2_Proliferating
Cdca3	1.04E-80	0.68	0.39	0.04	3.47E-76	CD8_2_Proliferating
Casc5	3.39E-80	0.57	0.31	0.02	1.14E-75	CD8_2_Proliferating
Lig1	3.68E-78	0.79	0.50	0.09	1.23E-73	CD8_2_Proliferating
Kpna2	3.42E-74	0.94	0.48	0.09	1.14E-69	CD8_2_Proliferating
Sgol1	5.04E-74	0.47	0.28	0.01	1.68E-69	CD8_2_Proliferating
Cdc20	7.30E-74	0.87	0.39	0.05	2.44E-69	CD8_2_Proliferating
Tyms	2.36E-73	0.75	0.51	0.11	7.89E-69	CD8_2_Proliferating
Tipin	1.65E-72	0.89	0.67	0.20	5.51E-68	CD8_2_Proliferating
Mki67	2.76E-72	0.57	0.34	0.03	9.22E-68	CD8_2_Proliferating
Cenpe	6.05E-71	0.54	0.30	0.02	2.03E-66	CD8_2_Proliferating
Tmpo	7.51E-70	0.79	0.63	0.18	2.51E-65	CD8_2_Proliferating
Tpx2	8.08E-70	0.54	0.31	0.03	2.70E-65	CD8_2_Proliferating
Hmmr	1.07E-69	0.54	0.28	0.02	3.59E-65	CD8_2_Proliferating
Cenpm	7.50E-69	0.50	0.33	0.04	2.51E-64	CD8_2_Proliferating
Cenpf	4.97E-68	0.59	0.30	0.03	1.66E-63	CD8_2_Proliferating
H2afx	2.00E-66	1.00	0.56	0.16	6.68E-62	CD8_2_Proliferating
Smc4	1.21E-65	0.79	0.69	0.24	4.04E-61	CD8_2_Proliferating
Anp32b	1.28E-65	0.78	0.88	0.49	4.29E-61	CD8_2_Proliferating
Pbk	1.73E-65	0.46	0.28	0.02	5.79E-61	CD8_2_Proliferating
Ybx1	3.93E-63	0.68	0.94	0.77	1.31E-58	CD8_2_Proliferating
Shcbp1	4.25E-62	0.43	0.25	0.02	1.42E-57	CD8_2_Proliferating
Rfc5	4.38E-62	0.53	0.46	0.10	1.46E-57	CD8_2_Proliferating
Gm10282	9.17E-60	0.53	0.40	0.07	3.07E-55	CD8_2_Proliferating
Mcm5	1.15E-59	0.57	0.43	0.09	3.86E-55	CD8_2_Proliferating
Cenpw	1.22E-59	0.58	0.49	0.12	4.07E-55	CD8_2_Proliferating
Ska1	3.94E-59	0.41	0.27	0.03	1.32E-54	CD8_2_Proliferating
Ranbp1	7.88E-59	0.86	0.85	0.50	2.64E-54	CD8_2_Proliferating
4930579G24Rik	2.08E-58	0.47	0.31	0.04	6.95E-54	CD8_2_Proliferating
Prc1	5.73E-58	0.40	0.28	0.03	1.92E-53	CD8_2_Proliferating
Dek	6.71E-58	0.81	0.78	0.36	2.24E-53	CD8_2_Proliferating

Hist1h1b	3.80E-57	0.49	0.27	0.03	1.27E-52	CD8_2_Proliferating
Erh	1.53E-56	0.69	0.92	0.62	5.12E-52	CD8_2_Proliferating
Kif22	8.10E-56	0.45	0.27	0.03	2.71E-51	CD8_2_Proliferating
1190002F15Rik	2.91E-55	0.54	0.40	0.08	9.73E-51	CD8_2_Proliferating
Aurka	2.77E-54	0.46	0.25	0.02	9.26E-50	CD8_2_Proliferating
Cdkn2c	5.95E-54	0.48	0.38	0.07	1.99E-49	CD8_2_Proliferating
Nucks1	1.25E-52	0.57	0.57	0.18	4.20E-48	CD8_2_Proliferating
Hmgb3	1.97E-52	0.51	0.40	0.08	6.58E-48	CD8_2_Proliferating
Lsm5	2.94E-51	0.67	0.83	0.48	9.84E-47	CD8_2_Proliferating
Lsm2	2.12E-50	0.57	0.59	0.20	7.09E-46	CD8_2_Proliferating
Dbf4	2.17E-50	0.41	0.34	0.06	7.27E-46	CD8_2_Proliferating
Mcm7	4.11E-50	0.56	0.44	0.11	1.38E-45	CD8_2_Proliferating
Rfc4	3.14E-49	0.45	0.37	0.08	1.05E-44	CD8_2_Proliferating
Ezh2	2.70E-48	0.56	0.50	0.15	9.03E-44	CD8_2_Proliferating
Pmf1	3.37E-48	0.51	0.40	0.09	1.13E-43	CD8_2_Proliferating
Pcna	6.25E-48	0.72	0.64	0.26	2.09E-43	CD8_2_Proliferating
Lmnb1	1.34E-47	0.54	0.58	0.20	4.49E-43	CD8_2_Proliferating
Fen1	1.99E-47	0.47	0.38	0.08	6.67E-43	CD8_2_Proliferating
Banf1	5.11E-47	0.56	0.65	0.24	1.71E-42	CD8_2_Proliferating
Apitd1	1.18E-46	0.44	0.29	0.05	3.94E-42	CD8_2_Proliferating
Hells	2.87E-46	0.50	0.37	0.08	9.60E-42	CD8_2_Proliferating
Hnrnpab	3.72E-46	0.63	0.72	0.32	1.25E-41	CD8_2_Proliferating
Knstrn	7.03E-46	0.46	0.31	0.06	2.35E-41	CD8_2_Proliferating
Pcna-ps2	3.67E-45	0.51	0.39	0.09	1.23E-40	CD8_2_Proliferating
Anapc5	4.54E-45	0.52	0.62	0.22	1.52E-40	CD8_2_Proliferating
Ccdc34	1.25E-44	0.46	0.32	0.06	4.17E-40	CD8_2_Proliferating
Racgap1	1.33E-44	0.49	0.36	0.08	4.46E-40	CD8_2_Proliferating
Prdx1	2.05E-44	0.52	0.96	0.83	6.85E-40	CD8_2_Proliferating
Dhfr	3.48E-44	0.35	0.25	0.04	1.17E-39	CD8_2_Proliferating
Slbp	5.39E-44	0.78	0.73	0.39	1.80E-39	CD8_2_Proliferating
Plk4	7.31E-44	0.34	0.28	0.04	2.45E-39	CD8_2_Proliferating
H2afv	1.91E-43	0.71	0.78	0.43	6.39E-39	CD8_2_Proliferating
Cmc2	3.14E-43	0.52	0.52	0.17	1.05E-38	CD8_2_Proliferating
Srsf3	4.62E-43	0.57	0.92	0.65	1.55E-38	CD8_2_Proliferating
Rps27l	1.66E-42	0.69	0.85	0.51	5.55E-38	CD8_2_Proliferating
Rad21	2.44E-42	0.46	0.46	0.13	8.16E-38	CD8_2_Proliferating
Dctpp1	1.76E-41	0.52	0.50	0.16	5.89E-37	CD8_2_Proliferating
Tex30	3.56E-41	0.42	0.39	0.10	1.19E-36	CD8_2_Proliferating
Nap1l1	5.79E-41	0.64	0.77	0.41	1.94E-36	CD8_2_Proliferating
Snrpd1	1.59E-40	0.57	0.71	0.34	5.33E-36	CD8_2_Proliferating
Rpa3	4.44E-40	0.61	0.64	0.28	1.48E-35	CD8_2_Proliferating
Lsm3	4.93E-40	0.57	0.68	0.29	1.65E-35	CD8_2_Proliferating
Tcf19	1.15E-39	0.36	0.26	0.04	3.84E-35	CD8_2_Proliferating
Fxn	1.93E-39	0.38	0.34	0.08	6.45E-35	CD8_2_Proliferating
Rpp30	2.08E-39	0.34	0.37	0.09	6.98E-35	CD8_2_Proliferating
Ube2s	3.24E-39	0.73	0.67	0.30	1.09E-34	CD8_2_Proliferating
Prim1	4.85E-39	0.38	0.27	0.05	1.62E-34	CD8_2_Proliferating
Hnrnpa3	6.60E-39	0.54	0.86	0.64	2.21E-34	CD8_2_Proliferating

Nup37	9.08E-39	0.37	0.31	0.06	3.04E-34	CD8_2_Proliferating
Anp32e	9.47E-38	0.53	0.57	0.23	3.17E-33	CD8_2_Proliferating
Rbbp7	1.28E-37	0.54	0.69	0.32	4.30E-33	CD8_2_Proliferating
Phgdh	1.44E-37	0.41	0.44	0.14	4.82E-33	CD8_2_Proliferating
Fkbp2	1.70E-37	0.44	0.53	0.19	5.70E-33	CD8_2_Proliferating
Lsm6	8.14E-37	0.60	0.75	0.40	2.72E-32	CD8_2_Proliferating
Mis18a	9.34E-37	0.44	0.47	0.16	3.12E-32	CD8_2_Proliferating
Hat1	2.46E-36	0.42	0.41	0.12	8.24E-32	CD8_2_Proliferating
Ly6e	3.49E-36	0.62	0.83	0.53	1.17E-31	CD8_2_Proliferating
Tuba1c	5.79E-36	0.62	0.37	0.10	1.94E-31	CD8_2_Proliferating
Sumo2	9.61E-36	0.39	0.95	0.88	3.22E-31	CD8_2_Proliferating
Tubb4b	1.14E-35	0.63	0.50	0.19	3.82E-31	CD8_2_Proliferating
Gins2	1.23E-35	0.35	0.25	0.05	4.11E-31	CD8_2_Proliferating
Bub3	1.56E-35	0.56	0.67	0.32	5.22E-31	CD8_2_Proliferating
Nasp	2.54E-35	0.45	0.43	0.14	8.49E-31	CD8_2_Proliferating
Cbx3	3.02E-35	0.58	0.77	0.46	1.01E-30	CD8_2_Proliferating
Siva1	3.96E-35	0.48	0.49	0.17	1.33E-30	CD8_2_Proliferating
Nudt21	3.96E-34	0.51	0.77	0.44	1.33E-29	CD8_2_Proliferating
Pfn1	1.24E-33	0.28	1.00	1.00	4.14E-29	CD8_2_Proliferating
Nudcd2	1.25E-33	0.45	0.50	0.18	4.19E-29	CD8_2_Proliferating
Ddx39	2.22E-33	0.47	0.59	0.25	7.41E-29	CD8_2_Proliferating
Srsf2	3.64E-33	0.52	0.79	0.49	1.22E-28	CD8_2_Proliferating
Nudt5	4.59E-33	0.46	0.51	0.19	1.54E-28	CD8_2_Proliferating
Srsf7	1.40E-32	0.51	0.79	0.46	4.68E-28	CD8_2_Proliferating
Usp1	2.30E-32	0.36	0.43	0.14	7.71E-28	CD8_2_Proliferating
Alyref	2.31E-32	0.51	0.55	0.22	7.72E-28	CD8_2_Proliferating
Rfc3	2.51E-32	0.33	0.31	0.08	8.40E-28	CD8_2_Proliferating
Rbm3	2.76E-32	0.43	0.92	0.82	9.23E-28	CD8_2_Proliferating
Orc6	5.04E-32	0.37	0.32	0.09	1.69E-27	CD8_2_Proliferating
Smc6	9.57E-32	0.49	0.66	0.31	3.20E-27	CD8_2_Proliferating
2700029M09Rik	9.97E-32	0.48	0.55	0.22	3.34E-27	CD8_2_Proliferating
Eri1	2.75E-31	0.29	0.43	0.14	9.19E-27	CD8_2_Proliferating
Mrpl42	3.80E-31	0.49	0.66	0.31	1.27E-26	CD8_2_Proliferating
Cox5a	4.31E-31	0.46	0.90	0.70	1.44E-26	CD8_2_Proliferating
Slc25a5	6.39E-31	0.44	0.90	0.72	2.14E-26	CD8_2_Proliferating
Hdgf	9.51E-31	0.45	0.58	0.25	3.18E-26	CD8_2_Proliferating
Ppih	9.56E-31	0.36	0.35	0.11	3.20E-26	CD8_2_Proliferating
Lgals1	1.76E-30	0.45	0.98	0.86	5.90E-26	CD8_2_Proliferating
Lyar	1.91E-30	0.49	0.50	0.19	6.40E-26	CD8_2_Proliferating
Ndufa4	3.33E-30	0.44	0.91	0.68	1.11E-25	CD8_2_Proliferating
Ywhah	3.48E-30	0.47	0.88	0.65	1.16E-25	CD8_2_Proliferating
Txn1	8.25E-30	0.47	0.85	0.58	2.76E-25	CD8_2_Proliferating
Pdia6	1.34E-29	0.50	0.65	0.32	4.49E-25	CD8_2_Proliferating
Smc3	1.37E-29	0.34	0.45	0.16	4.59E-25	CD8_2_Proliferating
Impdh2	1.77E-29	0.42	0.47	0.18	5.91E-25	CD8_2_Proliferating
Cdk2	2.41E-29	0.32	0.27	0.07	8.06E-25	CD8_2_Proliferating
Rnaseh2c	2.42E-29	0.46	0.54	0.23	8.09E-25	CD8_2_Proliferating
Dnajc9	2.64E-29	0.48	0.77	0.44	8.82E-25	CD8_2_Proliferating

Pfdn6	2.84E-29	0.42	0.52	0.21	9.51E-25	CD8_2_Proliferating
Nutf2	2.90E-29	0.40	0.56	0.25	9.70E-25	CD8_2_Proliferating
Nme1	5.05E-29	0.50	0.83	0.53	1.69E-24	CD8_2_Proliferating
Tubg1	5.29E-29	0.34	0.33	0.10	1.77E-24	CD8_2_Proliferating
Mcm3	1.29E-28	0.28	0.31	0.09	4.32E-24	CD8_2_Proliferating
Dnmt1	1.83E-28	0.31	0.30	0.08	6.13E-24	CD8_2_Proliferating
Dpy30	1.84E-28	0.44	0.65	0.31	6.17E-24	CD8_2_Proliferating
Nrm	1.97E-28	0.30	0.27	0.07	6.61E-24	CD8_2_Proliferating
Psat1	2.31E-28	0.32	0.30	0.09	7.72E-24	CD8_2_Proliferating
Tpi1	2.98E-28	0.47	0.44	0.17	9.96E-24	CD8_2_Proliferating
Eif5a	4.38E-28	0.45	0.92	0.77	1.47E-23	CD8_2_Proliferating
Gapdh	5.30E-28	0.44	0.90	0.72	1.77E-23	CD8_2_Proliferating
Fzr1	6.02E-28	0.29	0.32	0.10	2.01E-23	CD8_2_Proliferating
Cisd1	7.22E-28	0.44	0.48	0.20	2.42E-23	CD8_2_Proliferating
Hmgn1	7.36E-28	0.47	0.67	0.34	2.46E-23	CD8_2_Proliferating
Nhp2l1	1.28E-27	0.47	0.81	0.49	4.30E-23	CD8_2_Proliferating
Snrpe	1.57E-27	0.44	0.85	0.64	5.26E-23	CD8_2_Proliferating
Hsp90b1	1.97E-27	0.49	0.75	0.43	6.58E-23	CD8_2_Proliferating
Pold2	2.04E-27	0.35	0.32	0.10	6.84E-23	CD8_2_Proliferating
Hnrnpa2b1	2.54E-27	0.46	0.83	0.58	8.48E-23	CD8_2_Proliferating
Rfc2	3.35E-27	0.41	0.52	0.22	1.12E-22	CD8_2_Proliferating
Snrpf	3.91E-27	0.44	0.83	0.53	1.31E-22	CD8_2_Proliferating
Anapc15	4.27E-27	0.31	0.33	0.10	1.43E-22	CD8_2_Proliferating
Dbi	7.08E-27	0.49	0.70	0.38	2.37E-22	CD8_2_Proliferating
Snrpa1	7.56E-27	0.44	0.58	0.27	2.53E-22	CD8_2_Proliferating
Calm1	8.03E-27	0.34	0.98	0.88	2.69E-22	CD8_2_Proliferating
Exosc8	1.04E-26	0.41	0.58	0.26	3.47E-22	CD8_2_Proliferating
Reep4	1.36E-26	0.36	0.30	0.09	4.56E-22	CD8_2_Proliferating
Cdk4	2.00E-26	0.45	0.59	0.27	6.69E-22	CD8_2_Proliferating
Uchl5	2.38E-26	0.31	0.45	0.17	7.98E-22	CD8_2_Proliferating
Tcp1	2.68E-26	0.43	0.60	0.28	8.98E-22	CD8_2_Proliferating
D030056L22Rik	2.94E-26	0.29	0.35	0.11	9.83E-22	CD8_2_Proliferating
Sumo3	3.04E-26	0.43	0.58	0.27	1.02E-21	CD8_2_Proliferating
Sae1	3.61E-26	0.30	0.46	0.18	1.21E-21	CD8_2_Proliferating
Ly6a	4.49E-41	0.74	0.92	0.76	1.50E-36	CD8_3_Cytotoxic
Cd52	4.03E-33	0.39	0.99	0.97	1.35E-28	CD8_3_Cytotoxic
Gzma	1.01E-30	1.29	0.55	0.28	3.39E-26	CD8_3_Cytotoxic
Ms4a4b	1.37E-30	0.50	0.96	0.90	4.58E-26	CD8_3_Cytotoxic
Tmsb10	5.00E-29	0.44	0.99	0.96	1.67E-24	CD8_3_Cytotoxic
Ccl5	8.59E-28	0.51	0.99	0.97	2.87E-23	CD8_3_Cytotoxic
Hopx	6.79E-27	0.82	0.55	0.30	2.27E-22	CD8_3_Cytotoxic
Gzmk	1.12E-19	0.60	0.61	0.41	3.74E-15	CD8_3_Cytotoxic
Ctla2a	6.54E-19	0.63	0.65	0.46	2.19E-14	CD8_3_Cytotoxic
Klrk1	7.75E-15	0.60	0.48	0.31	2.59E-10	CD8_3_Cytotoxic
Epsti1	2.62E-14	0.59	0.49	0.33	8.75E-10	CD8_3_Cytotoxic
Ccr2	2.98E-14	0.48	0.40	0.22	9.98E-10	CD8_3_Cytotoxic
Ms4a6b	3.56E-14	0.37	0.85	0.76	1.19E-09	CD8_3_Cytotoxic

S100a10	5.54E-13	0.34	0.85	0.81	1.85E-08	CD8_3_Cytotoxic
Sp110	1.78E-12	0.47	0.43	0.27	5.96E-08	CD8_3_Cytotoxic
Plac8	7.05E-12	0.80	0.49	0.36	2.36E-07	CD8_3_Cytotoxic
Dnajc15	3.45E-11	0.42	0.50	0.35	1.15E-06	CD8_3_Cytotoxic
Crip1	6.43E-11	0.27	0.94	0.92	2.15E-06	CD8_3_Cytotoxic
Klf2	1.59E-10	0.39	0.64	0.48	5.33E-06	CD8_3_Cytotoxic
Cd47	4.81E-10	0.37	0.68	0.59	1.61E-05	CD8_3_Cytotoxic
Hcst	1.81E-09	0.39	0.71	0.62	6.07E-05	CD8_3_Cytotoxic
St3gal6	5.19E-09	0.36	0.28	0.15	1.74E-04	CD8_3_Cytotoxic
Gzmb	1.33E-08	0.39	0.51	0.37	4.43E-04	CD8_3_Cytotoxic
Lgals3	1.39E-08	0.43	0.61	0.51	4.65E-04	CD8_3_Cytotoxic
Hsd11b1	3.20E-08	0.39	0.25	0.14	1.07E-03	CD8_3_Cytotoxic
Arl6ip5	3.73E-08	0.28	0.72	0.65	1.25E-03	CD8_3_Cytotoxic
Lsp1	6.63E-08	0.30	0.70	0.69	2.22E-03	CD8_3_Cytotoxic
Klrc1	1.72E-07	0.37	0.62	0.50	5.76E-03	CD8_3_Cytotoxic
Selplg	2.32E-07	0.33	0.70	0.66	7.78E-03	CD8_3_Cytotoxic
Vasp	3.90E-07	0.28	0.73	0.69	1.31E-02	CD8_3_Cytotoxic
F2r	4.12E-07	0.43	0.45	0.35	1.38E-02	CD8_3_Cytotoxic
Glipr2	7.03E-07	0.38	0.41	0.31	2.35E-02	CD8_3_Cytotoxic
Pycard	1.07E-06	0.37	0.59	0.56	3.58E-02	CD8_3_Cytotoxic
Utf1	1.11E-37	0.59	0.30	0.03	3.71E-33	CD8_4_Xcl1+
Eif5a	1.57E-23	0.86	0.97	0.79	5.26E-19	CD8_4_Xcl1+
Npm1	8.77E-21	0.74	0.98	0.80	2.94E-16	CD8_4_Xcl1+
Nhp2	2.39E-19	0.83	0.78	0.39	8.00E-15	CD8_4_Xcl1+
Tnfrsf9	5.06E-19	0.98	0.61	0.23	1.69E-14	CD8_4_Xcl1+
Xcl1	2.31E-18	1.79	0.68	0.34	7.74E-14	CD8_4_Xcl1+
Mif	2.11E-17	0.80	0.86	0.65	7.05E-13	CD8_4_Xcl1+
C1qbp	3.91E-17	0.67	0.66	0.28	1.31E-12	CD8_4_Xcl1+
Nop16	4.33E-17	0.58	0.36	0.09	1.45E-12	CD8_4_Xcl1+
Srm	4.43E-17	0.68	0.40	0.11	1.48E-12	CD8_4_Xcl1+
Ebna1bp2	7.93E-17	0.77	0.62	0.26	2.65E-12	CD8_4_Xcl1+
Nolc1	1.01E-16	0.61	0.41	0.12	3.38E-12	CD8_4_Xcl1+
Fbl	1.60E-16	0.76	0.62	0.27	5.37E-12	CD8_4_Xcl1+
Tomm40	7.57E-16	0.71	0.48	0.17	2.53E-11	CD8_4_Xcl1+
Grwd1	2.25E-15	0.59	0.26	0.05	7.54E-11	CD8_4_Xcl1+
Rcl1	6.30E-15	0.44	0.31	0.07	2.11E-10	CD8_4_Xcl1+
Eif4a1	1.09E-14	0.56	0.94	0.75	3.63E-10	CD8_4_Xcl1+
Ncl	2.24E-14	0.69	0.78	0.48	7.48E-10	CD8_4_Xcl1+
Phb	3.81E-14	0.71	0.54	0.22	1.28E-09	CD8_4_Xcl1+
Ranbp1	6.41E-14	0.64	0.87	0.56	2.14E-09	CD8_4_Xcl1+
Tomm20	1.40E-13	0.62	0.87	0.61	4.67E-09	CD8_4_Xcl1+
Naa50	2.73E-13	0.64	0.60	0.26	9.14E-09	CD8_4_Xcl1+
Nme1	2.75E-13	0.65	0.82	0.57	9.21E-09	CD8_4_Xcl1+
Gar1	6.35E-13	0.58	0.53	0.22	2.12E-08	CD8_4_Xcl1+
Rgs16	9.24E-13	0.71	0.84	0.52	3.09E-08	CD8_4_Xcl1+
Cd200	1.23E-12	0.84	0.67	0.38	4.11E-08	CD8_4_Xcl1+
Nsun2	1.34E-12	0.49	0.40	0.14	4.48E-08	CD8_4_Xcl1+

Mrps18b	3.07E-12	0.48	0.31	0.09	1.03E-07	CD8_4_Xcl1+
Dkc1	5.24E-12	0.58	0.36	0.12	1.75E-07	CD8_4_Xcl1+
Cycs	8.67E-12	0.60	0.86	0.54	2.90E-07	CD8_4_Xcl1+
Apex1	1.86E-11	0.47	0.36	0.12	6.22E-07	CD8_4_Xcl1+
Emc6	2.17E-11	0.55	0.63	0.32	7.25E-07	CD8_4_Xcl1+
Wdr43	2.35E-11	0.60	0.48	0.20	7.87E-07	CD8_4_Xcl1+
Lsm7	3.45E-11	0.56	0.52	0.22	1.16E-06	CD8_4_Xcl1+
Rrs1	4.70E-11	0.61	0.41	0.16	1.57E-06	CD8_4_Xcl1+
Eef1e1	5.15E-11	0.67	0.53	0.25	1.72E-06	CD8_4_Xcl1+
Nop58	6.21E-11	0.60	0.51	0.22	2.08E-06	CD8_4_Xcl1+
Ptma	7.19E-11	0.34	1.00	0.95	2.41E-06	CD8_4_Xcl1+
St6galnac4	7.44E-11	0.54	0.38	0.14	2.49E-06	CD8_4_Xcl1+
Pno1	7.46E-11	0.49	0.37	0.13	2.50E-06	CD8_4_Xcl1+
Gtpbp4	1.04E-10	0.51	0.48	0.20	3.49E-06	CD8_4_Xcl1+
Gm11974	1.15E-10	0.61	0.38	0.14	3.85E-06	CD8_4_Xcl1+
Nek6	1.34E-10	0.48	0.25	0.07	4.48E-06	CD8_4_Xcl1+
Hspd1	1.99E-10	0.57	0.68	0.39	6.67E-06	CD8_4_Xcl1+
Set	2.36E-10	0.48	0.86	0.55	7.88E-06	CD8_4_Xcl1+
Rrp15	2.66E-10	0.40	0.32	0.10	8.91E-06	CD8_4_Xcl1+
Uqcrq	6.02E-10	0.41	0.92	0.80	2.01E-05	CD8_4_Xcl1+
Snhg1	7.03E-10	0.63	0.63	0.35	2.35E-05	CD8_4_Xcl1+
Npepl1	9.93E-10	0.33	0.33	0.11	3.32E-05	CD8_4_Xcl1+
Nop10	1.10E-09	0.53	0.90	0.60	3.67E-05	CD8_4_Xcl1+
Ppa1	1.54E-09	0.52	0.41	0.18	5.16E-05	CD8_4_Xcl1+
Prelid2	1.96E-09	0.49	0.39	0.15	6.55E-05	CD8_4_Xcl1+
Ddx21	2.76E-09	0.62	0.53	0.28	9.23E-05	CD8_4_Xcl1+
Nifk	3.01E-09	0.63	0.40	0.17	1.01E-04	CD8_4_Xcl1+
Eif4e	3.34E-09	0.50	0.68	0.38	1.12E-04	CD8_4_Xcl1+
Hspe1	3.42E-09	0.59	0.84	0.66	1.15E-04	CD8_4_Xcl1+
Fdx1l	3.58E-09	0.55	0.37	0.14	1.20E-04	CD8_4_Xcl1+
Cnbp	3.68E-09	0.50	0.87	0.74	1.23E-04	CD8_4_Xcl1+
Tomm5	3.73E-09	0.57	0.66	0.40	1.25E-04	CD8_4_Xcl1+
Mrpl12	3.81E-09	0.55	0.58	0.31	1.28E-04	CD8_4_Xcl1+
Nhp2l1	4.00E-09	0.49	0.78	0.54	1.34E-04	CD8_4_Xcl1+
Mrpl17	4.03E-09	0.54	0.51	0.26	1.35E-04	CD8_4_Xcl1+
Phb2	4.38E-09	0.49	0.70	0.43	1.47E-04	CD8_4_Xcl1+
Bcl2a1b	5.12E-09	0.49	0.85	0.66	1.71E-04	CD8_4_Xcl1+
Atp5g1	5.26E-09	0.48	0.82	0.62	1.76E-04	CD8_4_Xcl1+
Rrp9	5.38E-09	0.36	0.29	0.10	1.80E-04	CD8_4_Xcl1+
Gadd45b	5.90E-09	0.66	0.52	0.27	1.97E-04	CD8_4_Xcl1+
Ndufaf4	5.94E-09	0.56	0.38	0.15	1.99E-04	CD8_4_Xcl1+
Hspa9	9.31E-09	0.49	0.40	0.17	3.12E-04	CD8_4_Xcl1+
Gnl3	1.04E-08	0.39	0.33	0.12	3.47E-04	CD8_4_Xcl1+
Ccl4	1.13E-08	1.37	0.89	0.73	3.78E-04	CD8_4_Xcl1+
Irf8	1.14E-08	0.82	0.47	0.24	3.81E-04	CD8_4_Xcl1+
Mrto4	1.38E-08	0.41	0.35	0.14	4.61E-04	CD8_4_Xcl1+
Sar1a	1.40E-08	0.42	0.53	0.25	4.70E-04	CD8_4_Xcl1+
Snhg6	1.50E-08	0.42	0.29	0.10	5.03E-04	CD8_4_Xcl1+

Wdr74	1.57E-08	0.43	0.29	0.10	5.25E-04	CD8_4_Xcl1+
Srsf2	1.59E-08	0.45	0.79	0.54	5.32E-04	CD8_4_Xcl1+
Nob1	1.63E-08	0.46	0.29	0.10	5.47E-04	CD8_4_Xcl1+
Cct3	2.24E-08	0.51	0.45	0.22	7.49E-04	CD8_4_Xcl1+
Cacybp	3.20E-08	0.43	0.74	0.45	1.07E-03	CD8_4_Xcl1+
Rrp1b	3.51E-08	0.42	0.29	0.10	1.17E-03	CD8_4_Xcl1+
Map2k3	4.26E-08	0.59	0.44	0.22	1.42E-03	CD8_4_Xcl1+
Bcap29	4.62E-08	0.48	0.39	0.17	1.55E-03	CD8_4_Xcl1+
Serbp1	5.78E-08	0.43	0.87	0.70	1.93E-03	CD8_4_Xcl1+
Tgif1	6.22E-08	0.55	0.49	0.25	2.08E-03	CD8_4_Xcl1+
Slc1a5	8.28E-08	0.45	0.39	0.17	2.77E-03	CD8_4_Xcl1+
Srsf7	8.44E-08	0.44	0.76	0.52	2.83E-03	CD8_4_Xcl1+
Ldha	8.60E-08	0.46	0.89	0.71	2.88E-03	CD8_4_Xcl1+
Mrps28	9.01E-08	0.38	0.32	0.13	3.01E-03	CD8_4_Xcl1+
Bcl2a1d	9.48E-08	0.48	0.70	0.46	3.17E-03	CD8_4_Xcl1+
Cct8	1.01E-07	0.51	0.66	0.41	3.38E-03	CD8_4_Xcl1+
Ruvbl1	1.02E-07	0.32	0.31	0.12	3.40E-03	CD8_4_Xcl1+
Mrpl36	1.30E-07	0.42	0.58	0.32	4.35E-03	CD8_4_Xcl1+
Eif3g	1.50E-07	0.48	0.60	0.35	5.01E-03	CD8_4_Xcl1+
Nip7	1.69E-07	0.44	0.33	0.14	5.66E-03	CD8_4_Xcl1+
Ppie	1.78E-07	0.44	0.44	0.21	5.97E-03	CD8_4_Xcl1+
Txnl4a	1.87E-07	0.45	0.55	0.29	6.26E-03	CD8_4_Xcl1+
Gm26667	2.02E-07	0.30	0.28	0.10	6.75E-03	CD8_4_Xcl1+
Srgn	2.19E-07	0.47	0.93	0.80	7.31E-03	CD8_4_Xcl1+
Cd160	2.20E-07	0.50	0.44	0.21	7.35E-03	CD8_4_Xcl1+
Rps25	2.23E-07	0.28	1.00	0.93	7.45E-03	CD8_4_Xcl1+
Eif1ax	2.28E-07	0.41	0.61	0.35	7.61E-03	CD8_4_Xcl1+
Chd1	2.36E-07	0.43	0.44	0.20	7.91E-03	CD8_4_Xcl1+
Wdr12	2.83E-07	0.40	0.26	0.10	9.48E-03	CD8_4_Xcl1+
Psma7	2.83E-07	0.36	0.82	0.66	9.48E-03	CD8_4_Xcl1+
Tmem238	3.35E-07	0.39	0.29	0.11	1.12E-02	CD8_4_Xcl1+
Hsp90ab1	3.91E-07	0.37	0.93	0.82	1.31E-02	CD8_4_Xcl1+
Hnrnpll	4.15E-07	0.43	0.35	0.15	1.39E-02	CD8_4_Xcl1+
Ran	4.57E-07	0.33	0.92	0.71	1.53E-02	CD8_4_Xcl1+
Erh	5.75E-07	0.37	0.86	0.67	1.92E-02	CD8_4_Xcl1+
Brix1	6.24E-07	0.46	0.41	0.21	2.09E-02	CD8_4_Xcl1+
Ddx18	6.34E-07	0.63	0.41	0.21	2.12E-02	CD8_4_Xcl1+
Metap2	6.42E-07	0.41	0.66	0.40	2.15E-02	CD8_4_Xcl1+
Sh2d2a	6.51E-07	0.42	0.82	0.54	2.18E-02	CD8_4_Xcl1+
Bola3	6.87E-07	0.47	0.62	0.37	2.30E-02	CD8_4_Xcl1+
Ndufa12	8.68E-07	0.38	0.70	0.46	2.90E-02	CD8_4_Xcl1+
Kdm6b	9.25E-07	0.75	0.37	0.17	3.09E-02	CD8_4_Xcl1+
Prpf19	9.46E-07	0.35	0.32	0.14	3.16E-02	CD8_4_Xcl1+
Tomm70a	1.02E-06	0.40	0.36	0.16	3.42E-02	CD8_4_Xcl1+
Llph	1.17E-06	0.40	0.61	0.39	3.93E-02	CD8_4_Xcl1+
Hspa8	1.30E-06	0.30	0.97	0.96	4.35E-02	CD8_4_Xcl1+
Psme3	1.31E-06	0.41	0.37	0.18	4.38E-02	CD8_4_Xcl1+
Rps27l	1.40E-06	0.37	0.75	0.57	4.69E-02	CD8_4_Xcl1+

Cct7	1.41E-06	0.52	0.63	0.44	4.71E-02	CD8_4_Xcl1+