The role of the transcriptional regulator Lmo4 in $CD8^+$ T cell stemness, memory formation and antitumor immunity

Dissertation
zur Erlangung des Doktorgrades
der Biomedizinischen Wissenschaften
(Dr. rer. physiol.)

der
Fakultät für Medizin
der Universität Regensburg

vorgelegt von
Roland Schelker

im Jahr
2024

The role of the transcriptional regulator Lmo4 in $CD8^+$ T cell stemness, memory formation and antitumor immunity

Dissertation
zur Erlangung des Doktorgrades
der Biomedizinischen Wissenschaften
(Dr. rer. physiol.)

der
Fakultät für Medizin
der Universität Regensburg

vorgelegt von
Roland Schelker

im Jahr
2024

Dekan: Prof. Dr. Dirk Hellwig

Betreuer: Prof. Dr. Wolfgang Herr

Tag der mündlichen Prüfung**:

TABLE OF CONTENTS

LIST OF ABBREVIATIONS

$B16_{KVP}$	B16 melanoma expressing human gp100
BACH2	BTB Domain And CNC Homolog 2
BM	Bone Marrow
Cl	Clusters
CRISPRa	CRISPR activation
CTX	Cyclophosphamide
DCs	Dendritic Cells
FOXO1	Forkhead bOX protein O1
gp100-Adv	gp100-encoding Adenovirus type 2
gp100-VV	Vaccinia Virus expressing human gp100
GSEA	Gene Set Enrichment Analysis
GSK-3β	Glycogen Synthase Kinase-3β
ICS	Intracellular Cytokine Staining
IL-21	Interleukin-21
IFN-γ	Interferon-γ
LDHi	inhibitor of Lactate DeHydrogenase
LLC1	Lewis Lung Carcinoma
LLC1-OVA	LLC1 cells expressing OVAlbumin
LMO	LIM-domain-Only
NC	No Cytokine
nt	nucleotides
pSTAT3	phosphorylated STAT3
rh	recombinant human
SDS–PAGE	SDS–PolyAcrylamide Gel Electrophoresis
STAT3	Signal Transducer and Activator of Transcription 3
T-ALL	T-Acute Lymphoblastic Leukemia
TCF1	T Cell Factor 1
T_{SCM}	T memory stem cells

LIST OF FIGURES

Figure 1. Model of hierarchical CD8⁺ T cell differentiation. During an immune reaction, naive T (T_N) cells are primed by antigen-presenting cells (APCs). These T cells then progress through a differentiation pathway, ultimately generating terminally differentiated, short-lived effector T (T_{EFF}) cells. Once the antigenic and inflammatory stimuli subside, the primed T cells enter a dormant state and transition into the memory stem cell (T_{SCM}), central memory (T_{CM}), or effector memory (T_{EM}) cell pools.

Figure 2. **Schematic of Genome-wide CRISPRa screens for cytokine production in stimulated primary human T cells.**

Figure 3. **LMO4 is poorly expressed in human CD8⁺ T cells.** Violin plots depicting the expression levels of *LMO4*, *TCF7*, and *PRDM1* in (**a**) healthy donors (10X genomic database) or (**b**) HNSCC patients[1]. I gratefully acknowledge Nisha Rana for her support with bioinformatics analyses of public datasets and for granting permission to reproduce the underlying figure based on her data. The design, input selection, and structural decisions for the figure were achieved through my guidance and the mentorship of Prof. Luca Gattinoni, the last author on the project.

Figure 4. **LMO4 is among the most potent negative regulators of effector programs.** Volcano plot displaying median sgRNA log_2-fold change (IFN-$g^{hi/lo}$ sorting bin counts) for each gene tested in the genome-wide CRISPRa screen[2]. Genes included in the analysis were exclusively transcription factors or transcription regulators. I gratefully acknowledge Nisha Rana for her support with bioinformatics analyses of public datasets and for granting permission to reproduce the underlying figure based on her data. The design, input selection, and structural decisions for the figure were achieved through my guidance and the mentorship of Prof. Luca Gattinoni, the last author on the project.

Figure 5. **Only Lmo4 and Ikzf1 were upregulated in IL-21 + LDHi cultured cells**. Heatmap depicting the expression levels (assessed by RNA-seq) of the top negative hits identified in the CRISPRa screen in CD8⁺ T cells cultured for 4 d under different conditions: No Cytokine (NC), IL-2, IL-2 + LDHi, IL-21, IL-21 + LDHi[3]. I gratefully acknowledge Nisha Rana for her support with bioinformatics analyses of public datasets and for granting permission to reproduce the underlying figure based on her data. The design, input selection, and structural decisions for the figure were achieved through my guidance and the mentorship of Prof. Luca Gattinoni, the last author on the project.

Figure 6. Experimental design to assess the impact of *Lmo4* overexpression on stem-like CD8⁺ T cell formation. The experimental design figure was created by me, with input on the timeline design provided by Prof. Luca Gattinoni, using www.bioRender.com.

Figure 7. **Confirmation of LMO4 overexpression.** Immunoblot of LMO4 in *Thy1.1* and *Lmo4-Thy1.1* overexpressing T cells. ACTB served as control. The immunoblot experiment was entirely conceptualized by me, with assistance from Fabio Mastrogiovanni and Sree Pulugulla.

Figure 8. **Lmo4 overexpression enhances in vivo CD8⁺ T cell expansion**. Flow cytometry analysis (**a**) and quantification (**b**) of splenic pmel-1 CD8⁺ T cells following transfer of either 1 x 10^5 pmel-1 Ly5.1⁺ *Thy1.1*⁺ or *Lmo4-Thy1.1*⁺ CD8⁺ T cells into wild-type mice infected with gp100-vv. Assessment was conducted at various time points from 3 to 30 days post-transfer, with three mice per group for each time point. Data are from one representative of 3 experiments. ns, not significant, **P* < 0.05, ***P* < 0.01, (unpaired two-tailed Student's *t*-test). The in vivo experiments, analysis, and corresponding graphs for the underlying figure were created by me, with Jessica Fioravanti's, Ping Chen`s and William G Telford`s assistance in an initial experiment.

Figure 9: *Lmo4* overexpression enhances CD8⁺ T cell expansion in lymph nodes and lungs. (**a-d**) Flow cytometry analysis (**a, c**) and percentages (**b, d**) of lymphatic (**a, b**) and pulmonary (**c, d**) pmel-1 CD8⁺ T cells following transfer of either 1 x 10^5 pmel-1 Ly5.1⁺ *Thy1.1*⁺ or *Lmo4-Thy1.1*⁺ CD8⁺ T cells into wild-type mice infected with gp100-vv. Assessment was conducted at various time points from 0 to 30 days post-transfer, with three mice for d5, five mice at d30, and three mice each at d5 and d30 recall time points. ns, not significant, **P* < 0.05, ***P* < 0.01, (unpaired two-tailed Student's *t*-test). The in vivo experiments, analysis, and corresponding graphs for the underlying figure were created by me, with Jessica Fioravanti's and Ping Chen`s assistance in an initial experiment.

Figure 10. Lmo4 overexpression decreases CD8$^+$ T cell terminal differentiation. (**a, b**) Flow cytometry analysis (**a**) and percentages (**b**) of CD62L$^-$KLRG1$^+$ splenic pmel-1 T cells 5 d after transfer as in (**Fig 8 a,b**). (**c, d**) Flow cytometry analysis (**c**) and percentages (**d**) of CD62L$^-$KLRG1$^+$ splenic pmel-1 T cells 30 d after transfer as in (**Fig 8 a,b**). ns, not significant, **P* < 0.05, ***P* < 0.01, (unpaired two-tailed Student's *t*-test). The in vivo experiments, analysis, and corresponding graphs for the underlying figure were created by me, with Jessica Fioravanti's and Ping Chen`s assistance in an initial experiment.

Figure 11. Lmo4 conditional knockout impairs the generation of stem-like memory T cells by inducing terminal differentiation. (**a**) Immunoblot showing LMO4 in naive CD8$^+$ T cells from pmel-1 *Lmo4$^{fl/fl}$ Cre-ER^{T2}* (*Lmo4$^{\Delta/\Delta}$*) *and* pmel-1 *Lmo4$^{fl/fl}$* mice 5 d after intraperitoneal treatment with tamoxifen. ACTB served as control. (**b**) Flow cytometry of pmel-1 *Lmo4$^{fl/fl}$* and *Lmo4$^{\Delta/\Delta}$* CD8$^+$ T cells after naive T cell isolation. (**c**) Experimental design investigating LMO4's impact on pmel-1 CD8$^+$ T cell primary and secondary immune responses. (**d, e**) Flow cytometry analysis (**d**) and quantification (**e**) of splenic pmel-1 CD8$^+$ T cells 5 d after transfer of either 10^5 pmel-1 Ly5.2$^+$ *Lmo4$^{fl/fl}$* or *Lmo4$^{\Delta/\Delta}$* CD8$^+$ T cells into Ly5.1 mice infected with gp100-vv (with five mice per group for each time point). (**f-h**) Flow cytometry analysis (**f**) and percentages of CD62L$^-$KLRG1$^+$ (**g**) and CD62L$^+$KLRG1$^-$ (**h**) splenic pmel-1 T cells 5 d after transfer as in (**d,e**). ns, not significant, **P* < 0.05, ***P* < 0.01, (unpaired two-tailed Student's *t*-test). The in vivo experiments, analysis and the corresponding graphs for the underlying figure were created entirely by me.

Figure 12. Lmo4 overexpression enhances CD8$^+$ T cell polyfunctionality. Flow**:** (**a**) UMAP plot of concatenated *Thy1.1*$^+$ and *Lmo4-Thy1.1*$^+$ pmel-1 CD8$^+$ T cells isolated from spleens 5 d after treatment as in (**Fig 8 a,b**) showing the distribution of clusters (Cl) identified by FlowSOM. (**b**) UMAP plot of concatenated *Thy1.1*$^+$ and *Lmo4-Thy1.1*$^+$ pmel-1 CD8$^+$ T cells showing differences in cluster distributions. (**c**) Heatmap showing the relative expression levels of indicated cytokines in the FlowSOM clusters. (**d**) "Bar plot of *Thy1.1*$^+$ and *Lmo4-Thy1.1*$^+$ pmel-1 CD8$^+$ T cells isolated from spleens 5 d after treatment as in (**Fig 8 a,b**) quantifying the distribution of clusters assessed by FlowSOM. **P* < 0.05, ***P* < 0.01, (unpaired two-tailed Student's *t*-test). The in vivo experiments, analysis, and corresponding graphs for the underlying figure were created by me, with Jessica Fioravanti's assistance in an initial experiment.

Figure 13: Experimental design investigating the impact of *Lmo4* overexpression on CD8$^+$ T cell secondary responses. The experimental design figure was created by me, with input on the timeline design provided by Prof. Luca Gattinoni, using www.bioRender.com.

Figure 14. Lmo4 overexpression enhances in vivo CD8$^+$ T cell expansion after secondary infection. (**a-d**) Flow cytometry analysis (**a**) and percentages (**b-d**) of splenic pmel-1 CD8$^+$ T cells following transfer of either 1 x 10^5 pmel-1 Ly5.1$^+$ *Thy1.1*$^+$ or *Lmo4-Thy1.1*$^+$ CD8$^+$ T cells into wild-type mice infected with gp100-vv (primary infection) or gp100-Adv (secondary infection). Assessment was conducted at various time points: d30 after primary infection and d5 or d30 after secondary infection (recall); with seven mice per group for d30 and three mice per group for d5 recall and d30 recall. **P* < 0.05, ***P* < 0.01, (unpaired two-tailed Student's *t*-test). The in vivo experiments, analysis, and corresponding graphs for the underlying figure were created by me, with Jessica Fioravanti's assistance in an initial experiment.

Figure 15. *Lmo4* overexpression promotes the generation of stem-like memory T cells by restraining terminal differentiation. (**a-c**) Flow cytometry analysis (**a**) and percentages of CD62L$^-$KLRG1$^+$ (**b**) and CD62L$^+$KLRG1$^-$ (**c**) splenic pmel-1 T cells 5 d after transfer as in (**Fig. 14 a-d**). **P* < 0.05, ***P* < 0.01, (unpaired two-tailed Student's *t*-test). The in vivo experiments, analysis, and corresponding graphs for the underlying figure were created by me, with Jessica Fioravanti's assistance in an initial experiment.

Figure 16. *Lmo4 conditional knockout* impairs the generation of stem-like memory T cells *after secondary infection* by inducing terminal differentiation. (**a, b**) Flow cytometry analysis (**a**) and quantification (**b**) of splenic pmel-1 CD8$^+$ T cells 5 d after transfer of either 1 x 10^5 pmel-1 Ly5.2$^+$ *Lmo4$^{fl/fl}$* or *Lmo4$^{\Delta/\Delta}$* CD8$^+$ T cells into Ly5.1/Ly5.2 mice secondary infected with gp100-Adv (with three mice per

group for each time point). (**c-e**) Flow cytometry analysis (**c**) and percentages of $CD62L^{-}KLRG1^{+}$ (**d**) and $CD62L^{+}KLRG1^{-}$ (**e**) splenic pmel-1 T cells 5 d after transfer as in (**a, b**). ns, not significant, $*P < 0.05$, $**P < 0.01$, (unpaired two-tailed Student's *t*-test). The in vivo experiments, analysis and the corresponding graphs for the underlying figure were created entirely by me.

Figure 17. Lmo4 overexpression enhances $CD8^+$ T cell polyfunctionality after secondary infection. (**a**) UMAP plot of concatenated *Thy1.1*$^+$ and *Lmo4-Thy1.1*$^+$ pmel-1 $CD8^+$ T cells isolated from spleens 30 d after secondary transfer as in (**Fig. 14 a-d**) showing the distribution of clusters (Cl) identified by FlowSOM. (**b**) UMAP plot of *Thy1.1*$^+$ and *Lmo4-Thy1.1*$^+$ pmel-1 $CD8^+$ T cells showing differences in cluster distributions. (**c**) Heatmap showing the relative expression levels of indicated cytokines in the FlowSOM clusters. (**d**) Bar plot of *Thy1.1*$^+$ and *Lmo4-Thy1.1*$^+$ pmel-1 $CD8^+$ T cells isolated from spleens 5 d after treatment as in (**Fig. 14 a-d**) quantifying the distribution of clusters assessed by FlowSOM. $*P < 0.05$, $**P < 0.01$, (unpaired two-tailed Student's *t*-test). The in vivo experiments, analysis, and corresponding graphs for the underlying figure were created by me, with Jessica Fioravanti's assistance in an initial experiment.

Figure 18: Experimental design investigating the effect of Lmo4 overexpression on the antitumor immune response of $CD8^+$ T cells. The experimental design figure was created by me, with input on the timeline design provided by Prof. Luca Gattinoni, using www.bioRender.com.

Figure 19. Enforced expression of *Lmo4* enhances $CD8^+$ T cell antitumor immunity against melanoma. (**a, b**) Tumor size (**a**) and survival curve (**b**) of $B16_{KVP}$ tumor-bearing wild-type mice after transfer of either 3.5 x 10^5 pmel-1 *Thy1.1*$^+$ or *Lmo4-Thy1.1*$^+$ $CD8^+$ T cells into wild-type mice treated with gp100-vv and IL-2. $*P < 0.05$, $**P < 0.01$, (**a**, Wilcoxon rank sum test; **b**, log-rank (Mantel–Cox) test). The in vivo experiments, analysis, and corresponding graphs for the underlying figure were created by me, with Jessica Fioravanti's assistance in an initial experiment and technical help from Patrick Grandinetti.

Figure 20. Ectopic expression of LMO4 could be employed to enhance the generation of human stem-like T cells. (**a**) Representative flow cytometry plot depicting the gating strategy to assess the frequency of human T_{SCM} cells, defined as $CD45RA^+CD45R0^-CD62L^+CCR7^+CD95^+TCF1^+$ cells. (**b**) Percentage of T_{SCM} cells in *LMO4-Thy1.1* and *Thy1.1* transduced $CD8^+$ T cells after activation by TransAct and subsequent culture in IL-7 and IL-21 for 7 days ($n = 5$). $*P < 0.05$, $**P < 0.01$, (unpaired two-tailed Student's *t*-test). The underlying experiment and graph creation were directed by me, with technical assistance from Pedro Noronha and Azucena Martin-Santos. Christoph Heuser-Loy contributed to result analysis, and Dragana Slavkovic-Lukic assisted with the initial experimental design.

Figure 21. Experimental design investigating the effect of LMO4 overexpression on the antitumor immune response of human CD19-CAR-modified $CD8^+$ T cells (n = 5 to 7 mice/group). The experimental design figure was created by me, with input on the timeline design provided by Prof. Luca Gattinoni, using www.bioRender.com.

Figure 22. Enforced expression of *Lmo4* enhances $CD8^+$ T cell antitumor immunity against acute lymphoblastic leukemia. (**a**) Percentage of human $CD8^+$ T cells in the peripheral blood of NXG mice bearing NALM6-GL leukemia 7 days after adoptive transfer of *LMO4-Thy1.1* or *Thy1.1* CD19-CAR $CD8^+$ T cells in conjunction with recombinant human IL-15. (**b**) *In vivo* bioluminescent imaging and (**c**) survival of NALM6-GL-bearing NXG mice treated as in (**a**). ($*P < 0.05$ **a**, unpaired one-tailed Student's *t*-test, **c**, $P = 0.0597$ log-rank (Mantel-Cox) test). The underlying experiment and the graphs were conceptualized and analyzed by me, with technical assistance from Jeremy Baldwin.

Figure 23. Volcano plot displaying changes in gene expression between pmel-1 *Thy1.1*$^+$ and *Lmo4-Thy1.1*$^+$ $CD8^+$ T cells. Gene expression was evaluated by RNA-seq of pmel-1 $CD62L^-KLRG1^-$ T cells collected 5 d after transfer of 10^5 pmel-1 *Thy1.1*$^+$ and *Lmo4-Thy1.1*$^+$ $CD8^+$ T cells into wild-type mice infected with gp100-vv (n = 5 mice/group). The underlying experiment was conceptualized and performed by me, with bioinformatics analysis conducted by Nisha Rana and Peng Li and technical help by Jian-Xin Lin and Jangsuk Oh. The input selection, and structural decisions for the figure were made

through my guidance and the mentorship of Prof. Luca Gattinoni, the last author on the project. Claudia Gebhard, Jian-Xin Lin and Jangsuk Oh assisted with the initial experimental design. Michael Rehli contributed to result analysis and assisted with the initial experimental design.

Figure 24. Bubble plot illustrating significantly enriched pathways related to CD8$^+$ T cell memory and effector differentiation. The underlying experiment was conceptualized and performed by me, with bioinformatics analysis conducted by Nisha Rana and Peng Li and technical help by Jian-Xin Lin and Jangsuk Oh. The input selection, and structural decisions for the figure were made through my guidance and the mentorship of Prof. Luca Gattinoni, the last author on the project. Claudia Gebhard, Jian-Xin Lin and Jangsuk Oh assisted with the initial experimental design. Michael Rehli contributed to result analysis and assisted with the initial experimental design.

Figure 25. GSEA revealing positive enrichment of genes universally characteristic of stem-like T cells[4], in pmel-1 *Lmo4-Thy1.1*$^+$ CD8$^+$ T cells. P-value was calculated with Kolmogorov-Smirnov test. The underlying experiment was conceptualized and performed by me, with bioinformatics analysis conducted by Nisha Rana and Peng Li and technical help by Jian-Xin Lin and Jangsuk Oh. The input selection, and structural decisions for the figure were made through my guidance and the mentorship of Prof. Luca Gattinoni, the last author on the project. Claudia Gebhard, Jian-Xin Lin and Jangsuk Oh assisted with the initial experimental design. Michael Rehli contributed to result analysis and assisted with the initial experimental design.

Figure 26. Pathways significantly enriched in *Lmo4-Thy1.1*, displaying opposite enrichment patterns in *Myb*-deficient cells. (**a**) Venn diagram illustrating the overlap between pathways significantly upregulated in *Lmo4-Thy1.1*$^+$ and down-regulated in *Myb*$^{\Delta/\Delta}$ pmel-1 CD8$^+$ T cells, generated under identical experimental conditions, described in (**Fig. 23**). (**b**) Bidirectional bar plot displaying the enrichment scores of selected enriched pathways in *Lmo4-Thy1.1* and *Myb*$^{\Delta/\Delta}$ pmel-1 CD8$^+$ T cells. (**a**) P-value was calculated with Fisher's Exact Test. The underlying *Lmo4-Thy1.1*$^+$ experiment was conceptualized and performed by me, with bioinformatics analysis carried out by Nisha Rana and Peng Li, with technical help from Jian-Xin Lin and Jangsuk Oh. The *Myb*$^{\Delta/\Delta}$ data was extracted from another publication[15] and analyzed by Nisha Rana. The design, input selection, and structural decisions for the figure were made through my guidance and the mentorship of Prof. Luca Gattinoni, the last author of the project. Claudia Gebhard, Jian-Xin Lin and Jangsuk Oh assisted with the initial experimental design. Michael Rehli contributed to result analysis and assisted with the initial experimental design.

Figure 27. Upregulation of pro-memory factors in *Lmo4*-overexpressing cells. qPCR of *Tcf7*, *Zfp36*, *Socs3*, and *Junb* mRNA in pmel-1 *Thy1.1*$^+$ and *Lmo4-Thy1.1*$^+$ CD8$^+$ T cells 5 d after transfer of 10^5 pmel-1 CD8$^+$ T cells transduced with either *Thy1.1*$^+$ or *Lmo4-Thy1.1*$^+$ into wild-type mice infected with gp100-vv. $^*P < 0.05$, $^{**}P < 0.01$, (unpaired two-tailed Student's *t*-test). The in vivo experiments, analysis and the corresponding graphs for the underlying figure were created entirely by me.

Figure 28. Enrichment of genes upregulated in response to IL-21 and genes displaying one or more STAT3 binding motifs. (a) GSEA showing positive enrichment of genes upregulated in response to IL-21 in CD4$^+$ T cells[5] (left panel) and genes displaying one or more STAT3 binding motifs[6] (GSEA C3:STAT3_02) (right panel) in pmel-1 *Lmo4-Thy1.1*$^+$ CD8$^+$ T cells harvested as in (**Fig. 27**). (**b**) GSEA showing negative enrichment of genes upregulated in response to IL-21 in CD4$^+$ T cells in CD62L$^-$ KLRG1$^-$*Myb*$^{D/D}$ CD8$^+$ T cells isolated 5 d after transfer of 10^5 pmel-1 *Myb*$^{D/D}$ CD8$^+$ T cells into wild-type mice infected with gp100-vv. Results are shown in comparison to pmel-1 *Myb*$^{+/+}$ CD8$^+$ T cells (WT). P-value was calculated with the Kolmogorov-Smirnov test. ($^*P < 0.05$; ** $P < 0.001$, Kolmogorov-Smirnov test). The underlying *Lmo4-Thy1.1*$^+$ experiment was conceptualized and performed by me, with bioinformatics analysis carried out by Nisha Rana and Peng Li, with technical help from Jian-Xin Lin and Jangsuk Oh. The *Myb*$^{\Delta/\Delta}$ data was extracted from another publication[15] and analyzed by Nisha Rana. The design, input selection, and structural decisions for the figure were made through my guidance and the mentorship of Prof. Luca Gattinoni, the last author of the project. Claudia Gebhard, Jian-Xin Lin and Jangsuk Oh assisted with the initial experimental design. Michael Rehli contributed to result analysis and assisted with the initial experimental design.

Figure 29. Gene regulatory network that interfaces with *Stat3* in pmel-1 *Thy1.1*$^+$ vs. *Lmo4-Thy1.1*$^+$ CD8$^+$ T cells. Genes upregulated in *Thy1.1* cells are shown in gray color gradient, whereas those overexpressed in *Lmo4-Thy1.1* cells are marked in blue gradient. Network was created using Cytoscape software and STRING database. Line thickness of network edges indicates the strength of data support for each interaction based on the information available in the STRING database. The underlying experiment was conceptualized and performed by me, with bioinformatics analysis conducted by Nisha Rana and Peng Li and technical help by Jian-Xin Lin and Jangsuk Oh. The input selection, and structural decisions for the figure were made through my guidance and the mentorship of Prof. Luca Gattinoni, the last author on the project. Claudia Gebhard, Jian-Xin Lin and Jangsuk Oh assisted with the initial experimental design. Michael Rehli contributed to result analysis and assisted with the initial experimental design.

Figure 30. LMO4 directly interacts with JAK1 in primary CD8$^+$ T cells. Immunoblot of *Lmo4-Thy1.1* CD8$^+$ T cell lysates and anti-JAK1 immunoprecipitates blotted with JAK1 and LMO4 specific antibodies. Anti-IgG2a immunoprecipitates were used as controls. The co-immunoprecipitation experiment was entirely conceptualized by me, with assistance from Fabio Mastrogiovanni.

Figure 31. LMO4 enhances pSTAT3 in response to IL-6 and IL-21 but not IL-10. (**a**) Immunoblot of pSTAT3 and STAT3 (control) in *Thy1.1* and *Lmo4-Thy1.1* overexpressing T cells at 0, 0.5 and 2h after adding IL-6 (left panel), IL-10 (middle panel) or IL-21 (right panel) to the cell culture. (**b**) Quantification of pSTAT3 immunoblots in *Lmo4-Thy1.1* T cells normalized by total STAT3 in two independent experiments. Results are presented relative to *Thy1.1* controls. The immunoblot experiment was entirely conceptualized by me, with technical assistance from Fabio Mastrogiovanni.

Figure 32. IL-21, but not IL-6, induced the expression of *Tcf7*, *Zfp36*, *Socs3*, and *Junb* in LMO4-overexpressing T cells. q-PCR of *Tcf7* (left panel), *Zfp36* (middle left panel), *Socs3* (middle right panel), and *Junb* (right panel) mRNA in *Lmo4-Thy1.1* relative to *Thy1.1* overexpressing T cells that were cultured for 16 h with IL-6 or IL-21. The underlying experiment and the graphs were conceptualized and analyzed by me, with technical assistance from Emilia Kocks.

Figure 33. The negative impact of *Il21r* deletion on the generation of CD62L$^+$ memory T cell precursors abrogated the typical accumulation of *Lmo4-Thy1.1* T cells in lymph nodes. (**a**) Flow cytometry histograms showing IL21R expression in pmel-1 CD8$^+$ T cells to assess the knockout efficiency compared to controls. (**b**, **c**) Percentages of CD62L$^+$KLRG1$^-$ (**b**) and CD62L$^-$KLRG1$^+$ (**c**) splenic pmel-1 CD8$^+$ T cells 5 d after transfer of either 10^5 *Thy1.1*$^+$*Il21r*KO or *Lmo4-Thy1.1*$^+$*Il21r*KO pmel-1 Ly5.1$^+$ CD8$^+$ T cells into wild-type mice infected with gp100-vv (n = 5 mice/group). Results are relative to *Thy1.1*$^+$*Thy1.2*KO and *Lmo4-Thy1.1*$^+$*Thy1.2*KO control cells, respectively. (**d**) Percentages of pmel-1 CD8$^+$ T cells in the lymph nodes 5 d after transfer as in (**b**,**c**). (*P < 0.05; ** P < 0.001, **b**, **c**, unpaired two-tailed Student's t-test; **d**, ANOVA test. The underlying experiment and the graphs were conceptualized and analyzed by me, with assistance from Pedro Noronha, Timea Vadász, Fabio Mastrogiovanni, Leo Hesse and Rosanne Spolski. Warren J Leonard assisted with the initial experimental design.

Figure 34. LMO4 enhances IL-21-STAT3 signaling to facilitate CD8$^+$ T cell stemness. Cartoon depicting the potential interaction of LMO4 with the IL-21-STAT3 signaling pathway. LMO4 promotes STAT3 phosphorylation and the expression of target genes, including *Tcf7*, *Socs3, Junb,* and *Zfp36* to boost memory responses. The experimental design figure was created entirely by me, using www.bioRender.com.

Figure 35. CRISPR/Cas9 technology to delete *Stat3* or *Thy1.2* control in pmel-1 *Lmo4-Thy1.1* T cells. (**a**) Experimental design to assess the impact of *Stat3* versus *Thy1.2* (control) deletion on *Lmo4*-induced stem-like T cell formation. (**b**) Flow cytometry histograms showing Thy1.2 (left panel) and STAT3 (right panel) to assess knockout efficiency compared to controls in pmel-1 CD8$^+$ T cells. The experimental design figure (**a**) was created entirely by me, using www.bioRender.com. The underlying experiment (**b**) was conceptualized, performed and analyzed by me.

Figure 36. Deletion of *Stat3* abrogated the beneficial effects of LMO4 overexpression on T-cell expansion. (**a, b**) Flow cytometry analysis (**a**) and percentages (**b**) of splenic pmel-1 CD8$^+$ T cells 5 d after transfer of either 1 x 10^5 pmel-1 Ly5.1$^+$ *Thy1.1*$^+$*Thy1.2*KO, *Thy1.1*$^+$*Stat3*KO, *Lmo4-Thy1.1*$^+$*Thy1.2*KO or *Lmo4-Thy1.1*$^+$*Stat3*KO CD8$^+$ T cells into wild-type mice infected with gp100-vv

(five mice per group). *P < 0.05, **P < 0.01, (b unpaired two-tailed Student's t-test). The underlying experiment and graph creation were directed by me, with technical assistance from Pedro Noronha, Timea Vadász, Fabio Mastrogiovanni and Leo Hesse. Mario Lecce and Wolfgang Herr assisted with the initial experimental design.

Figure 37. *STAT3 is essential for LMO4-induced CD8⁺ T cell stemness.* (**a, b**) Flow cytometry analysis (**a**) and percentages (**b**) of CD62L⁺CD44⁺ splenic pmel-1 T cells 30 d after transfer as in (**Fig. 36a, b**). **P* < 0.05, ***P* < 0.01, (**b** unpaired two-tailed Student's *t*-test). The underlying experiment and the graphs were conceptualized and analyzed by me, with technical assistance from Pedro Noronha, Timea Vadász, Fabio Mastrogiovanni, Leo Hesse.

Figure 38. STAT3 is essential for LMO4-induced CD8⁺ T cell enhanced antitumor responses. (**a, b**) Tumor size (**a**) and survival curve (**b**) of $B16_{KVP}$ tumor-bearing wild-type mice after transfer of either 3.5 x 10^5 pmel-1 *Thy1.1⁺Thy1.2*KO, *Thy1.1⁺Stat3*KO, *Lmo4-Thy1.1⁺Thy1.2*KO or *Lmo4-Thy1.1⁺Stat3*KO CD8⁺ T cells into wild-type mice treated with gp100-vv and IL-2. **P* < 0.05, ***P* < 0.01, (**a**, Wilcoxon rank sum test; **b**, log-rank (Mantel–Cox) test). The underlying experiment and the graphs were conceptualized and analyzed by me, with technical assistance from Fabio Mastrogiovanni.

Figure 39. **Priming naive CD8⁺ T cells in the absence of TWS119 upregulated Lmo4.** q-PCR of *Lmo4* mRNA in CD8⁺ T cells cultured for 72 h with or without TWS119. I gratefully acknowledge Yun Ji for granting permission to reproduce the underlying figure based on her data. The experiments were performed by her. Nicholas P Restifo assisted with the initial experimental design.

Figure 40. Enforced expression of *Lmo4* enhances $CD8^+$ T cell antitumor immunity against lung carcinomas. (**a**) Experimental design investigating the effect of *Lmo4* overexpression on the antitumor immune response of OT-1 $CD8^+$ T cells. (**b**) Tumor size of LLC1-OVA, after transfer of 10^6 *Lmo4-Thy1.1 or Thy1.1* transduced OT-1 T cells into lymphodepleted tumor-bearing mice and subsequent vaccination with OVA peptide-loaded dendritic cells (*n* = 9-10 mice/group). (**P* < 0.05, Wilcoxon rank sum test). Cy, Cyclophosphamide, OVA, ovalbumin. I gratefully acknowledge Vincenzo Russo laboratory (including Giuseppe Damiano, Laura Raccosta, Daniela Maggioni) for granting permission to reproduce the underlying figure based on their data.

Figure 41. *Lmo4* overexpression does not induce uncontrolled $CD8^+$ T cell expansion. (**a-b**) Flow cytometry analysis (**a**) and percentages (**b**) of splenic pmel-1 $CD8^+$ T cells following transfer of either 2.5 x 10^5 CTV-labeled pmel-1 *Lmo4-Thy1.1* or *Thy1.1* T cells into wild-type mice. Assessment was conducted at 5 and 30 days post-transfer. (*n* = 5 mice/group) ***P* < 0.01, *****P* < 0.0001, (unpaired two-tailed Student's *t*-test). The in vivo experiments, analysis and the corresponding graphs for the underlying figure were created entirely by me.

LIST OF TABLES

LIST OF EXPERIMENTS AND ANALYSES PRIMARLY CONDUCTED BY ME

- *Retroviral vector generation and virus synthesis*
  Fig. 7-10, 12, 14, 15, 17, 19, 20, 22-33, 35-38, 41

- *Mouse $CD8^+$ T-cell in vitro stimulation and transduction*
  Fig. 7-10, 12, 14, 15, 17, 19, 23-33, 35-38, 41

- *Human $CD8^+$ T cell in vitro stimulation and transduction*
  Fig, 20, 22

- *Tamoxifen injections, adoptive cell transfer, virus infection and tumor inoculation*
  Fig. 8-11, 12, 14-17, 19, 22-29, 33, 35-38, 41

- *Quantification of adoptively transferred cells*
  Fig. 8, 9, 11, 14, 16, 33, 36, 41

- *Cas9/RNP nucleofection*
  Fig, 33, 35-38

- *Quantitative PCR*
  Fig. 27, 32

- *Immunoblot and Immunoprecipitation assays*
  Fig. 7, 30, 31

- *Statistical analyses*
  8-12, 14-17, 19, 20, 22-27, 31-33, 36-38, 41

ABSTRACT

High frequencies of stem-like memory T cells in infusion products correlate with superior patient outcomes across multiple T cell therapy trials. Herein, we analyzed a published CRISPR activation screening to identify transcriptional regulators that could be harnessed to augment stem-like behavior in $CD8^+$ T cells. Using IFN-γ production as a proxy for $CD8^+$ T cell terminal differentiation, *LMO4* emerged among the top hits inhibiting the development of effectors cells. Consistently, we found that *Lmo4* was downregulated upon $CD8^+$ T cell activation but maintained under culture conditions facilitating the formation of stem-like T cells. By employing a synthetic biology approach to ectopically express LMO4 in antitumor $CD8^+$ T cells, we enabled selective expansion and enhanced persistence of transduced cells, while limiting their terminal differentiation and senescence. LMO4 overexpression promoted transcriptional programs regulating stemness, increasing the numbers of stem-like CD8+ memory T cells and enhancing their polyfunctionality and recall capacity. When tested in syngeneic and xenograft tumor models, LMO4 overexpression boosted $CD8^+$ T cell antitumor immunity, resulting in enhanced tumor regression. Rather than directly modulating gene transcription, LMO4 bound to JAK1 and potentiated STAT3 signaling in response to IL-21, inducing the expression of target genes (*Tcf7*, *Socs3*, *Junb*, and *Zfp36*) crucial for memory responses. CRISPR/Cas9-deletion of *Stat3* nullified the enhanced memory signature conferred by LMO4, thereby abrogating the therapeutic benefit of LMO4 overexpression. These results establish *LMO4* overexpression as an effective strategy to boost $CD8^+$ T cell stemness, providing a new synthetic biology tool to bolster the efficacy of T cell-based immunotherapies.

INTRODUCTION

Introductory note: A substantial portion of this PhD thesis (>50%) has been reproduced from a recently published paper (Signal Transduct Target Ther. 2024 Aug 9;9(1):199. doi: 10.1038/s41392-024-01915-z.), for which the author served as the first author and primary driver, with instrumental contributions to the research and findings.

T cell-based therapies are revolutionizing medical oncology, providing groundbreaking treatments for previously incurable hematologic cancers. These therapies, however, have not yet achieved the same level of success against solid tumors, with their efficacy remaining disappointingly low[7]. Solid tumors present unique challenges, including a hostile tumor microenvironment, physical barriers to T cell infiltration, and immunosuppressive mechanisms that inhibit T cell function[7]. These challenges have spurred a concerted effort in the research community to identify and overcome the barriers preventing the successful application of T cell therapies to solid malignancies. The search for more effective treatments has led to an increased focus on the role of stem-like memory T cells, which have been highlighted by numerous preclinical models[8-11] and retrospective analyses[12,13] of T cell therapies as crucial mediators of successful antitumor responses. This has prompted extensive research efforts aimed at understanding the pathways that regulate the formation of these adult stem-like cells[14]. By delving into the molecular mechanisms that underpin the development and maintenance of stem-like memory T cells, researchers hope to uncover new strategies to enhance T cell efficacy against solid tumors.

Current T cell therapy options: TIL, TCR, and CAR

In the landscape of cancer immunotherapy, three primary T cell therapy options have emerged: Tumor-Infiltrating Lymphocytes (TILs), T Cell Receptors (TCRs), and Chimeric Antigen Receptors (CARs). Each approach has unique mechanisms, benefits, and challenges[7]:

Tumor-Infiltrating Lymphocytes (TILs)

Tumor-Infiltrating Lymphocyte (TIL) therapy involves isolating T cells directly from a patient's tumor. These T cells have naturally infiltrated the tumor and thus are presumed to be tumor-

specific. After isolation, the T cells are expanded ex vivo to large numbers and then reinfused into the patient, often following a lymphodepletion regimen to enhance T cell engraftment and efficacy.

- Advantages:
    a. Tumor Specificity: TILs are naturally tumor-reactive, having been primed in vivo by the patient's own tumor antigens.
    b. Polyclonality: TIL therapy provides a diverse repertoire of T cells, potentially recognizing multiple tumor antigens.
- Challenges:
    a. Tumor Accessibility: Not all tumors are accessible for TIL extraction, and the yield can be variable.
    b. Expansion Time: The ex vivo expansion process is lengthy and labor-intensive, requiring specialized facilities.

T Cell Receptors (TCRs)

T Cell Receptor (TCR) therapy involves engineering patient T cells to express TCRs that recognize specific tumor antigens presented by major histocompatibility complex (MHC) molecules. TCRs are naturally occurring proteins that allow T cells to recognize and bind to peptides derived from intracellular proteins presented on the cell surface by MHC molecules.

- Advantages:
    a. Target Diversity: TCRs can target a wide range of intracellular antigens, expanding the pool of potential tumor targets.
    b. Specificity: TCRs can be designed to target unique tumor-associated antigens, minimizing off-target effects.
- Challenges:
    a. MHC Restriction: TCRs require compatibility with the patient's MHC molecules, which limits their universal applicability.

b. Immune Escape: Tumor cells may downregulate MHC expression to evade detection by TCR-engineered T cells.

Chimeric Antigen Receptors (CARs)

Chimeric Antigen Receptor (CAR) T cell therapy involves genetically engineering T cells to express synthetic receptors that combine an antigen-binding domain (usually derived from an antibody) with T cell signaling domains. These CARs recognize specific antigens on the surface of tumor cells, independent of MHC.

- Advantages:
    a. MHC Independence: CAR T cells can recognize surface antigens directly without the need for MHC presentation, broadening their applicability.
    b. Potent Activation: The synthetic design of CARs includes strong signaling domains that enhance T cell activation and persistence.
- Challenges:
    a. On-Target, Off-Tumor Toxicity: CAR T cells may target normal tissues expressing the same antigen as tumor cells, leading to potential side effects.
    b. Cytokine Release Syndrome: The potent activation of CAR T cells can lead to severe inflammatory responses, requiring careful management.

Hierarchical model of $CD8^+$ T cell differentiation

The complexity of T cell biology and the intricacies of tumor microenvironments have driven researchers to explore various molecular and cellular mechanisms that could enhance the effectiveness of T cell-based therapies. Among these, the differentiation and maintenance of stem-like memory T cells have emerged as a critical area of study[14].

Similar to other organ systems, the $CD8^+$ T cell compartment comprises cells at various stages of differentiation, which can be distinguished by their surface molecules, anatomical locations, and functions. During a primary immune response, antigen-specific naive T (T_N) cells engage

with antigen-presenting cells (APCs) that have processed and presented tumor-associated antigens on major histocompatibility complex molecules. Depending on factors such as T cell receptor (TCR) density, the balance of co-stimulatory and inhibitory signals, and the inflammatory milieu, reactive T cells initiate a proliferation and differentiation program. Throughout this differentiation process, T_N cells progress to T memory stem cells (T_{SCM}), central memory T cells (T_{CM}), and effector memory T cells (T_{EM}), ultimately leading to the formation of highly differentiated, short-lived effector T cells (T_{EFF})[14] (Fig. 1). This progression is marked by continuous phenotypic and functional changes, alongside specific transcriptional programs[14]. A comparable hierarchical organization is observed in other T cell properties, especially stemness and antitumor efficacy[14].

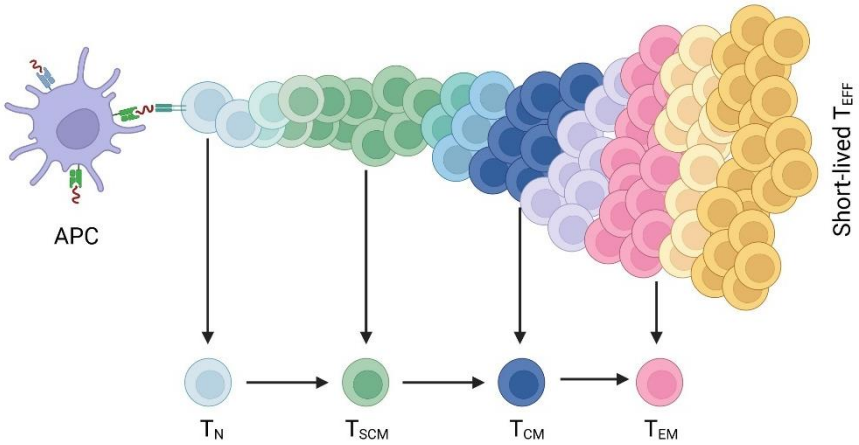


Figure 1. Model of hierarchical CD8⁺ T cell differentiation. During an immune reaction, naive T (T_N) cells are primed by antigen-presenting cells (APCs). These T cells then progress through a differentiation pathway, ultimately generating terminally differentiated, short-lived effector T (T_{EFF}) cells. Once the antigenic and inflammatory stimuli subside, the primed T cells enter a dormant state and transition into the memory stem cell (T_{SCM}), central memory (T_{CM}), or effector memory (T_{EM}) cell pools.

Stem cell-like properties in memory stem cells

Memory cells serve as the stem cell-like entities within the adaptive immune system. Extensive research indicates that T_{SCM} cells possess stem cell-like characteristics, with their memory and self-renewal capabilities surpassing those of any other memory T cell population. Studies employing carboxyfluorescein succinimidyl ester (CFSE) to track cell division have demonstrated that T_{SCM} cells are capable of self-renewal while simultaneously generating more

differentiated progeny in both mice and humans[8, 10]. Although T_{CM} and T_{EM} cells also exhibit a limited capacity for self-renewal, their ability to produce distinct progeny is increasingly constrained. In contrast, T_{SCM} cells uniquely generate all three memory subpopulations as well as T_{EFF} cells[8]. Corresponding to this hierarchical structure, the proliferative and survival capacities of memory T cell subsets in response to antigenic or homeostatic stimuli diminish progressively from T_{SCM} to T_{CM} and T_{EM} cells[8, 10].

The Role of Stemness in Antitumor Efficacy of $CD8^+$ T Cells

Immunotherapies based on the adoptive transfer of tumor-reactive T cells can induce persistent complete responses in some patients with advanced hematologic and solid neoplasia. Numerous factors influence the efficacy of T-cell-based treatments, comprising tumor- and host-associated factors as well as the functional properties of the transferred T cells. The ability of T cells to engraft and survive long-term seems a key prerequisite for effective tumor control. Due to their self-renewal capacity and multipotency, which are essential for sustaining long-term immune responses, and their ability to differentiate into all memory and effector T cell subsets, thereby maintaining a reservoir of T cells capable of responding to tumor antigens over extended periods, T_{SCM}-like cells can induce very efficient and durable tumor responses even when only small T cell numbers are transferred. The potency of memory T cells to induce tumor regression after adoptive transfer progressively declines from T_{SCM} cells to T_{CM} cells and T_{EM} cells[8, 10].

Understanding the regulatory networks that govern these properties is paramount for developing strategies to improve T cell persistence and function in the tumor milieu. Researchers are particularly interested in identifying the signaling pathways and transcriptional networks that support the development of these stem-like properties, as manipulating these pathways could lead to significant improvements in the longevity and efficacy of T cell therapies.

Identification of genes involved in the generation and maintenance of T_N or T_{SCM}

Key to these efforts have been knockout studies, which have been instrumental in identifying transcriptional regulators essential for maintaining long-term immune responsiveness and memory function. Among these critical regulators are c-MYB[15], T cell factor 1 (TCF1)[16], forkhead box protein O1 (FOXO1)[17], BTB Domain And CNC Homolog 2 (BACH2)[18], DNA-binding protein inhibitors ID3[19], and signal transducer and activator of transcription 3 (STAT3)[20]. These factors play vital roles in the differentiation and function of T cells, and their proper regulation is crucial for effective immune responses. c-MYB is involved in the regulation of hematopoietic stem cell proliferation and differentiation[15], while TCF1 is crucial for the maintenance of the naive T cell pool and the formation of memory T cells[16]. FOXO1 regulates the expression of genes involved in cell cycle arrest, apoptosis, and oxidative stress resistance[17]. BACH2 plays a role in the development of regulatory T cells and the maintenance of immune homeostasis[18]. ID3 functions as a dominant-negative regulator of helix-loop-helix transcription factors, influencing T cell differentiation and survival[19]. STAT3 is a key mediator of cytokine signaling, with roles in promoting cell survival, proliferation, and differentiation[20]. The identification of these regulators has provided valuable insights into the molecular underpinnings of T cell memory and has set the stage for further exploration of their roles in T cell-based immunotherapies.

Leveraging synthetic biology and gene editing in T cell therapies

The field of synthetic biology presents exciting new opportunities to enhance or impart new functions to cells through genetic manipulation. This approach allows researchers to investigate and utilize genes that do not typically operate in a specific cell under physiological conditions[21]. Synthetic biology techniques enable the reprogramming of T cells to enhance their therapeutic potential by modifying their genetic and functional properties. This field has seen rapid advancements, including the development of novel gene editing tools and the ability to design synthetic gene circuits that can precisely control cellular behavior.

Among these techniques, CRISPR activation (CRISPRa) gain-of-function screens are particularly powerful tools. These screens enable the identification of genes that, while inactive under normal conditions, have the potential to promote desirable phenotypes[2]. CRISPRa technology leverages the CRISPR/Cas9 system to activate the transcription of target genes, providing a high-throughput method for discovering genes that can enhance T cell function[2]. Here, we analyzed a previously published CRISPRa screen in which primary human T cells were transduced with dCas9-VP64 lentivirus and an sgRNA lentiviral library. Following transduction, the CRISPRa-modified T cells were restimulated, stained for cytokines, and sorted. This methodology allowed for the efficient screening and identification of genes capable of enhancing or perturbing T cell cytokine production (Fig. 2).

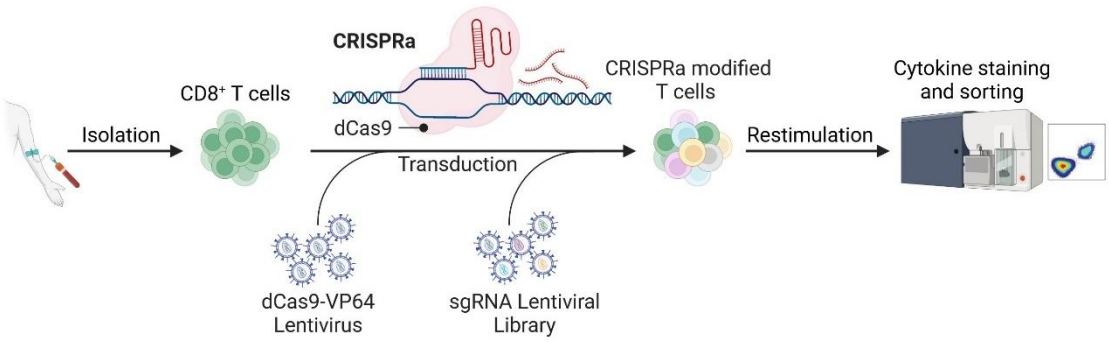


Figure 2. **Schematic of Genome-wide CRISPRa screens for cytokine production in stimulated primary human T cells.** Modified after Schmidt et al.[2]

Through such a CRISPRa screen analysis, we identified LIM-domain-only 4 (LMO4) as one of the top transcriptional regulators that could be harnessed to augment stem-like behavior in $CD8^+$ T cells. This discovery highlights the potential of synthetic biology to uncover novel targets for enhancing T cell therapies. By using CRISPRa to modulate gene expression in T cells, we can explore a vast array of genetic modifications that might improve T cell efficacy, persistence, and functionality in therapeutic settings. The identification of LMO4 as a key regulator underscores the value of CRISPRa screens in advancing our understanding of T cell biology and developing more effective cancer immunotherapies.

LIM domain only 4

LMO4 belongs to the family of LIM-domain-only proteins, which are transcriptional co-regulators known for their significant roles in cell fate determination, cell growth and differentiation, and organ development[22]. The LIM domains enable these proteins to interact with various other proteins, thereby influencing multiple signaling pathways and cellular processes[22]. LMO proteins do not possess DNA-binding domains themselves but function by forming complexes with other transcription factors, thereby modulating gene expression[22]. Much of our understanding of LMO proteins in T cells comes from studies focused on their oncogenic properties[23]. For instance, LMO1 and LMO2 were initially identified due to their involvement in chromosomal translocations associated with acute T cell leukemia (T-ALL)[23]. These early studies highlighted the potential of LMO proteins to drive oncogenic transformation, sparking interest in their broader biological roles. LMO2, in particular, has been extensively studied in the context of hematopoiesis and T cell development, revealing its role in both normal and malignant processes[23]. The study of LMO proteins in T cells has provided insights into their functions in regulating cell proliferation, differentiation, and survival, making them attractive targets for therapeutic intervention[23].

LMO4 stands out as the only LMO family member expressed in mature post-thymic T cells[24], although its expression levels are considerably lower compared to those in innate immune cell populations, as indicated by data from the Immunological Genome Project (https://www.immgen.org). This low expression level in T cells, combined with the fact that LMO4 expression is not dynamically modulated across the $CD8^+$ T cell differentiation spectrum (Fig. 3), suggests that LMO4 could be an untapped resource for therapeutic intervention through synthetic biology. The relatively stable expression pattern of LMO4 provides an opportunity to explore its functional roles without the confounding effects of dynamic expression changes seen with other transcription factors. By leveraging the unique properties of LMO4, we aimed to uncover new ways to enhance T cell function and persistence, potentially leading to more effective immunotherapies for solid tumors. The exploration of

LMO4's role in T cells is poised to provide valuable insights into the regulation of T cell stemness and the development of innovative therapeutic strategies.

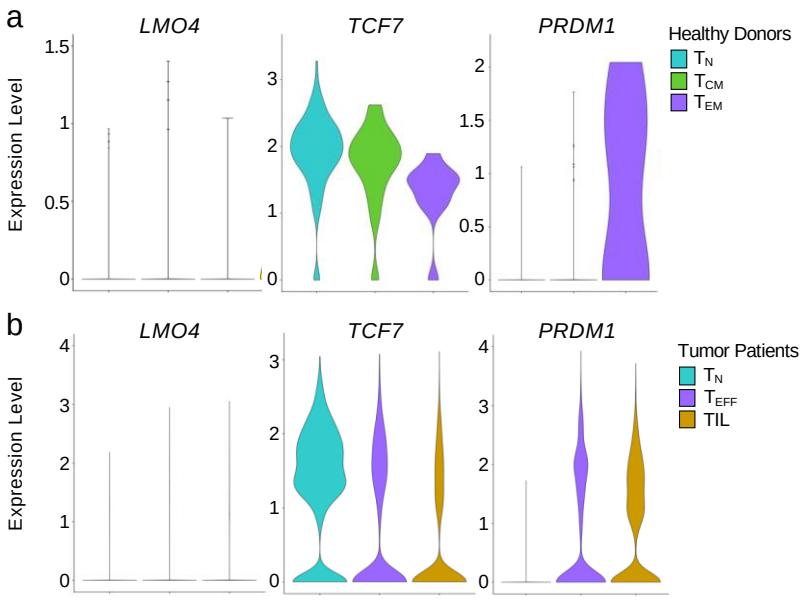


Figure 3. **LMO4 is poorly expressed in human CD8⁺ T cells.** Violin plots depicting the expression levels of *LMO4*, *TCF7*, and *PRDM1* in (**a**) healthy donors (10X genomic database) or (**b**) HNSCC patients[1]. I gratefully acknowledge Nisha Rana for her support with bioinformatics analyses of public datasets and for granting permission to reproduce the underlying figure based on her data. The design, input selection, and structural decisions for the figure were achieved through my guidance and the mentorship of Prof. Luca Gattinoni, the last author on the project.

Here, we demonstrate that LMO4 can be repurposed in $CD8^+$ T cells to augment their stemness. Instead of directly influencing gene transcription, LMO4 primarily modulated cytokine signaling, specifically related to interleukin-21 (IL-21). IL-21 is a pleiotropic cytokine with broad actions including promoting T follicular helper cell and terminal B cell differentiation[26], but it is also known to cooperatively expand $CD8^+$ T cells[27] and to promote adoptive transfer-mediated antitumor activity[3,28]. By boosting the IL-21-STAT3 axis, LMO4 promoted the expression of key memory-related factors to enhance the formation of memory T cells while curbing their terminal differentiation. Lastly, our findings reveal the therapeutic potential of LMO4 manipulation: enforcing LMO4 expression in adoptively transferred $CD8^+$ T cells significantly boosted $CD8^+$ T-cell antitumor immunity, resulting in enhanced tumor clearance and prolonged survival of tumor-bearing animals. This approach offers a promising strategy for improving the efficacy of T cell therapies against solid tumors. By enhancing the

stem-like qualities and functional capabilities of $CD8^+$ T cells through LMO4, we can potentially overcome some of the major barriers that have limited the success of T cell therapies in solid malignancies.

The potential to repurpose LMO4 for therapeutic applications underscores the importance of continued research into the molecular mechanisms that regulate T cell function and persistence. By integrating insights from synthetic biology, gene editing, and immunology, we can develop innovative approaches to enhance the efficacy of T cell-based therapies, providing new hope for patients with solid tumors.

METHODS

Mice

We obtained C57BL/6NCr, B6-Ly5.1/Cr and OT-1 mice from Charles River Frederick Sulzfeld or Calco; pmel-1 (B6. Cg-Thy1^{a}/Cy Tg (TcraTcrb)8Rest/J) mice were bought from the Jackson Laboratory; Cre-ER^{T2} (B6-Gt(ROSA)26Sor$^{tm9(cre/Esr1)Arte}$) mice were from Taconic. *Lmo4*$^{fl/fl}$ mice[29] were obtained from Bogi Andersen and were back-crossed with C57BL/6NCr mice for more than 30 generations. Pmel-1 mice were crossed with *Lmo4*$^{fl/fl}$ mice for the formation of pmel-1 *Lmo4*$^{fl/fl}$ mice and were further crossed with Cre-ER^{T2} mice for the generation of pmel-1 Cre-ER^{T2} *Lmo4*$^{fl/fl}$ mice. Immunodeficient NCG and NXG mice ages 6–8 weeks were obtained from Janvier Labs. All mouse experiments were performed with the approval of the National Cancer Institute, the National Heart, Lung, and Blood Institute Animal Care and Use Committees, the Institutional Animal Care and Use Committee programme (IACUC n° 1178 and 1208) and the Government of Lower Franconia. Experiments performed at NIH were done according to NIH guidelines for research using mice.

Cell lines

Platinum-E cells were from Cell Biolabs, 293GP cells from ATCC, both being authenticated and validated mycoplasma free. B16 melanoma expressing human gp100 ($B16_{KVP}$)[30] were obtained from K.-I. Hanada (National Cancer Institute, Bethesda), Lewis Lung Carcinoma (LLC1) cells from ATCC, NALM6-GL cells were obtained from T. Fry (National Cancer Institute, Bethesda). All cell lines were validated by PCR-assay to be mycoplasma free.

Antibodies, flow cytometry and cell sorting

Anti-Ly5.1 (A20), Anti-Ly5.2 (104), anti-Thy1.1 (OX-7), anti-CD62L (MEL-14), anti-IFNγ (XMG1.2), anti-TNFα (MP6-XT2), anti-CD8 (HIT8a), anti-THY1.1 (HIS51), anti-CCR7 (2-L1-A), anti-CD45RA (5H9), anti-CD45R0 (UCHL1) were bought from BD Biosciences; anti-CD8α (53-6.7), anti-Thy1.2 (30-H12), anti-KLRG-1 (2F1), anti-CD44 (IM7), anti-IL-2 (JE56-5H4), anti-STAT3 (4G4B45), anti-IL-21R (4A9), anti-CD95 (DX2), anti-CD62L (DREG-56) were from

Biolegend; anti-TCF1 (C63D9) was from CellSignaling; LIVE/DEAD™ Fixable Far Red Dead Cell Stain from Invitrogen. CellTrace™ Violet Cell Proliferation Kit (Invitrogen) was employed to label cells for tracking multiple generations via dye dilution using flow cytometry. For intracellular staining of STAT3, cells were fixed and permeabilized (eBioscience, 00-5524). Leukocyte Activation Cocktail containing phorbol myristate acetate and ionomycin (BD Biosciences) was employed to activate $CD8^+$ T cells for intercellular cytokine staining. A Fixation/Permeabilization Solution Kit (BD Biosciences) was used to fix and permeabilize the cells. Flow Cytometry Acquisition was done on an LSR II or BDFortessa (BD Biosciences) flow cytometer. The raw data were analyzed by using FlowJo software (TreeStar). For naïve $CD8^+$ T-cell enrichment, the Naïve $CD8^+$ T-cell isolation kit from Stem Cell Technology was used. All other T-cell isolations were done on FACSAria (BD Biosciences).

Quantitative PCR

The Isolation of RNA was performed using the RNeasy Mini Kit (Qiagen). Complementary DNA (Applied Biosystems) was obtained by PCR. qPCR was done using primers from Applied Biosystems and a Quant Studio 3 (Applied Biosystems) using PowerUp SYBR Green Master Mix (Applied Biosystems). Findings are shown relative to *Actb* or *Rpl13* expression.

List of primers:

ActbF, *ActbR*: Primers from Applied Biosystems were used.

*Rpl13*F: CGAGGCATGCTGCCCCACAA

*Rpl13*R: AGCAGGGACCACCATCCGCT

*Tcf7*F: AGCTTTCTCCACTCTACGAACA

*Tcf7*R: AATCCAGAGAGATCGGGGGTC

*Socs3*F: ATGGTCACCCACAGCAAGTTT

*Socs3*R: TCCAGTAGAATCCGCTCTCCT

*JunB*F: TCACGACGACTCTTACGCAG

*JunB*R: CCTTGAGACCCCGATAGGGA

*Zfp36*F: CCACCTCCTCTCGATACAAGA

*Zfp36*R: GCTTGGCGAAGTTCACCCA

Immunoblot and Immunoprecipitation assays

Proteins were segregated by 4-12% SDS-PAGE, then standard immunoblot analysis was performed with anti-LMO4 (Cell Signaling Technology, clone D6V4Z), anti-ACTB (Cell Signaling, clone 8H10D10), anti-STAT3 (Cell Signaling Technology, clone 124H6), anti-pSTAT3(Tyr705) (Cell Signaling Technology, clone M9C6), horseradish peroxidase-conjugated goat anti-mouse IgG (sc-2031; Santa Cruz Biotechnology) and horseradish peroxidase-conjugated anti-rabbit IgG (sc-2030; Santa Cruz Biotechnology). Immunoprecipitation of JAK1 was performed using anti-JAK1 antibody (Cell Signaling Technology, clone D1T6W). IgG2a was used as negative control (Cell Signaling Technology, clone E5Y6Q). In brief, the cells were washed twice with PBS and lysed in in ice-cold lysis buffer (50 mM Tris–Cl (pH 7.5), 150 mM NaCl, and 1% NP-40) with protease and phosphatase inhibitors (Cell Signaling). The cell lysates containing 1 to 3 mg of protein were pre-cleared with 30 µl protein A/G-Sepharose beads (Thermo Scientific) for 1 h at 4C° and thereafter incubated with the appropriate antibody overnight at 4° C, following another incubation with 30 µl of protein A/G-Sepharose beads for additional 2 h at 4°C. The immunoprecipitates were washed three times with washing buffer (20 mM Tris–Cl (pH7.5), 150 mM NaCl, and 0,1% NP-40), separated by SDS–polyacrylamide gel electrophoresis (SDS–PAGE) after being boiled in Laemmli buffer, and transferred to a 0.2 µm nitrocellulose membrane. The membrane was blocked with PBS containing 0.1% Tween-20 and 1% bovine serum albumin before it was incubated with the appropriate primary and secondary antibodies. The bound antibodies were visualized using Pierce ECL WB Substrate (Thermo Fisher).

Retroviral vector generation and virus synthesis

Lmo4 was cloned into the MSGV-1-*Thy1.1* vector as formerly reported[19]. Platinum-E (mouse setting) or 293GP (human setting) cell lines were employed for gamma-retroviral vector generation by transfection with DNA plasmids using Lipofectamine 2000 (Invitrogen) and collecting the virus 40 h after transfection.

Mouse CD8$^+$ T-cell in vitro stimulation and transduction

Naïve CD8$^+$ T cells were stimulated in 24-well tissue culture plates coated with anti-CD3ε (2 μg ml^{-1}; 145-2C11; BD Biosciences) and soluble anti-CD28 (1 μg ml^{-1}; 37.51; BD Biosciences) in culture medium including recombinant human (rh) IL-2 (10 ng ml^{-1}; Prometheus Laboratories). The virus was spun at 2,000 g for 2 h at 32°C on non-tissue culture plates coated with retronectin (Takara). CD8$^+$ T cells stimulated for 24 h were spun on these plates after aspiration of the viral supernatant. The transduction efficiency was measured after 48 h. For experiments evaluating STAT3 phosphorylation and target gene expression, CD8$^+$ T cells were washed from rhIL-2 supplemented medium 3 days after stimulation and incubated o/n at 37°C. CD8$^+$ T cells were then exposed for 30 min to 20 ng ml^{-1} of mouse IL-6, IL-10 and IL-21 (all Miltenyi Biotec). LLC1 cells were transduced with virus-containing supernatant and selected for ΔLNGFr expression by magnetic beads (Dynabeads M-450, Dynal) coated with the LNGFr-specific mAb 20.4 (ATCC).

Human CD8$^+$ T cell in vitro stimulation and transduction

PBMCs (NIH, US and University Hospital Regensburg, Germany) were enriched for naive CD8$^+$ T cells using naive CD8$^+$ T cell isolation kit (Stem Cell Technologies) before freezing. To generate T_{SCM}-enriched cells, naive CD8$^+$ T cells were thawed and activated with GMP-grade TransAct (Miltenyi Biotec) in GMP-grade TexMACS medium (Miltenyi Biotec), 0.5% human AB serum (ZKT Tübingen, FSM/TV 276), supplemented with 1% PenStrep (Gibco) in the presence of 5 ng/mL IL-7 and 30 ng/mL IL-21 (both Miltenyi Biotec). Cells were transduced on days 2 and 3 and expanded for 5 more days in media containing IL-7 and IL-21. To generate T_{SCM}-enriched cells modified with CD19-CAR, naive CD8$^+$ T cells were thawed and stimulated using anti-CD3/CD28 beads (Dynabeads Human T-Expander CD3/CD28; Thermo Fisher Scientific) at a 1:1 bead-to-cell ratio in AIM-V (Gibco), supplemented with 5% human AB serum 2 mM GMAX (Gibco), 5 ng/mL IL-7 and 30 ng/mL IL-21. Transduction with the PG13 expressing CD19-CAR (FMC63-28-ζ) retrovirus was performed on days 2 and 3, followed by expansion

in media containing IL-7 and IL-21 for an additional 5 days after the removal of activating beads on day 4.

Generation of dendritic cell vaccine

Dendritic cells (DCs) were generated from bone marrow (BM) of femurs and tibias. BM was flushed out with RPMI, and a single cell suspension was prepared by passing the BM solution through a 19-gauge needle. BM cells re-suspended at 5×10^5 cells/ml in 6-well plates were cultured in IMDM 10 % FBS, GM-CSF and IL-4 (PeproTech), both at 20 ng/ml. At day 2, cells were split 1:2 by adding fresh medium and cytokines. At day 5, we removed and discarded 2 ml of supernatant and added 2 ml of fresh medium with GM-CSF and IL-4 (both 40 ng/ml). At day 7, DCs were activated with LPS (1 mg/ml) for 16 hrs. The day after DCs were collected and pulsed with 5 µg/ml of the OVA-derived peptide SIINFEKL, for 1 h at 37 °C. Peptide-pulsed DCs were then washed and resuspended at 5×10^6 cells/ml. We injected 100 µl of PBS containing peptide pulsed DCs/mice s.c. the day after ACT.

Tamoxifen injections, adoptive cell transfer, virus infection and tumor inoculation

Cre-ER^{T2} activity was prompted by intraperitoneal injection of 2 mg tamoxifen (Sigma-Aldrich) dissolved in corn oil (Sigma-Aldrich) on 4 successive days. The adoptive transfer of pmel-1 $CD8^+$ T cells (1.5 to 10 x 10^5 cells) into 6- to 8-week-old C57BL/6 mice was performed together with the vaccination of 2 x 10^7 PFU recombinant vaccinia virus expressing human gp100 (gp100-VV). For recall response,35 d after primary infection with gp100-VV pmel-1 memory T cells were sorted, normalized for cell numbers, and transferred into secondary C57BL/6 mice infected with 10^8 PFU recombinant adenovirus type 2 expressing human gp100. To prevent potential rejection in conditional knockout experiments investigating the late contraction phase of the immune response and in secondary treatment experiments, we used recipient mice carrying the *Lmo4*^{fl} allele. In these experiments, as wild-type controls, we used pmel-1 $CD8^+$ T cells isolated from tamoxifen-injected littermates carrying the *Lmo4*^{fl} allele but not Cre-ER^{T2}.

Murine syngeneic melanoma model: 2 x 10^5 $B16_{KVP}$ cells were inoculated subcutaneously into 6- to 8-week-old C57BL/6 mice. After 10 days mice were adoptively transferred with 3.5 x 10^5 pmel-1 $CD8^+$ T cells and vaccinated intravenously with 2 x 10^7 PFU gp100-VV. Recombinant human IL-2 (2.4e5 IU per dose) was injected intraperitoneally twice a day for a total of 6 doses. *Murine syngeneic lung carcinoma model*: Mice were injected subcutaneously with LLC1 cells (5 x 10^5) expressing ovalbumin (LLC1-OVA). Seven days later, mice were injected intraperitoneally with a single dose of cyclophosphamide (CTX 3 mg/mouse). After 24 hours, mice were randomized and adoptively transferred with OT-1 T cells transduced with *Thy1.1* or *Lmo4-Thy1.1* (10^6 cells). The day after, mice were subcutaneously injected with dendritic cells (5 x 10^5) loaded with the SIINFEKL peptide. Tumor volume was measured every 2 days. *Xenograft acute lymphoblastic leukemia model*: NXG host mice received intravenous injections of NALM6-GL (8 x 105) cells, followed by the administration of 1.25 × 10^5 CD19-CAR^+ $CD8^+$ T cells after a 3-day interval. Recombinant human IL-15 (NCI) was administered intraperitoneally every other day at a dosage of 1 µg per mouse. Tumor burden was assessed using the IVIS Lumina III In Vivo Imaging System (PerkinElmer). After 7 days, blood samples were collected from the mice to estimate the engraftment of $CD8^+$ T cells.

Quantification of adoptively transferred cells

After processing the spleen, cells were counted by trypan blue exclusion of dead cells. The percentage of transferred $CD8^+$ T cells was measured by analyzing the expression of CD8 and Thy1.1/Ly5.1 or Ly5.2 by flow cytometry. The absolute quantity of transferred cells was calculated by multiplying the total cell count by the frequency of $CD8^+Thy1.1^+Ly5.1^+$ or $CD8^+Ly5.2^+$ cells.

RNA-seq

Total cellular RNA was isolated from $CD8^+$ T-cells using the RNeasy Mini Kit (Qiagen) according to the manufacturer's instructions. The concentration and quality of the purified RNA was analyzed using the RNA ScreenTape Kit (Agilent). Generation of dsDNA libraries for

Illumina sequencing from total cellular RNA was carried out using the TruSeq Stranded Total RNA Kit (Illumina) according to the manufacturer's instructions. The quality of dsDNA libraries was analyzed using the High Sensitivity D1000 ScreenTape Kit (Agilent) and concentrations were assessed with the Qubit dsDNA HS Kit (Thermo Fisher Scientific). Sequencing was performed using an Illumina NextSeq550 sequencer. Sequenced reads were processed and aligned to the mm10 genome using splice-aware aligner TopHat 2.1.1. Then, raw mapped read counts were processed in R with edgeR (doi:10.1093/bioinformatics/btp616) to generate normalized read counts and determine differentially expressed genes with log2 FC ≥ 0.3 and $P < 0.05$. Volcano plot was generated using EnhancedVolcano package (doi:10.18129/B9.bioc.EnhancedVolcano). Volcano plot shows differentially expressed genes ($P \leq 0.05$) in pmel-1 *Lmo4-Thy1.1*$^+$ compared to *Thy1.1*$^+$ CD8$^+$ T cells. The position of the Lmo4 gene in the volcano plot was altered by capping its log2-FC values at a maximum threshold of 1.4, thereby constraining its positioning in the volcano plot.

CRISPRa screen analysis

Genes that are deemed to be transcription factors or transcription regulators were filtered from the list of genes targeted in a genome-wide CRISPRa screen analysis[2]. Filtering was done based on the Transcription Factor dataset available on Transcription Factor checkpoint 2.0 database (https://www.tfcheckpoint.org/index.php), which is a resource for Human, Mouse, and Rat Transcription Factors. The filtered gene list was used to generate a volcano plot with EnhancedVolcano package. Volcano plot shows median sgRNA $\log_2$-fold change (IFN-$\gamma^{hi/lo}$ sorting bin counts) for each gene ($P \leq 0.05$, log2 FC ≥ 0.52 and ≤ −0.531)

Cas9/RNP nucleofection

Pmel-1 CD8$^+$ T cells isolated from *Cas9*$^+$ C57BL/6 mice were stimulated 24 h before transfection. To prepare the crRNA-tracrRNA duplex each Alt-R crRNA and Alt-R tracrRNA (IDT) was reconstituted to 100 µM with nuclease-Free Duplex Buffer (IDT). After mixing the

oligos at equimolar concentrations [0.75 µl Alt-R crRNA and 0.75 µl Alt-R tracrRNA per guide with 1.5 µl Buffer (Mirus Ingenio Electroporation)] in a sterile PCR tube, the mix was annealed by heating at 95°C for 5 min in PCR thermocycler and then slowly cooled down to room temperature. For CAS9/RNP precomplexing, resulted 3 µl crRNA-tracrRNA duplex and 1.2 µl TrueCut CAS9 Protein v2 (Thermo Fisher) were gently mixed and incubated at room temperature for 20 min. After prewarming 200 µl complete T-cell media containing rhIL-2 (10 ng ml^{-1}) per well of a 96-well plate, 1 million $CD8^+$ T cells were resuspended in 20 µl primary cell nucleofection solution (P4 Primary Cell 4D-Nucleofector X kit; 32 RCT; V4XP-4032, Lonza). T cells were then mixed and incubated with 4.2 µl RNP and 15.8 µl Buffer (Mirus) for a total volume of 20 µl at room temperature for 2 min in round bottom 96-well plate. Cell/RNP mix was transferred to nucleofection cuvette strips (4D-Nucleofector X kit S; Lonza) and electroporated using a 4D nucleofector (4D-Nucleofector X Unit: AAF-1002X, Lonza) and a CM137 pulse. Following nucleofection, transfected cells were transferred to 96-well plates containing 200 µl prewarmed complete T-cell media per well and incubated at 37°C for 6 hours, preceding retroviral transduction and adoptive transfer into C57BL/6 mice.

List of crRNAs used:

Thy1.2#1:

/AltR1 /rCrCrU rUrGrG rUrGrU rUrArU rUrCrU rCrArU rGrGrG rUrUrU rUrArG rArGrC rUrArU rGrCrU /AltR2/

Thy1.2#2:

/AltR1 /rGrArG rCrArG rGrArG rArGrC rGrArC rGrCrU rGrArG rUrUrU rUrArG rArGrC rUrArU rGrCrU /AltR2/

Stat3#1:

/AltR1/rCrArArCrArUrCrUrGrCrCrUrGrGrArCrCrGrUrCrGrUrUrUrUrArGrArGrCrUrArU rGrCrU/AltR2/

Stat3#2:

/AltR1/rArGrUrUrGrArArArUrCrArArArGrUrCrGrUrCrCrGrUrUrUrUrArGrArGrCrUrArUr GrCrU/AltR2/

IL-21R#1:

/AltR1/rGrUrCrArArUrGrUrGrArCrGrGrArCrCrArGrUrCrGrUrUrUrUrArGrArGrCrUrArU

rGrCrU/AltR2/

IL-21R3#2:

/AltR1/rCrCrCrUrCrCrArArCrUrArCrGrUrGrCrUrGrArGrGrUrUrUrUrArGrArGrCrUrArU

rGrCrU/AltR2/

Gene-set enrichment, STRING network, and pathway analyses

Mouse gene symbols were initially mapped to the orthologous human genes using the homology data from the MGI website (ftp://ftp.informatics.jax.org/pub/reports/HMD_HGNC_ Accession.rpt) and were ranked by the fold changes of the gene expression as profiled by RNA-seq. Subsequently, gene-set enrichment analyses GSEA was performed using ClusterProfiler R package (doi:10.1016/j.xinn.2021.100141). C7 immunologic signature gene set from MSigDB (https://www.gsea-msigdb.org/gsea/msigdb/), was employed for GSEA of naïve/memory and effector signatures. Gene sets of interest were visualized on a bubble plot, generated using the ggplot2 R package. Pathway analysis was performed using Panther DB (https://www.pantherdb.org/). Significant pathways with p-value <0.05 were selected for downstream analysis. Pathways of interest showing a reverse relationship between *Lmo4-Thy1.1* and *Myb*-deficient T cells were visualized on bidirectional bar plot. The *Stat3* gene regulatory network was created using Cytoscape software and STRING database together with our RNA-seq dataset.

Statistical analyses

Two-tailed Student`s *t*-test was performed with Graphpad Prism 9 software for comparison of data such as gene expression levels, cell proliferation, and functionality (numbers and percentages). Comparisons between multiple groups were done with a one-way ANOVA test. Tumor growth graphs were analyzed using Wilcoxon Rank Sum test on tumor growth slopes. For comparison of survival curves, a log-rank (Mantel-Cox) test was used. Fisher's exact test

was used to calculate the significance of the overlapping pathways in the Venn diagram. GSEA's significance was assessed using the Kolmogorov-Smirnov test.

RESULTS

Note: The author gratefully acknowledges the valuable support provided by the co-authors of the recently published paper (Signal Transduct Target Ther. 2024 Aug 9;9(1):199. doi: 10.1038/s41392-024-01915-z.) in the development of the results section of the thesis. The publication addresses the same data as the thesis, which serves as an expanded version for the completion of the author`s PhD.

CRISPRa screen identifies LMO4 as a candidate gene to enhance CD8⁺ T-cell stemness.

To identify transcriptional regulators that could be harnessed to augment stem-like behavior in CD8⁺ T cells beyond physiological function, we analyzed a recently published genome-wide CRISPRa screen dataset[2]. We used interferon-γ (IFN-γ) production as a proxy for terminal differentiation to select the most potent negative regulators of effector programs. Top positive hits included well-established transcription factors that orchestrate effector differentiation such as *EOMES*, *TBX21*, *PRDM1*, and *IRF4* (Fig. 4 and Supplementary Table 1)[25,31]. *MYB* and *BACH2*, which are known regulators of CD8⁺ T-cell stemness[15,18] were among the negative hits, validating the robustness of the assay (Fig. 4 and Supplementary Table 1). Notably, with the exception of *IKZF1*, which has recently been demonstrated to restrain effector differentiation[32], the most significant negative hits have unknown functions in CD8⁺ T-cell memory formation (Supplementary Table 1).

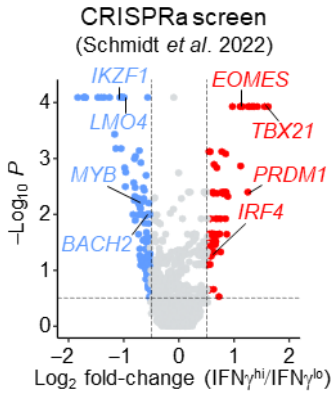


Figure 4. LMO4 is among the most potent negative regulators of effector programs. Volcano plot displaying median sgRNA log_2-fold change (IFN-$g^{hi/lo}$ sorting bin counts) for each gene tested in the genome-wide CRISPRa screen[2]. Genes included in the analysis were exclusively transcription factors or transcription regulators. We acknowledge Nisha Rana for her support in creating the graph for this figure. I gratefully acknowledge Nisha Rana for her support with bioinformatics analyses of public datasets and for granting permission to reproduce the underlying figure based on her data. The design, input selection, and structural decisions for the figure were achieved through my guidance and the mentorship of Prof. Luca Gattinoni, the last author on the project.

To narrow down the list of candidate genes, we analyzed the expression of the top 14 transcriptional regulators in culture conditions favoring the formation of stem-like T cells. It was previously shown that stem-like T cells can be efficiently induced by activating $CD8^+$ T cells in the presence of IL-21 and an inhibitor of lactate dehydrogenase (LDHi)[3]. Several of the candidates, such as *Foxf1*, *Foxf2*, *Foxl2*, *Cebpb* and *Gata6* were not expressed in $CD8^+$ T cells (Supplementary Table 2). Strikingly, only *Lmo4* and *Ikzf1* were upregulated in IL-21 + LDHi cultured cells compared to cells cultured with no cytokine (NC), IL-2, IL-2 + LDHi, or IL-21 (Fig. 5 and Supplementary Table 2).

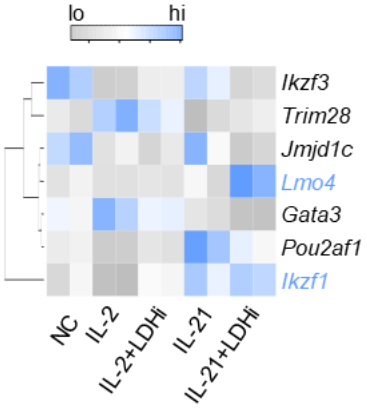


Figure 5. **Only Lmo4 and Ikzf1 were upregulated in IL-21 + LDHi cultured cells**. Heatmap depicting the expression levels (assessed by RNA-seq) of the top negative hits identified in the CRISPRa screen in $CD8^+$ T cells cultured for 4 d under different conditions: No Cytokine (NC), IL-2, IL-2 + LDHi, IL-21, IL-21 + LDHi[3]. I gratefully acknowledge Nisha Rana for her support with bioinformatics analyses of public datasets and for granting permission to reproduce the underlying figure based on her data. The design, input selection, and structural decisions for the figure were achieved through my guidance and the mentorship of Prof. Luca Gattinoni, the last author on the project.

Together, these results reveal that the maintenance of *Lmo4* as a common feature of stem-like T cells, suggesting that modulating its expression might regulate $CD8^+$ T-cell stemness.

Ectopic LMO4 expression promotes the generation of stem-like T cells while restraining terminal differentiation.

To ascertain if $CD8^+$ T-cell stemness could be enhanced by increasing LMO4 expression at supraphysiological levels, we employed a synthetic biology approach to overexpress *Lmo4* in $CD8^+$ T cells and measured their ability to generate long-lived memory cells. We transduced pmel-1 $Ly5.1^+$ T cells (which recognize the shared melanoma–melanocyte differentiation

antigen gp100) with *Lmo4-Thy1.1* or *Thy1.1* and transferred them into wild-type mice infected with gp100-VV (Fig. 6).

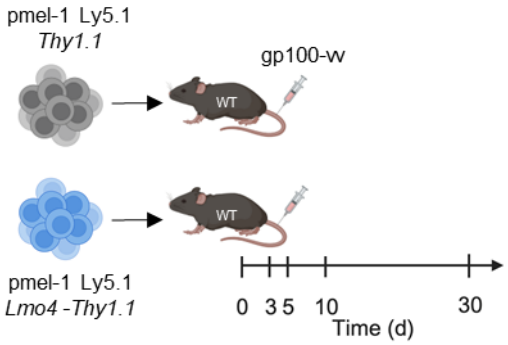


Figure 6. Experimental design to assess the impact of *Lmo4* overexpression on stem-like CD8⁺ T cell formation. The experimental design figure was created by me, with input on the timeline design provided by Prof. Luca Gattinoni, using www.bioRender.com.

Overexpression of LMO4 protein was confirmed by western blotting before adoptive T-cell transfer (Fig. 7).

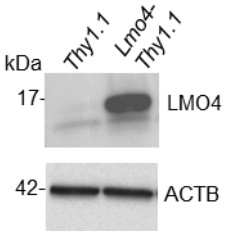


Figure 7. **Confirmation of LMO4 overexpression.** Immunoblot of LMO4 in *Thy1.1* and *Lmo4-Thy1.1* overexpressing T cells. ACTB served as control. The immunoblot experiment was entirely conceptualized by me, with assistance from Fabio Mastrogiovanni and Sree Pulugulla.

We found that enforced expression of *Lmo4* promoted the expansion of pmel-1 T cells, which accumulated in the spleen at almost three-fold the frequency of control *Thy1.1* cells during the expansion phase (day 3) and at the peak (day 5) of the immune response (Fig. 8a, b).

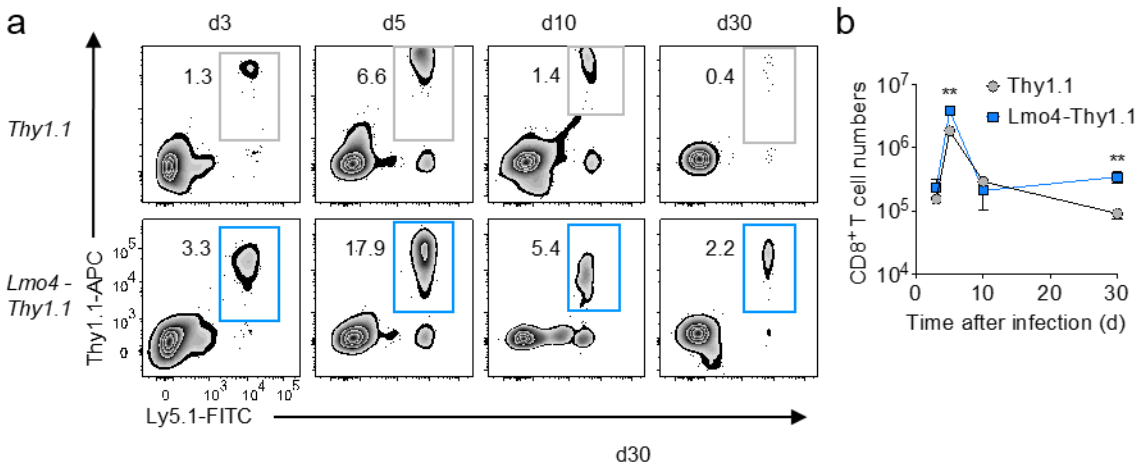


Figure 8. **Lmo4 overexpression enhances in vivo CD8⁺ T cell expansion**. Flow cytometry analysis (**a**) and quantification (**b**) of splenic pmel-1 CD8⁺ T cells following transfer of either 1 x 10^5 pmel-1 Ly5.1⁺ *Thy1.1*⁺ or *Lmo4-Thy1.1*⁺ CD8⁺ T cells into wild-type mice infected with gp100-vv. Assessment was conducted at various time points from 3 to 30 days post-transfer, with three mice per group for each time point. Data are from one representative of 3 experiments. ns, not significant, **P* < 0.05, ***P* < 0.01, (unpaired two-tailed Student's *t*-test). The in vivo experiments, analysis, and corresponding graphs for the underlying figure were created by me, with Jessica Fioravanti's, Ping Chen`s and William G Telford`s assistance in an initial experiment.

Similar findings were observed in lymph nodes and lungs (Fig. 9), indicating that LMO4 overexpression enhances the accumulation of antigen-specific T cells in both lymphoid and peripheral tissues.

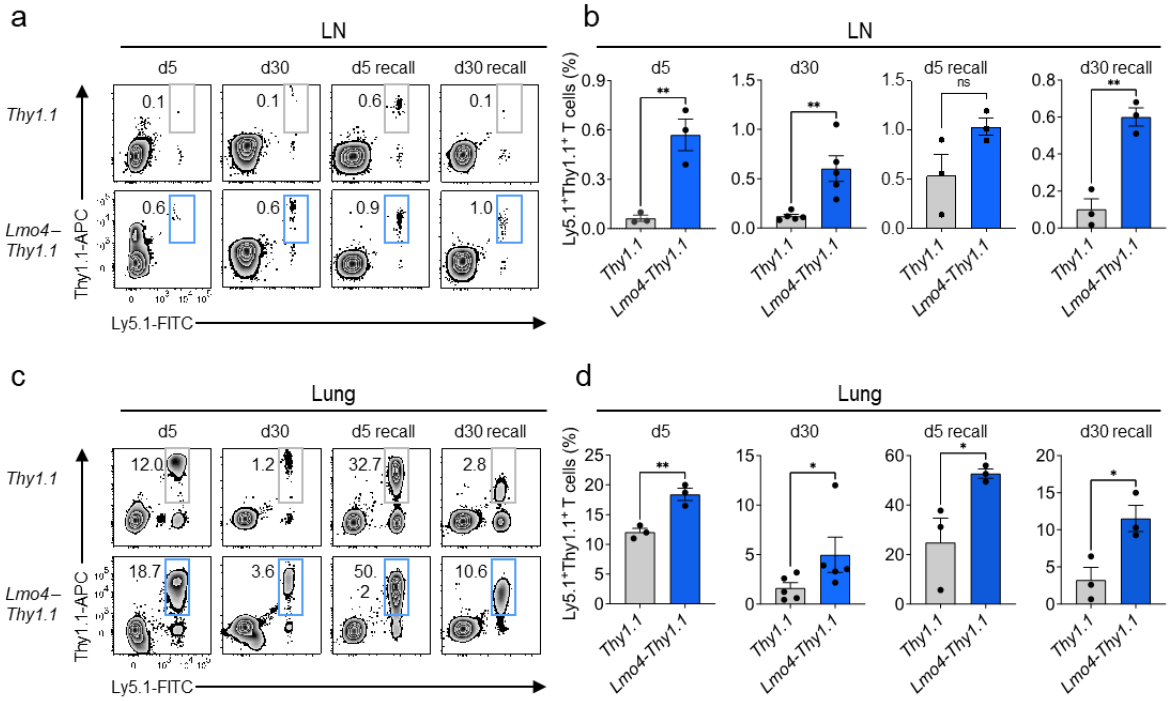


Figure 9: *Lmo4* overexpression enhances CD8⁺ T cell expansion in lymph nodes and lungs. (**a-d**) Flow cytometry analysis (**a, c**) and percentages (**b, d**) of lymphatic (**a, b**) and pulmonary (**c, d**) pmel-1 CD8⁺ T cells following transfer of either 1 x 10^5 pmel-1 Ly5.1⁺ *Thy1.1*⁺ or *Lmo4-Thy1.1*⁺ CD8⁺ T cells into wild-type mice infected with gp100-vv. Assessment was conducted at various time points from 0 to 30 days post-transfer, with three mice for d5, five mice at d30, and three mice each at d5 and d30 recall time points. ns, not significant, **P* < 0.05, ***P* < 0.01, (unpaired two-tailed Student's *t*-test). The in vivo experiments, analysis, and corresponding graphs for the underlying figure were created by me, with Jessica Fioravanti's and Ping Chen`s assistance in an initial experiment.

These differences were amplified in the memory phase of the immune response as manifested by a five-fold increase in pmel-1 *Lmo4-Thy1.1* T-cell frequencies and numbers 30 days after infection (Fig. 8a, b). Similarly, we observed a notable increase in pmel-1 T cells overexpressing *Lmo4* on day 30 in the lungs and an even more pronounced accumulation of these cells in the lymph nodes, which are known to serve as a niche for stem-like T cells[33] (Fig. 9).

We next investigated whether LMO4 overexpression could also qualitatively affect the immune response by altering the frequencies of CD8$^+$ T-cell effector and memory subsets. We found that enforced expression of *Lmo4* restrained terminal effector differentiation, resulting in lower frequencies of CD62L$^-$KLRG1$^+$ short-lived effectors compared to control *Thy1.1* cells both at the peak of expansion (day 5) and in the late memory phase (day 30) (Fig. 10a-d).

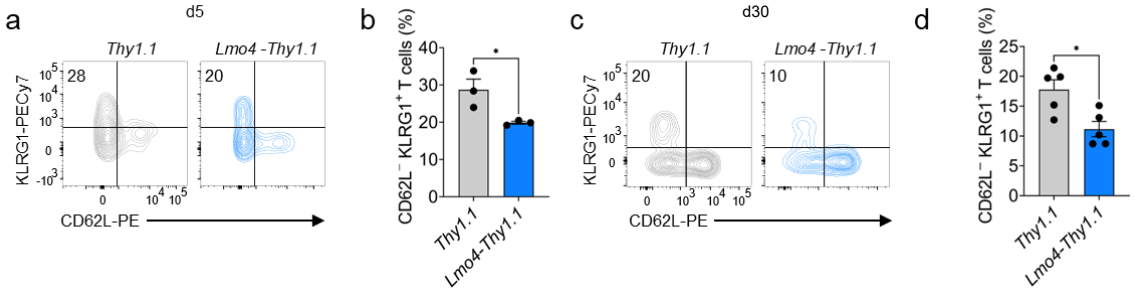


Figure 10. Lmo4 overexpression decreases CD8$^+$ T cell terminal differentiation. (**a, b**) Flow cytometry analysis (**a**) and percentages (**b**) of CD62L$^-$KLRG1$^+$ splenic pmel-1 T cells 5 d after transfer as in (**Fig 8 a,b**). (**c, d**) Flow cytometry analysis (**c**) and percentages (**d**) of CD62L$^-$KLRG1$^+$ splenic pmel-1 T cells 30 d after transfer as in (**Fig 8 a,b**). ns, not significant, **P* < 0.05, ***P* < 0.01, (unpaired two-tailed Student's *t*-test). The in vivo experiments, analysis, and corresponding graphs for the underlying figure were created by me, with Jessica Fioravanti's and Ping Chen`s assistance in an initial experiment.

Conversely, knocking out *Lmo4* (Fig. 11a, b) did not significantly impact pmel-1 T cell accumulation (Fig. 11c-e), but resulted in higher frequencies of CD62L$^-$KLRG1$^+$ short-lived effectors and a decline in CD62L$^+$KLRG1$^-$ memory precursor compared to pmel-1 *Lmo4*$^{fl/fl}$ T cells at day 5 (Fig. 11f-h).

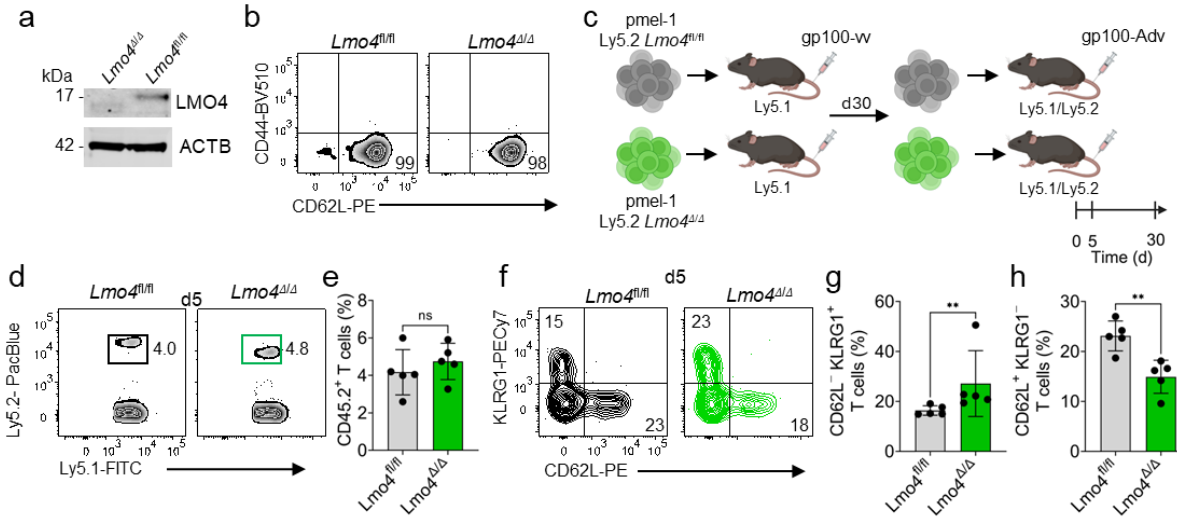


Figure 11. *Lmo4 conditional knockout* impairs the generation of stem-like memory T cells by inducing terminal differentiation. (**a**) Immunoblot showing LMO4 in naive CD8$^+$ T cells from pmel-1

Lmo4$^{fl/fl}$ *Cre-ER*^{T2} (*Lmo4*$^{\Delta/\Delta}$) *and* pmel-1 *Lmo4*$^{fl/fl}$ mice 5 d after intraperitoneal treatment with tamoxifen. ACTB served as control. (**b**) Flow cytometry of pmel-1 *Lmo4*$^{fl/fl}$ and *Lmo4*$^{\Delta/\Delta}$ CD8$^+$ T cells after naive T cell isolation. (**c**) Experimental design investigating LMO4's impact on pmel-1 CD8$^+$ T cell primary and secondary immune responses. (**d, e**) Flow cytometry analysis (**d**) and quantification (**e**) of splenic pmel-1 CD8$^+$ T cells 5 d after transfer of either 10^5 pmel-1 Ly5.2$^+$ *Lmo4*$^{fl/fl}$ or *Lmo4*$^{\Delta/\Delta}$ CD8$^+$ T cells into Ly5.1 mice infected with gp100-vv (with five mice per group for each time point). (**f-h**) Flow cytometry analysis (**f**) and percentages of CD62L$^-$KLRG1$^+$ (**g**) and CD62L$^+$KLRG1$^-$ (**h**) splenic pmel-1 T cells 5 d after transfer as in (**d,e**). ns, not significant, **P* < 0.05, ***P* < 0.01, (unpaired two-tailed Student's *t*-test). The in vivo experiments, analysis and the corresponding graphs for the underlying figure were created entirely by me.

These findings underscore that LMO4 exerts some influence on the control of T-cell differentiation, even when expressed at low physiological levels. As T cells undergo differentiation into terminal effectors, they progressively lose the capacity to produce various types of cytokines, ultimately transitioning into monofunctional IFN-γ producers. To determine if LMO4 overexpression also affect CD8$^+$ T-cell function, we measured IL-2, TNF-α, and IFN-γ production in memory T cells by intracellular cytokine staining (ICS). We found that LMO4-overexpressing cells not only exhibited increased frequencies of cytokine-producing cells but that most of these cells displayed stronger polyfunctionality (i.e. produced 2 or more cytokines) (Fig. 12a-d).

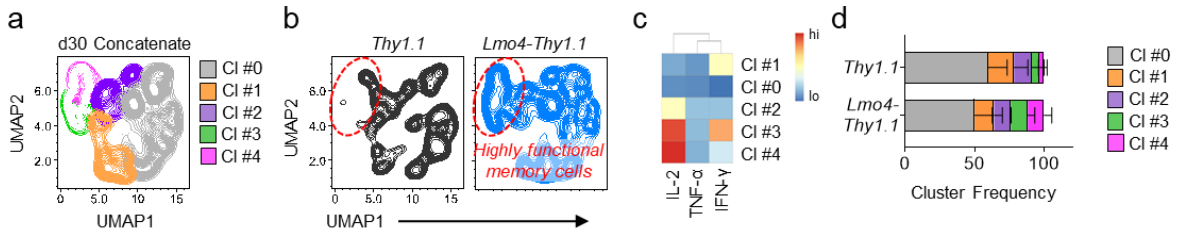


Figure 12. Lmo4 overexpression enhances CD8$^+$ T cell polyfunctionality. Flow**:** (**a**) UMAP plot of concatenated *Thy1.1*$^+$ and *Lmo4-Thy1.1*$^+$ pmel-1 CD8$^+$ T cells isolated from spleens 5 d after treatment as in (**Fig 8 a,b**) showing the distribution of clusters (Cl) identified by FlowSOM. (**b**) UMAP plot of concatenated *Thy1.1*$^+$ and *Lmo4-Thy1.1*$^+$ pmel-1 CD8$^+$ T cells showing differences in cluster distributions. (**c**) Heatmap showing the relative expression levels of indicated cytokines in the FlowSOM clusters. (**d**) "Bar plot of *Thy1.1*$^+$ and *Lmo4-Thy1.1*$^+$ pmel-1 CD8$^+$ T cells isolated from spleens 5 d after treatment as in (**Fig 8 a,b**) quantifying the distribution of clusters assessed by FlowSOM. **P* < 0.05, ***P* < 0.01, (unpaired two-tailed Student's *t*-test). The in vivo experiments, analysis, and corresponding graphs for the underlying figure were created by me, with Jessica Fioravanti's assistance in an initial experiment.

Notably, the ability of LMO4-transduced CD8$^+$ T cells to produce IL-2 could serve as a potential mechanism for sustaining their proliferative advantage through autocrine or paracrine signals[34]. Taken together, these findings demonstrate that enhancing *Lmo4* expression in

$CD8^+$ T cells is an effective strategy to enhance the generation of polyfunctional stem-like memory T cells.

LMO4 overexpression enhances $CD8^+$ T-cell recall responses.

Having established LMO4 as a key regulator of $CD8^+$ T-cell differentiation and formation of stem-like memory T cells, we next investigated if LMO4-overexpression could promote more robust recall responses after secondary infection. Thirty days after primary infection with gp100-vv, we isolated pmel-1 T cells overexpressing *Lmo4-Thy1.1* or *Thy1.1* and transferred them in equal numbers into new wild-type hosts together with a gp100-encoding adenovirus type 2 (gp100-A dv) (Fig. 13).

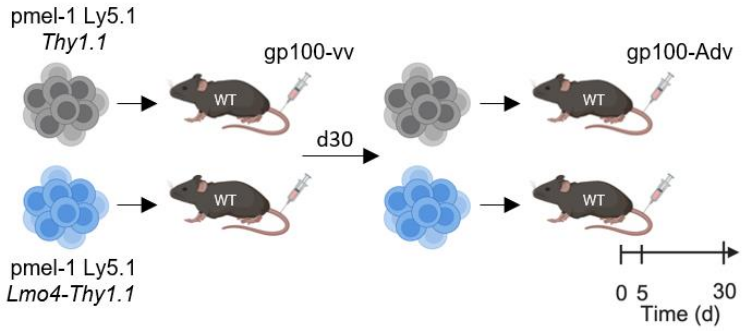


Figure 13: Experimental design investigating the impact of *Lmo4* overexpression on $CD8^+$ T cell secondary responses. The experimental design figure was created by me, with input on the timeline design provided by Prof. Luca Gattinoni, using www.bioRender.com.

Strikingly, as in primary infection, we observed an increased expansion of LMO4-overexpressing T cells at the peak of the recall response (day 5) and an even greater accumulation in the secondary memory phase (day 30) in all organs examined (Fig. 14a-d and Fig. 9). Similar to primary infection, we detected marked differences in T-cell accumulation in lymph node reservoirs (Fig. 9a, b). Repetitive antigen stimulation is known to drive $CD8^+$ T cells toward terminal differentiation, while progressively reducing the pool of stem-like T cells[35].

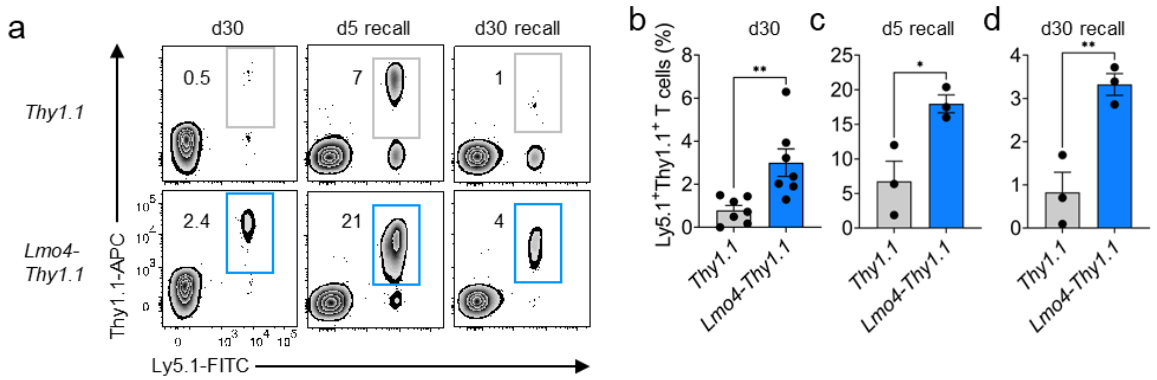


Figure 14. Lmo4 overexpression enhances in vivo CD8⁺ T cell expansion after secondary infection. (**a-d**) Flow cytometry analysis (**a**) and percentages (**b-d**) of splenic pmel-1 CD8⁺ T cells following transfer of either 1 x 10^5 pmel-1 Ly5.1⁺ *Thy1.1*⁺ or *Lmo4-Thy1.1*⁺ CD8⁺ T cells into wild-type mice infected with gp100-vv (primary infection) or gp100-Adv (secondary infection). Assessment was conducted at various time points: d30 after primary infection and d5 or d30 after secondary infection (recall); with seven mice per group for d30 and three mice per group for d5 recall and d30 recall. **P* < 0.05, ***P* < 0.01, (unpaired two-tailed Student's *t*-test). The in vivo experiments, analysis, and corresponding graphs for the underlying figure were created by me, with Jessica Fioravanti's assistance in an initial experiment..

We found that enforced expression of *Lmo4* reduced the percentage of CD62L⁻KLRG1⁺ terminal effectors whereas it doubled the frequencies of stem-like CD62L⁺KLRG1⁻ T cells 30 days after secondary infection with gp100-Adv (Fig. 15a-c).

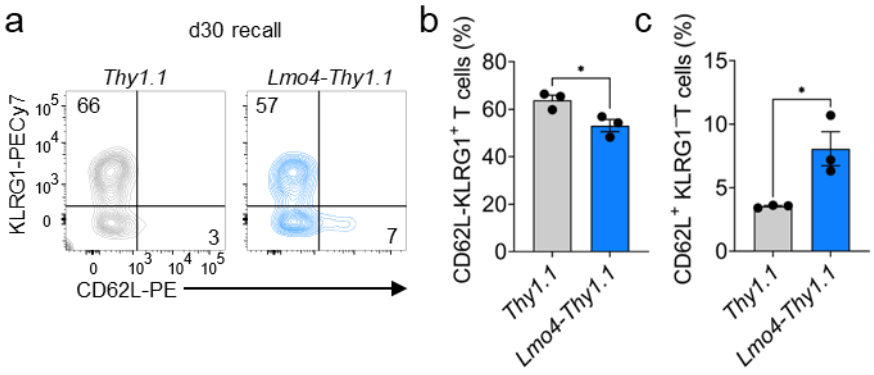


Figure 15. *Lmo4* overexpression promotes the generation of stem-like memory T cells by restraining terminal differentiation. (**a-c**) Flow cytometry analysis (**a**) and percentages of CD62L⁻KLRG1⁺ (**b**) and CD62L⁺KLRG1⁻ (**c**) splenic pmel-1 T cells 5 d after transfer as in (**Fig. 14a-d**). **P* < 0.05, ***P* < 0.01, (unpaired two-tailed Student's *t*-test). The in vivo experiments, analysis, and corresponding graphs for the underlying figure were created by me, with Jessica Fioravanti's assistance in an initial experiment.

Again, we did not observe significant defects in pmel-1 T-cell recall expansion when *Lmo4* was knocked out (Fig.16a, b), but we consistently measured greater differentiation into KLRG1⁺ effectors in pmel-1 *Lmo4*$^{\Delta/\Delta}$ T cells compared to controls (Fig. 16c-e).

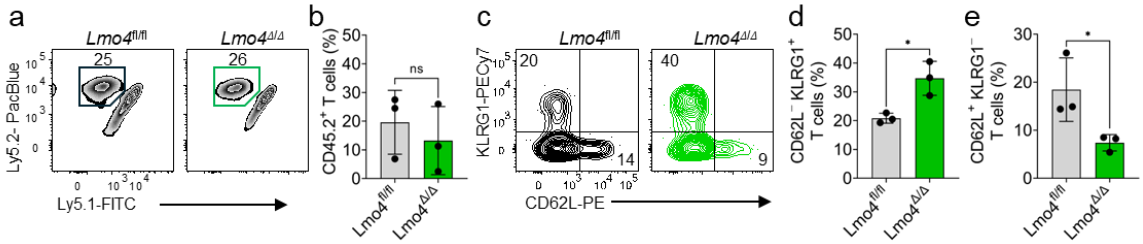


Figure 16. *Lmo4 conditional knockout* impairs the generation of stem-like memory T cells by inducing terminal differentiation. (**a, b**) Flow cytometry analysis (**a**) and quantification (**b**) of splenic pmel-1 CD8$^+$ T cells 5 d after transfer of either 1 x 10^5 pmel-1 Ly5.2$^+$ *Lmo4*$^{fl/fl}$ or *Lmo4*$^{\Delta/\Delta}$ CD8$^+$ T cells into Ly5.1/Ly5.2 mice secondary infected with gp100-Adv (with three mice per group for each time point). (**c-e**) Flow cytometry analysis (**c**) and percentages of CD62L$^-$KLRG1$^+$ (**d**) and CD62L$^+$KLRG1$^-$ (**e**) splenic pmel-1 T cells 5 d after transfer as in (**a, b**). ns, not significant, **P* < 0.05, ***P* < 0.01, (unpaired two-tailed Student's *t*-test). The in vivo experiments, analysis and the corresponding graphs for the underlying figure were created entirely by me.

Similar to primary infections, we also observed that overexpression of LMO4 boosted secondary memory CD8$^+$ T-cell polyfunctionality (Fig. 17a-d).

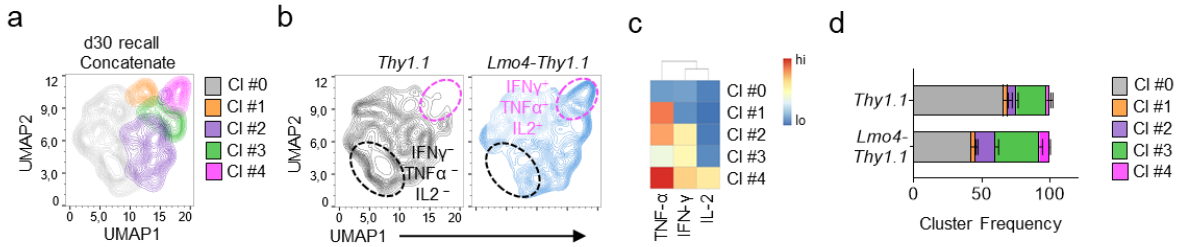


Figure 17. Lmo4 overexpression enhances CD8$^+$ T cell polyfunctionality after secondary infection. (**a**) UMAP plot of concatenated *Thy1.1*$^+$ and *Lmo4-Thy1.1*$^+$ pmel-1 CD8$^+$ T cells isolated from spleens 30 d after secondary transfer as in (**Fig. 14 a-d**) showing the distribution of clusters (Cl) identified by FlowSOM. (**b**) UMAP plot of *Thy1.1*$^+$ and *Lmo4-Thy1.1*$^+$ pmel-1 CD8$^+$ T cells showing differences in cluster distributions. (**c**) Heatmap showing the relative expression levels of indicated cytokines in the FlowSOM clusters. (**d**) Bar plot of *Thy1.1*$^+$ and *Lmo4-Thy1.1*$^+$ pmel-1 CD8$^+$ T cells isolated from spleens 5 d after treatment as in (**Fig. 14 a-d**) quantifying the distribution of clusters assessed by FlowSOM. **P* < 0.05, ***P* < 0.01, (unpaired two-tailed Student's *t*-test). The in vivo experiments, analysis, and corresponding graphs for the underlying figure were created by me, with Jessica Fioravanti's assistance in an initial experiment.

Taken together, these results show that elevated levels of LMO4 enhance CD8$^+$ T-cell recall responses and facilitate the maintenance of a robust pool of stem-like T cells.

Enforced expression of LMO4 promotes superior CD8$^+$ T-cell antitumor responses.

Given the ability of LMO4 overexpression to enhance stem-like T-cell formation, we sought to determine whether LMO4 overexpression could potentiate the therapeutic efficacy of pmel-1 T cells in a model of neoantigen-targeted adoptive immunotherapy. We adoptively transferred

pmel-1 T cells overexpressing *Lmo4-Thy1.1* or *Thy1.1* control into wild-type mice bearing subcutaneous B16 melanomas carrying the mutated gp100 epitope (KVP)[30]. To enhance the expansion and function of transferred T cells, we co-delivered a gp100-vv vaccine intravenously and administered high doses of IL-2 intraperitoneally (Fig. 18).

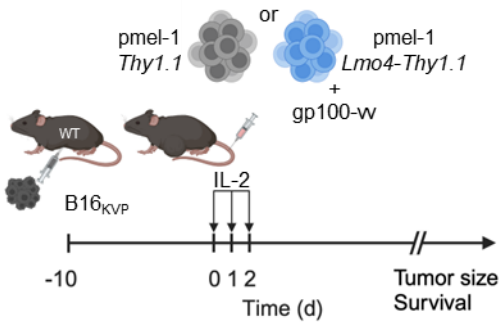


Figure 18: Experimental design investigating the effect of Lmo4 overexpression on the antitumor immune response of CD8⁺ T cells. The experimental design figure was created by me, with input on the timeline design provided by Prof. Luca Gattinoni, using www.bioRender.com.

We found that pmel-1 T cells overexpressing LMO4 were much more effective at controlling tumor growth than control cells (Fig. 19a). This robust antitumor effect led to curative responses in eight out of nine mice. In contrast, *Thy1.1* control cells were able to cure only a small fraction of the animals (Fig. 19b).

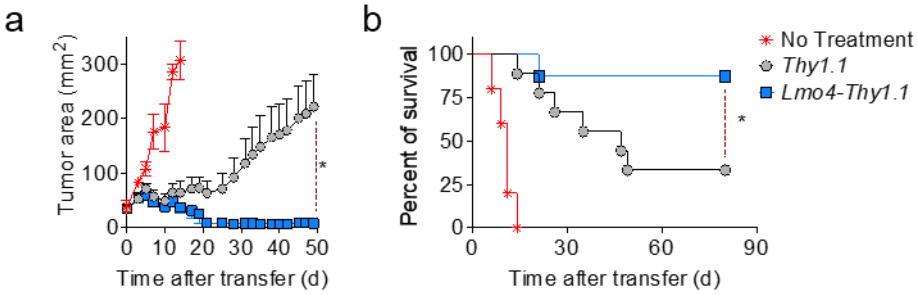


Figure 19. Enforced expression of *Lmo4* enhances CD8⁺ T cell antitumor immunity against melanoma. (**a, b**) Tumor size (**a**) and survival curve (**b**) of $B16_{KVP}$ tumor-bearing wild-type mice after transfer of either 3.5 x 10^5 pmel-1 *Thy1.1*⁺ or *Lmo4-Thy1.1*⁺ CD8⁺ T cells into wild-type mice treated with gp100-vv and IL-2. **P* < 0.05, ***P* < 0.01, (**a**, Wilcoxon rank sum test; **b**, log-rank (Mantel–Cox) test). The in vivo experiments, analysis, and corresponding graphs for the underlying figure were created by me, with Jessica Fioravanti's assistance in an initial experiment and technical help from Patrick Grandinetti.

To gauge the relevance of this approach in humans, we sought first to ascertain whether ectopic expression of LMO4 could be employed to enhance the generation of human stem-like T cells. We activated naive CD8$^+$ T cells in the presence of IL-21 and IL-7, a combination of cytokines commonly used in the production of clinical-grade CAR stem-like T cells[11], and subsequently transduced them with either *LMO4-Thy1.1* or *Thy1.1* control. Strikingly, LMO4 overexpression significantly increased the formation of T memory stem cells (T_{SCM}) across several donors (Fig. 20a, b).

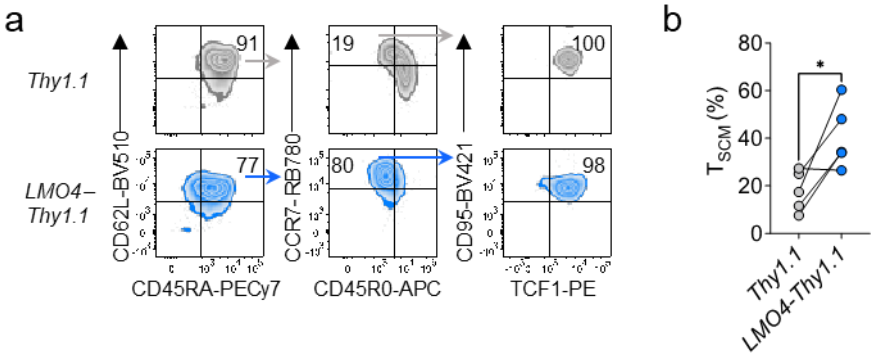


Figure 20. Ectopic expression of LMO4 could be employed to enhance the generation of human stem-like T cells. (**a**) Representative flow cytometry plot depicting the gating strategy to assess the frequency of human T_{SCM} cells, defined as CD45RA$^+$CD45R0$^-$CD62L$^+$CCR7$^+$CD95$^+$TCF1$^+$ cells. (**b**) Percentage of T_{SCM} cells in *LMO4-Thy1.1* and *Thy1.1* transduced CD8$^+$ T cells after activation by TransAct and subsequent culture in IL-7 and IL-21 for 7 days (n = 5). *P < 0.05, **P < 0.01, (unpaired two-tailed Student's t-test). The underlying experiment and graph creation were directed by me, with technical assistance from Pedro Noronha and Azucena Martin-Santos. Christoph Heuser-Loy contributed to result analysis, and Dragana Slavkovic-Lukic assisted with the initial experimental design.

We next evaluated whether the LMO4 technology could be adopted to potentiate the efficacy of human CAR T cells in a xenograft model of acute lymphoblasts leukemia (NALM6-GL)[11] (Fig. 21).

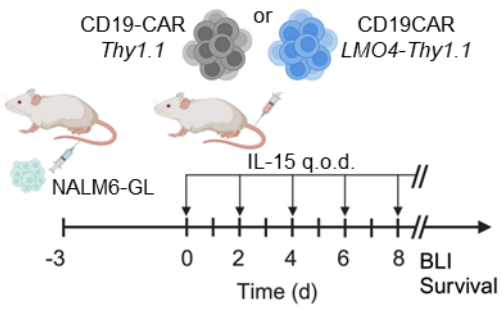


Figure 21. Experimental design investigating the effect of LMO4 overexpression on the antitumor immune response of human CD19-CAR-modified CD8$^+$ T cells (n = 5 to 7 mice/group). The

experimental design figure was created by me, with input on the timeline design provided by Prof. Luca Gattinoni, using www.bioRender.com.

Overexpression of LMO4 promoted the expansion of $CD8^+$ T cells in the circulation of NALM6-bearing NXG mice seven days after adoptive transfer (Fig. 22a). This enhanced engraftment was associated with improved tumor control and prolonged animal survival (Fig. 22b, c).

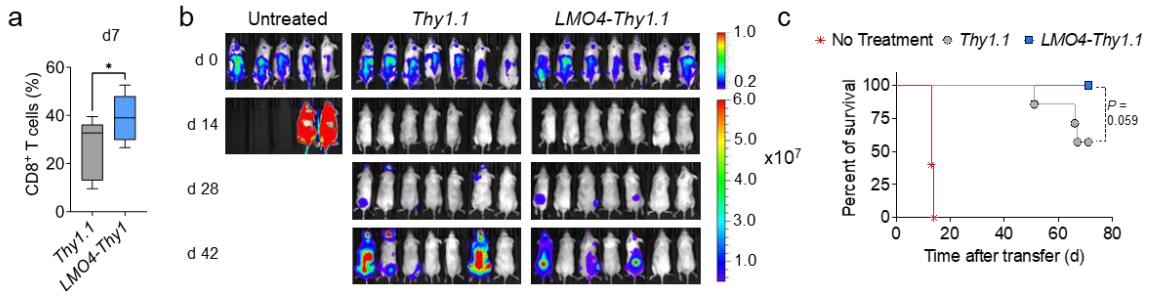


Figure 22. Enforced expression of *Lmo4* enhances $CD8^+$ T cell antitumor immunity against acute lymphoblastic leukemia. (**a**) Percentage of human $CD8^+$ T cells in the peripheral blood of NXG mice bearing NALM6-GL leukemia 7 days after adoptive transfer of *LMO4-Thy1.1* or *Thy1.1* CD19-CAR $CD8^+$ T cells in conjunction with recombinant human IL-15. (**b**) *In vivo* bioluminescent imaging and (**c**) survival of NALM6-GL-bearing NXG mice treated as in (**a**). (*$P < 0.05$ **a**, unpaired one-tailed Student's *t*-test, **c**, $P = 0.0597$ log-rank (Mantel-Cox) test). The underlying experiment and the graphs were conceptualized and analyzed by me, with technical assistance from Jeremy Baldwin.

These findings highlight the potential of LMO4 overexpression to enhance T-cell therapy, demonstrating efficacy not only in syngeneic tumor models but also in human xenograft settings.

LMO4 overexpression promotes transcriptional programs regulating stemness.

To elucidate the molecular mechanisms by which LMO4 influences $CD8^+$ T-cell memory differentiation and antitumor immunity, we performed RNA-seq of LMO4-overexpressing pmel-1 T cells and control pmel-1 T cells harvested 5 d after adoptive transfer into mice infected with gp100-vv. To avoid potential misinterpretation arising from transcriptional variances influenced by the skewed composition of T-cell subsets in control and LMO4-overexpressing T cells, we sorted a homogenous population of $CD62L^-KLRG1^-$ cells with purities exceeding 99%. We found 889 upregulated and 776 downregulated genes ($p < 0.05$) between LMO4-overexpressing T cells and Thy1.1 (Supplementary Table 3). Even after phenotypic subset

normalization *Lmo4-Thy1.1* transduced cells expressed higher levels of genes known to regulate memory T-cell differentiation. In particular, *Tcf7*, a pivotal regulator of T-cell stemness and longevity[16], was highly expressed in LMO4-overexpressing T cells compared to control cells. Similarly, *Socs3*, a suppressor of cytokine signaling that has been shown to prevent terminal differentiation by shielding developing memory CD8$^+$ T cells from inflammatory cytokines[20], was elevated in LMO4-overexpressing T cells. LMO4-overexpressing T cells also displayed increased mRNA levels of *Zfp36*, an RNA-binding protein that was recently shown to dampen CD8$^+$ T-cell effector responses, facilitating the formation of memory precursors[36]. The AP-1 transcription factor subunit *Junb* was upregulated in CD8$^+$ T cells expressing heightened levels of LMO4. AP-1 has been mostly linked to effector differentiation[18], but recent evidence has demonstrated the role of its subunits for T-cell survival and stemness[37]. Conversely, control cells displayed heightened expression of effector transcripts, such as *Prdm1*, *Zeb2*, and *Klrg1* (Fig. 23).

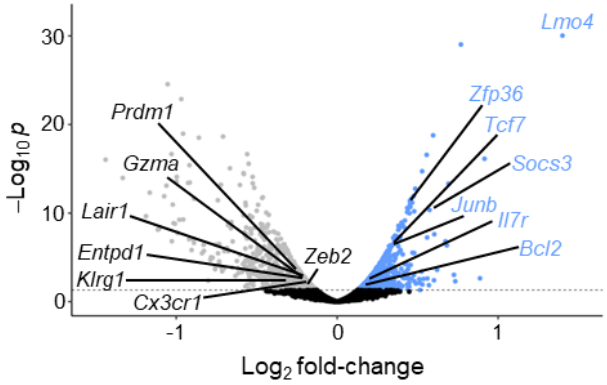


Figure 23. Volcano plot displaying changes in gene expression between pmel-1 *Thy1.1*$^+$ and *Lmo4-Thy1.1*$^+$ CD8$^+$ T cells. Gene expression was evaluated by RNA-seq of pmel-1 CD62L$^-$KLRG1$^-$ T cells collected 5 d after transfer of 10^5 pmel-1 *Thy1.1*$^+$ and *Lmo4-Thy1.1*$^+$ CD8$^+$ T cells into wild-type mice infected with gp100-vv (n = 5 mice/group). The underlying experiment was conceptualized and performed by me, with bioinformatics analysis conducted by Nisha Rana and Peng Li and technical help by Jian-Xin Lin and Jangsuk Oh. The input selection, and structural decisions for the figure were made through my guidance and the mentorship of Prof. Luca Gattinoni, the last author on the project. Claudia Gebhard, Jian-Xin Lin and Jangsuk Oh assisted with the initial experimental design. Michael Rehli contributed to result analysis and assisted with the initial experimental design.

Accordingly, Gene Set Enrichment Analysis (GSEA) revealed that *Lmo4*-overexpressing cells exhibited enrichment for gene sets linked to naive and memory CD8$^+$ T cells or IL-7R^{hi} memory precursors (Fig. 24). By contrast, gene signatures associated with effectors as well as TCF1-deficient memory T cells, were negatively enriched (Fig. 24).

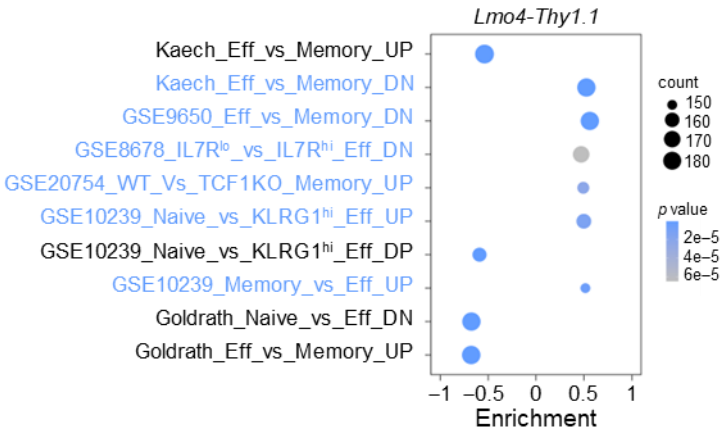


Figure 24. Bubble plot illustrating significantly enriched pathways related to CD8$^+$ T cell memory and effector differentiation. The underlying experiment was conceptualized and performed by me, with bioinformatics analysis conducted by Nisha Rana and Peng Li and technical help by Jian-Xin Lin and Jangsuk Oh. The input selection, and structural decisions for the figure were made through my guidance and the mentorship of Prof. Luca Gattinoni, the last author on the project. Claudia Gebhard, Jian-Xin Lin and Jangsuk Oh assisted with the initial experimental design. Michael Rehli contributed to result analysis and assisted with the initial experimental design.

Remarkably, ectopic expression of LMO4 upregulated genes that are universally characteristic of stem-like T cells across various diseases, including acute and chronic viral infections as well as tumors[4] (Fig. 25, Supplementary Table 4).

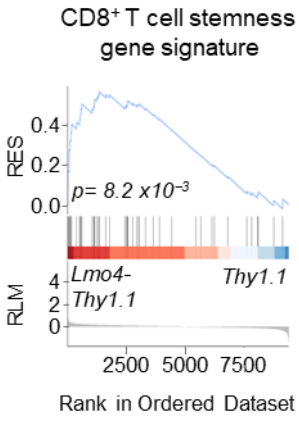


Figure 25. GSEA revealing positive enrichment of genes universally characteristic of stem-like T cells[4], in pmel-1 *Lmo4-Thy1.1*$^{+}$ CD8^{+} T cells. P-value was calculated with Kolmogorov-Smirnov test. The underlying experiment was conceptualized and performed by me, with bioinformatics analysis conducted by Nisha Rana and Peng Li and technical help by Jian-Xin Lin and Jangsuk Oh. The input selection, and structural decisions for the figure were made through my guidance and the mentorship of Prof. Luca Gattinoni, the last author on the project. Claudia Gebhard, Jian-Xin Lin and Jangsuk Oh assisted with the initial experimental design. Michael Rehli contributed to result analysis and assisted with the initial experimental design.

c-Myb has been recently identified as a key transcription factor promoting CD8^{+} T cell stemness[15,38]. To assess the degree to which LMO4 and c-Myb regulate overlapping transcriptional programs associated with stemness, we conducted pathway analysis on *Lmo4*-overexpressing cells. We then compared these results with those obtained from pmel-1 CD8^{+} *Myb*$^{\Delta/\Delta}$ T cells, which were previously generated under identical experimental conditions[15]. Out of the 174 pathways significantly enriched in *Lmo4-Thy1.1,* 74 (42.5%) displayed opposite enrichment patterns in *Myb*-deficient cells ($p < 0.00001$) (Fig. 26a, Supplementary Table 5). Strikingly, many of the upregulated pathways in *Lmo4*-overexpressing cells were associated with stemness, including the regulation of WNT[16], Hedgehog[39], and NRF2 (also known as NFE2L2) signaling[40] (Fig. 26b). Additionally, pathways related to mitochondrial metabolism, vital for the fitness of stem-like memory cells[41], were also prominently upregulated (Fig. 26b). Inhibition of the MAPK pathway has similarly been associated with the development of stem-like T cells[42]. Notably, ectopic expression of LMO4 led to the upregulation of gene sets associated with the negative regulation of this signaling pathway (Fig. 26b). Among the negatively enriched pathways in *Lmo4-Thy1.1* cells, only one was oppositely regulated in *Myb*$^{\Delta/\Delta}$ T cells. This pathway relates to the ATR response to replication stress[43] (Fig. 26b), suggesting that LMO4 overexpression promoted cellular quiescence during the peak of the immune response, which likely facilitates the commitment of cells to enter the memory pool[44].

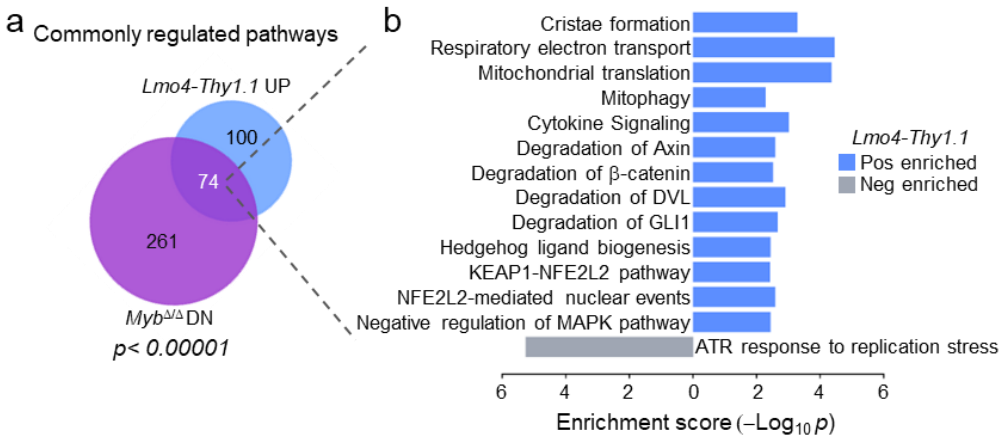


Figure 26. Pathways significantly enriched in *Lmo4-Thy1.1*, displaying opposite enrichment patterns in *Myb*-deficient cells. (**a**) Venn diagram illustrating the overlap between pathways significantly upregulated in *Lmo4-Thy1.1*$^{+}$ and down-regulated in *Myb*$^{\Delta/\Delta}$ pmel-1 CD8^{+} T cells, generated under identical experimental conditions, described in (**Fig. 23**). (**b**) Bidirectional bar plot displaying the enrichment scores of selected enriched pathways in *Lmo4-Thy1.1* and *Myb*$^{\Delta/\Delta}$ pmel-1 CD8^{+} T cells. (**a**) P-value was calculated with Fisher's Exact Test. The underlying *Lmo4-Thy1.1*$^{+}$ experiment was conceptualized and performed by me, with bioinformatics analysis carried out by Nisha Rana and Peng Li, with technical help from Jian-Xin Lin and Jangsuk Oh. The *Myb*$^{\Delta/\Delta}$ data was extracted from another publication[15] and analyzed by Nisha Rana. The design, input selection, and structural decisions for the figure were made through my guidance and the mentorship of Prof. Luca Gattinoni, the last author of the project. Claudia Gebhard, Jian-Xin Lin and Jangsuk Oh assisted with the initial experimental design. Michael Rehli contributed to result analysis and assisted with the initial experimental design.

Taken together, these findings highlight the capacity of LMO4 to orchestrate several transcriptional programs associated with stemness and cellular fitness.

LMO4 overexpression boosts IL-21-mediated STAT3 signaling to orchestrate a memory-promoting gene regulatory network.

Among the pathways influenced by both LMO4 and c-Myb manipulation, we also observed a pathway related to cytokine signaling (Fig. 26b), which includes several molecules involved in STAT signaling. Interestingly, *Tcf7*, *Zfp36*, *Socs3,* and *Junb* are all known targets of STAT3[6], implying a potential involvement of the STAT3 pathway in the actions of LMO4. To substantiate this hypothesis, we first validated our RNA-seq results by q-PCR, confirming the upregulation of these pro-memory factors in *Lmo4*-overexpressing cells (Fig. 27).

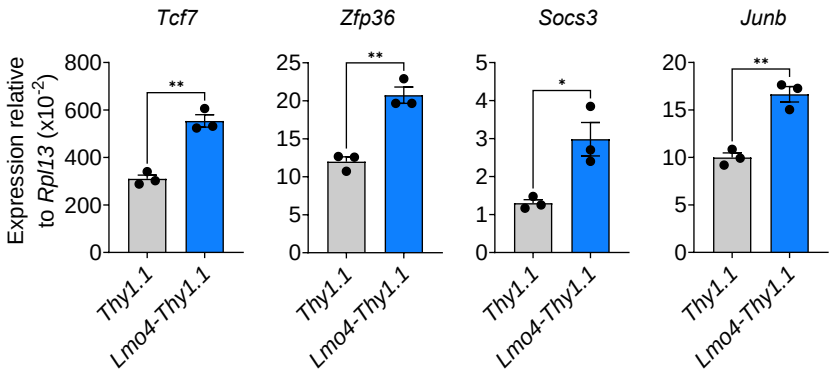


Figure 27. Upregulation of pro-memory factors in *Lmo4*-overexpressing cells. qPCR of *Tcf7*, *Zfp36*, *Socs3*, and *Junb* mRNA in pmel-1 *Thy1.1*$^+$ and *Lmo4-Thy1.1*$^+$ CD8$^+$ T cells 5 d after transfer of 10^5 pmel-1 CD8$^+$ T cells transduced with either *Thy1.1*$^+$ or *Lmo4-Thy1.1*$^+$ into wild-type mice infected with gp100-vv. **P* < 0.05, ***P* < 0.01, (unpaired two-tailed Student's *t*-test). The in vivo experiments, analysis and the corresponding graphs for the underlying figure were created entirely by me.

We then conducted GSEA utilizing STAT3 datasets. We found that *Lmo4-Thy1.1* T cells exhibited an enrichment of STAT3-dependent genes that are upregulated in CD4$^+$ T cells in response to IL-21[5], whereas *Myb*-deficient cells were negatively enriched (Fig. 28a, b, Supplementary Table 6). Moreover, LMO4-overexpressing T cells were enriched with genes displaying one or more STAT3 binding motifs[6] (GSEA C3:STAT3_02) (Fig. 28a, Supplementary Table 7).

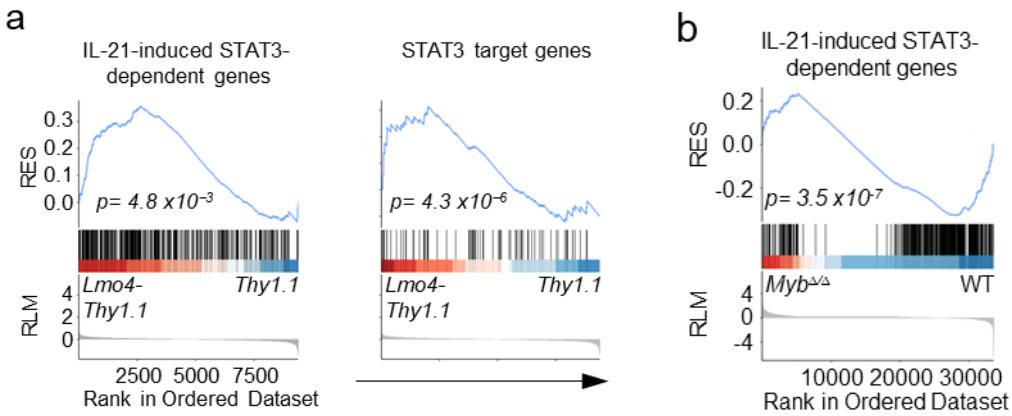


Figure 28. Enrichment of genes upregulated in response to IL-21 and genes displaying one or more STAT3 binding motifs. (a) GSEA showing positive enrichment of genes upregulated in response to IL-21 in CD4$^+$ T cells[5] (left panel) and genes displaying one or more STAT3 binding motifs[6] (GSEA C3:STAT3_02) (right panel) in pmel-1 *Lmo4-Thy1.1*$^+$ CD8$^+$ T cells harvested as in (**Fig. 27**). (**b**) GSEA showing negative enrichment of genes upregulated in response to IL-21 in CD4$^+$ T cells[41] in CD62L$^-$ KLRG1$^-$*Myb*$^{D/D}$ CD8$^+$ T cells isolated 5 d after transfer of 10^5 pmel-1 *Myb*$^{D/D}$ CD8$^+$ T cells into wild-type

mice infected with gp100-vv. Results are shown in comparison to pmel-1 *Myb*$^{+/+}$ CD8^{+} T cells (WT). P-value was calculated with the Kolmogorov-Smirnov test. (*P < 0.05; ** P < 0.001, Kolmogorov-Smirnov test). The underlying *Lmo4-Thy1.1*$^{+}$ experiment was conceptualized and performed by me, with bioinformatics analysis carried out by Nisha Rana and Peng Li., with technical help from Jian-Xin Lin and Jangsuk Oh The *Myb*$^{\Delta/\Delta}$ data was extracted from another publication[15] and analyzed by Nisha Rana. The design, input selection, and structural decisions for the figure were made through my guidance and the mentorship of Prof. Luca Gattinoni, the last author of the project. Claudia Gebhard, Jian-Xin Lin and Jangsuk Oh assisted with the initial experimental design. Michael Rehli contributed to result analysis and assisted with the initial experimental design.

Notably, *Lmo4, Tcf7*, *Junb, Socs3,* and *Zfp36* were interconnected in a complex gene regulatory network that interfaces with *Stat3* (Fig. 29).

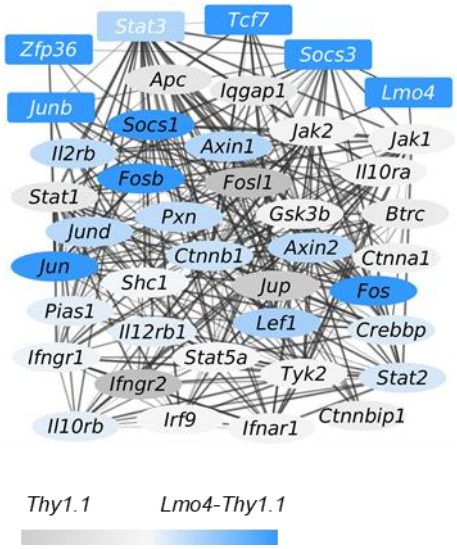


Figure 29. Gene regulatory network that interfaces with *Stat3* in pmel-1 *Thy1.1*$^{+}$ vs. *Lmo4-Thy1.1*$^{+}$ CD8^{+} T cells. Genes upregulated in *Thy1.1* cells are shown in gray color gradient, whereas those overexpressed in *Lmo4-Thy1.1* cells are marked in blue gradient. Network was created using Cytoscape software and STRING database. Line thickness of network edges indicates the strength of data support for each interaction based on the information available in the STRING database. The underlying experiment was conceptualized and performed by me, with bioinformatics analysis conducted by Nisha Rana and Peng Li and technical help by Jian-Xin Lin and Jangsuk Oh. The input selection, and structural decisions for the figure were made through my guidance and the mentorship of Prof. Luca Gattinoni, the last author on the project. Claudia Gebhard, Jian-Xin Lin and Jangsuk Oh assisted with the initial experimental design. Michael Rehli contributed to result analysis and assisted with the initial experimental design.

Taken together, these analyses further corroborate an enhancement of STAT3 signaling in LMO4-overexpressing CD8^{+} T cells.

LMO4 has been previously demonstrated to enhance STAT3 signaling in Jurkat cells, by stabilizing the IL-6-gp130 complex, via gp130, and JAKs binding[45]. Furthermore, LMO4 has

been shown to enhance the activity of the STAT3 pathway in response to diverse STAT3-signaling molecules[46]. IL-6[47], IL-10[20], and IL-21[26,28] are well-established STAT3-signaling cytokines that promote CD8$^+$ T-cell memory, and they commonly signal through the recruitment of JAK1 to their receptors. Immunoprecipitation of JAK1 in *Lmo4-Thy1.1* T cells revealed that LMO4 directly interacts with JAK1 in primary CD8$^+$ T cells (Fig. 30), underscoring its potential involvement in boosting STAT3 signaling upon binding of IL-6, IL-10, and IL-21.

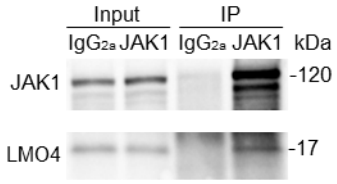
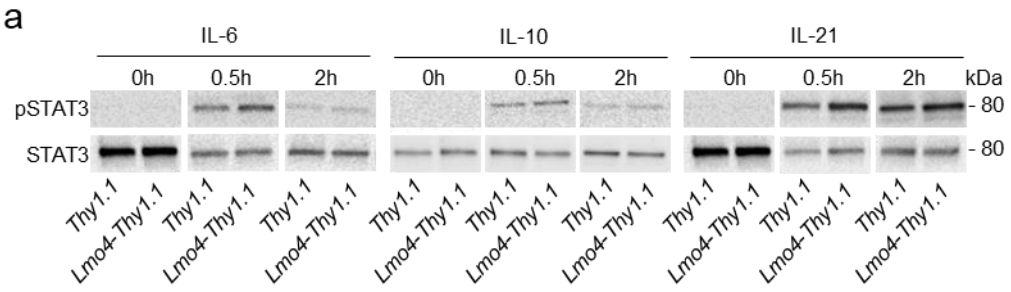


Figure 30. LMO4 directly interacts with JAK1 in primary CD8$^+$ T cells. Immunoblot of *Lmo4-Thy1.1* CD8$^+$ T cell lysates and anti-JAK1 immunoprecipitates blotted with JAK1 and LMO4 specific antibodies. Anti-IgG2a immunoprecipitates were used as controls. The co-immunoprecipitation experiment was conceptualized by me, with assistance from Fabio Mastrogiovanni.

To determine which of these cytokines had a predominant effect in our system, we stimulated *Lmo4-Thy1.1* or *Thy1.1* T cells with each of these cytokines and measured the level of phosphorylated STAT3 (pSTAT3) at different time points. IL-6 and IL-21 induced a more pronounced STAT3 phosphorylation in LMO4-overexpressing T cells compared to controls (Fig. 31a, b). IL-10, on the other hand, induced pSTAT3 without noticeable differences between the two experimental groups (Fig. 31a, b), indicating that this cytokine does not play a major role in the pro-memory function of LMO4.



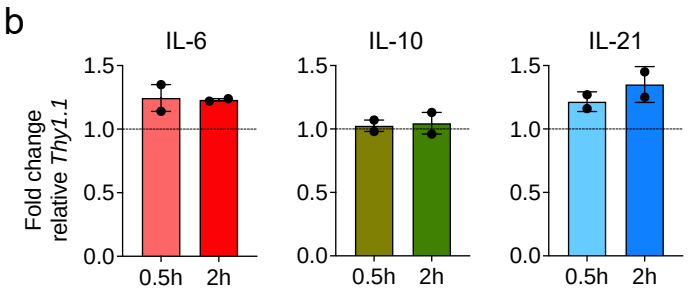
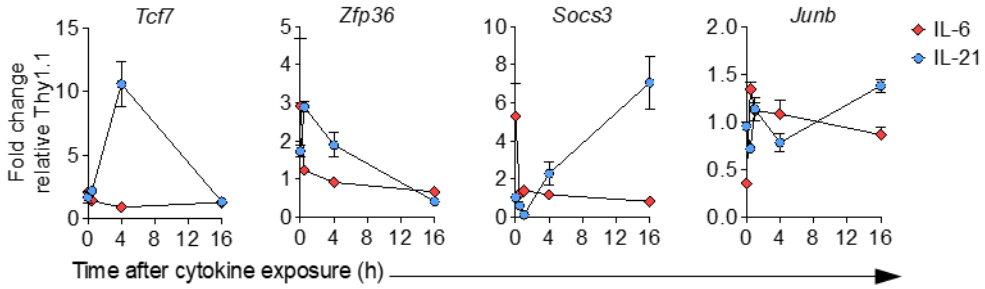


Figure 31. LMO4 enhances pSTAT3 in response to IL-6 and IL-21 but not IL-10. (**a**) Immunoblot of pSTAT3 and STAT3 (control) in *Thy1.1* and *Lmo4-Thy1.1* overexpressing T cells at 0, 0.5 and 2h after adding IL-6 (left panel), IL-10 (middle panel) or IL-21 (right panel) to the cell culture. (**b**) Quantification of pSTAT3 immunoblots in *Lmo4-Thy1.1* T cells normalized by total STAT3 in two independent experiments. Results are presented relative to *Thy1.1* controls. The immunoblot experiment was entirely conceptualized by me, with technical assistance from Fabio Mastrogiovanni.

To dissect the potential involvement of IL-6 and IL-21, we evaluated the impact of these two cytokines on the expression of *Tcf7*, *Zfp36, Socs3,* and *Junb* in LMO4-overexpressing T cells



and controls. Strikingly, IL-21, but not IL-6, induced the expression of all these molecules, though with distinct kinetics (Fig. 32). IL-6 was only able to trigger a rapid but transient induction of *Junb* (Fig. 32, right panel).

Figure 32. IL-21, but not IL-6, induced the expression of *Tcf7*, *Zfp36*, *Socs3*, and *Junb* in LMO4-overexpressing T cells. q-PCR of *Tcf7* (left panel), *Zfp36* (middle left panel), *Socs3* (middle right panel), and *Junb* (right panel) mRNA in *Lmo4-Thy1.1* relative to *Thy1.1* overexpressing T cells that were cultured for 16 h with IL-6 or IL-21. The underlying experiment and the graphs were conceptualized and analyzed by me, with technical assistance from Emilia Kocks.

To substantiate the involvement of IL-21 in LMO4-mediated stemness, we evaluated the impact of deleting *Il21r* on the generation of CD62L^{+} memory T cell precursors in response to gp100-vv. Using CRISPR/Cas9, we profoundly downregulated IL21R expression on CD8+ T cell surface (Fig. 33a). Five days after adoptive transfer of pmel-1 T cells, we found that knocking out *Il21r* reduced the frequencies of splenic CD62L^{+}KLRG1^{-} T cells in *Lmo4-Thy1.1* T cells relative to *Thy1.2* knockout controls (Fig. 33b). Conversely, the percentage of

CD62L⁻KLRG1⁺ terminal effectors was increased upon deletion of the IL-21 receptor (Fig. 33c). Notably knocking out *Il21r* did not have a significant impact on CD8⁺ T cells transduced with *Thy1.1* (Fig. 33b, c). The negative impact of *Il21r* deletion on the generation of CD62L⁺ memory T cell precursors abrogated the typical accumulation of *Lmo4-Thy1.1* T cells in lymph nodes, whereas it had no effects on *Thy.1.1* controls (Fig. 33d).

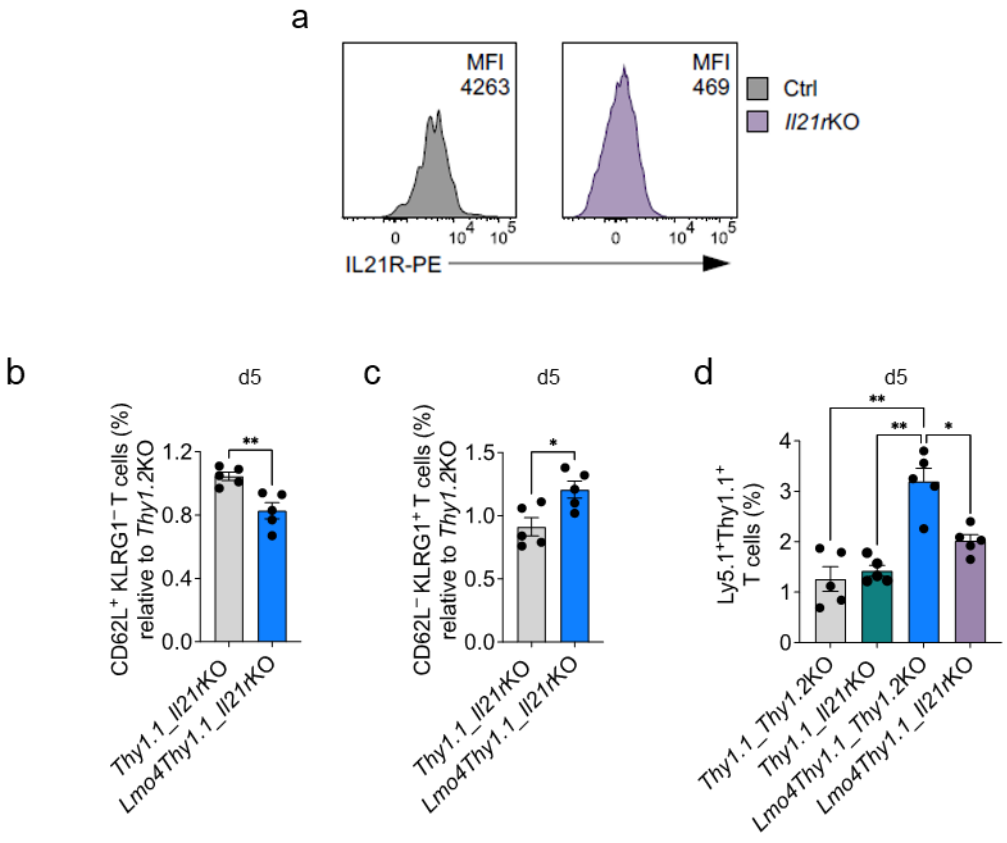


Figure 33. The negative impact of *Il21r* deletion on the generation of CD62L⁺ memory T cell precursors abrogated the typical accumulation of *Lmo4-Thy1.1* T cells in lymph nodes. (**a**) Flow cytometry histograms showing IL21R expression in pmel-1 CD8⁺ T cells to assess the knockout efficiency compared to controls. (**b**, **c**) Percentages of CD62L⁺KLRG1⁻ (**b**) and CD62L⁻KLRG1⁺ (**c**) splenic pmel-1 CD8⁺ T cells 5 d after transfer of either 10^5 *Thy1.1⁺Il21r*KO or *Lmo4-Thy1.1⁺Il21r*KO pmel-1 Ly5.1⁺ CD8⁺ T cells into wild-type mice infected with gp100-vv (n = 5 mice/group). Results are relative to *Thy1.1⁺Thy1.2*KO and *Lmo4-Thy1.1⁺Thy1.2*KO control cells, respectively. (**d**) Percentages of pmel-1 CD8⁺ T cells in the lymph nodes 5 d after transfer as in (**b**,**c**). (*P < 0.05; ** P < 0.001, **b**, **c**, unpaired two-tailed Student's t-test; **d**, ANOVA test. The underlying experiment and the graphs were conceptualized and analyzed by me, with assistance from Pedro Noronha, Timea Vadász, Fabio

Mastrogiovanni, Leo Hesse and Rosanne Spolski. Warren J Leonard assisted with the initial experimental design.

Collectively, these results underscore the pivotal role of IL-21 signaling in the setting of LMO4 overexpression, supporting a model by which LMO4 enhances T-cell stemness by boosting IL21-STAT3 signaling and its downstream pro-memory factors (Fig. 34).

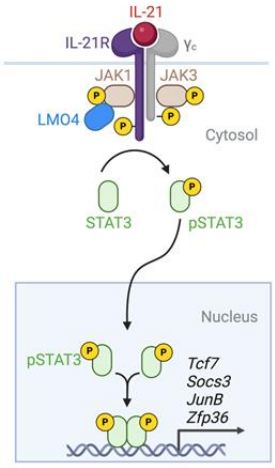


Figure 34. LMO4 enhances IL-21-STAT3 signaling to facilitate CD8$^+$ T cell stemness. Cartoon depicting the potential interaction of LMO4 with the IL-21-STAT3 signaling pathway. LMO4 promotes STAT3 phosphorylation and the expression of target genes, including *Tcf7*, *Socs3, Junb,* and *Zfp36* to boost memory responses. The experimental design figure was created entirely by me, using www.bioRender.com.

LMO4 overexpression increases CD8$^+$ T-cell stemness and antitumor immunity in a STAT3-dependent manner.

To investigate if STAT3 signaling is a crucial mediator of the memory phenotype induced by LMO4, we next evaluated the effects of knocking out *Stat3* on the expansion and memory differentiation of pmel-1 *Lmo4-Thy1.1* T cells (Fig. 35a). We employed CRISPR/Cas9 technology to delete *Stat3* or *Thy1.2* control with knock-out efficiencies of 90% and 78%, respectively (Fig. 35b).

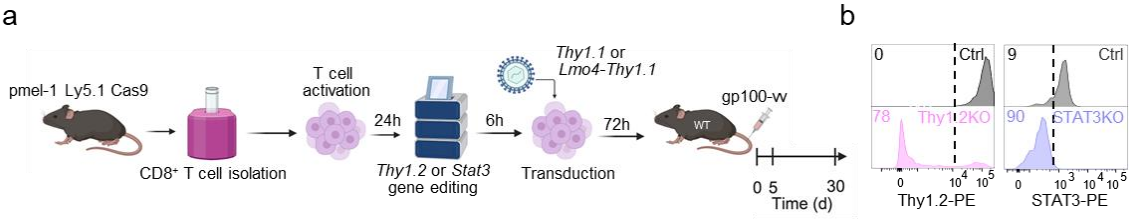


Figure 35. CRISPR/Cas9 technology to delete *Stat3* or *Thy1.2* control in pmel-1 *Lmo4-Thy1.1* T cells. (**a**) Experimental design to assess the impact of *Stat3* versus *Thy1.2* (control) deletion on *Lmo4*-induced stem-like T cell formation. (**b**) Flow cytometry histograms showing Thy1.2 (left panel) and STAT3 (right panel) to assess knockout efficiency compared to controls in pmel-1 $CD8^+$ T cells. The experimental design figure (**a**) was created entirely by me, using www.bioRender.com. The underlying experiment (**b**) was conceptualized, performed and analyzed by me.

We then adoptively transferred pmel-1 *Lmo4-Thy1.1* and pmel-1 *Thy1.1* T cells either deficient for *Stat3* or *Thy1.2* into wild-type mice infected with gp100-VV, and measured antigen-specific $CD8^+$ T-cell expansion, and memory formation over time. We found that the deletion of *Stat3* abrogated the beneficial effects of LMO4 overexpression on T-cell expansion (Fig. 36a, b). Of note, we did not observe a major impact of *Stat3* removal on Thy1.1 control cells, highlighting the specific role of STAT3 in the context of LMO4 overexpression (Fig. 36a, b).

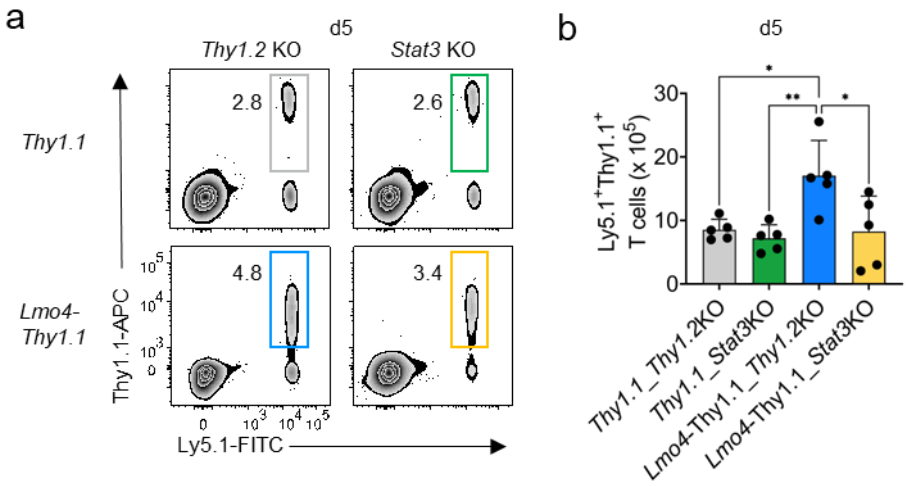


Figure 36. Deletion of *Stat3* abrogated the beneficial effects of LMO4 overexpression on T-cell expansion. (**a, b**) Flow cytometry analysis (**a**) and percentages (**b**) of splenic pmel-1 $CD8^+$ T cells 5 d after transfer of either 1 x 10^5 pmel-1 $Ly5.1^+$ *Thy1.1*$^+$*Thy1.2*KO, *Thy1.1*$^+$*Stat3*KO, *Lmo4-Thy1.1*$^+$*Thy1.2*KO or *Lmo4-Thy1.1*$^+$*Stat3*KO $CD8^+$ T cells into wild-type mice infected with gp100-vv (five mice per group). *P < 0.05, **P < 0.01, (b unpaired two-tailed Student's t-test). The underlying experiment and graph creation were directed by me, with technical assistance from Pedro Noronha, Timea Vadász, Fabio Mastrogiovanni and Leo Hesse. Mario Lecce and Wolfgang Herr assisted with the initial experimental design.

Similarly, *Stat3* deficiency impaired the augmented formation of stem-like T cells observed in the setting of LMO4 overexpression (Fig. 37a, b).

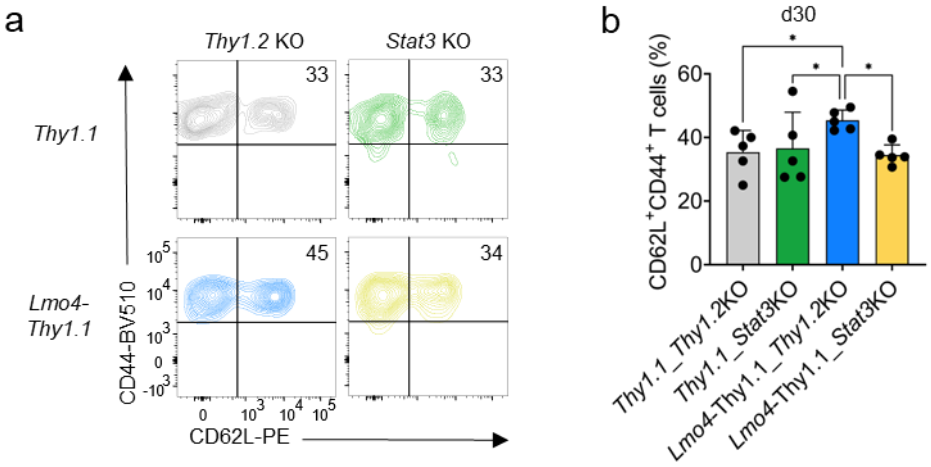


Figure 37. *STAT3 is essential for LMO4-induced CD8⁺ T cell stemness.* (**a, b**) Flow cytometry analysis (**a**) and percentages (**b**) of CD62L⁺CD44⁺ splenic pmel-1 T cells 30 d after transfer as in (**Fig. 36a, b**). **P* < 0.05, ***P* < 0.01, (**b** unpaired two-tailed Student's *t*-test). The underlying experiment and the graphs were conceptualized and analyzed by me, with technical assistance from Pedro Noronha, Timea Vadász, Fabio Mastrogiovanni, Leo Hesse.

These results demonstrate the central role of the STAT3 signaling pathway in LMO4-induced regulation of CD8⁺ T-cell responses and their development of stem-like cells.

To further determine if STAT3 signaling is also essential for the antitumor effects of LMO4-overexpressing T cells, we adoptively transferred pmel-1Cas9 *Lmo4-Thy1.1* and *Thy1.1* T cells nucleofected with gRNAs specific for *Stat3* or *Thy1.2* into mice bearing subcutaneous $B16_{KVP}$ melanomas in conjunction with gp100-VV and IL-2. Consistent with our findings in the infection model, we found that the enhanced antitumor responses promoted by the heightened levels of LMO4 also depend on STAT3 (Fig. 38a, b).

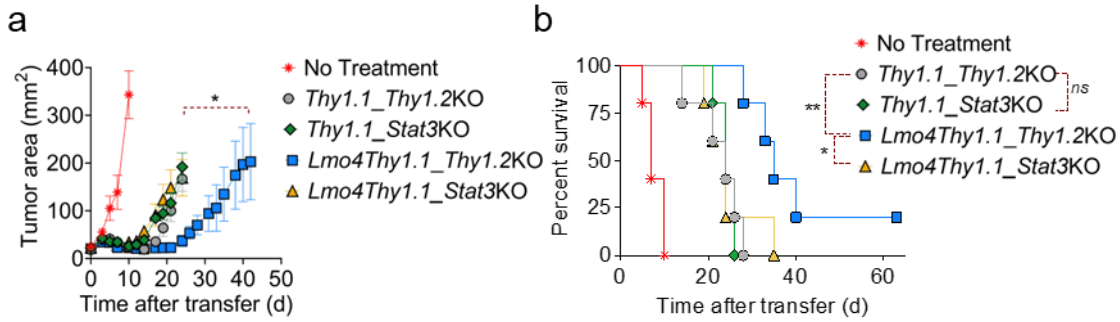


Figure 38. STAT3 is essential for LMO4-induced CD8$^+$ T cell enhanced antitumor responses. (**a, b**) Tumor size (**a**) and survival curve (**b**) of $B16_{KVP}$ tumor-bearing wild-type mice after transfer of either 3.5 x 10^5 pmel-1 *Thy1.1*$^+$*Thy1.2*KO, *Thy1.1*$^+$*Stat3*KO, *Lmo4-Thy1.1*$^+$*Thy1.2*KO or *Lmo4-Thy1.1*$^+$*Stat3*KO CD8$^+$ T cells into wild-type mice treated with gp100-vv and IL-2. **P* < 0.05, ***P* < 0.01, (**a**, Wilcoxon rank sum test; **b**, log-rank (Mantel–Cox) test). The underlying experiment and the graphs were conceptualized and analyzed by me, with technical assistance from Fabio Mastrogiovanni.

The reduced antitumor potency of LMO4-overexpressing T cells observed in this experiment might be due to incomplete recovery of cellular fitness following electroporation[48]. Altogether, these findings highlight the pivotal role of STAT3 in mediating the effects of LMO4 in enhancing CD8$^+$ T-cell stemness and antitumor immunity.

DISCUSSION

Strategies aimed at enhancing the stemness and persistence of antitumor T cells are actively pursued due to the pivotal role of stem-like cells in generating effective antitumor responses[9,14]. Stem-like T cells are crucial because they possess the unique ability to self-renew and differentiate into various effector cells, maintaining a continuous supply of antitumor T cells over an extended period. This ability to sustain long-term efficacy and resist exhaustion underscores their significance in the development of robust cancer immunotherapies[14].

The resilience of these stem-like cells allows them to persist and function effectively within the often hostile tumor microenvironment, where other T cells might become exhausted or dysfunctional. By understanding and enhancing these properties, researchers aim to create therapies that not only target tumors more effectively but also provide durable responses, reducing the likelihood of relapse. In preclinical tumor models, several pathways and key players influencing the formation and maintenance of these cells have been identified. These discoveries offer promising targets for augmenting T-cell therapy, as they provide a roadmap for developing interventions that can boost the stemness and persistence of T cells, thereby improving their antitumor activity[15-20].

Utilizing CRISPRa gain-of-function screens, we sought to significantly expand the spectrum of actionable targets aimed at enhancing $CD8^+$ T-cell stemness well beyond physiological norms. This innovative and systematic approach enabled us to conduct a thorough and exhaustive exploration of a wide array of genes, delving deep into their potential roles within T-cell biology. By harnessing the power of CRISPRa technology, we aimed not only to identify novel targets but also to elucidate their mechanisms of action in enhancing the stem-like properties of $CD8^+$ T cells. This comprehensive analysis provided invaluable insights into how these genes could be manipulated to optimize T-cell therapy strategies, paving the way for transformative advancements in cancer immunotherapy.

Our detailed analysis definitively identified LMO4 as a highly potent modulator capable of profoundly influencing CD8$^+$ T-cell stemness and memory formation upon ectopic expression. Given the known function of LMO family proteins in cell differentiation, and the as-yet-undetermined role of LMO4 in mature CD8$^+$ T cells, we selected this molecule for further investigation. To determine whether the *Lmo4* induction represents a common trait of cells undergoing stem-like T-cell differentiation, experiments performed by Yun Ji (NCI, Bethesda, USA) evaluated the abundance of *Lmo4* transcripts in CD8$^+$ T cells activated in the presence of TWS119. TWS119 is a potent inhibitor of glycogen synthase kinase-3β (GSK-3β), which we have shown to drive the generation of both human and mouse stem-like T cells[10,11] and is being used in a clinical trial evaluating CD19 CAR-modified stem-like T cells (NCT01087294). Priming naive CD8$^+$ T cells in the absence of TWS119 downregulated *Lmo4,* whereas *Lmo4* mRNA levels were mildly increased when the GSK-3β inhibitor was added to the culture medium (Fig. 39).

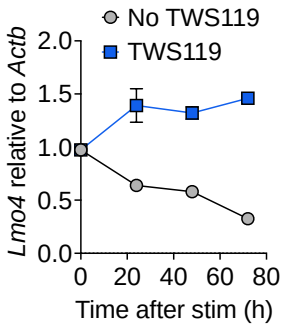


Figure 39. **Priming naive CD8$^+$ T cells in the absence of TWS119 upregulated Lmo4.** q-PCR of *Lmo4* mRNA in CD8$^+$ T cells cultured for 72 h with or without TWS119. I gratefully acknowledge Yun Ji for granting permission to reproduce the underlying figure based on her data. The experiments were performed by her. Nicholas P Restifo assisted with the initial experimental design.

This discovery opens new avenues in T-cell biology and therapeutic applications. Remarkably, LMO4 not only augmented CD8$^+$ T-cell responses but also effectively preserved a resilient reservoir of stem-like memory T cells, even under conditions of repetitive exposure to antigens. This resilience is critical in maintaining a sustained antitumor response, which is often compromised in conventional T-cell therapies due to cellular exhaustion over time. These

compelling findings vividly underscore the transformative potential of synthetic biology in conferring desired cellular functions.

By harnessing molecules that typically regulate specific cellular processes like cell fate control in one cell type, and successfully applying them to another where such regulation is not naturally exerted, LMO4 exemplifies how innovative strategies can enhance T-cell therapies, promising significant advancements in cancer immunotherapy. The potential of LMO4 lies not only in its ability to enhance the immediate antitumor activity of $CD8^+$ T cells but also in its capacity to foster long-term immune surveillance, a feature that is paramount for preventing cancer recurrence.

The mechanism by which LMO4 exerts its effects involves intricate regulatory pathways. Detailed molecular analyses have shown that LMO4 enhances the activation of key transcription factors and signaling molecules that are essential for maintaining T-cell stemness and functionality. For instance, LMO4 has been found to upregulate the expression of STAT3, a critical player in cytokine signaling, upon exposure to IL-21. This upregulation leads to the initiation of a sophisticated gene regulatory network that orchestrates the expression of several downstream targets known for their roles in cell proliferation, differentiation, and survival. Notably, among the genes induced by this network are key players such as JUNB, JUN, FOS, FOSB, and ZFP36. Recent studies have identified these genes as significantly enriched in a specialized subset of highly functional T cells derived from human head and neck squamous cell carcinoma[49]. This compelling association underscores the potential of these genes to enhance the antitumor efficacy of T cells engineered to overexpress LMO4. Thus, our findings emphasize the critical role of LMO4 in augmenting T-cell functionality across diverse cancer contexts, highlighting its promise as a potent modulator in advancing the field of cancer immunotherapy.

Furthermore, the ability of LMO4 to preserve a reservoir of stem-like memory T cells even under continuous antigenic stimulation is particularly noteworthy. In many cases, T cells become exhausted and lose their functional capacity after prolonged exposure to tumor antigens. However, LMO4 appears to counteract this exhaustion, maintaining a pool of T cells that retain their stem-like properties and functional potency. This preservation of stem-like memory T cells could translate into more effective and long-lasting immunotherapies, reducing the need for repeated treatments and improving overall patient outcomes.

Our findings present profound implications for advancing the development of potent T cell-based immunotherapies. To extend our investigation, we initiated a collaboration with Vincenzo Russo's group at San Raffaele in Milan, Italy, who further examined the effects of LMO4 overexpression in an additional challenging solid tumor model, which relies on the targeting of LLC1-OVA lung carcinomas by OVA-specific OT-1 T cells (Fig. 40a). Theses Once more, we observed enhanced tumor control in mice administered with *Lmo4-Thy1.1* T cells (Fig. 40b), thus validating the broad efficacy of this therapeutic strategy.

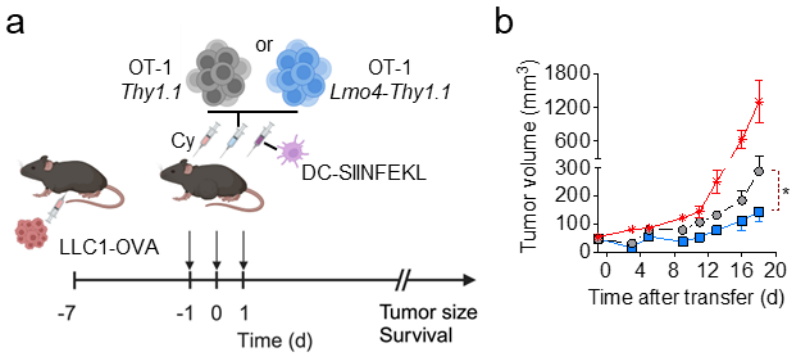


Figure 40. Enforced expression of Lmo4 enhances CD8+ T cell antitumor immunity against lung carcinomas. (**a**) Experimental design investigating the effect of Lmo4 overexpression on the antitumor immune response of OT-1 $CD8^+$ T cells. (**b**) Tumor size of LLC1-OVA, after transfer of 10^6 *Lmo4-Thy1.1* or *Thy1.1* transduced OT-1 T cells into lymphodepleted tumor-bearing mice and subsequent vaccination with OVA peptide-loaded dendritic cells (n = 9-10 mice/group). (*P < 0.05, Wilcoxon rank sum test). Cy, Cyclophosphamide, OVA, ovalbumin. I gratefully acknowledge Vincenzo Russo laboratory (including Giuseppe Damiano, Laura Raccosta, Daniela Maggioni) for granting permission to reproduce the underlying figure based on their data.

Through our investigations, we have clearly demonstrated that overexpression of LMO4 significantly enhances antitumor T cell responses across a spectrum of models, encompassing

solid cancers and hematologic malignancies, evaluated in both syngeneic and xenograft settings. This extensive efficacy underscores the remarkable versatility and therapeutic potential inherent in LMO4.

Furthermore, our study revealed substantial overlap in the gene regulatory networks influenced by LMO4 and c-MYB. This overlap indicates that both LMO4 and c-MYB are involved in key processes related to T-cell differentiation and function. However, a closer examination of these networks showed that LMO4 appears to regulate a more focused and specific array of pathways. This specificity suggests that LMO4 might offer a more targeted mechanism for controlling T-cell differentiation, which is crucial for enhancing therapeutic outcomes. By fine-tuning specific pathways, LMO4 can potentially improve the precision and effectiveness of T-cell therapies, reducing the likelihood of off-target effects that might occur with broader regulatory mechanisms.

Moreover, the compact genetic footprint of LMO4, spanning less than 500 nucleotides (nt), confers distinct advantages for its integration into CAR and TCR vectors currently employed in clinical settings. This small size facilitates easier and more efficient incorporation into viral and non-viral delivery systems used for gene therapy. In contrast, the *Myb* gene spans approximately 2,000 nucleotides, which poses greater challenges for its practical application. The larger size of *Myb* can complicate the delivery process, increase the risk of insertional mutagenesis, and limit the overall efficiency of the therapeutic vector.

Additionally, the compact nature of LMO4 allows for its inclusion in multi-gene vectors, enabling the co-delivery of multiple therapeutic genes within a single construct. This capability can be particularly advantageous in cancer immunotherapy, where combining different genetic modifications can synergistically enhance T-cell functionality and antitumor activity. For instance, LMO4 could be co-expressed with genes encoding for membrane-tethered

cytokines, or genes redirecting T cells for antigen-unrestricted cytokine-initiated killing (TRUCK), creating a more robust and multifaceted therapeutic approach.

These findings underscore the translational potential of LMO4 in advancing the efficacy and precision of T cell-based therapies, paving the way for novel strategies to combat various cancers. Continued research into LMO4 and its mechanisms promises to further optimize therapeutic approaches, potentially revolutionizing cancer treatment paradigms and improving patient outcomes significantly.

It is important to note that the relatively milder effects observed in CD19-CAR T and OT-1 models may stem from the absence of IL-21 sources in vivo (e.g., activated $CD4^+$ T cells), which are instead activated by the vaccinia virus vaccine in the pmel-1 model. This is a critical factor, as IL-21 plays a significant role in promoting the proliferation and persistence of Lmo4-overexpressed T cells. The lack of IL-21 in certain models could result in a less robust response of the LMO4-enhanced T cells, highlighting the necessity of a supportive cytokine environment for optimal T cell function.

NXG mice, which are employed in this study, lack functional human immune cells. This absence of a complete immune system can limit the ability to fully assess the potential of LMO4-enhanced T cells in a human-like immune environment. The interplay between various immune cells, including $CD4^+$ T cells and dendritic cells, is crucial for the full activation and function of $CD8^+$ T cells. Therefore, the lack of these interactions in NXG mice may result in an underestimation of the potential efficacy of LMO4-enhanced T cells.

Furthermore, the DC-based vaccine strategy used in the OT-1 model exclusively targets the stimulation of OT-1 T cells by the SIINFEKL peptide. This focused approach might not fully replicate the complex interactions and activation signals present in a natural tumor microenvironment. In contrast, the pmel-1 model, which uses a vaccinia virus vaccine, can

activate a broader range of immune responses, including the activation of $CD4^+$ T cells that produce IL-21. This broader activation can create a more favorable environment for the function of LMO4-enhanced T cells, leading to more pronounced antitumor effects.

This contextual difference underscores the role of the immunological environment in modulating the efficacy of LMO4-enhanced T cells. The presence or absence of key cytokines and immune cell interactions can significantly influence the outcomes of these T cell-based therapies. Therefore, it is essential to consider these factors when evaluating the potential of new therapeutic strategies. Future studies should aim to create more representative models that include the full spectrum of immune cell interactions and cytokine milieus found in human tumors. This will provide a more accurate assessment of the therapeutic potential of LMO4-enhanced T cells and other similar strategies.

Understanding these nuances can guide the design of combination therapies that might include cytokine support or co-stimulation to enhance the efficacy of LMO4-enhanced T cells. For instance, incorporating sources of IL-21 or other supportive cytokines in conjunction with LMO4-enhanced T cells could potentially overcome the limitations observed in certain models and lead to more effective antitumor responses. Additionally, the development of more sophisticated mouse models that better mimic human immune responses could provide deeper insights into the mechanisms through which LMO4 enhances T cell function and persistence.

The involvement of LMO1 and LMO2 in T-cell acute lymphoblastic leukemia (T-ALL)[23] raises understandable concerns regarding the potential for T-cell transformation resulting from LMO4 overexpression. This concern is particularly pertinent given the known oncogenic roles of LMO1 and LMO2[23]. Their documented association with T-ALL underscores the importance of thoroughly assessing the safety of manipulating similar pathways in therapeutic contexts. The oncogenic potential of these molecules warrants careful consideration and rigorous monitoring to prevent adverse outcomes when applying related strategies in immunotherapy.

In our studies, while enforced LMO4 expression indeed led to significant $CD8^+$ T-cell expansion, we were diligent in monitoring for any signs of uncontrolled proliferation or transformation. This included detailed analyses at multiple time points and across various experimental conditions to ensure that any potential risks were identified early. Importantly, across all conducted studies, no instances of unrestricted expansion or cell transformation were observed, even under conditions of continuous exposure to the cognate antigen on melanocytes. This comprehensive monitoring process involved regular assessments using advanced techniques such as flow cytometry to detect even subtle changes in cell behavior that might indicate a shift toward oncogenic transformation.

These findings are consistent with existing evidence suggesting that mature T cells exhibit a degree of resistance to transformation, even when exposed to high levels of well-known oncogenes[50]. This inherent resistance is a crucial factor in the safety profile of T-cell-based therapies, providing a layer of assurance that such treatments can be developed without inadvertently triggering malignant transformations. The robust nature of mature T cells in maintaining their normal functions despite genetic modifications is a promising aspect of this therapeutic approach.

Furthermore, the experimental conditions were designed to mimic clinically relevant scenarios as closely as possible. This included using humanized mouse models and exposure to antigens representative of those found in human tumors. By simulating the clinical environment, we aimed to ensure that our findings would be applicable to real-world therapeutic settings. The absence of transformation in these models, even under extended periods of antigen exposure, provides strong evidence supporting the safety of LMO4-enhanced T cells.

Although our studies did not detect overt oncogenicity (as illustrated in Fig. 41a, b), it remains crucial to approach the translation of this technology to human applications with a high degree of caution. The absence of transformation in our models is indeed reassuring, but the potential

risks associated with introducing new genetic elements into T cells necessitate rigorous safety measures. The complexity of human immune systems and the potential for unforeseen interactions mean that comprehensive risk assessment and mitigation strategies are essential to ensure patient safety.

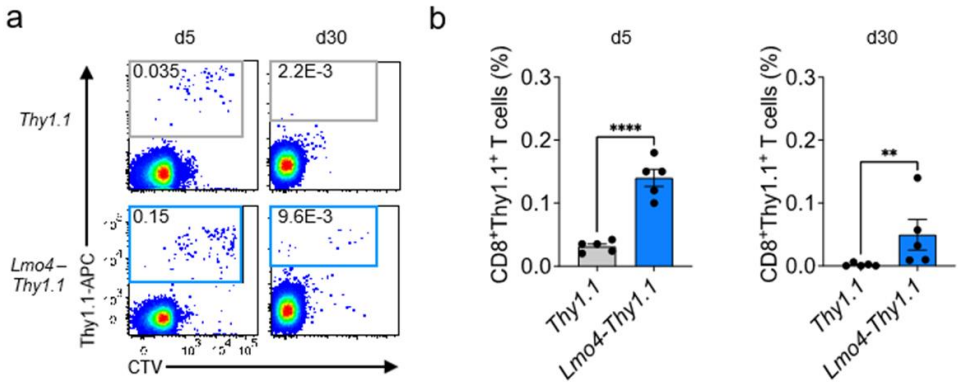


Figure 41. *Lmo4* overexpression does not induce uncontrolled CD8$^+$ T cell expansion. (**a-b**) Flow cytometry analysis (**a**) and percentages (**b**) of splenic pmel-1 CD8$^+$ T cells following transfer of either 2.5 x 10^5 CTV-labeled pmel-1 *Lmo4-Thy1.1* or *Thy1.1* T cells into wild-type mice. Assessment was conducted at 5 and 30 days post-transfer. (n = 5 mice/group) $^{**}P < 0.01$, $^{****}P < 0.0001$, (unpaired two-tailed Student's t-test). The in vivo experiments, analysis and the corresponding graphs for the underlying figure were created entirely by me.

To mitigate these risks, several strategies can be employed to enhance the safety profile of LMO4-modified T cells. One effective strategy is the introduction of suicide genes into the modified T cells. Suicide genes act as a fail-safe mechanism, providing a way to eliminate the transferred cells in the event of transformation or uncontrolled proliferation[51]. This approach ensures that any potentially harmful cells can be swiftly and efficiently removed from the patient, thereby preventing adverse outcomes.

Alternatively, using inducible promoters to control the expression of LMO4 offers another layer of safety. Inducible promoters allow for the precise regulation of LMO4 expression, enabling researchers and clinicians to modulate the activity of the gene as needed. This controlled expression minimizes the risk of unintended consequences[51] by ensuring that LMO4 is only

active when required, reducing the likelihood of adverse effects associated with its overexpression.

Furthermore, the implementation of advanced monitoring techniques is essential for the early detection of any signs of transformation or aberrant cell behavior. Regular and thorough monitoring of patients receiving LMO4-modified T cells will allow for the timely identification of potential issues, enabling prompt intervention to mitigate risks. This proactive approach ensures that any negative effects can be addressed swiftly, maintaining the safety and efficacy of the treatment.

Ultimately, the “synthetic” expression of LMO4 holds tremendous promise for innovative and transformative approaches in cancer immunotherapy, particularly when it comes to addressing the formidable challenge posed by solid tumors. Solid tumors often present a significant barrier to effective treatment due to their complex microenvironments and the physical and immunological barriers they pose to therapeutic agents[7]. However, by harnessing the unique regulatory capabilities of LMO4, we can potentially overcome these obstacles and develop strategies that markedly improve the efficacy and durability of T cell-based therapies.

The synthetic expression of LMO4 enables the precise modulation of T cell functions, allowing for a tailored approach to enhance their anti-tumor activity. LMO4's ability to influence gene expression and cellular pathways in T cells results in superior survival, proliferation, and effector functions within the hostile tumor microenvironment. This is particularly important for solid tumors, where the immune landscape can be highly suppressive and can hinder the effectiveness of conventional T cell therapies[7].

In conclusion, the findings presented here underscore the transformative potential of LMO4 in reshaping T cell-based cancer immunotherapy. The insights gained pave the way for further exploration into the clinical translation of LMO4-enhanced T cell therapies, highlighting the need for continued research to optimize safety and efficacy in human applications. This

approach not only holds promise for enhancing current treatment modalities but also opens new avenues for overcoming resistance and advancing personalized cancer therapies.

ACKNOWLEDGEMENTS

As previously noted in the results section, the author gratefully acknowledges the valuable support provided by the co-authors of the recently published paper (*Signal Transduct Target Ther.* 2024 Aug 9;9(1):199. doi: 10.1038/s41392-024-01915-z.) in the development of the results. A substantial portion of this paper (>50%) has been reproduced within this thesis.

This project was supported by the Deutsche Forschungsgemeinschaft (DFG) research grant (Project Nr. 421981137) (to R.S.), DFG Sonderforschungsbereich Transregio 221 Gerok position (to R.S. and W.H.), the University Regensburg ReForM B grant (to R.S.), the Intramural Research Program of the US National Institutes of Health, National Cancer Institute (to L.G.) and National Heart, Lung, and Blood Institute (to W.J.L.), the Italian Association for Cancer Research (AIRC) (IG 26305), and AIRC Special Program 5x1000 IG 22737 (to V.R.).

We thank K. Hanada for providing $B16_{KVP}$. Cartoons and schematics were created with BioRender.com. Sequencing and bioinformatic analysis were conducted at the NGS Core Unit of the Leibniz Institute of Immunotherapy (LIT). We would like to add a special thanks to Jaqueline Dirmeier and Irina Fink from the FACS-Analytics and Cell Sorting at the LIT for their assistance with cell sorting. We would like to also thank Justin Azmoodeh, Shirley Tenesaca, Neal Lacey, Rosa Nguyen, and Franziska Roscher for their technical help.

REFERENCES

1 Mair, F. *et al.* Extricating human tumour immune alterations from tissue inflammation. *Nature* **605**, 728-735 (2022).

2 Schmidt, R. *et al.* CRISPR activation and interference screens decode stimulation responses in primary human T cells. *Science* **375**, 513-+ (2022).

3 Hermans, D. *et al.* Lactate dehydrogenase inhibition synergizes with IL-21 to promote CD8(+) T cell stemness and antitumor immunity. *Proc Natl Acad Sci U S A* **117**, 6047-6055 (2020).

4 Zehn, D., Thimme, R., Lugli, E., de Almeida, G. P. & Oxenius, A. 'Stem-like' precursors are the fount to sustain persistent CD8(+) T cell responses. *Nat Immunol* **23**, 836-847 (2022).

5 Wan, C. K. *et al.* Opposing roles of STAT1 and STAT3 in IL-21 function in CD4+ T cells. *Proc Natl Acad Sci U S A* **112**, 9394-9399 (2015).

6 Tripathi, S. K. *et al.* Genome-wide Analysis of STAT3-Mediated Transcription during Early Human Th17 Cell Differentiation. *Cell Rep* **19**, 1888-1901 (2017).

7 Finck, A. V., Blanchard, T., Roselle, C. P., Golinelli, G. & June, C. H. Engineered cellular immunotherapies in cancer and beyond. *Nature Medicine* **28**, 678-689 (2022).

8 Gattinoni, L. *et al.* A human memory T cell subset with stem cell-like properties. *Nat Med* **17**, 1290-1297 (2011).

9 Gattinoni, L., Speiser, D. E., Lichterfeld, M. & Bonini, C. T memory stem cells in health and disease. *Nat Med* **23**, 18-27 (2017).

10 Gattinoni, L. *et al.* Wnt signaling arrests effector T cell differentiation and generates CD8+ memory stem cells. *Nat Med* **15**, 808-813 (2009).

11 Sabatino, M. *et al.* Generation of clinical-grade CD19-specific CAR-modified CD8+ memory stem cells for the treatment of human B-cell malignancies. *Blood* **128**, 519-528 (2016).

12 Krishna, S. *et al.* Stem-like CD8 T cells mediate response of adoptive cell immunotherapy against human cancer. *Science* **370**, 1328-1334 (2020).

13 Wang, Y. *et al.* Characteristics of premanufacture CD8(+)T cells determine CAR-T efficacy in patients with diffuse large B-cell lymphoma. *Signal Transduct Target Ther* **8**, 409 (2023).

14 Gattinoni, L., Klebanoff, C. A. & Restifo, N. P. Paths to stemness: building the ultimate antitumour T cell. *Nat Rev Cancer* **12**, 671-684 (2012).

15 Gautam, S. *et al.* The transcription factor c-Myb regulates CD8(+) T cell stemness and antitumor immunity. *Nat Immunol* **20**, 337-349 (2019).

16 Jeannet, G. *et al.* Essential role of the Wnt pathway effector Tcf-1 for the establishment of functional CD8 T cell memory. *Proc Natl Acad Sci U S A* **107**, 9777-9782 (2010).

17 Hess Michelini, R., Doedens, A. L., Goldrath, A. W. & Hedrick, S. M. Differentiation of CD8 memory T cells depends on Foxo1. *J Exp Med* **210**, 1189-1200 (2013).

18 Roychoudhuri, R. *et al.* BACH2 regulates CD8(+) T cell differentiation by controlling access of AP-1 factors to enhancers. *Nat Immunol* **17**, 851-860 (2016).

19 Ji, Y. *et al.* Repression of the DNA-binding inhibitor Id3 by Blimp-1 limits the formation of memory CD8+ T cells. *Nat Immunol* **12**, 1230-1237 (2011).

20 Cui, W., Liu, Y., Weinstein, J. S., Craft, J. & Kaech, S. M. An interleukin-21-interleukin-10-STAT3 pathway is critical for functional maturation of memory CD8+ T cells. *Immunity* **35**, 792-805 (2011).

21 Zhao, N. *et al.* Synthetic biology-inspired cell engineering in diagnosis, treatment, and drug development. *Signal Transduct Target Ther* **8**, 112 (2023).

22 Dawid, I. B., Breen, J. J. & Toyama, R. LIM domains: multiple roles as adapters and functional modifiers in protein interactions. *Trends Genet* **14**, 156-162 (1998).

23 Matthews, J. M., Lester, K., Joseph, S. & Curtis, D. J. LIM-domain-only proteins in cancer. *Nat Rev Cancer* **13**, 111-122 (2013).

24 Michell, A. C. *et al.* A novel role for transcription factor Lmo4 in thymus development through genetic interaction with Cited2. *Dev Dyn* **239**, 1988-1994 (2010).

25 Kaech, S. M. & Cui, W. G. Transcriptional control of effector and memory CD8

T cell differentiation. *Nature Reviews Immunology* **12**, 749-761 (2012).

26 Spolski, R. & Leonard, W. J. Interleukin-21: a double-edged sword with therapeutic potential. *Nat Rev Drug Discov* **13**, 379-395 (2014).

27 Zeng, R. *et al.* Synergy of IL-21 and IL-15 in regulating CD8+ T cell expansion and function. *J Exp Med* **201**, 139-148 (2005).

28 Hinrichs, C. S. *et al.* IL-2 and IL-21 confer opposing differentiation programs to CD8+ T cells for adoptive immunotherapy. *Blood* **111**, 5326-5333 (2008).

29 Lee, S. K. *et al.* The LIM domain-only protein LMO4 is required for neural tube closure. *Mol Cell Neurosci* **28**, 205-214 (2005).

30 Hanada, K. I., Yu, Z., Chappell, G. R., Park, A. S. & Restifo, N. P. An effective mouse model for adoptive cancer immunotherapy targeting neoantigens. *JCI Insight* **4** (2019).

31 Man, K. *et al.* Transcription Factor IRF4 Promotes CD8 T Cell Exhaustion and Limits the Development of Memory-like T Cells during Chronic Infection. *Immunity* **47**, 1129-+ (2017).

32 O'Brien, S. *et al.* Ikaros Imposes a Barrier to CD8 T Cell Differentiation by Restricting Autocrine IL-2 Production. *Journal of Immunology* **192**, 5118-5129 (2014).

33 Connolly, K. A. *et al.* A reservoir of stem-like CD8(+) T cells in the tumor-draining lymph node preserves the ongoing antitumor immune response. *Sci Immunol* **6**, eabg7836 (2021).

34 Feau, S., Arens, R., Togher, S. & Schoenberger, S. P. Autocrine IL-2 is required for secondary population expansion of CD8(+) memory T cells. *Nat Immunol* **12**, 908-913 (2011).

35 Wirth, T. C. *et al.* Repetitive antigen stimulation induces stepwise transcriptome diversification but preserves a core signature of memory CD8(+) T cell differentiation. *Immunity* **33**, 128-140 (2010).

36 Moore, M. J. *et al.* ZFP36 RNA-binding proteins restrain T cell activation and anti-viral immunity. *Elife* **7** (2018).

37 Lynn, R. C. *et al.* c-Jun overexpression in CAR T cells induces exhaustion resistance. *Nature* **576**, 293-300 (2019).

38 Tsui, C. *et al.* MYB orchestrates T cell exhaustion and response to checkpoint inhibition. *Nature* **609**, 354-360 (2022).

39 Briscoe, J. & Therond, P. P. The mechanisms of Hedgehog signalling and its roles in development and disease. *Nat Rev Mol Cell Biol* **14**, 416-429 (2013).

40 Jang, J., Wang, Y., Kim, H. S., Lalli, M. A. & Kosik, K. S. Nrf2, a regulator of the proteasome, controls self-renewal and pluripotency in human embryonic stem cells. *Stem Cells* **32**, 2616-2625 (2014).

41 Sukumar, M. *et al.* Mitochondrial Membrane Potential Identifies Cells with Enhanced Stemness for Cellular Therapy. *Cell Metab* **23**, 63-76 (2016).

42 Verma, V. *et al.* MEK inhibition reprograms CD8(+) T lymphocytes into memory stem cells with potent antitumor effects. *Nat Immunol* **22**, 53-66 (2021).

43 Saxena, S. & Zou, L. Hallmarks of DNA replication stress. *Mol Cell* **82**, 2298-2314 (2022).

44 Kretschmer, L. *et al.* Differential expansion of T central memory precursor and effector subsets is regulated by division speed. *Nat Commun* **11**, 113 (2020).

45 Novotny-Diermayr, V., Lin, B., Gu, L. & Cao, X. Modulation of the interleukin-6 receptor subunit glycoprotein 130 complex and its signaling by LMO4 interaction. *J Biol Chem* **280**, 12747-12757 (2005).

46 Bong, Y. S. *et al.* ephrinB1 signals from the cell surface to the nucleus by recruitment of STAT3. *Proc Natl Acad Sci U S A* **104**, 17305-17310 (2007).

47 Castellino, F. & Germain, R. N. Chemokine-guided CD4+ T cell help enhances generation of IL-6RalphahighIL-7Ralpha high prememory CD8+ T cells. *J Immunol* **178**, 778-787 (2007).

48 Vavassori, V. *et al.* Lipid nanoparticles allow efficient and harmless ex vivo gene editing of human hematopoietic cells. *Blood* **142**, 812-826 (2023).

49 Ray, A. *et al.* Multimodal identification of rare potent effector CD8 T cells in solid tumors. *bioRxiv* (2023).

50 Newrzela, S. *et al.* Resistance of mature T cells to oncogene transformation. *Blood* **112**, 2278-2286 (2008).

51 Li, H. & Zhao, Y. Increasing the safety and efficacy of chimeric antigen receptor T cell therapy. *Protein Cell* **8**, 573-589 (2017).

APPENDIX

Supplementary Table 1. sgRNA log2-fold change (IFN-g$^{hi/lo}$ sorting bin counts) and FDR for each gene tested in a genome-wide CRISPRa screen[16]

Gene	*Screen_Version*	*CRISPRa_or_i*	*CD4_or_CD8*	*Cytokine*	*LFC*	*FDR*
MUC1	Primary	CRISPRa	CD8	IFNG	-2,1793	0,000081
JMJD1C	Primary	CRISPRa	CD8	IFNG	-2,1524	0,000081
IKZF3	Primary	CRISPRa	CD8	IFNG	-1,8336	0,000081
FOXF1	Primary	CRISPRa	CD8	IFNG	-1,726	0,000081
FOXL2	Primary	CRISPRa	CD8	IFNG	-1,7083	0,000081
GATA3	Primary	CRISPRa	CD8	IFNG	-1,7062	0,000081
EBF2	Primary	CRISPRa	CD8	IFNG	-1,6911	0,000081
GATA6	Primary	CRISPRa	CD8	IFNG	-1,4689	0,000081
SETD1B	Primary	CRISPRa	CD8	IFNG	-1,4086	0,000081
CEBPB	Primary	CRISPRa	CD8	IFNG	-1,353	0,000081
NFKBIA	Primary	CRISPRa	CD8	IFNG	-1,2571	0,000081
FOXA3	Primary	CRISPRa	CD8	IFNG	-1,0691	0,000081
TRIM28	Primary	CRISPRa	CD8	IFNG	-1,0523	0,000081
IKZF1	Primary	CRISPRa	CD8	IFNG	-1,0515	0,000081
POU2AF1	Primary	CRISPRa	CD8	IFNG	-1,0353	0,000081
FOXF2	Primary	CRISPRa	CD8	IFNG	-1,0319	0,000081
PCBP2	Primary	CRISPRa	CD8	IFNG	-1,008	0,000081
LMO4	Primary	CRISPRa	CD8	IFNG	-0,99478	0,000081
BTBD2	Primary	CRISPRa	CD8	IFNG	-0,56473	0,000081
POGZ	Primary	CRISPRa	CD8	IFNG	-0,093278	0,000081
PRKD2	Primary	CRISPRa	CD8	IFNG	0,97168	0,000118
EOMES	Primary	CRISPRa	CD8	IFNG	1,1139	0,000118
FOXD2	Primary	CRISPRa	CD8	IFNG	1,1208	0,000118
DEPDC7	Primary	CRISPRa	CD8	IFNG	1,1532	0,000118
FOXQ1	Primary	CRISPRa	CD8	IFNG	1,26	0,000118
TRIM21	Primary	CRISPRa	CD8	IFNG	1,2796	0,000118
WT1	Primary	CRISPRa	CD8	IFNG	1,3288	0,000118
FOSL1	Primary	CRISPRa	CD8	IFNG	1,3619	0,000118
HELZ2	Primary	CRISPRa	CD8	IFNG	1,4235	0,000118
TBX21	Primary	CRISPRa	CD8	IFNG	1,5555	0,000118
RELA	Primary	CRISPRa	CD8	IFNG	1,6201	0,000118
NFATC1	Primary	CRISPRa	CD8	IFNG	-1,1648	0,000369
CEBPA	Primary	CRISPRa	CD8	IFNG	-1,1422	0,000664
SMAD9	Primary	CRISPRa	CD8	IFNG	-1,0469	0,000664
NKX2-1	Primary	CRISPRa	CD8	IFNG	-0,71765	0,000723
FOSB	Primary	CRISPRa	CD8	IFNG	0,54855	0,000755
TAB3	Primary	CRISPRa	CD8	IFNG	0,56754	0,000755
FOXD1	Primary	CRISPRa	CD8	IFNG	0,77968	0,000755
PLAGL1	Primary	CRISPRa	CD8	IFNG	0,84927	0,000825
MBD1	Primary	CRISPRa	CD8	IFNG	-0,78576	0,000915
SOX18	Primary	CRISPRa	CD8	IFNG	-0,80393	0,001011
EIF3K	Primary	CRISPRa	CD8	IFNG	-0,68948	0,001186
LDB2	Primary	CRISPRa	CD8	IFNG	0,63885	0,001275
ZC3HAV1	Primary	CRISPRa	CD8	IFNG	1,1201	0,001363
NOTO	Primary	CRISPRa	CD8	IFNG	0,68807	0,001464
NFKB2	Primary	CRISPRa	CD8	IFNG	-0,98376	0,001465
SOX13	Primary	CRISPRa	CD8	IFNG	-0,96429	0,001761
PDLIM1	Primary	CRISPRa	CD8	IFNG	-0,0049872	0,001804

NKX2-6	Primary	CRISPRa	CD8	IFNG	-0,59406	0,002007
RBFOX2	Primary	CRISPRa	CD8	IFNG	-0,81926	0,002704
SOX7	Primary	CRISPRa	CD8	IFNG	-0,96946	0,00318
FOXI3	Primary	CRISPRa	CD8	IFNG	-0,79341	0,003313
RAP2C	Primary	CRISPRa	CD8	IFNG	-0,64413	0,003339
SMYD3	Primary	CRISPRa	CD8	IFNG	-0,62609	0,003713
ZBTB43	Primary	CRISPRa	CD8	IFNG	0,17587	0,003989
ZNF717	Primary	CRISPRa	CD8	IFNG	0,20445	0,003989
DEAF1	Primary	CRISPRa	CD8	IFNG	0,45932	0,003989
EP300	Primary	CRISPRa	CD8	IFNG	0,46622	0,003989
SAFB2	Primary	CRISPRa	CD8	IFNG	0,46812	0,003989
XPA	Primary	CRISPRa	CD8	IFNG	0,49838	0,003989
PRKCB	Primary	CRISPRa	CD8	IFNG	0,50011	0,003989
TRADD	Primary	CRISPRa	CD8	IFNG	0,6153	0,003989
FOXO6	Primary	CRISPRa	CD8	IFNG	0,78114	0,003989
POU2F2	Primary	CRISPRa	CD8	IFNG	0,82402	0,003989
UBE2D1	Primary	CRISPRa	CD8	IFNG	0,85623	0,003989
PRDM1	Primary	CRISPRa	CD8	IFNG	1,2512	0,003989
BCL9	Primary	CRISPRa	CD8	IFNG	0,47866	0,004199
PAX2	Primary	CRISPRa	CD8	IFNG	0,62766	0,004199
CUL1	Primary	CRISPRa	CD8	IFNG	0,69327	0,004199
STAT4	Primary	CRISPRa	CD8	IFNG	0,79746	0,004199
EPAS1	Primary	CRISPRa	CD8	IFNG	0,80478	0,004199
TRIM8	Primary	CRISPRa	CD8	IFNG	-0,79767	0,004766
CREB5	Primary	CRISPRa	CD8	IFNG	0,88676	0,004781
FOXJ1	Primary	CRISPRa	CD8	IFNG	-0,43636	0,005023
FOXE1	Primary	CRISPRa	CD8	IFNG	-0,73219	0,005188
ZNF474	Primary	CRISPRa	CD8	IFNG	-0,63605	0,005188
ATF4	Primary	CRISPRa	CD8	IFNG	-0,45875	0,005188
SMARCD1	Primary	CRISPRa	CD8	IFNG	0,045092	0,005188
BLM	Primary	CRISPRa	CD8	IFNG	-0,8068	0,005615
GATA4	Primary	CRISPRa	CD8	IFNG	-0,63721	0,005833
NR4A1	Primary	CRISPRa	CD8	IFNG	-0,5444	0,006277
MYB	Primary	CRISPRa	CD8	IFNG	-0,73033	0,006357
TCEAL2	Primary	CRISPRa	CD8	IFNG	-0,7107	0,006629
ISL2	Primary	CRISPRa	CD8	IFNG	-0,70507	0,007331
ZEB2	Primary	CRISPRa	CD8	IFNG	-0,69707	0,007852
RORB	Primary	CRISPRa	CD8	IFNG	-0,098568	0,008084
CAMK2D	Primary	CRISPRa	CD8	IFNG	-0,15372	0,009562
EBF3	Primary	CRISPRa	CD8	IFNG	-0,68776	0,00978
RBPMS	Primary	CRISPRa	CD8	IFNG	-0,5549	0,00978
BHLHE40	Primary	CRISPRa	CD8	IFNG	-0,50482	0,00978
KLF2	Primary	CRISPRa	CD8	IFNG	-0,83088	0,010018
NR2F1	Primary	CRISPRa	CD8	IFNG	-0,67346	0,010018
EBF1	Primary	CRISPRa	CD8	IFNG	-0,52557	0,010107
TLX1	Primary	CRISPRa	CD8	IFNG	-0,73239	0,010184
KLF4	Primary	CRISPRa	CD8	IFNG	-0,39959	0,010184
SMAD4	Primary	CRISPRa	CD8	IFNG	-0,63568	0,010423
ZKSCAN4	Primary	CRISPRa	CD8	IFNG	-0,61026	0,010458
BACH2	Primary	CRISPRa	CD8	IFNG	-0,58857	0,010458
CIPC	Primary	CRISPRa	CD8	IFNG	0,064263	0,011939
BCL9L	Primary	CRISPRa	CD8	IFNG	0,4067	0,011939
TAF15	Primary	CRISPRa	CD8	IFNG	0,51387	0,011939
GSX1	Primary	CRISPRa	CD8	IFNG	0,57205	0,011939
SP3	Primary	CRISPRa	CD8	IFNG	0,6684	0,011939

CHD4	Primary	CRISPRa	CD8	IFNG	0,70574	0,011939
SIRT1	Primary	CRISPRa	CD8	IFNG	0,7588	0,011939
NFKB1	Primary	CRISPRa	CD8	IFNG	0,84437	0,011939
TBX2	Primary	CRISPRa	CD8	IFNG	-0,42866	0,012767
TBX3	Primary	CRISPRa	CD8	IFNG	-0,79136	0,012795
BAHD1	Primary	CRISPRa	CD8	IFNG	-0,37191	0,013843
RREB1	Primary	CRISPRa	CD8	IFNG	-0,62163	0,014307
BTRC	Primary	CRISPRa	CD8	IFNG	-0,54763	0,014527
ZNF416	Primary	CRISPRa	CD8	IFNG	-0,33694	0,014781
CARF	Primary	CRISPRa	CD8	IFNG	-0,58767	0,020934
TNRC6A	Primary	CRISPRa	CD8	IFNG	0,27605	0,02229
KAT2B	Primary	CRISPRa	CD8	IFNG	0,28564	0,02229
ANKRD1	Primary	CRISPRa	CD8	IFNG	0,56041	0,02229
IRX5	Primary	CRISPRa	CD8	IFNG	0,59461	0,02229
SRC	Primary	CRISPRa	CD8	IFNG	0,60299	0,02229
NFATC2	Primary	CRISPRa	CD8	IFNG	0,63344	0,02229
BAZ1A	Primary	CRISPRa	CD8	IFNG	0,73813	0,02229
REL	Primary	CRISPRa	CD8	IFNG	0,72407	0,022577
IVNS1ABP	Primary	CRISPRa	CD8	IFNG	0,15687	0,022613
ZNF417	Primary	CRISPRa	CD8	IFNG	-0,24001	0,022614
KDM5B	Primary	CRISPRa	CD8	IFNG	0,60451	0,022614
PRDM13	Primary	CRISPRa	CD8	IFNG	0,86783	0,022614
ZNF630	Primary	CRISPRa	CD8	IFNG	0,31001	0,022628
MXD3	Primary	CRISPRa	CD8	IFNG	0,68625	0,022628
ZBTB25	Primary	CRISPRa	CD8	IFNG	-0,73016	0,022638
ZIC2	Primary	CRISPRa	CD8	IFNG	-0,43909	0,022727
ICE1	Primary	CRISPRa	CD8	IFNG	0,23577	0,023666
ZNF592	Primary	CRISPRa	CD8	IFNG	0,60495	0,023666
RNF8	Primary	CRISPRa	CD8	IFNG	0,67983	0,023666
NUP98	Primary	CRISPRa	CD8	IFNG	0,55816	0,023917
RFX6	Primary	CRISPRa	CD8	IFNG	0,59285	0,024279
SUMO1	Primary	CRISPRa	CD8	IFNG	0,52471	0,024694
ZNF580	Primary	CRISPRa	CD8	IFNG	-0,55768	0,025515
SQSTM1	Primary	CRISPRa	CD8	IFNG	0,30255	0,026493
NR4A3	Primary	CRISPRa	CD8	IFNG	-0,59592	0,026697
MLLT10	Primary	CRISPRa	CD8	IFNG	0,58427	0,027606
KLHL42	Primary	CRISPRa	CD8	IFNG	-0,62649	0,028672
PRDM16	Primary	CRISPRa	CD8	IFNG	-0,47084	0,028672
SOX10	Primary	CRISPRa	CD8	IFNG	-0,30702	0,028672
ZEB1	Primary	CRISPRa	CD8	IFNG	-0,43314	0,028742
ZNF106	Primary	CRISPRa	CD8	IFNG	-0,61397	0,029065
CCDC88A	Primary	CRISPRa	CD8	IFNG	-0,64438	0,0291
ZNF445	Primary	CRISPRa	CD8	IFNG	-0,6392	0,0291
POU4F2	Primary	CRISPRa	CD8	IFNG	-0,56505	0,029607
HOXD11	Primary	CRISPRa	CD8	IFNG	-0,48021	0,029607
THRSP	Primary	CRISPRa	CD8	IFNG	0,26091	0,030206
KLHL5	Primary	CRISPRa	CD8	IFNG	0,66839	0,030206
EZR	Primary	CRISPRa	CD8	IFNG	-0,29275	0,030237
HLX	Primary	CRISPRa	CD8	IFNG	0,65386	0,030292
GFI1	Primary	CRISPRa	CD8	IFNG	0,45093	0,030449
NOTCH1	Primary	CRISPRa	CD8	IFNG	0,63613	0,030471
PLEK2	Primary	CRISPRa	CD8	IFNG	0,55708	0,030647
SMYD2	Primary	CRISPRa	CD8	IFNG	-0,57563	0,030964
TRIM15	Primary	CRISPRa	CD8	IFNG	-0,42013	0,030964
HMGA2	Primary	CRISPRa	CD8	IFNG	-0,59479	0,031033

KLF3	Primary	CRISPRa	CD8	IFNG	0,48593	0,032105
ZNF316	Primary	CRISPRa	CD8	IFNG	0,19261	0,034168
PRAME	Primary	CRISPRa	CD8	IFNG	0,51549	0,034168
CHD3	Primary	CRISPRa	CD8	IFNG	0,65575	0,034168
NKRF	Primary	CRISPRa	CD8	IFNG	0,49718	0,034807
BTK	Primary	CRISPRa	CD8	IFNG	0,65343	0,03493
RUNX3	Primary	CRISPRa	CD8	IFNG	0,62475	0,03501
CCNA1	Primary	CRISPRa	CD8	IFNG	0,178	0,035479
MEF2B	Primary	CRISPRa	CD8	IFNG	0,37782	0,036299
TIRAP	Primary	CRISPRa	CD8	IFNG	0,57491	0,036299
ZBTB9	Primary	CRISPRa	CD8	IFNG	-0,51951	0,039843
GABPB1	Primary	CRISPRa	CD8	IFNG	-0,35585	0,040394
CBFA2T2	Primary	CRISPRa	CD8	IFNG	-0,70776	0,041465
PLXNA4	Primary	CRISPRa	CD8	IFNG	-0,60125	0,041525
GCM2	Primary	CRISPRa	CD8	IFNG	0,11538	0,041525
TCEAL8	Primary	CRISPRa	CD8	IFNG	-0,59573	0,041591
NAIF1	Primary	CRISPRa	CD8	IFNG	0,0063915	0,042854
PITX1	Primary	CRISPRa	CD8	IFNG	0,52924	0,042986
TOB2	Primary	CRISPRa	CD8	IFNG	0,53826	0,044325
DCC	Primary	CRISPRa	CD8	IFNG	-0,032281	0,044419
ZGLP1	Primary	CRISPRa	CD8	IFNG	0,30953	0,044618
TUT1	Primary	CRISPRa	CD8	IFNG	0,44052	0,045128
ZNF16	Primary	CRISPRa	CD8	IFNG	0,03252	0,045458
FOXD3	Primary	CRISPRa	CD8	IFNG	0,42335	0,045727
SOX21	Primary	CRISPRa	CD8	IFNG	-0,056174	0,045939
PRMT6	Primary	CRISPRa	CD8	IFNG	0,60377	0,045939
LARP1B	Primary	CRISPRa	CD8	IFNG	0,40325	0,046518
ZNF395	Primary	CRISPRa	CD8	IFNG	0,51584	0,046518
PRKAA2	Primary	CRISPRa	CD8	IFNG	0,52477	0,046681
MSANTD3	Primary	CRISPRa	CD8	IFNG	-0,13662	0,046913
EPC1	Primary	CRISPRa	CD8	IFNG	0,34221	0,046913
LHX6	Primary	CRISPRa	CD8	IFNG	0,4123	0,046913
SETSIP	Primary	CRISPRa	CD8	IFNG	0,53347	0,046913
TSC22D3	Primary	CRISPRa	CD8	IFNG	0,60552	0,046913
HSF4	Primary	CRISPRa	CD8	IFNG	-0,019332	0,046963
ZNF471	Primary	CRISPRa	CD8	IFNG	0,11809	0,046963
ZNF318	Primary	CRISPRa	CD8	IFNG	0,25411	0,046963
ETV2	Primary	CRISPRa	CD8	IFNG	0,28619	0,046963
ZNF214	Primary	CRISPRa	CD8	IFNG	0,42428	0,046963
LRRFIP2	Primary	CRISPRa	CD8	IFNG	0,53162	0,046963
PATZ1	Primary	CRISPRa	CD8	IFNG	0,54316	0,046963
CDKN1C	Primary	CRISPRa	CD8	IFNG	0,7565	0,046963
SUB1	Primary	CRISPRa	CD8	IFNG	0,48939	0,047531
MYOG	Primary	CRISPRa	CD8	IFNG	-0,34474	0,047751
ARNT	Primary	CRISPRa	CD8	IFNG	-0,0082459	0,048064
IRX3	Primary	CRISPRa	CD8	IFNG	0,44049	0,048064
SOHLH2	Primary	CRISPRa	CD8	IFNG	0,63877	0,048064
IRF4	Primary	CRISPRa	CD8	IFNG	0,53166	0,049061
SSRP1	Primary	CRISPRa	CD8	IFNG	0,10006	0,050685
CHUK	Primary	CRISPRa	CD8	IFNG	-0,52525	0,050804
ENY2	Primary	CRISPRa	CD8	IFNG	-0,53468	0,051174
ZNF713	Primary	CRISPRa	CD8	IFNG	-0,52126	0,051174
RPS6KA3	Primary	CRISPRa	CD8	IFNG	0,46538	0,051194
MLLT6	Primary	CRISPRa	CD8	IFNG	0,54643	0,051194
POU2F1	Primary	CRISPRa	CD8	IFNG	0,59339	0,051194

ASCC2	Primary	CRISPRa	CD8	IFNG	0,47536	0,051401
HSPA5	Primary	CRISPRa	CD8	IFNG	-0,012747	0,051423
FOXD4L6	Primary	CRISPRa	CD8	IFNG	0,13155	0,051423
ZNF774	Primary	CRISPRa	CD8	IFNG	0,20161	0,051423
RNF2	Primary	CRISPRa	CD8	IFNG	-0,3577	0,052853
MAP3K10	Primary	CRISPRa	CD8	IFNG	-0,0017233	0,053545
ING5	Primary	CRISPRa	CD8	IFNG	0,09187	0,053545
ZNF638	Primary	CRISPRa	CD8	IFNG	0,38274	0,053545
ZNF7	Primary	CRISPRa	CD8	IFNG	0,47317	0,053545
ZNF615	Primary	CRISPRa	CD8	IFNG	0,49599	0,053545
MAP2K6	Primary	CRISPRa	CD8	IFNG	0,36073	0,05388
ZBTB14	Primary	CRISPRa	CD8	IFNG	-0,70773	0,054603
HNF1B	Primary	CRISPRa	CD8	IFNG	-0,56137	0,054603
MLXIP	Primary	CRISPRa	CD8	IFNG	0,41073	0,055281
UBTF	Primary	CRISPRa	CD8	IFNG	-0,19502	0,05562
SP8	Primary	CRISPRa	CD8	IFNG	0,58262	0,056022
FOXA1	Primary	CRISPRa	CD8	IFNG	-0,59376	0,05615
ZNF740	Primary	CRISPRa	CD8	IFNG	-0,56191	0,05615
ACTB	Primary	CRISPRa	CD8	IFNG	0,54879	0,056211
NFYB	Primary	CRISPRa	CD8	IFNG	-0,29689	0,056226
RFPL3	Primary	CRISPRa	CD8	IFNG	0,44694	0,057463
PSMC4	Primary	CRISPRa	CD8	IFNG	0,053027	0,05814
LMO3	Primary	CRISPRa	CD8	IFNG	-0,2159	0,058359
CUL3	Primary	CRISPRa	CD8	IFNG	-0,13191	0,058842
PPARG	Primary	CRISPRa	CD8	IFNG	-0,51363	0,059937
CDKN1B	Primary	CRISPRa	CD8	IFNG	0,50464	0,061168
KCNIP1	Primary	CRISPRa	CD8	IFNG	0,48604	0,064418
RCOR3	Primary	CRISPRa	CD8	IFNG	-0,60937	0,064678
PARP10	Primary	CRISPRa	CD8	IFNG	-0,55378	0,064678
FOXL1	Primary	CRISPRa	CD8	IFNG	-0,52896	0,064678
AEBP1	Primary	CRISPRa	CD8	IFNG	-0,48087	0,064678
ZNF787	Primary	CRISPRa	CD8	IFNG	-0,41299	0,064678
HLTF	Primary	CRISPRa	CD8	IFNG	-0,36817	0,064678
BRPF3	Primary	CRISPRa	CD8	IFNG	-0,35611	0,064678
CIR1	Primary	CRISPRa	CD8	IFNG	-0,20527	0,064678
FOXN3	Primary	CRISPRa	CD8	IFNG	-0,68652	0,065041
ZNF319	Primary	CRISPRa	CD8	IFNG	-0,52819	0,065237
NKX2-3	Primary	CRISPRa	CD8	IFNG	-0,38868	0,065237
CCNT2	Primary	CRISPRa	CD8	IFNG	0,032817	0,065237
FOXK1	Primary	CRISPRa	CD8	IFNG	-0,22196	0,065402
TGIF2	Primary	CRISPRa	CD8	IFNG	-0,63338	0,066697
DEPDC4	Primary	CRISPRa	CD8	IFNG	-0,49633	0,066697
GPBP1	Primary	CRISPRa	CD8	IFNG	-0,45238	0,066697
TRIT1	Primary	CRISPRa	CD8	IFNG	-0,37641	0,066697
MTPN	Primary	CRISPRa	CD8	IFNG	-0,29306	0,066697
ARNTL2	Primary	CRISPRa	CD8	IFNG	-0,048282	0,066697
TNRC18	Primary	CRISPRa	CD8	IFNG	-0,065813	0,067328
HLA-DQB2	Primary	CRISPRa	CD8	IFNG	-0,67245	0,067514
PRMT3	Primary	CRISPRa	CD8	IFNG	-0,57614	0,067514
NKX1-1	Primary	CRISPRa	CD8	IFNG	-0,3411	0,067514
SOX15	Primary	CRISPRa	CD8	IFNG	-0,50958	0,067572
TULP1	Primary	CRISPRa	CD8	IFNG	-0,58321	0,068039
CALCOCO1	Primary	CRISPRa	CD8	IFNG	-0,20821	0,068662
COMMD4	Primary	CRISPRa	CD8	IFNG	-0,53427	0,068784
KLF10	Primary	CRISPRa	CD8	IFNG	-0,49296	0,068784

TTC21B	Primary	CRISPRa	CD8	IFNG	-0,47888	0,068784
RORA	Primary	CRISPRa	CD8	IFNG	-0,44546	0,068784
SFMBT1	Primary	CRISPRa	CD8	IFNG	-0,42518	0,068784
ARHGEF5	Primary	CRISPRa	CD8	IFNG	-0,36257	0,068784
KMT2E	Primary	CRISPRa	CD8	IFNG	-0,35848	0,068784
ZNF878	Primary	CRISPRa	CD8	IFNG	0,18839	0,070249
EGFR	Primary	CRISPRa	CD8	IFNG	-0,057167	0,072651
BARX1	Primary	CRISPRa	CD8	IFNG	-0,25998	0,072738
ZNF202	Primary	CRISPRa	CD8	IFNG	-0,28175	0,07444
ID3	Primary	CRISPRa	CD8	IFNG	-0,43902	0,07453
DMRTB1	Primary	CRISPRa	CD8	IFNG	-0,58063	0,074731
CROCC	Primary	CRISPRa	CD8	IFNG	0,04724	0,074857
TLE4	Primary	CRISPRa	CD8	IFNG	0,42909	0,074857
ZBED3	Primary	CRISPRa	CD8	IFNG	-0,5577	0,07542
CD3D	Primary	CRISPRa	CD8	IFNG	0,37181	0,076181
KAT6A	Primary	CRISPRa	CD8	IFNG	0,37891	0,076181
PHF8	Primary	CRISPRa	CD8	IFNG	0,45899	0,076181
EMX2	Primary	CRISPRa	CD8	IFNG	-0,34343	0,077005
IFRD1	Primary	CRISPRa	CD8	IFNG	-0,22371	0,077269
ZNF595	Primary	CRISPRa	CD8	IFNG	0,30299	0,077269
TXNIP	Primary	CRISPRa	CD8	IFNG	0,56499	0,078291
FARSB	Primary	CRISPRa	CD8	IFNG	0,53031	0,079133
SRF	Primary	CRISPRa	CD8	IFNG	-0,54622	0,079345
ATF3	Primary	CRISPRa	CD8	IFNG	0,51316	0,079638
SNAI3	Primary	CRISPRa	CD8	IFNG	0,53118	0,079813
MST1R	Primary	CRISPRa	CD8	IFNG	-0,080493	0,080177
LMNA	Primary	CRISPRa	CD8	IFNG	0,32087	0,080177
PYGO1	Primary	CRISPRa	CD8	IFNG	0,37239	0,080177
ZNF710	Primary	CRISPRa	CD8	IFNG	0,4378	0,080177
HNRNPAB	Primary	CRISPRa	CD8	IFNG	0,47133	0,080177
AHCTF1	Primary	CRISPRa	CD8	IFNG	0,48104	0,080177
PAGE4	Primary	CRISPRa	CD8	IFNG	0,48581	0,080177
RC3H1	Primary	CRISPRa	CD8	IFNG	0,49504	0,080177
NFE2	Primary	CRISPRa	CD8	IFNG	0,50432	0,080177
MYCBP2	Primary	CRISPRa	CD8	IFNG	-0,51951	0,08079
CENPF	Primary	CRISPRa	CD8	IFNG	-0,69099	0,081223
ZFP64	Primary	CRISPRa	CD8	IFNG	-0,52415	0,084664
GLI3	Primary	CRISPRa	CD8	IFNG	-0,62534	0,087466
S100A9	Primary	CRISPRa	CD8	IFNG	0,036057	0,088428
TFCP2L1	Primary	CRISPRa	CD8	IFNG	-0,48164	0,090154
LEUTX	Primary	CRISPRa	CD8	IFNG	0,13265	0,090154
TRIM33	Primary	CRISPRa	CD8	IFNG	-0,38699	0,094677
HIC1	Primary	CRISPRa	CD8	IFNG	0,13374	0,097627
ZNF77	Primary	CRISPRa	CD8	IFNG	-0,42356	0,098407
NCOR1	Primary	CRISPRa	CD8	IFNG	-0,59861	0,098486
TSG101	Primary	CRISPRa	CD8	IFNG	-0,52329	0,098486
MINK1	Primary	CRISPRa	CD8	IFNG	-0,46438	0,100325
PFN1	Primary	CRISPRa	CD8	IFNG	-0,43537	0,100325
ETV1	Primary	CRISPRa	CD8	IFNG	-0,13969	0,100325
ZNF831	Primary	CRISPRa	CD8	IFNG	-0,50264	0,100757
ATF6	Primary	CRISPRa	CD8	IFNG	-0,49836	0,100757
EVX2	Primary	CRISPRa	CD8	IFNG	-0,43901	0,105355
PSMC3IP	Primary	CRISPRa	CD8	IFNG	-0,40912	0,106085
ZNF473	Primary	CRISPRa	CD8	IFNG	0,044886	0,10624
BTG2	Primary	CRISPRa	CD8	IFNG	-0,022888	0,10753

MED18	Primary	CRISPRa	CD8	IFNG	-0,53586	0,107801
ZBTB20	Primary	CRISPRa	CD8	IFNG	-0,18659	0,107801
THAP9	Primary	CRISPRa	CD8	IFNG	-0,43343	0,110328
MID1	Primary	CRISPRa	CD8	IFNG	-0,48662	0,110626
PAGR1	Primary	CRISPRa	CD8	IFNG	-0,46441	0,111429
HMOX1	Primary	CRISPRa	CD8	IFNG	-0,57207	0,111479
EVX1	Primary	CRISPRa	CD8	IFNG	-0,49343	0,111479
ZNF212	Primary	CRISPRa	CD8	IFNG	-0,15968	0,111479
KCNIP4	Primary	CRISPRa	CD8	IFNG	-0,46531	0,11432
PASD1	Primary	CRISPRa	CD8	IFNG	-0,3825	0,11432
ZNF853	Primary	CRISPRa	CD8	IFNG	-0,353	0,11432
MLLT11	Primary	CRISPRa	CD8	IFNG	-0,16012	0,11432
MAGEA1	Primary	CRISPRa	CD8	IFNG	0,039214	0,11432
MAPK14	Primary	CRISPRa	CD8	IFNG	-0,1875	0,114874
NEUROG2	Primary	CRISPRa	CD8	IFNG	-0,58148	0,115838
RORC	Primary	CRISPRa	CD8	IFNG	-0,46343	0,115838
PSMC5	Primary	CRISPRa	CD8	IFNG	-0,17187	0,115838
HIPK2	Primary	CRISPRa	CD8	IFNG	-0,46516	0,120017
GSK3B	Primary	CRISPRa	CD8	IFNG	-0,1378	0,120542
BAZ2A	Primary	CRISPRa	CD8	IFNG	-0,044334	0,122418
FOXC1	Primary	CRISPRa	CD8	IFNG	-0,5682	0,12592
RFXANK	Primary	CRISPRa	CD8	IFNG	-0,52526	0,12592
SIX4	Primary	CRISPRa	CD8	IFNG	-0,40914	0,131015
CAMK4	Primary	CRISPRa	CD8	IFNG	-0,32759	0,131015
BEX1	Primary	CRISPRa	CD8	IFNG	-0,013855	0,131978
AGAP2	Primary	CRISPRa	CD8	IFNG	-0,49569	0,133072
NFIC	Primary	CRISPRa	CD8	IFNG	-0,4121	0,134753
BHLHB9	Primary	CRISPRa	CD8	IFNG	-0,12289	0,134851
HDAC4	Primary	CRISPRa	CD8	IFNG	-0,46282	0,135159
TGIF1	Primary	CRISPRa	CD8	IFNG	-0,52802	0,135827
SETDB2	Primary	CRISPRa	CD8	IFNG	-0,48793	0,138055
ANKZF1	Primary	CRISPRa	CD8	IFNG	-0,21614	0,138055
ZNF296	Primary	CRISPRa	CD8	IFNG	-0,49773	0,13853
NRK	Primary	CRISPRa	CD8	IFNG	-0,3037	0,140848
ATXN2	Primary	CRISPRa	CD8	IFNG	-0,27405	0,140848
TCF3	Primary	CRISPRa	CD8	IFNG	-0,12409	0,140848
CREBL2	Primary	CRISPRa	CD8	IFNG	-0,091293	0,140848
ZKSCAN5	Primary	CRISPRa	CD8	IFNG	-0,49515	0,141404
SETDB1	Primary	CRISPRa	CD8	IFNG	-0,25063	0,141404
ELF1	Primary	CRISPRa	CD8	IFNG	-0,49784	0,143774
MNT	Primary	CRISPRa	CD8	IFNG	-0,47975	0,143774
NAA15	Primary	CRISPRa	CD8	IFNG	-0,59647	0,14382
CDX2	Primary	CRISPRa	CD8	IFNG	-0,52217	0,14382
ZCCHC18	Primary	CRISPRa	CD8	IFNG	-0,5206	0,14382
CDK8	Primary	CRISPRa	CD8	IFNG	-0,46266	0,14382
SATB2	Primary	CRISPRa	CD8	IFNG	-0,43823	0,14382
ZNF503	Primary	CRISPRa	CD8	IFNG	-0,38488	0,14382
ATOH1	Primary	CRISPRa	CD8	IFNG	-0,27145	0,14382
PLCB1	Primary	CRISPRa	CD8	IFNG	-0,16338	0,14382
FOXP4	Primary	CRISPRa	CD8	IFNG	-0,50537	0,151197
DLX4	Primary	CRISPRa	CD8	IFNG	-0,44833	0,152502
ZNF546	Primary	CRISPRa	CD8	IFNG	-0,46272	0,15699
NAB1	Primary	CRISPRa	CD8	IFNG	-0,37906	0,15699
CDYL2	Primary	CRISPRa	CD8	IFNG	-0,51063	0,168571
GRM6	Primary	CRISPRa	CD8	IFNG	-0,51016	0,168571

ZNF614	Primary	CRISPRa	CD8	IFNG	-0,42644	0,168571
ATF5	Primary	CRISPRa	CD8	IFNG	-0,39272	0,168571
BRD9	Primary	CRISPRa	CD8	IFNG	-0,37186	0,168571
SUPT6H	Primary	CRISPRa	CD8	IFNG	-0,0083877	0,168571
IER2	Primary	CRISPRa	CD8	IFNG	-0,51785	0,168644
ARRB2	Primary	CRISPRa	CD8	IFNG	-0,37646	0,168644
OLIG3	Primary	CRISPRa	CD8	IFNG	-0,35044	0,168644
RAI1	Primary	CRISPRa	CD8	IFNG	-0,2759	0,168644
ZNF12	Primary	CRISPRa	CD8	IFNG	-0,05473	0,169209
NCOR2	Primary	CRISPRa	CD8	IFNG	-0,51939	0,170779
ZNF346	Primary	CRISPRa	CD8	IFNG	-0,49268	0,170779
IFI27	Primary	CRISPRa	CD8	IFNG	-0,073471	0,170779
TRERF1	Primary	CRISPRa	CD8	IFNG	-0,48764	0,172206
KDM2A	Primary	CRISPRa	CD8	IFNG	-0,55084	0,175295
ZNF600	Primary	CRISPRa	CD8	IFNG	-0,49853	0,175295
HDX	Primary	CRISPRa	CD8	IFNG	-0,49201	0,175295
ZNF134	Primary	CRISPRa	CD8	IFNG	-0,44624	0,175295
DLX3	Primary	CRISPRa	CD8	IFNG	-0,3224	0,175295
RBMXL1	Primary	CRISPRa	CD8	IFNG	-0,3154	0,175295
KLHL28	Primary	CRISPRa	CD8	IFNG	-0,28491	0,175295
PRDM6	Primary	CRISPRa	CD8	IFNG	-0,19427	0,175295
UTF1	Primary	CRISPRa	CD8	IFNG	-0,038668	0,175295
CERS3	Primary	CRISPRa	CD8	IFNG	-0,077032	0,175672
TNIP1	Primary	CRISPRa	CD8	IFNG	-0,46341	0,179561
KDM2B	Primary	CRISPRa	CD8	IFNG	-0,44681	0,179561
PRDM11	Primary	CRISPRa	CD8	IFNG	-0,3811	0,179561
MYCL	Primary	CRISPRa	CD8	IFNG	-0,47527	0,179658
YAP1	Primary	CRISPRa	CD8	IFNG	-0,36074	0,180947
FGFR2	Primary	CRISPRa	CD8	IFNG	-0,42372	0,181432
DAXX	Primary	CRISPRa	CD8	IFNG	-0,4869	0,182929
GATAD2B	Primary	CRISPRa	CD8	IFNG	0,14003	0,182929
HAX1	Primary	CRISPRa	CD8	IFNG	0,40492	0,18516
CD36	Primary	CRISPRa	CD8	IFNG	-0,3692	0,185503
HOXA4	Primary	CRISPRa	CD8	IFNG	-0,20563	0,185503
HDAC6	Primary	CRISPRa	CD8	IFNG	-0,20012	0,185503
CITED1	Primary	CRISPRa	CD8	IFNG	-0,17882	0,185503
TFDP1	Primary	CRISPRa	CD8	IFNG	0,018079	0,185503
PADI4	Primary	CRISPRa	CD8	IFNG	-0,4823	0,186297
ACTN1	Primary	CRISPRa	CD8	IFNG	-0,44092	0,186297
ZNF532	Primary	CRISPRa	CD8	IFNG	0,0058784	0,186297
SATB1	Primary	CRISPRa	CD8	IFNG	0,048446	0,186297
GTF2H2C	Primary	CRISPRa	CD8	IFNG	-0,54595	0,186299
UBR4	Primary	CRISPRa	CD8	IFNG	-0,52445	0,187177
CAND1	Primary	CRISPRa	CD8	IFNG	-0,50546	0,187177
CBFA2T3	Primary	CRISPRa	CD8	IFNG	-0,49217	0,187177
TRIB1	Primary	CRISPRa	CD8	IFNG	-0,44971	0,187177
PHF2	Primary	CRISPRa	CD8	IFNG	-0,44766	0,187177
MAFK	Primary	CRISPRa	CD8	IFNG	-0,44259	0,187177
EGLN1	Primary	CRISPRa	CD8	IFNG	-0,41732	0,187177
PTPN14	Primary	CRISPRa	CD8	IFNG	-0,40537	0,187177
UBE2I	Primary	CRISPRa	CD8	IFNG	-0,39946	0,187177
SPEN	Primary	CRISPRa	CD8	IFNG	-0,22404	0,187177
BRD4	Primary	CRISPRa	CD8	IFNG	-0,034176	0,187177
ZIC1	Primary	CRISPRa	CD8	IFNG	-0,45306	0,189476
TCF19	Primary	CRISPRa	CD8	IFNG	-0,55296	0,190449

TIMELESS	Primary	CRISPRa	CD8	IFNG	-0,23389	0,193353
ZFP30	Primary	CRISPRa	CD8	IFNG	-0,033412	0,193435
ZNF747	Primary	CRISPRa	CD8	IFNG	-0,38449	0,194425
ZNF20	Primary	CRISPRa	CD8	IFNG	-0,44366	0,195343
SOX4	Primary	CRISPRa	CD8	IFNG	-0,43603	0,195343
CDYL	Primary	CRISPRa	CD8	IFNG	-0,42513	0,195343
TLX3	Primary	CRISPRa	CD8	IFNG	-0,40812	0,195343
ZNF596	Primary	CRISPRa	CD8	IFNG	-0,29452	0,195343
ZNF610	Primary	CRISPRa	CD8	IFNG	-0,14057	0,195343
BLZF1	Primary	CRISPRa	CD8	IFNG	-0,40745	0,19689
CDCA7L	Primary	CRISPRa	CD8	IFNG	-0,36975	0,19689
SETBP1	Primary	CRISPRa	CD8	IFNG	-0,29616	0,19689
HIVEP2	Primary	CRISPRa	CD8	IFNG	-0,26039	0,19689
UBE2D3	Primary	CRISPRa	CD8	IFNG	0,034672	0,19689
HOXA2	Primary	CRISPRa	CD8	IFNG	0,16424	0,19689
LITAF	Primary	CRISPRa	CD8	IFNG	-0,32575	0,197873
ZNF780A	Primary	CRISPRa	CD8	IFNG	-0,12098	0,197873
TFB1M	Primary	CRISPRa	CD8	IFNG	-0,46715	0,199201
ZBTB10	Primary	CRISPRa	CD8	IFNG	-0,40512	0,199509
GREB1	Primary	CRISPRa	CD8	IFNG	-0,21983	0,202472
CEBPD	Primary	CRISPRa	CD8	IFNG	-0,48449	0,204177
SOX12	Primary	CRISPRa	CD8	IFNG	-0,55782	0,208343
PIAS3	Primary	CRISPRa	CD8	IFNG	-0,2202	0,208343
ZNF33B	Primary	CRISPRa	CD8	IFNG	-0,42784	0,216345
ETV3	Primary	CRISPRa	CD8	IFNG	-0,18506	0,216345
TRIM69	Primary	CRISPRa	CD8	IFNG	-0,027477	0,216381
CTDSPL2	Primary	CRISPRa	CD8	IFNG	0,012269	0,216381
CXXC1	Primary	CRISPRa	CD8	IFNG	-0,34089	0,218667
PHF1	Primary	CRISPRa	CD8	IFNG	-0,051876	0,218667
ZFHX2	Primary	CRISPRa	CD8	IFNG	0,016787	0,218667
AMOT	Primary	CRISPRa	CD8	IFNG	0,050234	0,218667
XPO1	Primary	CRISPRa	CD8	IFNG	0,061332	0,218667
COMMD9	Primary	CRISPRa	CD8	IFNG	0,076662	0,218667
ZNF136	Primary	CRISPRa	CD8	IFNG	0,086697	0,218667
GATAD2A	Primary	CRISPRa	CD8	IFNG	0,094956	0,218667
TIGD4	Primary	CRISPRa	CD8	IFNG	0,10263	0,218667
MAMLD1	Primary	CRISPRa	CD8	IFNG	0,10424	0,218667
MED7	Primary	CRISPRa	CD8	IFNG	0,10931	0,218667
DDN	Primary	CRISPRa	CD8	IFNG	0,11898	0,218667
NPM3	Primary	CRISPRa	CD8	IFNG	0,12593	0,218667
CUX2	Primary	CRISPRa	CD8	IFNG	0,15746	0,218667
RELL2	Primary	CRISPRa	CD8	IFNG	0,18809	0,218667
RBBP4	Primary	CRISPRa	CD8	IFNG	0,2121	0,218667
PPARGC1A	Primary	CRISPRa	CD8	IFNG	0,21252	0,218667
ATF6B	Primary	CRISPRa	CD8	IFNG	0,26933	0,218667
ZNF781	Primary	CRISPRa	CD8	IFNG	0,29818	0,218667
ZNF577	Primary	CRISPRa	CD8	IFNG	0,30651	0,218667
ZNF431	Primary	CRISPRa	CD8	IFNG	0,31523	0,218667
NELFCD	Primary	CRISPRa	CD8	IFNG	0,32199	0,218667
PURA	Primary	CRISPRa	CD8	IFNG	0,32608	0,218667
FEZF2	Primary	CRISPRa	CD8	IFNG	0,34603	0,218667
FABP4	Primary	CRISPRa	CD8	IFNG	0,36113	0,218667
ZNF22	Primary	CRISPRa	CD8	IFNG	0,36289	0,218667
TAF1	Primary	CRISPRa	CD8	IFNG	0,37491	0,218667
IRX4	Primary	CRISPRa	CD8	IFNG	0,39221	0,218667

FBXO5	Primary	CRISPRa	CD8	IFNG	0,39358	0,218667
LGR4	Primary	CRISPRa	CD8	IFNG	0,40149	0,218667
LIMA1	Primary	CRISPRa	CD8	IFNG	0,40299	0,218667
SF3A2	Primary	CRISPRa	CD8	IFNG	0,40803	0,218667
AKAP17A	Primary	CRISPRa	CD8	IFNG	0,40895	0,218667
TRIM25	Primary	CRISPRa	CD8	IFNG	0,41072	0,218667
KAT6B	Primary	CRISPRa	CD8	IFNG	0,42883	0,218667
HOXC8	Primary	CRISPRa	CD8	IFNG	0,4441	0,218667
ANKAR	Primary	CRISPRa	CD8	IFNG	0,45971	0,218667
HOXD13	Primary	CRISPRa	CD8	IFNG	0,46884	0,218667
PRB3	Primary	CRISPRa	CD8	IFNG	0,47496	0,218667
TULP2	Primary	CRISPRa	CD8	IFNG	0,49681	0,218667
PARP12	Primary	CRISPRa	CD8	IFNG	0,50713	0,218667
NEDD4L	Primary	CRISPRa	CD8	IFNG	0,51113	0,218667
MAP2K1	Primary	CRISPRa	CD8	IFNG	0,51352	0,218667
MEGF8	Primary	CRISPRa	CD8	IFNG	0,52627	0,218667
CSRNP3	Primary	CRISPRa	CD8	IFNG	0,54089	0,218667
FBXO41	Primary	CRISPRa	CD8	IFNG	0,62886	0,218667
TCF7L1	Primary	CRISPRa	CD8	IFNG	-0,29086	0,221039
LMO7	Primary	CRISPRa	CD8	IFNG	-0,35556	0,221287
TADA2B	Primary	CRISPRa	CD8	IFNG	-0,15579	0,2213
ZNF644	Primary	CRISPRa	CD8	IFNG	-0,15579	0,2213
SIX2	Primary	CRISPRa	CD8	IFNG	0,035303	0,2213
CXXC4	Primary	CRISPRa	CD8	IFNG	0,11722	0,2213
RNF14	Primary	CRISPRa	CD8	IFNG	0,11788	0,2213
KDM4E	Primary	CRISPRa	CD8	IFNG	0,12662	0,2213
BMP2	Primary	CRISPRa	CD8	IFNG	0,1834	0,2213
PIR	Primary	CRISPRa	CD8	IFNG	0,27017	0,2213
UBA52	Primary	CRISPRa	CD8	IFNG	0,34821	0,2213
TCEA1	Primary	CRISPRa	CD8	IFNG	0,377	0,2213
MSL3	Primary	CRISPRa	CD8	IFNG	0,45135	0,2213
ATF7	Primary	CRISPRa	CD8	IFNG	0,45649	0,2213
CBX3	Primary	CRISPRa	CD8	IFNG	0,50941	0,2213
NPM1	Primary	CRISPRa	CD8	IFNG	0,53798	0,2213
NACC1	Primary	CRISPRa	CD8	IFNG	0,16879	0,226042
PAX5	Primary	CRISPRa	CD8	IFNG	-0,28349	0,227559
ZHX3	Primary	CRISPRa	CD8	IFNG	0,3744	0,227559
AKT1	Primary	CRISPRa	CD8	IFNG	0,44423	0,227559
KRBOX4	Primary	CRISPRa	CD8	IFNG	0,13378	0,227886
PNRC2	Primary	CRISPRa	CD8	IFNG	-0,23579	0,227968
PRDM8	Primary	CRISPRa	CD8	IFNG	-0,18362	0,227968
HOXC13	Primary	CRISPRa	CD8	IFNG	-0,045113	0,227968
NSD2	Primary	CRISPRa	CD8	IFNG	0,19753	0,227968
KLF14	Primary	CRISPRa	CD8	IFNG	0,36035	0,227968
DACT1	Primary	CRISPRa	CD8	IFNG	0,53064	0,227968
ZYX	Primary	CRISPRa	CD8	IFNG	0,19889	0,228222
ZNF772	Primary	CRISPRa	CD8	IFNG	0,49442	0,228222
SAMD4B	Primary	CRISPRa	CD8	IFNG	-0,5201	0,228543
RSF1	Primary	CRISPRa	CD8	IFNG	-0,35927	0,228606
ZNF778	Primary	CRISPRa	CD8	IFNG	-0,37698	0,234214
ZNF804A	Primary	CRISPRa	CD8	IFNG	-0,14236	0,235158
SF3A3	Primary	CRISPRa	CD8	IFNG	0,10613	0,235539
PRAMEF33	Primary	CRISPRa	CD8	IFNG	-0,33101	0,23635
KLHL36	Primary	CRISPRa	CD8	IFNG	-0,18036	0,23635
TRIM9	Primary	CRISPRa	CD8	IFNG	-0,0063757	0,236692

AHDC1	Primary	CRISPRa	CD8	IFNG	-0,46586	0,23752
ZNF57	Primary	CRISPRa	CD8	IFNG	-0,42109	0,237714
BTN3A3	Primary	CRISPRa	CD8	IFNG	-0,38074	0,237714
PRKN	Primary	CRISPRa	CD8	IFNG	0,7262	0,295018
SP6	Primary	CRISPRa	CD8	IFNG	-0,53263	0,296545
C6orf89	Primary	CRISPRa	CD8	IFNG	-0,38199	0,296545
KLHL3	Primary	CRISPRa	CD8	IFNG	-0,28008	0,296669
HIPK3	Primary	CRISPRa	CD8	IFNG	-0,4203	0,298911
CAMK1	Primary	CRISPRa	CD8	IFNG	-0,34903	0,298911
ZNF720	Primary	CRISPRa	CD8	IFNG	-0,29619	0,298911
TBL1XR1	Primary	CRISPRa	CD8	IFNG	-0,47277	0,299137
GTF2H2	Primary	CRISPRa	CD8	IFNG	-0,3336	0,299372
ZBTB6	Primary	CRISPRa	CD8	IFNG	-0,41863	0,300871
GSC	Primary	CRISPRa	CD8	IFNG	-0,4739	0,301098
STAT6	Primary	CRISPRa	CD8	IFNG	-0,43878	0,301098
RAX2	Primary	CRISPRa	CD8	IFNG	-0,43562	0,301098
FARSA	Primary	CRISPRa	CD8	IFNG	-0,40777	0,301098
SON	Primary	CRISPRa	CD8	IFNG	-0,40567	0,301098
GATA5	Primary	CRISPRa	CD8	IFNG	-0,38427	0,301098
CARM1	Primary	CRISPRa	CD8	IFNG	-0,35661	0,301098
FOXD4L4	Primary	CRISPRa	CD8	IFNG	-0,35364	0,301098
CERS2	Primary	CRISPRa	CD8	IFNG	-0,35116	0,301098
ELL2	Primary	CRISPRa	CD8	IFNG	-0,33083	0,301098
STAT2	Primary	CRISPRa	CD8	IFNG	-0,31817	0,301098
ZNF555	Primary	CRISPRa	CD8	IFNG	-0,25634	0,301098
RNF112	Primary	CRISPRa	CD8	IFNG	-0,048727	0,301098
TOE1	Primary	CRISPRa	CD8	IFNG	-0,42074	0,301374
BHLHA9	Primary	CRISPRa	CD8	IFNG	-0,35751	0,301374
ZNF599	Primary	CRISPRa	CD8	IFNG	-0,34558	0,301374
MESP2	Primary	CRISPRa	CD8	IFNG	-0,3282	0,301374
AHRR	Primary	CRISPRa	CD8	IFNG	-0,4836	0,303919
REST	Primary	CRISPRa	CD8	IFNG	-0,39282	0,303919
SALL2	Primary	CRISPRa	CD8	IFNG	-0,26803	0,304835
PAX6	Primary	CRISPRa	CD8	IFNG	-0,3611	0,305006
BACH1	Primary	CRISPRa	CD8	IFNG	-0,34946	0,305006
ZNF219	Primary	CRISPRa	CD8	IFNG	-0,20379	0,305006
ZNF277	Primary	CRISPRa	CD8	IFNG	-0,18624	0,305006
PHTF1	Primary	CRISPRa	CD8	IFNG	0,0052136	0,30514
ZSCAN21	Primary	CRISPRa	CD8	IFNG	0,018818	0,30514
STAT5B	Primary	CRISPRa	CD8	IFNG	0,16421	0,30514
ZNF74	Primary	CRISPRa	CD8	IFNG	0,18548	0,30514
GPR155	Primary	CRISPRa	CD8	IFNG	0,22539	0,30514
DNAJC21	Primary	CRISPRa	CD8	IFNG	0,25294	0,30514
CNOT6	Primary	CRISPRa	CD8	IFNG	0,31587	0,30514
MAML2	Primary	CRISPRa	CD8	IFNG	0,36124	0,30514
ZNF140	Primary	CRISPRa	CD8	IFNG	0,39259	0,30514
IRF8	Primary	CRISPRa	CD8	IFNG	0,39274	0,30514
DPY30	Primary	CRISPRa	CD8	IFNG	0,39501	0,30514
SP110	Primary	CRISPRa	CD8	IFNG	0,39855	0,30514
NFKBIZ	Primary	CRISPRa	CD8	IFNG	0,40141	0,30514
RUNX1	Primary	CRISPRa	CD8	IFNG	0,40875	0,30514
PARP14	Primary	CRISPRa	CD8	IFNG	0,41713	0,30514
ZNF181	Primary	CRISPRa	CD8	IFNG	0,42476	0,30514
HSF2BP	Primary	CRISPRa	CD8	IFNG	0,4494	0,30514
MPHOSPH8	Primary	CRISPRa	CD8	IFNG	0,46386	0,30514

ZC3H18	Primary	CRISPRa	CD8	IFNG	0,49174	0,30514
ATF2	Primary	CRISPRa	CD8	IFNG	0,15699	0,305946
ZNF585B	Primary	CRISPRa	CD8	IFNG	0,381	0,305946
ZKSCAN1	Primary	CRISPRa	CD8	IFNG	0,054081	0,306237
ZNF81	Primary	CRISPRa	CD8	IFNG	-0,28478	0,306489
PPRC1	Primary	CRISPRa	CD8	IFNG	-0,17444	0,306489
TAL2	Primary	CRISPRa	CD8	IFNG	-0,020845	0,306489
HOXC12	Primary	CRISPRa	CD8	IFNG	-0,080134	0,306795
TESC	Primary	CRISPRa	CD8	IFNG	-0,098744	0,307296
ZBTB37	Primary	CRISPRa	CD8	IFNG	0,34939	0,308505
ZNF304	Primary	CRISPRa	CD8	IFNG	0,085825	0,30865
ASCL4	Primary	CRISPRa	CD8	IFNG	0,14066	0,30865
NCOA4	Primary	CRISPRa	CD8	IFNG	0,1554	0,30865
ZNF384	Primary	CRISPRa	CD8	IFNG	0,31901	0,30865
NCOA3	Primary	CRISPRa	CD8	IFNG	0,37458	0,30865
LEO1	Primary	CRISPRa	CD8	IFNG	0,40008	0,30865
ZNF44	Primary	CRISPRa	CD8	IFNG	0,40078	0,30865
CREB3L1	Primary	CRISPRa	CD8	IFNG	0,41376	0,30865
THRB	Primary	CRISPRa	CD8	IFNG	0,17777	0,309076
ZMIZ1	Primary	CRISPRa	CD8	IFNG	-0,44611	0,312049
RRP8	Primary	CRISPRa	CD8	IFNG	-0,42461	0,312049
WTIP	Primary	CRISPRa	CD8	IFNG	-0,35547	0,312049
SRSF10	Primary	CRISPRa	CD8	IFNG	-0,34785	0,312049
ARNT2	Primary	CRISPRa	CD8	IFNG	-0,33368	0,312049
CXXC5	Primary	CRISPRa	CD8	IFNG	-0,28792	0,312049
AXIN2	Primary	CRISPRa	CD8	IFNG	-0,25989	0,312049
ZNF785	Primary	CRISPRa	CD8	IFNG	-0,2524	0,312049
ZNF578	Primary	CRISPRa	CD8	IFNG	-0,089416	0,312049
RPS27A	Primary	CRISPRa	CD8	IFNG	-0,43259	0,316051
PCNA	Primary	CRISPRa	CD8	IFNG	-0,41089	0,316051
E4F1	Primary	CRISPRa	CD8	IFNG	-0,36733	0,316051
MAFF	Primary	CRISPRa	CD8	IFNG	-0,32577	0,316051
BCL3	Primary	CRISPRa	CD8	IFNG	-0,52048	0,318253
ZNF385D	Primary	CRISPRa	CD8	IFNG	-0,43564	0,318253
TRIM68	Primary	CRISPRa	CD8	IFNG	-0,43167	0,318253
MBNL3	Primary	CRISPRa	CD8	IFNG	-0,41508	0,318253
DHX36	Primary	CRISPRa	CD8	IFNG	-0,40132	0,318253
SRCAP	Primary	CRISPRa	CD8	IFNG	-0,33244	0,318253
ZNF497	Primary	CRISPRa	CD8	IFNG	-0,30678	0,318253
SUFU	Primary	CRISPRa	CD8	IFNG	-0,19279	0,318253
ADNP2	Primary	CRISPRa	CD8	IFNG	-0,15143	0,318253
SMYD1	Primary	CRISPRa	CD8	IFNG	-0,1223	0,318253
ZFHX3	Primary	CRISPRa	CD8	IFNG	-0,086592	0,318253
LYL1	Primary	CRISPRa	CD8	IFNG	-0,069802	0,318253
TGS1	Primary	CRISPRa	CD8	IFNG	-0,059031	0,318253
ZNF660	Primary	CRISPRa	CD8	IFNG	-0,057247	0,318253
MAP2K2	Primary	CRISPRa	CD8	IFNG	0,0032679	0,318253
PGBD1	Primary	CRISPRa	CD8	IFNG	0,017975	0,318253
ZNF850	Primary	CRISPRa	CD8	IFNG	0,051457	0,318253
ZNF429	Primary	CRISPRa	CD8	IFNG	0,084771	0,318253
ELOC	Primary	CRISPRa	CD8	IFNG	0,24221	0,318253
IRX2	Primary	CRISPRa	CD8	IFNG	0,2915	0,318253
NLRP3	Primary	CRISPRa	CD8	IFNG	-0,45068	0,318627
ZNF24	Primary	CRISPRa	CD8	IFNG	-0,3986	0,318627
DLX6	Primary	CRISPRa	CD8	IFNG	-0,39412	0,318627

ZBTB42	Primary	CRISPRa	CD8	IFNG	0,046928	0,318627
JADE3	Primary	CRISPRa	CD8	IFNG	0,10204	0,318627
TAF10	Primary	CRISPRa	CD8	IFNG	-0,3961	0,320058
LHX9	Primary	CRISPRa	CD8	IFNG	-0,36343	0,320058
CBX1	Primary	CRISPRa	CD8	IFNG	-0,29128	0,320058
KMT2A	Primary	CRISPRa	CD8	IFNG	-0,20263	0,320058
SENP1	Primary	CRISPRa	CD8	IFNG	-0,19715	0,320058
BRIP1	Primary	CRISPRa	CD8	IFNG	0,12174	0,320058
SIRT7	Primary	CRISPRa	CD8	IFNG	-0,41972	0,32133
ANXA4	Primary	CRISPRa	CD8	IFNG	-0,040919	0,321749
DMRT2	Primary	CRISPRa	CD8	IFNG	-0,39816	0,322093
KLHL12	Primary	CRISPRa	CD8	IFNG	-0,14933	0,365033
NKX2-8	Primary	CRISPRa	CD8	IFNG	-0,18863	0,365231
MLX	Primary	CRISPRa	CD8	IFNG	0,20529	0,365231
ZNF502	Primary	CRISPRa	CD8	IFNG	-0,5125	0,366149
ZNF519	Primary	CRISPRa	CD8	IFNG	-0,025399	0,366149
ZNF729	Primary	CRISPRa	CD8	IFNG	-0,25862	0,367119
MECP2	Primary	CRISPRa	CD8	IFNG	-0,19156	0,367119
CBX8	Primary	CRISPRa	CD8	IFNG	-0,16829	0,367119
COMMD10	Primary	CRISPRa	CD8	IFNG	-0,10897	0,367119
BMI1	Primary	CRISPRa	CD8	IFNG	0,29767	0,367119
PRAMEF20	Primary	CRISPRa	CD8	IFNG	-0,34385	0,36921
CSRNP1	Primary	CRISPRa	CD8	IFNG	-0,27747	0,36921
PYCARD	Primary	CRISPRa	CD8	IFNG	-0,27513	0,36921
ATN1	Primary	CRISPRa	CD8	IFNG	-0,1894	0,36921
PLK1	Primary	CRISPRa	CD8	IFNG	-0,46434	0,369343
NHLH2	Primary	CRISPRa	CD8	IFNG	-0,36858	0,369343
TSN	Primary	CRISPRa	CD8	IFNG	-0,34887	0,369343
SUPT5H	Primary	CRISPRa	CD8	IFNG	-0,33864	0,369343
ZNF593	Primary	CRISPRa	CD8	IFNG	-0,3145	0,369343
TRIM35	Primary	CRISPRa	CD8	IFNG	-0,27754	0,369343
ZNF706	Primary	CRISPRa	CD8	IFNG	-0,24461	0,369343
RNF135	Primary	CRISPRa	CD8	IFNG	-0,21835	0,369343
DRAP1	Primary	CRISPRa	CD8	IFNG	-0,15973	0,369343
L3MBTL4	Primary	CRISPRa	CD8	IFNG	-0,024962	0,369343
KPNA6	Primary	CRISPRa	CD8	IFNG	0,047539	0,369343
NOL11	Primary	CRISPRa	CD8	IFNG	0,062241	0,369343
IRF3	Primary	CRISPRa	CD8	IFNG	0,10385	0,369343
PPARGC1B	Primary	CRISPRa	CD8	IFNG	-0,45171	0,370909
ILF3	Primary	CRISPRa	CD8	IFNG	-0,28723	0,370909
AHR	Primary	CRISPRa	CD8	IFNG	-0,26589	0,370909
JMY	Primary	CRISPRa	CD8	IFNG	-0,24983	0,370909
RIPPLY1	Primary	CRISPRa	CD8	IFNG	-0,21798	0,370909
ELOB	Primary	CRISPRa	CD8	IFNG	-0,076443	0,370909
ZNF80	Primary	CRISPRa	CD8	IFNG	0,18281	0,370909
YY1	Primary	CRISPRa	CD8	IFNG	0,18411	0,370909
TEAD1	Primary	CRISPRa	CD8	IFNG	0,22504	0,370909
ZNF337	Primary	CRISPRa	CD8	IFNG	-0,38606	0,371893
ZNF250	Primary	CRISPRa	CD8	IFNG	-0,36691	0,371893
ZBTB39	Primary	CRISPRa	CD8	IFNG	-0,069587	0,371893
SNAPC4	Primary	CRISPRa	CD8	IFNG	0,028466	0,371893
TOX3	Primary	CRISPRa	CD8	IFNG	-0,26221	0,374629
HNRNPD	Primary	CRISPRa	CD8	IFNG	-0,15405	0,374629
JRKL	Primary	CRISPRa	CD8	IFNG	-0,13833	0,374629
WIZ	Primary	CRISPRa	CD8	IFNG	-0,001476	0,374629

SIM1	Primary	CRISPRa	CD8	IFNG	0,0019726	0,374629
RGS9	Primary	CRISPRa	CD8	IFNG	0,011439	0,374629
PLXNB1	Primary	CRISPRa	CD8	IFNG	0,012547	0,374629
EID1	Primary	CRISPRa	CD8	IFNG	0,012722	0,374629
UTY	Primary	CRISPRa	CD8	IFNG	0,030071	0,374629
BSX	Primary	CRISPRa	CD8	IFNG	0,037936	0,374629
MPRIP	Primary	CRISPRa	CD8	IFNG	0,04999	0,374629
PURG	Primary	CRISPRa	CD8	IFNG	0,08151	0,374629
ZXDA	Primary	CRISPRa	CD8	IFNG	0,10455	0,374629
ZNF17	Primary	CRISPRa	CD8	IFNG	0,10583	0,374629
SS18L1	Primary	CRISPRa	CD8	IFNG	0,11318	0,374629
CDK13	Primary	CRISPRa	CD8	IFNG	0,14166	0,374629
SKOR1	Primary	CRISPRa	CD8	IFNG	0,154	0,374629
FOXH1	Primary	CRISPRa	CD8	IFNG	0,16889	0,374629
KDM3A	Primary	CRISPRa	CD8	IFNG	0,19117	0,374629
EMX1	Primary	CRISPRa	CD8	IFNG	0,20045	0,374629
MACF1	Primary	CRISPRa	CD8	IFNG	0,20419	0,374629
PRRX1	Primary	CRISPRa	CD8	IFNG	0,20437	0,374629
SMARCE1	Primary	CRISPRa	CD8	IFNG	0,20438	0,374629
RNASE2	Primary	CRISPRa	CD8	IFNG	0,22954	0,374629
YEATS4	Primary	CRISPRa	CD8	IFNG	0,2395	0,374629
ZNF618	Primary	CRISPRa	CD8	IFNG	0,24032	0,374629
TCERG1	Primary	CRISPRa	CD8	IFNG	0,24492	0,374629
TRIM17	Primary	CRISPRa	CD8	IFNG	0,26436	0,374629
ZNF697	Primary	CRISPRa	CD8	IFNG	0,28034	0,374629
ZNF141	Primary	CRISPRa	CD8	IFNG	0,28383	0,374629
RAF1	Primary	CRISPRa	CD8	IFNG	0,29066	0,374629
NCOA2	Primary	CRISPRa	CD8	IFNG	0,29635	0,374629
LRRC14	Primary	CRISPRa	CD8	IFNG	0,29639	0,374629
ZNF254	Primary	CRISPRa	CD8	IFNG	0,29978	0,374629
CCDC85B	Primary	CRISPRa	CD8	IFNG	0,30772	0,374629
ZNF418	Primary	CRISPRa	CD8	IFNG	0,31055	0,374629
ELANE	Primary	CRISPRa	CD8	IFNG	0,31629	0,374629
KLF15	Primary	CRISPRa	CD8	IFNG	0,31821	0,374629
ZNFX1	Primary	CRISPRa	CD8	IFNG	0,32357	0,374629
AIP	Primary	CRISPRa	CD8	IFNG	0,32658	0,374629
ZNF484	Primary	CRISPRa	CD8	IFNG	0,33133	0,374629
NRIP2	Primary	CRISPRa	CD8	IFNG	0,34125	0,374629
CCNE1	Primary	CRISPRa	CD8	IFNG	0,34255	0,374629
ZNF233	Primary	CRISPRa	CD8	IFNG	0,34458	0,374629
PPHLN1	Primary	CRISPRa	CD8	IFNG	0,35043	0,374629
PDS5B	Primary	CRISPRa	CD8	IFNG	0,35045	0,374629
SMARCD3	Primary	CRISPRa	CD8	IFNG	0,36605	0,374629
NUP107	Primary	CRISPRa	CD8	IFNG	0,36662	0,374629
STOX1	Primary	CRISPRa	CD8	IFNG	0,36996	0,374629
AASS	Primary	CRISPRa	CD8	IFNG	0,37355	0,374629
NFE2L3	Primary	CRISPRa	CD8	IFNG	0,37469	0,374629
ARNTL	Primary	CRISPRa	CD8	IFNG	0,3754	0,374629
ZNF333	Primary	CRISPRa	CD8	IFNG	0,37915	0,374629
ANHX	Primary	CRISPRa	CD8	IFNG	0,38706	0,374629
HDGFL1	Primary	CRISPRa	CD8	IFNG	0,38728	0,374629
MPND	Primary	CRISPRa	CD8	IFNG	0,3874	0,374629
GLI1	Primary	CRISPRa	CD8	IFNG	0,38767	0,374629
SFMBT2	Primary	CRISPRa	CD8	IFNG	0,39033	0,374629
NFKBID	Primary	CRISPRa	CD8	IFNG	0,39318	0,374629

MYRFL	Primary	CRISPRa	CD8	IFNG	0,39774	0,374629
PIAS1	Primary	CRISPRa	CD8	IFNG	0,39872	0,374629
RGS14	Primary	CRISPRa	CD8	IFNG	0,40883	0,374629
TP53	Primary	CRISPRa	CD8	IFNG	0,41598	0,374629
ZNF207	Primary	CRISPRa	CD8	IFNG	0,41646	0,374629
HMX3	Primary	CRISPRa	CD8	IFNG	0,41822	0,374629
CHD7	Primary	CRISPRa	CD8	IFNG	0,42735	0,374629
CCT4	Primary	CRISPRa	CD8	IFNG	0,43156	0,374629
HABP4	Primary	CRISPRa	CD8	IFNG	0,44097	0,374629
SART3	Primary	CRISPRa	CD8	IFNG	0,44241	0,374629
CREB3	Primary	CRISPRa	CD8	IFNG	0,4587	0,374629
HDAC7	Primary	CRISPRa	CD8	IFNG	0,47031	0,374629
HSFY1	Primary	CRISPRa	CD8	IFNG	0,52065	0,374629
FUS	Primary	CRISPRa	CD8	IFNG	0,2525	0,374939
HOXB3	Primary	CRISPRa	CD8	IFNG	0,1108	0,37543
XIAP	Primary	CRISPRa	CD8	IFNG	0,18464	0,376901
ZNF564	Primary	CRISPRa	CD8	IFNG	0,2684	0,376901
BUD23	Primary	CRISPRa	CD8	IFNG	-0,16715	0,377019
POLE4	Primary	CRISPRa	CD8	IFNG	0,37531	0,377019
SNAPC1	Primary	CRISPRa	CD8	IFNG	0,38697	0,377019
SMARCA2	Primary	CRISPRa	CD8	IFNG	-0,28433	0,377179
ETS1	Primary	CRISPRa	CD8	IFNG	0,10844	0,377179
FOXA2	Primary	CRISPRa	CD8	IFNG	-0,29917	0,377422
ARGLU1	Primary	CRISPRa	CD8	IFNG	-0,1676	0,377422
PRKD1	Primary	CRISPRa	CD8	IFNG	0,21595	0,378356
MED30	Primary	CRISPRa	CD8	IFNG	-0,17608	0,378975
ZBTB5	Primary	CRISPRa	CD8	IFNG	-0,090191	0,378975
PRNP	Primary	CRISPRa	CD8	IFNG	0,18585	0,378975
ELP2	Primary	CRISPRa	CD8	IFNG	0,20337	0,378975
KLHL4	Primary	CRISPRa	CD8	IFNG	0,22222	0,378975
TCF7L2	Primary	CRISPRa	CD8	IFNG	0,27535	0,378975
FOXR2	Primary	CRISPRa	CD8	IFNG	0,32329	0,378975
POU5F2	Primary	CRISPRa	CD8	IFNG	0,36649	0,378975
ZNF362	Primary	CRISPRa	CD8	IFNG	0,38157	0,378975
TCF12	Primary	CRISPRa	CD8	IFNG	0,44358	0,378975
TFAP2A	Primary	CRISPRa	CD8	IFNG	-0,20075	0,37915
TRRAP	Primary	CRISPRa	CD8	IFNG	-0,27738	0,380121
PRDM12	Primary	CRISPRa	CD8	IFNG	0,10746	0,380121
LMO1	Primary	CRISPRa	CD8	IFNG	0,15556	0,381474
PACS2	Primary	CRISPRa	CD8	IFNG	0,17293	0,381474
ZNF570	Primary	CRISPRa	CD8	IFNG	0,24296	0,381474
ZNF280A	Primary	CRISPRa	CD8	IFNG	0,36122	0,381474
KRTAP5-1	Primary	CRISPRa	CD8	IFNG	-0,32119	0,381938
VAX2	Primary	CRISPRa	CD8	IFNG	-0,25905	0,381938
HES3	Primary	CRISPRa	CD8	IFNG	-0,066777	0,381938
EGLN2	Primary	CRISPRa	CD8	IFNG	-0,22676	0,382006
NFIX	Primary	CRISPRa	CD8	IFNG	0,10361	0,382111
FOXD4L1	Primary	CRISPRa	CD8	IFNG	0,48679	0,382111
DLX5	Primary	CRISPRa	CD8	IFNG	-0,23469	0,38272
THAP11	Primary	CRISPRa	CD8	IFNG	-0,23414	0,38272
ZNF506	Primary	CRISPRa	CD8	IFNG	-0,22588	0,38272
SNAI2	Primary	CRISPRa	CD8	IFNG	-0,2068	0,38272
SFPQ	Primary	CRISPRa	CD8	IFNG	-0,20254	0,38272
GTF3C3	Primary	CRISPRa	CD8	IFNG	-0,18354	0,38272
PARP1	Primary	CRISPRa	CD8	IFNG	-0,16321	0,38272

KLHL8	Primary	CRISPRa	CD8	IFNG	-0,14792	0,38272
NPAS2	Primary	CRISPRa	CD8	IFNG	-0,12955	0,38272
ZNF343	Primary	CRISPRa	CD8	IFNG	-0,12836	0,38272
PSMD11	Primary	CRISPRa	CD8	IFNG	-0,12397	0,38272
KDM5D	Primary	CRISPRa	CD8	IFNG	-0,12148	0,38272
MED23	Primary	CRISPRa	CD8	IFNG	-0,094671	0,38272
PBX2	Primary	CRISPRa	CD8	IFNG	-0,093812	0,38272
ZBTB3	Primary	CRISPRa	CD8	IFNG	-0,091468	0,38272
RBBP9	Primary	CRISPRa	CD8	IFNG	-0,091398	0,38272
IRF2	Primary	CRISPRa	CD8	IFNG	-0,089588	0,38272
RIPK3	Primary	CRISPRa	CD8	IFNG	-0,081562	0,38272
ZNF701	Primary	CRISPRa	CD8	IFNG	-0,077481	0,38272
KMT2D	Primary	CRISPRa	CD8	IFNG	-0,063598	0,38272
ZNF18	Primary	CRISPRa	CD8	IFNG	-0,051169	0,38272
ZNF562	Primary	CRISPRa	CD8	IFNG	-0,034601	0,38272
GBX2	Primary	CRISPRa	CD8	IFNG	-0,030379	0,38272
ATF7IP2	Primary	CRISPRa	CD8	IFNG	-0,016662	0,38272
DEK	Primary	CRISPRa	CD8	IFNG	-0,011342	0,38272
IRX1	Primary	CRISPRa	CD8	IFNG	-0,0053174	0,38272
ZNF425	Primary	CRISPRa	CD8	IFNG	-0,0043719	0,38272
CEBPG	Primary	CRISPRa	CD8	IFNG	-0,0039924	0,38272
ECD	Primary	CRISPRa	CD8	IFNG	-0,00381	0,38272
POU3F3	Primary	CRISPRa	CD8	IFNG	-0,0037175	0,38272
NRF1	Primary	CRISPRa	CD8	IFNG	-0,0012803	0,38272
MORF4L1	Primary	CRISPRa	CD8	IFNG	0,011746	0,38272
SENP2	Primary	CRISPRa	CD8	IFNG	0,026488	0,38272
ZNF160	Primary	CRISPRa	CD8	IFNG	0,038982	0,38272
ZCCHC12	Primary	CRISPRa	CD8	IFNG	0,041991	0,38272
ZDHHC1	Primary	CRISPRa	CD8	IFNG	0,044158	0,38272
TCF4	Primary	CRISPRa	CD8	IFNG	0,04967	0,38272
GLIS2	Primary	CRISPRa	CD8	IFNG	0,061149	0,38272
CRAMP1	Primary	CRISPRa	CD8	IFNG	0,062691	0,38272
PRKCQ	Primary	CRISPRa	CD8	IFNG	0,063566	0,38272
CDKN2B	Primary	CRISPRa	CD8	IFNG	0,065952	0,38272
ZNF727	Primary	CRISPRa	CD8	IFNG	0,066815	0,38272
RUNX1T1	Primary	CRISPRa	CD8	IFNG	0,06694	0,38272
ZNF721	Primary	CRISPRa	CD8	IFNG	0,07469	0,38272
ZNF320	Primary	CRISPRa	CD8	IFNG	0,075416	0,38272
BTAF1	Primary	CRISPRa	CD8	IFNG	0,075762	0,38272
HMBOX1	Primary	CRISPRa	CD8	IFNG	0,080527	0,38272
GABPB2	Primary	CRISPRa	CD8	IFNG	0,092245	0,38272
ZNF566	Primary	CRISPRa	CD8	IFNG	0,096071	0,38272
AKIRIN2	Primary	CRISPRa	CD8	IFNG	0,10552	0,38272
YAF2	Primary	CRISPRa	CD8	IFNG	0,10706	0,38272
GTF2H4	Primary	CRISPRa	CD8	IFNG	0,11216	0,38272
MYT1	Primary	CRISPRa	CD8	IFNG	0,12011	0,38272
LPIN1	Primary	CRISPRa	CD8	IFNG	0,12454	0,38272
PYHIN1	Primary	CRISPRa	CD8	IFNG	0,12487	0,38272
TTF1	Primary	CRISPRa	CD8	IFNG	0,12515	0,38272
WWTR1	Primary	CRISPRa	CD8	IFNG	0,12949	0,38272
DHX34	Primary	CRISPRa	CD8	IFNG	0,1299	0,38272
MYSM1	Primary	CRISPRa	CD8	IFNG	0,1328	0,38272
HCLS1	Primary	CRISPRa	CD8	IFNG	0,13353	0,38272
BRDT	Primary	CRISPRa	CD8	IFNG	0,14186	0,38272
GBX1	Primary	CRISPRa	CD8	IFNG	0,14521	0,38272

ZNF622	Primary	CRISPRa	CD8	IFNG	0,14724	0,38272
MED29	Primary	CRISPRa	CD8	IFNG	0,15201	0,38272
ZFY	Primary	CRISPRa	CD8	IFNG	0,15835	0,38272
ZNF41	Primary	CRISPRa	CD8	IFNG	0,16984	0,38272
GTF2F1	Primary	CRISPRa	CD8	IFNG	0,17382	0,38272
TIAL1	Primary	CRISPRa	CD8	IFNG	0,18326	0,38272
TP53BP2	Primary	CRISPRa	CD8	IFNG	0,18627	0,38272
DMBX1	Primary	CRISPRa	CD8	IFNG	0,18978	0,38272
SMARCA5	Primary	CRISPRa	CD8	IFNG	0,19662	0,38272
ZBTB49	Primary	CRISPRa	CD8	IFNG	0,19686	0,38272
ZSCAN10	Primary	CRISPRa	CD8	IFNG	0,1974	0,38272
ZC3H7A	Primary	CRISPRa	CD8	IFNG	0,19871	0,38272
ZNF180	Primary	CRISPRa	CD8	IFNG	0,20072	0,38272
E2F5	Primary	CRISPRa	CD8	IFNG	0,2061	0,38272
PRAMEF12	Primary	CRISPRa	CD8	IFNG	0,20842	0,38272
ZMAT3	Primary	CRISPRa	CD8	IFNG	0,20842	0,38272
SIM2	Primary	CRISPRa	CD8	IFNG	0,21615	0,38272
ZBTB45	Primary	CRISPRa	CD8	IFNG	0,21953	0,38272
NCK1	Primary	CRISPRa	CD8	IFNG	0,23241	0,38272
BCL10	Primary	CRISPRa	CD8	IFNG	0,23752	0,38272
ZNF513	Primary	CRISPRa	CD8	IFNG	0,2376	0,38272
PIN1	Primary	CRISPRa	CD8	IFNG	0,24023	0,38272
DIDO1	Primary	CRISPRa	CD8	IFNG	0,2421	0,38272
PSMC3	Primary	CRISPRa	CD8	IFNG	0,24248	0,38272
TRIM14	Primary	CRISPRa	CD8	IFNG	0,24804	0,38272
PIAS4	Primary	CRISPRa	CD8	IFNG	0,2499	0,38272
ZNF675	Primary	CRISPRa	CD8	IFNG	0,25636	0,38272
ZNF35	Primary	CRISPRa	CD8	IFNG	0,26237	0,38272
PLXND1	Primary	CRISPRa	CD8	IFNG	0,26693	0,38272
KHDRBS2	Primary	CRISPRa	CD8	IFNG	0,26722	0,38272
TRIM3	Primary	CRISPRa	CD8	IFNG	0,26872	0,38272
RIMS3	Primary	CRISPRa	CD8	IFNG	0,27077	0,38272
KRBOX1	Primary	CRISPRa	CD8	IFNG	0,2746	0,38272
SMAD6	Primary	CRISPRa	CD8	IFNG	0,27952	0,38272
ZNF776	Primary	CRISPRa	CD8	IFNG	0,28039	0,38272
EIF2AK2	Primary	CRISPRa	CD8	IFNG	0,28642	0,38272
HMGN2	Primary	CRISPRa	CD8	IFNG	0,28819	0,38272
CDC5L	Primary	CRISPRa	CD8	IFNG	0,29238	0,38272
HOXB8	Primary	CRISPRa	CD8	IFNG	0,29834	0,38272
MEF2A	Primary	CRISPRa	CD8	IFNG	0,29866	0,38272
SMARCAL1	Primary	CRISPRa	CD8	IFNG	0,29945	0,38272
WDR75	Primary	CRISPRa	CD8	IFNG	0,29975	0,38272
E2F3	Primary	CRISPRa	CD8	IFNG	0,30399	0,38272
FOXE3	Primary	CRISPRa	CD8	IFNG	0,30892	0,38272
PCSK4	Primary	CRISPRa	CD8	IFNG	0,30946	0,38272
MNX1	Primary	CRISPRa	CD8	IFNG	0,312	0,38272
ZBTB7C	Primary	CRISPRa	CD8	IFNG	0,31563	0,38272
ZNF718	Primary	CRISPRa	CD8	IFNG	0,31725	0,38272
HMX1	Primary	CRISPRa	CD8	IFNG	0,32037	0,38272
CSRNP2	Primary	CRISPRa	CD8	IFNG	0,32043	0,38272
CHEK1	Primary	CRISPRa	CD8	IFNG	0,32215	0,38272
DDX20	Primary	CRISPRa	CD8	IFNG	0,32275	0,38272
INSM2	Primary	CRISPRa	CD8	IFNG	0,32698	0,38272
KLF7	Primary	CRISPRa	CD8	IFNG	0,32915	0,38272
MAP3K7	Primary	CRISPRa	CD8	IFNG	0,33258	0,38272

HMGB4	Primary	CRISPRa	CD8	IFNG	0,33427	0,38272
RLIM	Primary	CRISPRa	CD8	IFNG	0,33509	0,38272
HEY1	Primary	CRISPRa	CD8	IFNG	0,34358	0,38272
PRMT2	Primary	CRISPRa	CD8	IFNG	0,34539	0,38272
ZKSCAN7	Primary	CRISPRa	CD8	IFNG	0,3465	0,38272
RPS6KA1	Primary	CRISPRa	CD8	IFNG	0,34765	0,38272
PHF21A	Primary	CRISPRa	CD8	IFNG	0,34856	0,38272
PARK7	Primary	CRISPRa	CD8	IFNG	0,35355	0,38272
TERF2IP	Primary	CRISPRa	CD8	IFNG	0,36022	0,38272
EGLN3	Primary	CRISPRa	CD8	IFNG	0,36147	0,38272
MDFI	Primary	CRISPRa	CD8	IFNG	0,36347	0,38272
ASCL2	Primary	CRISPRa	CD8	IFNG	0,37659	0,38272
TRIM24	Primary	CRISPRa	CD8	IFNG	0,38853	0,38272
MYCBP	Primary	CRISPRa	CD8	IFNG	0,031468	0,384338
NR2C1	Primary	CRISPRa	CD8	IFNG	-0,25561	0,386328
PRDM14	Primary	CRISPRa	CD8	IFNG	-0,22227	0,386328
DNAJC2	Primary	CRISPRa	CD8	IFNG	-0,063091	0,386328
SIX5	Primary	CRISPRa	CD8	IFNG	0,12475	0,386328
LHX5	Primary	CRISPRa	CD8	IFNG	-0,41811	0,386814
ZMYM6	Primary	CRISPRa	CD8	IFNG	-0,37378	0,386814
ZNF583	Primary	CRISPRa	CD8	IFNG	-0,36655	0,386814
NKX2-5	Primary	CRISPRa	CD8	IFNG	-0,3404	0,386814
ELF3	Primary	CRISPRa	CD8	IFNG	-0,32636	0,386814
PCGF1	Primary	CRISPRa	CD8	IFNG	-0,32035	0,386814
ZC3H8	Primary	CRISPRa	CD8	IFNG	-0,31908	0,386814
TRIM26	Primary	CRISPRa	CD8	IFNG	-0,31059	0,386814
TAF3	Primary	CRISPRa	CD8	IFNG	-0,31058	0,386814
ZC3H15	Primary	CRISPRa	CD8	IFNG	-0,30828	0,386814
NEUROG3	Primary	CRISPRa	CD8	IFNG	-0,30101	0,386814
ZBTB8B	Primary	CRISPRa	CD8	IFNG	-0,29869	0,386814
STK36	Primary	CRISPRa	CD8	IFNG	-0,27843	0,386814
ID4	Primary	CRISPRa	CD8	IFNG	-0,22025	0,386814
TBX10	Primary	CRISPRa	CD8	IFNG	-0,1725	0,386814
TXN	Primary	CRISPRa	CD8	IFNG	-0,17052	0,386814
ONECUT3	Primary	CRISPRa	CD8	IFNG	-0,16126	0,386814
NFE4	Primary	CRISPRa	CD8	IFNG	-0,13685	0,386814
DVL3	Primary	CRISPRa	CD8	IFNG	-0,12526	0,386814
SUZ12	Primary	CRISPRa	CD8	IFNG	-0,058349	0,386814
CRABP2	Primary	CRISPRa	CD8	IFNG	-0,046612	0,386814
ZNF84	Primary	CRISPRa	CD8	IFNG	-0,037351	0,386814
ZNF239	Primary	CRISPRa	CD8	IFNG	-0,028556	0,386814
FAM170A	Primary	CRISPRa	CD8	IFNG	0,036174	0,386814
KNTC1	Primary	CRISPRa	CD8	IFNG	0,049731	0,386814
ZNF561	Primary	CRISPRa	CD8	IFNG	0,050375	0,386814
NLK	Primary	CRISPRa	CD8	IFNG	0,093972	0,386814
PPP1R10	Primary	CRISPRa	CD8	IFNG	0,11339	0,386814
ELK3	Primary	CRISPRa	CD8	IFNG	0,1424	0,386814
FMNL2	Primary	CRISPRa	CD8	IFNG	0,19437	0,387343
ATRX	Primary	CRISPRa	CD8	IFNG	0,35216	0,387343
TBL1Y	Primary	CRISPRa	CD8	IFNG	-0,1369	0,38888
CHD6	Primary	CRISPRa	CD8	IFNG	-0,035622	0,38888
ZNF461	Primary	CRISPRa	CD8	IFNG	0,12401	0,38888
KHDRBS3	Primary	CRISPRa	CD8	IFNG	0,21009	0,38888
SCAPER	Primary	CRISPRa	CD8	IFNG	-0,15802	0,389938
RXRA	Primary	CRISPRa	CD8	IFNG	-0,18513	0,38995

PRMT5	Primary	CRISPRa	CD8	IFNG	0,035454	0,38995
PROP1	Primary	CRISPRa	CD8	IFNG	-0,17152	0,390246
ZNF34	Primary	CRISPRa	CD8	IFNG	0,057556	0,390246
ELP3	Primary	CRISPRa	CD8	IFNG	0,19468	0,390246
DZIP1L	Primary	CRISPRa	CD8	IFNG	-0,13526	0,390366
RBM27	Primary	CRISPRa	CD8	IFNG	-0,35788	0,391106
ZSCAN12	Primary	CRISPRa	CD8	IFNG	-0,22952	0,391106
DDIT3	Primary	CRISPRa	CD8	IFNG	-0,14236	0,391106
AFF4	Primary	CRISPRa	CD8	IFNG	0,18053	0,391106
PLSCR1	Primary	CRISPRa	CD8	IFNG	-0,40211	0,391539
MTERF3	Primary	CRISPRa	CD8	IFNG	-0,35198	0,391539
RFX5	Primary	CRISPRa	CD8	IFNG	-0,34703	0,391539
ZNF589	Primary	CRISPRa	CD8	IFNG	0,27811	0,39231
DR1	Primary	CRISPRa	CD8	IFNG	-0,012175	0,393379
RAPGEF3	Primary	CRISPRa	CD8	IFNG	-0,41176	0,397244
SUPT4H1	Primary	CRISPRa	CD8	IFNG	-0,29307	0,397244
DZIP1	Primary	CRISPRa	CD8	IFNG	0,32915	0,424908
TRIM4	Primary	CRISPRa	CD8	IFNG	-0,19708	0,425036
TXLNG	Primary	CRISPRa	CD8	IFNG	0,058629	0,425036
ZMYND8	Primary	CRISPRa	CD8	IFNG	0,24672	0,425036
ZNF679	Primary	CRISPRa	CD8	IFNG	0,26166	0,425036
ZBTB32	Primary	CRISPRa	CD8	IFNG	0,33167	0,425036
MTA3	Primary	CRISPRa	CD8	IFNG	0,33869	0,425036
RPS14	Primary	CRISPRa	CD8	IFNG	0,18469	0,425758
RNASEL	Primary	CRISPRa	CD8	IFNG	0,20541	0,425758
MAPK11	Primary	CRISPRa	CD8	IFNG	0,25967	0,425758
DNAJB1	Primary	CRISPRa	CD8	IFNG	0,2743	0,425843
NR2E1	Primary	CRISPRa	CD8	IFNG	-0,0037155	0,427599
TENM1	Primary	CRISPRa	CD8	IFNG	0,16421	0,427599
ZNF648	Primary	CRISPRa	CD8	IFNG	-0,18863	0,428791
E2F7	Primary	CRISPRa	CD8	IFNG	0,0053875	0,428791
ZNF761	Primary	CRISPRa	CD8	IFNG	0,11404	0,428791
YOD1	Primary	CRISPRa	CD8	IFNG	0,1372	0,428791
IL31RA	Primary	CRISPRa	CD8	IFNG	0,15289	0,428791
ASH2L	Primary	CRISPRa	CD8	IFNG	0,20155	0,428791
NPAS4	Primary	CRISPRa	CD8	IFNG	0,26508	0,428791
LPIN3	Primary	CRISPRa	CD8	IFNG	0,27022	0,428791
ZBTB1	Primary	CRISPRa	CD8	IFNG	0,29214	0,428791
HMGB3	Primary	CRISPRa	CD8	IFNG	0,29228	0,428791
EGR2	Primary	CRISPRa	CD8	IFNG	0,29675	0,428791
CENPJ	Primary	CRISPRa	CD8	IFNG	0,30073	0,428791
ZSCAN5B	Primary	CRISPRa	CD8	IFNG	0,30151	0,428791
THAP10	Primary	CRISPRa	CD8	IFNG	0,30893	0,428791
ZNF100	Primary	CRISPRa	CD8	IFNG	0,31864	0,428791
PKN1	Primary	CRISPRa	CD8	IFNG	0,33193	0,428791
ZMYM2	Primary	CRISPRa	CD8	IFNG	0,29296	0,429177
TRIM22	Primary	CRISPRa	CD8	IFNG	0,32595	0,429232
MYNN	Primary	CRISPRa	CD8	IFNG	-0,23496	0,429474
JUN	Primary	CRISPRa	CD8	IFNG	-0,10428	0,429474
MYO6	Primary	CRISPRa	CD8	IFNG	0,0068282	0,429474
AJUBA	Primary	CRISPRa	CD8	IFNG	-0,31215	0,430146
ZSCAN16	Primary	CRISPRa	CD8	IFNG	-0,031504	0,430831
KLHL1	Primary	CRISPRa	CD8	IFNG	0,1357	0,430831
BATF	Primary	CRISPRa	CD8	IFNG	0,2097	0,430831
ZNF175	Primary	CRISPRa	CD8	IFNG	0,22776	0,430831

ZNF514	Primary	CRISPRa	CD8	IFNG	0,23201	0,430831
TBR1	Primary	CRISPRa	CD8	IFNG	0,29165	0,431357
TIGD6	Primary	CRISPRa	CD8	IFNG	-0,062281	0,433462
LHX3	Primary	CRISPRa	CD8	IFNG	-0,37584	0,433622
BHLHE41	Primary	CRISPRa	CD8	IFNG	-0,37264	0,433622
AKAP8	Primary	CRISPRa	CD8	IFNG	-0,31487	0,433622
ZNF625	Primary	CRISPRa	CD8	IFNG	-0,22664	0,433622
RFX8	Primary	CRISPRa	CD8	IFNG	-0,20014	0,433622
INSR	Primary	CRISPRa	CD8	IFNG	-0,10261	0,433622
IFT74	Primary	CRISPRa	CD8	IFNG	0,00031553	0,433622
THAP1	Primary	CRISPRa	CD8	IFNG	-0,26625	0,433666
HIF3A	Primary	CRISPRa	CD8	IFNG	-0,16266	0,433666
ERBB2	Primary	CRISPRa	CD8	IFNG	-0,078065	0,433986
HNF4A	Primary	CRISPRa	CD8	IFNG	-0,09653	0,434012
ARID1A	Primary	CRISPRa	CD8	IFNG	-0,05975	0,434012
SRSF2	Primary	CRISPRa	CD8	IFNG	-0,057578	0,434012
CAMTA2	Primary	CRISPRa	CD8	IFNG	0,015092	0,434012
NOTCH3	Primary	CRISPRa	CD8	IFNG	0,040573	0,434012
ZFP42	Primary	CRISPRa	CD8	IFNG	0,045969	0,434012
ZNF266	Primary	CRISPRa	CD8	IFNG	0,097099	0,434012
MIER3	Primary	CRISPRa	CD8	IFNG	0,22154	0,434012
TRIM62	Primary	CRISPRa	CD8	IFNG	0,24557	0,434012
PPIE	Primary	CRISPRa	CD8	IFNG	0,30043	0,43436
ZC3H12B	Primary	CRISPRa	CD8	IFNG	-0,41014	0,434487
ONECUT2	Primary	CRISPRa	CD8	IFNG	-0,38255	0,434487
KCTD1	Primary	CRISPRa	CD8	IFNG	-0,28551	0,434487
NPAT	Primary	CRISPRa	CD8	IFNG	-0,21155	0,434487
AEBP2	Primary	CRISPRa	CD8	IFNG	-0,17422	0,434487
RAPGEF4	Primary	CRISPRa	CD8	IFNG	-0,16373	0,434487
TAF4B	Primary	CRISPRa	CD8	IFNG	-0,15709	0,434487
SS18	Primary	CRISPRa	CD8	IFNG	-0,15181	0,434487
WDR61	Primary	CRISPRa	CD8	IFNG	-0,1433	0,434487
ZNF808	Primary	CRISPRa	CD8	IFNG	-0,14273	0,434487
KLF16	Primary	CRISPRa	CD8	IFNG	0,084791	0,434487
BHLHE23	Primary	CRISPRa	CD8	IFNG	0,11969	0,434487
DACH1	Primary	CRISPRa	CD8	IFNG	0,14565	0,434487
TCF23	Primary	CRISPRa	CD8	IFNG	-0,36116	0,436423
ADAMTS19	Primary	CRISPRa	CD8	IFNG	-0,27966	0,436423
NCS1	Primary	CRISPRa	CD8	IFNG	-0,19782	0,436423
RBM20	Primary	CRISPRa	CD8	IFNG	-0,11095	0,436423
STAT1	Primary	CRISPRa	CD8	IFNG	-0,039219	0,436423
FIZ1	Primary	CRISPRa	CD8	IFNG	-0,010619	0,436423
ZNF423	Primary	CRISPRa	CD8	IFNG	-0,36495	0,436559
MBNL1	Primary	CRISPRa	CD8	IFNG	-0,26695	0,437892
ZNF276	Primary	CRISPRa	CD8	IFNG	0,017346	0,437892
IRAK1BP1	Primary	CRISPRa	CD8	IFNG	-0,058022	0,438707
RIN3	Primary	CRISPRa	CD8	IFNG	0,17066	0,43961
ZKSCAN2	Primary	CRISPRa	CD8	IFNG	0,26886	0,43961
ZBTB2	Primary	CRISPRa	CD8	IFNG	-0,24706	0,439797
RHOXF1	Primary	CRISPRa	CD8	IFNG	-0,11035	0,439797
TFEC	Primary	CRISPRa	CD8	IFNG	-0,058194	0,439797
TSC22D4	Primary	CRISPRa	CD8	IFNG	0,23508	0,439797
TNKS	Primary	CRISPRa	CD8	IFNG	-0,3257	0,44051
RFX7	Primary	CRISPRa	CD8	IFNG	-0,22088	0,442147
BHLHE22	Primary	CRISPRa	CD8	IFNG	0,20149	0,442147

TGIF2LX	Primary	CRISPRa	CD8	IFNG	0,28141	0,442147
ZFPL1	Primary	CRISPRa	CD8	IFNG	0,31609	0,442147
PRKAA1	Primary	CRISPRa	CD8	IFNG	0,0048043	0,443728
SOHLH1	Primary	CRISPRa	CD8	IFNG	0,12897	0,444429
TLX2	Primary	CRISPRa	CD8	IFNG	-0,057436	0,445673
ZNF683	Primary	CRISPRa	CD8	IFNG	0,3217	0,449426
ERCC3	Primary	CRISPRa	CD8	IFNG	-0,1212	0,450881
HOXB13	Primary	CRISPRa	CD8	IFNG	0,12104	0,450881
ZMAT4	Primary	CRISPRa	CD8	IFNG	0,2188	0,450881
ENC1	Primary	CRISPRa	CD8	IFNG	0,21924	0,450881
PLEK	Primary	CRISPRa	CD8	IFNG	0,25281	0,450881
NFX1	Primary	CRISPRa	CD8	IFNG	0,26291	0,450881
RALGAPA1	Primary	CRISPRa	CD8	IFNG	0,27542	0,450881
PHRF1	Primary	CRISPRa	CD8	IFNG	0,29171	0,450881
SUPT20HL1	Primary	CRISPRa	CD8	IFNG	-0,31827	0,451369
ZNF324	Primary	CRISPRa	CD8	IFNG	0,15887	0,454023
RNF187	Primary	CRISPRa	CD8	IFNG	0,20416	0,454023
SETX	Primary	CRISPRa	CD8	IFNG	0,26458	0,454023
ZNF678	Primary	CRISPRa	CD8	IFNG	0,30589	0,454949
ZC3H13	Primary	CRISPRa	CD8	IFNG	-0,04673	0,455429
CCAR1	Primary	CRISPRa	CD8	IFNG	0,047511	0,457346
DVL2	Primary	CRISPRa	CD8	IFNG	-0,12621	0,458446
MET	Primary	CRISPRa	CD8	IFNG	0,059098	0,458446
MTDH	Primary	CRISPRa	CD8	IFNG	0,10434	0,458446
HDAC5	Primary	CRISPRa	CD8	IFNG	0,15038	0,458446
SEBOX	Primary	CRISPRa	CD8	IFNG	0,15652	0,458446
ZNF211	Primary	CRISPRa	CD8	IFNG	0,19681	0,458446
DMTF1	Primary	CRISPRa	CD8	IFNG	0,23296	0,458446
ASF1B	Primary	CRISPRa	CD8	IFNG	0,26828	0,458446
CBFB	Primary	CRISPRa	CD8	IFNG	0,28204	0,458446
PML	Primary	CRISPRa	CD8	IFNG	0,35793	0,458446
RAD21	Primary	CRISPRa	CD8	IFNG	0,0057672	0,459136
ZNF569	Primary	CRISPRa	CD8	IFNG	0,17556	0,459922
MITF	Primary	CRISPRa	CD8	IFNG	-0,20304	0,460099
ZNF804B	Primary	CRISPRa	CD8	IFNG	0,36115	0,461528
ANP32D	Primary	CRISPRa	CD8	IFNG	0,086573	0,461572
FAM200B	Primary	CRISPRa	CD8	IFNG	0,30381	0,461572
RUNX2	Primary	CRISPRa	CD8	IFNG	0,33153	0,461572
EYA2	Primary	CRISPRa	CD8	IFNG	0,029041	0,464256
TFE3	Primary	CRISPRa	CD8	IFNG	0,068925	0,464256
ZNF524	Primary	CRISPRa	CD8	IFNG	0,082498	0,464256
BRWD3	Primary	CRISPRa	CD8	IFNG	0,1592	0,464256
RBBP7	Primary	CRISPRa	CD8	IFNG	0,18798	0,464256
PBX1	Primary	CRISPRa	CD8	IFNG	0,29956	0,464256
ILF2	Primary	CRISPRa	CD8	IFNG	0,31354	0,464256
GLI2	Primary	CRISPRa	CD8	IFNG	0,35015	0,464256
KDM7A	Primary	CRISPRa	CD8	IFNG	0,1082	0,465046
HOXB2	Primary	CRISPRa	CD8	IFNG	0,28236	0,466584
KAT2A	Primary	CRISPRa	CD8	IFNG	-0,095446	0,467505
KLHL14	Primary	CRISPRa	CD8	IFNG	0,0092398	0,467505
ZBTB7A	Primary	CRISPRa	CD8	IFNG	0,12612	0,467505
CFAP20	Primary	CRISPRa	CD8	IFNG	-0,05297	0,46846
CAMTA1	Primary	CRISPRa	CD8	IFNG	0,015983	0,46846
EWSR1	Primary	CRISPRa	CD8	IFNG	0,19158	0,46846
LARP6	Primary	CRISPRa	CD8	IFNG	0,2246	0,46846

CCDC17	Primary	CRISPRa	CD8	IFNG	0,23785	0,46846
ADAR	Primary	CRISPRa	CD8	IFNG	0,25757	0,46846
SERTAD2	Primary	CRISPRa	CD8	IFNG	0,2762	0,46846
DRGX	Primary	CRISPRa	CD8	IFNG	0,35002	0,46846
BRD7	Primary	CRISPRa	CD8	IFNG	0,0075062	0,469998
FOXN4	Primary	CRISPRa	CD8	IFNG	0,11584	0,469998
ING1	Primary	CRISPRa	CD8	IFNG	0,14846	0,469998
MED12	Primary	CRISPRa	CD8	IFNG	0,20973	0,469998
HOXA6	Primary	CRISPRa	CD8	IFNG	0,29751	0,469998
ZC3H7B	Primary	CRISPRa	CD8	IFNG	0,30316	0,469998
BCAS3	Primary	CRISPRa	CD8	IFNG	0,31804	0,469998
UBE2O	Primary	CRISPRa	CD8	IFNG	0,32288	0,469998
SMAD3	Primary	CRISPRa	CD8	IFNG	-0,46809	0,470325
TAL1	Primary	CRISPRa	CD8	IFNG	-0,37154	0,470325
HNRNPA2B1	Primary	CRISPRa	CD8	IFNG	-0,35492	0,470325
OAZ1	Primary	CRISPRa	CD8	IFNG	-0,35341	0,470325
TBX15	Primary	CRISPRa	CD8	IFNG	-0,3396	0,470325
ZNF705A	Primary	CRISPRa	CD8	IFNG	-0,32999	0,470325
ZNF267	Primary	CRISPRa	CD8	IFNG	-0,30253	0,470325
RBMX	Primary	CRISPRa	CD8	IFNG	-0,29294	0,470325
ZNF784	Primary	CRISPRa	CD8	IFNG	-0,2561	0,470325
ZNF777	Primary	CRISPRa	CD8	IFNG	-0,22584	0,470325
PID1	Primary	CRISPRa	CD8	IFNG	-0,21224	0,470325
TCEAL5	Primary	CRISPRa	CD8	IFNG	-0,19003	0,470325
PDPK1	Primary	CRISPRa	CD8	IFNG	-0,023241	0,470325
KCNH8	Primary	CRISPRa	CD8	IFNG	0,016361	0,470325
ETS2	Primary	CRISPRa	CD8	IFNG	0,18455	0,470325
ZNF786	Primary	CRISPRa	CD8	IFNG	0,20239	0,470325
HCFC1	Primary	CRISPRa	CD8	IFNG	-0,4326	0,471462
XBP1	Primary	CRISPRa	CD8	IFNG	-0,40495	0,471462
SETD7	Primary	CRISPRa	CD8	IFNG	-0,39345	0,471462
DNMT3A	Primary	CRISPRa	CD8	IFNG	-0,38255	0,471462
SP1	Primary	CRISPRa	CD8	IFNG	-0,38155	0,471462
TOB1	Primary	CRISPRa	CD8	IFNG	-0,31956	0,471462
ZNF530	Primary	CRISPRa	CD8	IFNG	-0,29025	0,471462
TCF7	Primary	CRISPRa	CD8	IFNG	-0,28095	0,471462
CIC	Primary	CRISPRa	CD8	IFNG	-0,27027	0,471462
RRM2	Primary	CRISPRa	CD8	IFNG	-0,25786	0,471462
PLK3	Primary	CRISPRa	CD8	IFNG	-0,25226	0,471462
DBX2	Primary	CRISPRa	CD8	IFNG	-0,17116	0,471462
ZSCAN1	Primary	CRISPRa	CD8	IFNG	-0,10625	0,471462
PCBP4	Primary	CRISPRa	CD8	IFNG	-0,08034	0,471462
WWP1	Primary	CRISPRa	CD8	IFNG	-0,074742	0,471462
KDM3B	Primary	CRISPRa	CD8	IFNG	-0,065727	0,471462
ZFP41	Primary	CRISPRa	CD8	IFNG	0,20545	0,472584
ZC3H10	Primary	CRISPRa	CD8	IFNG	-0,2853	0,472845
ZSCAN31	Primary	CRISPRa	CD8	IFNG	-0,25869	0,472845
CPXCR1	Primary	CRISPRa	CD8	IFNG	-0,19248	0,472845
SMARCA4	Primary	CRISPRa	CD8	IFNG	-0,15291	0,472845
DEPDC5	Primary	CRISPRa	CD8	IFNG	-0,12886	0,472845
EP400	Primary	CRISPRa	CD8	IFNG	-0,31131	0,473319
PMS1	Primary	CRISPRa	CD8	IFNG	-0,29582	0,473319
ZNF823	Primary	CRISPRa	CD8	IFNG	-0,29554	0,473319
DPF1	Primary	CRISPRa	CD8	IFNG	-0,22382	0,473319
PCBD2	Primary	CRISPRa	CD8	IFNG	-0,21811	0,473319

MBD3L4	Primary	CRISPRa	CD8	IFNG	-0,15049	0,473319
ZBTB21	Primary	CRISPRa	CD8	IFNG	-0,068127	0,473319
CHD1	Primary	CRISPRa	CD8	IFNG	0,0039554	0,473319
CCAR2	Primary	CRISPRa	CD8	IFNG	0,22312	0,473602
MAML1	Primary	CRISPRa	CD8	IFNG	-0,13397	0,473645
DTX1	Primary	CRISPRa	CD8	IFNG	0,11366	0,473645
TCF21	Primary	CRISPRa	CD8	IFNG	-0,094111	0,474151
CDC45	Primary	CRISPRa	CD8	IFNG	-0,0014378	0,474151
ZNF841	Primary	CRISPRa	CD8	IFNG	-0,14905	0,47417
ZNF736	Primary	CRISPRa	CD8	IFNG	0,34261	0,475182
MAFB	Primary	CRISPRa	CD8	IFNG	0,2848	0,476621
PIK3R2	Primary	CRISPRa	CD8	IFNG	0,018808	0,477276
ZNF558	Primary	CRISPRa	CD8	IFNG	0,030424	0,477276
KLF17	Primary	CRISPRa	CD8	IFNG	0,16242	0,477276
TSC22D1	Primary	CRISPRa	CD8	IFNG	0,23363	0,477276
BRCA2	Primary	CRISPRa	CD8	IFNG	0,070781	0,477293
ZNF800	Primary	CRISPRa	CD8	IFNG	-0,46955	0,477697
PLXNC1	Primary	CRISPRa	CD8	IFNG	-0,25833	0,477697
ZNF124	Primary	CRISPRa	CD8	IFNG	0,1561	0,478483
ZNF672	Primary	CRISPRa	CD8	IFNG	-0,41261	0,478936
CASZ1	Primary	CRISPRa	CD8	IFNG	-0,30166	0,478936
LEF1	Primary	CRISPRa	CD8	IFNG	-0,25696	0,478936
MAPK10	Primary	CRISPRa	CD8	IFNG	-0,21039	0,478936
MAGEA2	Primary	CRISPRa	CD8	IFNG	-0,18624	0,478936
CAVIN1	Primary	CRISPRa	CD8	IFNG	-0,14471	0,478936
ZSCAN2	Primary	CRISPRa	CD8	IFNG	-0,12684	0,478936
PIM1	Primary	CRISPRa	CD8	IFNG	0,060606	0,478936
FGF1	Primary	CRISPRa	CD8	IFNG	0,093435	0,478936
LRRFIP1	Primary	CRISPRa	CD8	IFNG	-0,1156	0,479261
ZNF891	Primary	CRISPRa	CD8	IFNG	0,2081	0,479261
CNOT11	Primary	CRISPRa	CD8	IFNG	-0,090471	0,481893
CHD9	Primary	CRISPRa	CD8	IFNG	-0,017997	0,481893
VSX1	Primary	CRISPRa	CD8	IFNG	-0,2118	0,482028
EN2	Primary	CRISPRa	CD8	IFNG	-0,19937	0,482028
HOXB6	Primary	CRISPRa	CD8	IFNG	-0,11164	0,482028
BRWD1	Primary	CRISPRa	CD8	IFNG	-0,058842	0,482028
TAF1D	Primary	CRISPRa	CD8	IFNG	-0,047877	0,482028
ZKSCAN8	Primary	CRISPRa	CD8	IFNG	0,067599	0,482028
ZNF670	Primary	CRISPRa	CD8	IFNG	0,071326	0,482028
TIGD1	Primary	CRISPRa	CD8	IFNG	0,075677	0,482028
ZMAT5	Primary	CRISPRa	CD8	IFNG	0,077037	0,482028
RARB	Primary	CRISPRa	CD8	IFNG	0,081674	0,482028
FOXO4	Primary	CRISPRa	CD8	IFNG	0,16362	0,482028
RCBTB1	Primary	CRISPRa	CD8	IFNG	0,16696	0,482028
ZNF486	Primary	CRISPRa	CD8	IFNG	0,18337	0,482028
NOC4L	Primary	CRISPRa	CD8	IFNG	0,21841	0,482028
MSANTD1	Primary	CRISPRa	CD8	IFNG	0,24883	0,482028
ZNF883	Primary	CRISPRa	CD8	IFNG	0,28446	0,482028
FLYWCH1	Primary	CRISPRa	CD8	IFNG	-0,3869	0,482108
TFAP2D	Primary	CRISPRa	CD8	IFNG	-0,31183	0,482108
JDP2	Primary	CRISPRa	CD8	IFNG	-0,18763	0,482108
ESR1	Primary	CRISPRa	CD8	IFNG	-0,10582	0,482108
FHL3	Primary	CRISPRa	CD8	IFNG	0,0080599	0,482108
FOXD4	Primary	CRISPRa	CD8	IFNG	0,35232	0,482216
FAM189B	Primary	CRISPRa	CD8	IFNG	-0,21897	0,483019

ZNF14	Primary	CRISPRa	CD8	IFNG	-0,19878	0,483019
PRAMEF5	Primary	CRISPRa	CD8	IFNG	-0,15181	0,483812
TSHZ1	Primary	CRISPRa	CD8	IFNG	-0,2569	0,48397
CHD2	Primary	CRISPRa	CD8	IFNG	-0,23287	0,48397
ZNF852	Primary	CRISPRa	CD8	IFNG	-0,03985	0,48397
INF2	Primary	CRISPRa	CD8	IFNG	0,037205	0,48397
ZNF280D	Primary	CRISPRa	CD8	IFNG	0,14305	0,48397
ZNF517	Primary	CRISPRa	CD8	IFNG	0,25001	0,48397
SLC22A4	Primary	CRISPRa	CD8	IFNG	0,26422	0,48397
ZNF608	Primary	CRISPRa	CD8	IFNG	-0,30841	0,484449
ZBTB41	Primary	CRISPRa	CD8	IFNG	0,23881	0,484504
BCOR	Primary	CRISPRa	CD8	IFNG	-0,24237	0,485746
PLXNA1	Primary	CRISPRa	CD8	IFNG	-0,2247	0,485746
FBXL19	Primary	CRISPRa	CD8	IFNG	-0,21308	0,485746
ZDHHC11	Primary	CRISPRa	CD8	IFNG	-0,1223	0,485746
PREX2	Primary	CRISPRa	CD8	IFNG	-0,099534	0,485746
PKNOX1	Primary	CRISPRa	CD8	IFNG	-0,066335	0,485746
ZNF354C	Primary	CRISPRa	CD8	IFNG	0,017396	0,485746
WNT8B	Primary	CRISPRa	CD8	IFNG	0,11204	0,485746
GABPA	Primary	CRISPRa	CD8	IFNG	0,17148	0,485746
ZNF674	Primary	CRISPRa	CD8	IFNG	-0,39425	0,488606
MED1	Primary	CRISPRa	CD8	IFNG	-0,28062	0,488606
NFKBIE	Primary	CRISPRa	CD8	IFNG	-0,23427	0,488606
SYK	Primary	CRISPRa	CD8	IFNG	-0,18704	0,488606
MAP2K5	Primary	CRISPRa	CD8	IFNG	-0,17771	0,488606
ZNF624	Primary	CRISPRa	CD8	IFNG	-0,14133	0,488606
MSX2	Primary	CRISPRa	CD8	IFNG	-0,13493	0,488606
ZC3H11A	Primary	CRISPRa	CD8	IFNG	-0,12024	0,488606
ZNF3	Primary	CRISPRa	CD8	IFNG	0,075862	0,488606
TRIM16	Primary	CRISPRa	CD8	IFNG	0,080451	0,491424
ZNF408	Primary	CRISPRa	CD8	IFNG	-0,19803	0,493283
TOP1MT	Primary	CRISPRa	CD8	IFNG	-0,26864	0,496187
NKX3-2	Primary	CRISPRa	CD8	IFNG	-0,20664	0,496187
DHX33	Primary	CRISPRa	CD8	IFNG	-0,1531	0,496187
BANP	Primary	CRISPRa	CD8	IFNG	-0,073747	0,496187
TEAD4	Primary	CRISPRa	CD8	IFNG	0,025398	0,496187
SCRT2	Primary	CRISPRa	CD8	IFNG	0,17862	0,496187
TCP10L	Primary	CRISPRa	CD8	IFNG	-0,37534	0,496299
GMCL1	Primary	CRISPRa	CD8	IFNG	-0,24059	0,496348
ZNF536	Primary	CRISPRa	CD8	IFNG	-0,034141	0,496348
MYBL2	Primary	CRISPRa	CD8	IFNG	-0,41115	0,497013
VGLL4	Primary	CRISPRa	CD8	IFNG	-0,3492	0,497013
KIAA1549	Primary	CRISPRa	CD8	IFNG	0,0017472	0,497013
CTCF	Primary	CRISPRa	CD8	IFNG	0,07441	0,497013
TIPARP	Primary	CRISPRa	CD8	IFNG	-0,31301	0,499512
PPP2R1A	Primary	CRISPRa	CD8	IFNG	-0,28983	0,499512
MORF4L2	Primary	CRISPRa	CD8	IFNG	-0,28822	0,499512
CTR9	Primary	CRISPRa	CD8	IFNG	-0,27061	0,499512
FOXC2	Primary	CRISPRa	CD8	IFNG	-0,25875	0,499512
ZNF518B	Primary	CRISPRa	CD8	IFNG	-0,10592	0,499704
MAPK8	Primary	CRISPRa	CD8	IFNG	-0,038965	0,503129
SMAD1	Primary	CRISPRa	CD8	IFNG	-0,21274	0,503398
SOX8	Primary	CRISPRa	CD8	IFNG	-0,071971	0,503398
ZNF619	Primary	CRISPRa	CD8	IFNG	-0,37312	0,505499
DMRTA2	Primary	CRISPRa	CD8	IFNG	-0,35756	0,505499

PPP3CB	Primary	CRISPRa	CD8	IFNG	-0,22366	0,505499
GATAD1	Primary	CRISPRa	CD8	IFNG	-0,38618	0,505676
AIRE	Primary	CRISPRa	CD8	IFNG	0,091231	0,505676
STK3	Primary	CRISPRa	CD8	IFNG	-0,29546	0,50633
TRIP11	Primary	CRISPRa	CD8	IFNG	-0,27919	0,50633
CBX5	Primary	CRISPRa	CD8	IFNG	0,16091	0,506482
ZNF326	Primary	CRISPRa	CD8	IFNG	0,17612	0,506482
OVOL1	Primary	CRISPRa	CD8	IFNG	0,29939	0,506482
HSPA1B	Primary	CRISPRa	CD8	IFNG	0,19414	0,506814
SUPT3H	Primary	CRISPRa	CD8	IFNG	0,045677	0,507241
ZNF385C	Primary	CRISPRa	CD8	IFNG	0,049774	0,507241
WBP2	Primary	CRISPRa	CD8	IFNG	-0,3221	0,507555
UBE2K	Primary	CRISPRa	CD8	IFNG	-0,0038408	0,508886
CBX6	Primary	CRISPRa	CD8	IFNG	0,029789	0,508886
WNT4	Primary	CRISPRa	CD8	IFNG	0,14595	0,508886
HMX2	Primary	CRISPRa	CD8	IFNG	0,3143	0,508886
MAPK1	Primary	CRISPRa	CD8	IFNG	0,32671	0,508886
YLPM1	Primary	CRISPRa	CD8	IFNG	-0,072108	0,50894
UBE2V1	Primary	CRISPRa	CD8	IFNG	0,0032292	0,50894
TRIP10	Primary	CRISPRa	CD8	IFNG	0,055831	0,50894
CSRP1	Primary	CRISPRa	CD8	IFNG	0,25444	0,50894
NRBF2	Primary	CRISPRa	CD8	IFNG	0,26389	0,50894
ESRRA	Primary	CRISPRa	CD8	IFNG	0,23466	0,511271
SP140L	Primary	CRISPRa	CD8	IFNG	0,23799	0,511271
PPP2CA	Primary	CRISPRa	CD8	IFNG	0,27437	0,511523
DHX9	Primary	CRISPRa	CD8	IFNG	-0,18062	0,511641
ASH1L	Primary	CRISPRa	CD8	IFNG	0,18028	0,511641
ZNF443	Primary	CRISPRa	CD8	IFNG	0,15966	0,511865
ID2	Primary	CRISPRa	CD8	IFNG	-0,00034338	0,51188
CC2D1A	Primary	CRISPRa	CD8	IFNG	0,121	0,51188
SCAND1	Primary	CRISPRa	CD8	IFNG	0,16194	0,51188
ZNF441	Primary	CRISPRa	CD8	IFNG	0,20591	0,51188
CHMP3	Primary	CRISPRa	CD8	IFNG	0,30012	0,51188
MED22	Primary	CRISPRa	CD8	IFNG	0,10827	0,517106
EZH2	Primary	CRISPRa	CD8	IFNG	-0,42866	0,517469
PRR3	Primary	CRISPRa	CD8	IFNG	-0,28492	0,517469
SCMH1	Primary	CRISPRa	CD8	IFNG	-0,25274	0,517469
NIPBL	Primary	CRISPRa	CD8	IFNG	-0,24532	0,517469
RGS6	Primary	CRISPRa	CD8	IFNG	-0,17248	0,517469
ZFP28	Primary	CRISPRa	CD8	IFNG	-0,16127	0,517469
ZNF385B	Primary	CRISPRa	CD8	IFNG	-0,13606	0,517469
TRAPPC2	Primary	CRISPRa	CD8	IFNG	0,0073869	0,517469
RBSN	Primary	CRISPRa	CD8	IFNG	0,064427	0,517469
ELF5	Primary	CRISPRa	CD8	IFNG	0,08004	0,517469
ZSCAN30	Primary	CRISPRa	CD8	IFNG	0,1047	0,517469
POU1F1	Primary	CRISPRa	CD8	IFNG	0,22724	0,517964
KLF8	Primary	CRISPRa	CD8	IFNG	0,31438	0,517964
HOXD1	Primary	CRISPRa	CD8	IFNG	-0,3685	0,518285
SOX2	Primary	CRISPRa	CD8	IFNG	-0,33612	0,518285
METTL3	Primary	CRISPRa	CD8	IFNG	-0,28656	0,518285
SALL4	Primary	CRISPRa	CD8	IFNG	-0,25793	0,518285
GTF2H3	Primary	CRISPRa	CD8	IFNG	-0,25292	0,518285
ZIM2	Primary	CRISPRa	CD8	IFNG	-0,22056	0,518285
TBPL1	Primary	CRISPRa	CD8	IFNG	-0,17177	0,518285
ZFP92	Primary	CRISPRa	CD8	IFNG	-0,04885	0,518285

MNAT1	Primary	CRISPRa	CD8	IFNG	0,0052186	0,518285
ZNF814	Primary	CRISPRa	CD8	IFNG	0,15588	0,518285
ZNF347	Primary	CRISPRa	CD8	IFNG	-0,31142	0,518623
MECOM	Primary	CRISPRa	CD8	IFNG	-0,2664	0,518623
FOXP1	Primary	CRISPRa	CD8	IFNG	-0,13644	0,518623
ETV4	Primary	CRISPRa	CD8	IFNG	-0,13561	0,518623
ZNF773	Primary	CRISPRa	CD8	IFNG	-0,0067848	0,518623
MLLT1	Primary	CRISPRa	CD8	IFNG	-0,10895	0,52033
FLI1	Primary	CRISPRa	CD8	IFNG	0,024167	0,52033
THAP5	Primary	CRISPRa	CD8	IFNG	0,077257	0,52033
PKIG	Primary	CRISPRa	CD8	IFNG	0,15576	0,52033
ARGFX	Primary	CRISPRa	CD8	IFNG	0,29677	0,52033
GATA1	Primary	CRISPRa	CD8	IFNG	-0,39774	0,520652
ZNF439	Primary	CRISPRa	CD8	IFNG	-0,38882	0,520652
DPPA4	Primary	CRISPRa	CD8	IFNG	-0,36055	0,520652
NEUROD2	Primary	CRISPRa	CD8	IFNG	-0,34153	0,520652
MIXL1	Primary	CRISPRa	CD8	IFNG	-0,32133	0,520652
MTF1	Primary	CRISPRa	CD8	IFNG	-0,32028	0,520652
NKX2-2	Primary	CRISPRa	CD8	IFNG	-0,3115	0,520652
SREBF1	Primary	CRISPRa	CD8	IFNG	-0,29721	0,520652
UIMC1	Primary	CRISPRa	CD8	IFNG	-0,29674	0,520652
GATA2	Primary	CRISPRa	CD8	IFNG	-0,29631	0,520652
TFAP2C	Primary	CRISPRa	CD8	IFNG	-0,27694	0,520652
FHOD1	Primary	CRISPRa	CD8	IFNG	-0,26284	0,520652
ALX3	Primary	CRISPRa	CD8	IFNG	-0,26239	0,520652
KDM4A	Primary	CRISPRa	CD8	IFNG	-0,25398	0,520652
ZNF468	Primary	CRISPRa	CD8	IFNG	-0,23953	0,520652
CDK9	Primary	CRISPRa	CD8	IFNG	-0,23186	0,520652
PRR12	Primary	CRISPRa	CD8	IFNG	-0,22575	0,520652
TPRX1	Primary	CRISPRa	CD8	IFNG	-0,16673	0,520652
ZNF501	Primary	CRISPRa	CD8	IFNG	-0,16149	0,520652
HOXD4	Primary	CRISPRa	CD8	IFNG	-0,14721	0,520652
CIZ1	Primary	CRISPRa	CD8	IFNG	-0,14606	0,520652
ZNF550	Primary	CRISPRa	CD8	IFNG	-0,12998	0,520652
ZFAND5	Primary	CRISPRa	CD8	IFNG	-0,11245	0,520652
ZSCAN23	Primary	CRISPRa	CD8	IFNG	-0,088885	0,520652
ZNF275	Primary	CRISPRa	CD8	IFNG	-0,084158	0,520652
JARID2	Primary	CRISPRa	CD8	IFNG	-0,080307	0,520652
NKX6-1	Primary	CRISPRa	CD8	IFNG	-0,059476	0,520652
PRAMEF19	Primary	CRISPRa	CD8	IFNG	-0,054734	0,520652
TFEB	Primary	CRISPRa	CD8	IFNG	-0,033297	0,520652
THAP4	Primary	CRISPRa	CD8	IFNG	-0,016443	0,520652
TRAK1	Primary	CRISPRa	CD8	IFNG	-0,016113	0,520652
LARP4	Primary	CRISPRa	CD8	IFNG	-0,0095565	0,520652
PAF1	Primary	CRISPRa	CD8	IFNG	0,0017757	0,520652
YBX3	Primary	CRISPRa	CD8	IFNG	0,055876	0,520652
SSBP2	Primary	CRISPRa	CD8	IFNG	0,057517	0,520652
ZFP69	Primary	CRISPRa	CD8	IFNG	0,15273	0,520652
RNF111	Primary	CRISPRa	CD8	IFNG	-0,040149	0,521199
KLF12	Primary	CRISPRa	CD8	IFNG	0,02262	0,521199
EEF1A1	Primary	CRISPRa	CD8	IFNG	-0,14785	0,521764
AATF	Primary	CRISPRa	CD8	IFNG	-0,086357	0,521764
CASP8AP2	Primary	CRISPRa	CD8	IFNG	0,12461	0,521764
NFRKB	Primary	CRISPRa	CD8	IFNG	-0,044109	0,522293
PBXIP1	Primary	CRISPRa	CD8	IFNG	0,031703	0,522493

AURKAIP1	Primary	CRISPRa	CD8	IFNG	0,31846	0,523516
FBXW11	Primary	CRISPRa	CD8	IFNG	-0,34019	0,524627
SUPT20H	Primary	CRISPRa	CD8	IFNG	-0,3156	0,524627
ZMAT2	Primary	CRISPRa	CD8	IFNG	-0,25811	0,524627
DENND4A	Primary	CRISPRa	CD8	IFNG	-0,24708	0,524627
U2AF1	Primary	CRISPRa	CD8	IFNG	-0,23171	0,524627
RPRD1B	Primary	CRISPRa	CD8	IFNG	-0,22828	0,524627
PYGO2	Primary	CRISPRa	CD8	IFNG	-0,22462	0,524627
KDM4C	Primary	CRISPRa	CD8	IFNG	-0,21285	0,524627
ZC3H6	Primary	CRISPRa	CD8	IFNG	-0,20515	0,524627
SALL1	Primary	CRISPRa	CD8	IFNG	-0,1615	0,524627
ITGB3BP	Primary	CRISPRa	CD8	IFNG	-0,13001	0,524627
BAZ2B	Primary	CRISPRa	CD8	IFNG	-0,0811	0,524627
WNT3A	Primary	CRISPRa	CD8	IFNG	-0,068214	0,524627
TOX4	Primary	CRISPRa	CD8	IFNG	0,05334	0,524627
TCF15	Primary	CRISPRa	CD8	IFNG	-0,086899	0,526616
SIVA1	Primary	CRISPRa	CD8	IFNG	0,14909	0,527589
RPTOR	Primary	CRISPRa	CD8	IFNG	0,10358	0,528442
MYBL1	Primary	CRISPRa	CD8	IFNG	-0,25821	0,528832
ZBTB26	Primary	CRISPRa	CD8	IFNG	-0,14043	0,528832
FOS	Primary	CRISPRa	CD8	IFNG	0,24265	0,528852
TRIM23	Primary	CRISPRa	CD8	IFNG	0,15909	0,529003
PFDN5	Primary	CRISPRa	CD8	IFNG	0,18056	0,529003
RCOR2	Primary	CRISPRa	CD8	IFNG	0,066649	0,529685
KHDRBS1	Primary	CRISPRa	CD8	IFNG	-0,15029	0,529898
EPC2	Primary	CRISPRa	CD8	IFNG	0,074085	0,530247
GTF2H1	Primary	CRISPRa	CD8	IFNG	0,20357	0,530247
CALR	Primary	CRISPRa	CD8	IFNG	-0,030297	0,530711
ZBP1	Primary	CRISPRa	CD8	IFNG	-0,12953	0,53243
JPH2	Primary	CRISPRa	CD8	IFNG	-0,23777	0,532813
DCAF1	Primary	CRISPRa	CD8	IFNG	-0,12185	0,532813
RBPJ	Primary	CRISPRa	CD8	IFNG	-0,28968	0,53294
ONECUT1	Primary	CRISPRa	CD8	IFNG	-0,23818	0,53294
FOXO3	Primary	CRISPRa	CD8	IFNG	0,054956	0,53294
PRDM7	Primary	CRISPRa	CD8	IFNG	0,21457	0,53294
TAF4	Primary	CRISPRa	CD8	IFNG	-0,08658	0,535136
MAFA	Primary	CRISPRa	CD8	IFNG	-0,080249	0,535136
RUVBL1	Primary	CRISPRa	CD8	IFNG	-0,011649	0,535136
NUP133	Primary	CRISPRa	CD8	IFNG	0,02332	0,535136
ZSCAN9	Primary	CRISPRa	CD8	IFNG	0,082207	0,535136
LOXL3	Primary	CRISPRa	CD8	IFNG	0,09799	0,535136
ZBED6	Primary	CRISPRa	CD8	IFNG	0,17217	0,535136
ARRB1	Primary	CRISPRa	CD8	IFNG	0,20827	0,535136
KDM5C	Primary	CRISPRa	CD8	IFNG	0,2309	0,535136
ZNF705B	Primary	CRISPRa	CD8	IFNG	0,23481	0,535136
LGALS9	Primary	CRISPRa	CD8	IFNG	-0,17876	0,535715
MLXIPL	Primary	CRISPRa	CD8	IFNG	-0,16793	0,535715
SKIDA1	Primary	CRISPRa	CD8	IFNG	-0,084274	0,535715
CNPY3	Primary	CRISPRa	CD8	IFNG	-0,0064903	0,535715
HPCAL1	Primary	CRISPRa	CD8	IFNG	-0,0042368	0,535715
LCORL	Primary	CRISPRa	CD8	IFNG	0,074879	0,535715
ZBTB8A	Primary	CRISPRa	CD8	IFNG	0,08339	0,535715
HEYL	Primary	CRISPRa	CD8	IFNG	0,12892	0,535715
PLAGL2	Primary	CRISPRa	CD8	IFNG	0,13146	0,535715
ZNF791	Primary	CRISPRa	CD8	IFNG	0,15491	0,535715

KHSRP	Primary	CRISPRa	CD8	IFNG	0,18434	0,535715
TCEAL1	Primary	CRISPRa	CD8	IFNG	-0,2309	0,536772
HYAL2	Primary	CRISPRa	CD8	IFNG	-0,055906	0,536772
SAP30	Primary	CRISPRa	CD8	IFNG	0,12564	0,536772
C1D	Primary	CRISPRa	CD8	IFNG	0,13457	0,536772
JUP	Primary	CRISPRa	CD8	IFNG	0,2113	0,536772
MIS18BP1	Primary	CRISPRa	CD8	IFNG	0,24147	0,536772
PPARD	Primary	CRISPRa	CD8	IFNG	0,27317	0,536772
FBP1	Primary	CRISPRa	CD8	IFNG	0,28421	0,536772
PADI2	Primary	CRISPRa	CD8	IFNG	0,30273	0,536772
ZNF547	Primary	CRISPRa	CD8	IFNG	-0,22105	0,537211
YBX2	Primary	CRISPRa	CD8	IFNG	-0,081714	0,537211
ZNF334	Primary	CRISPRa	CD8	IFNG	-0,18295	0,537421
KAT5	Primary	CRISPRa	CD8	IFNG	-0,14193	0,537421
SP4	Primary	CRISPRa	CD8	IFNG	0,043441	0,537887
ZNF526	Primary	CRISPRa	CD8	IFNG	0,023933	0,53853
ID1	Primary	CRISPRa	CD8	IFNG	0,091072	0,53853
NFE2L2	Primary	CRISPRa	CD8	IFNG	0,1601	0,53853
MAML3	Primary	CRISPRa	CD8	IFNG	-0,19997	0,539307
HOXA11	Primary	CRISPRa	CD8	IFNG	-0,18432	0,539307
IKBKB	Primary	CRISPRa	CD8	IFNG	0,2319	0,539307
TRPS1	Primary	CRISPRa	CD8	IFNG	0,24005	0,539307
HESX1	Primary	CRISPRa	CD8	IFNG	0,24362	0,539307
RASD1	Primary	CRISPRa	CD8	IFNG	0,25103	0,539307
CARHSP1	Primary	CRISPRa	CD8	IFNG	0,10647	0,541397
RBL2	Primary	CRISPRa	CD8	IFNG	-0,057709	0,541533
SOX17	Primary	CRISPRa	CD8	IFNG	-0,052805	0,541533
FIGLA	Primary	CRISPRa	CD8	IFNG	-0,028479	0,541533
CREM	Primary	CRISPRa	CD8	IFNG	0,0094798	0,541533
TDG	Primary	CRISPRa	CD8	IFNG	0,013016	0,541533
SRA1	Primary	CRISPRa	CD8	IFNG	0,031201	0,541533
NUPR1	Primary	CRISPRa	CD8	IFNG	0,049314	0,541533
ZNF300	Primary	CRISPRa	CD8	IFNG	0,067516	0,541533
BRF1	Primary	CRISPRa	CD8	IFNG	0,073461	0,541533
SUPT16H	Primary	CRISPRa	CD8	IFNG	0,16319	0,541533
POU3F1	Primary	CRISPRa	CD8	IFNG	0,1783	0,541533
NOBOX	Primary	CRISPRa	CD8	IFNG	0,21449	0,541533
ZNF611	Primary	CRISPRa	CD8	IFNG	0,21533	0,541533
KEAP1	Primary	CRISPRa	CD8	IFNG	0,23886	0,541533
LDOC1	Primary	CRISPRa	CD8	IFNG	0,25562	0,541533
LIN9	Primary	CRISPRa	CD8	IFNG	0,26047	0,541533
ZFPM2	Primary	CRISPRa	CD8	IFNG	0,2833	0,541533
HELZ	Primary	CRISPRa	CD8	IFNG	0,31087	0,541533
GMEB1	Primary	CRISPRa	CD8	IFNG	0,35282	0,541533
ZNF668	Primary	CRISPRa	CD8	IFNG	0,39259	0,541533
BIRC2	Primary	CRISPRa	CD8	IFNG	0,14465	0,542812
SORBS3	Primary	CRISPRa	CD8	IFNG	-0,024173	0,545552
FGF2	Primary	CRISPRa	CD8	IFNG	0,24148	0,545552
CTBP2	Primary	CRISPRa	CD8	IFNG	0,10318	0,54895
ZNF681	Primary	CRISPRa	CD8	IFNG	0,14365	0,54895
HOXA10	Primary	CRISPRa	CD8	IFNG	0,18892	0,54895
ZNF655	Primary	CRISPRa	CD8	IFNG	-0,09997	0,549449
POLR3C	Primary	CRISPRa	CD8	IFNG	0,13524	0,549449
MAK	Primary	CRISPRa	CD8	IFNG	0,27261	0,549449
MAP2K3	Primary	CRISPRa	CD8	IFNG	-0,092547	0,55066

ZNF236	Primary	CRISPRa	CD8	IFNG	0,18485	0,55066
DUSP12	Primary	CRISPRa	CD8	IFNG	0,27906	0,551044
ZSCAN5A	Primary	CRISPRa	CD8	IFNG	0,037676	0,551195
TAB1	Primary	CRISPRa	CD8	IFNG	0,1962	0,551828
FEV	Primary	CRISPRa	CD8	IFNG	-0,11338	0,55325
ZFP37	Primary	CRISPRa	CD8	IFNG	0,029837	0,55325
ACTL6A	Primary	CRISPRa	CD8	IFNG	0,10475	0,55325
SF1	Primary	CRISPRa	CD8	IFNG	0,23668	0,55325
FOXI2	Primary	CRISPRa	CD8	IFNG	-0,39172	0,553858
ZNF329	Primary	CRISPRa	CD8	IFNG	-0,36184	0,553858
DNTTIP1	Primary	CRISPRa	CD8	IFNG	-0,33895	0,553858
USP34	Primary	CRISPRa	CD8	IFNG	-0,31264	0,553858
LANCL2	Primary	CRISPRa	CD8	IFNG	-0,24125	0,553858
LTN1	Primary	CRISPRa	CD8	IFNG	-0,18589	0,553858
CNOT3	Primary	CRISPRa	CD8	IFNG	-0,18227	0,553858
SSBP4	Primary	CRISPRa	CD8	IFNG	-0,12869	0,553858
BARHL2	Primary	CRISPRa	CD8	IFNG	0,038925	0,553858
TSC22D2	Primary	CRISPRa	CD8	IFNG	-0,0071824	0,554442
ZNF444	Primary	CRISPRa	CD8	IFNG	-0,26804	0,554844
ZPR1	Primary	CRISPRa	CD8	IFNG	0,03369	0,554844
ANKRA2	Primary	CRISPRa	CD8	IFNG	0,084683	0,554844
CITED2	Primary	CRISPRa	CD8	IFNG	0,21499	0,554844
ZNF430	Primary	CRISPRa	CD8	IFNG	0,29952	0,554844
APEX1	Primary	CRISPRa	CD8	IFNG	0,078804	0,555673
DNMT3B	Primary	CRISPRa	CD8	IFNG	0,080054	0,555673
CBX4	Primary	CRISPRa	CD8	IFNG	0,18095	0,555673
CDIP1	Primary	CRISPRa	CD8	IFNG	0,068516	0,556499
MYEF2	Primary	CRISPRa	CD8	IFNG	0,06606	0,556711
TOX2	Primary	CRISPRa	CD8	IFNG	-0,090532	0,557514
TRIM52	Primary	CRISPRa	CD8	IFNG	0,10153	0,557514
GCFC2	Primary	CRISPRa	CD8	IFNG	0,15252	0,557514
TET3	Primary	CRISPRa	CD8	IFNG	-0,36117	0,557922
SUMO2	Primary	CRISPRa	CD8	IFNG	-0,2225	0,557922
ZNF865	Primary	CRISPRa	CD8	IFNG	-0,21214	0,557922
GLIS3	Primary	CRISPRa	CD8	IFNG	-0,12472	0,557922
ZNF511	Primary	CRISPRa	CD8	IFNG	-0,040201	0,557922
CPEB1	Primary	CRISPRa	CD8	IFNG	-0,21696	0,558536
ZNF99	Primary	CRISPRa	CD8	IFNG	-0,10397	0,558536
AP5Z1	Primary	CRISPRa	CD8	IFNG	-0,28915	0,558835
TP53INP1	Primary	CRISPRa	CD8	IFNG	-0,15747	0,558835
DDX54	Primary	CRISPRa	CD8	IFNG	-0,12579	0,558835
SIX3	Primary	CRISPRa	CD8	IFNG	-0,10827	0,558835
MAPK7	Primary	CRISPRa	CD8	IFNG	-0,037491	0,558835
BRD2	Primary	CRISPRa	CD8	IFNG	0,044977	0,558835
SMARCB1	Primary	CRISPRa	CD8	IFNG	0,050882	0,558835
THAP3	Primary	CRISPRa	CD8	IFNG	0,11158	0,558835
HDAC3	Primary	CRISPRa	CD8	IFNG	0,12186	0,558835
SSX1	Primary	CRISPRa	CD8	IFNG	0,1498	0,558835
ZNF398	Primary	CRISPRa	CD8	IFNG	0,18091	0,558835
ZNF829	Primary	CRISPRa	CD8	IFNG	0,28359	0,558835
PRDM9	Primary	CRISPRa	CD8	IFNG	-0,20607	0,559871
ZFP69B	Primary	CRISPRa	CD8	IFNG	-0,073077	0,559871
TGFB1	Primary	CRISPRa	CD8	IFNG	0,031147	0,559871
ZBTB16	Primary	CRISPRa	CD8	IFNG	0,043286	0,559871
PINK1	Primary	CRISPRa	CD8	IFNG	0,18583	0,559871

CRX	Primary	CRISPRa	CD8	IFNG	-0,014289	0,561333
COMMD8	Primary	CRISPRa	CD8	IFNG	0,22221	0,561333
DYRK1A	Primary	CRISPRa	CD8	IFNG	0,25827	0,561333
ZBTB46	Primary	CRISPRa	CD8	IFNG	-0,17006	0,561443
ZNF90	Primary	CRISPRa	CD8	IFNG	0,1729	0,561443
HNRNPCL2	Primary	CRISPRa	CD8	IFNG	0,3532	0,561821
KDM8	Primary	CRISPRa	CD8	IFNG	-0,24958	0,572051
ZNF726	Primary	CRISPRa	CD8	IFNG	-0,2495	0,572051
TAF1C	Primary	CRISPRa	CD8	IFNG	-0,20707	0,572051
ZNF860	Primary	CRISPRa	CD8	IFNG	-0,15776	0,572051
TFAP2B	Primary	CRISPRa	CD8	IFNG	-0,042112	0,572051
SKIL	Primary	CRISPRa	CD8	IFNG	0,1707	0,574905
WDR77	Primary	CRISPRa	CD8	IFNG	-0,10135	0,575963
PPID	Primary	CRISPRa	CD8	IFNG	0,098855	0,575963
ANAPC2	Primary	CRISPRa	CD8	IFNG	0,12444	0,575963
CEBPE	Primary	CRISPRa	CD8	IFNG	-0,17219	0,576308
CRTC1	Primary	CRISPRa	CD8	IFNG	-0,16139	0,576308
RNF114	Primary	CRISPRa	CD8	IFNG	-0,11989	0,576308
ZNF138	Primary	CRISPRa	CD8	IFNG	-0,10938	0,576308
JAK2	Primary	CRISPRa	CD8	IFNG	-0,066352	0,576308
FOXB2	Primary	CRISPRa	CD8	IFNG	0,057522	0,576308
ARID4A	Primary	CRISPRa	CD8	IFNG	0,14607	0,576308
AFF2	Primary	CRISPRa	CD8	IFNG	0,26308	0,576308
CRK	Primary	CRISPRa	CD8	IFNG	0,27669	0,576308
RNF25	Primary	CRISPRa	CD8	IFNG	-0,28849	0,57647
DBP	Primary	CRISPRa	CD8	IFNG	0,20552	0,57647
HOXC10	Primary	CRISPRa	CD8	IFNG	-0,36018	0,576857
POU3F4	Primary	CRISPRa	CD8	IFNG	-0,32124	0,576857
ZNF449	Primary	CRISPRa	CD8	IFNG	0,069634	0,576857
TERB1	Primary	CRISPRa	CD8	IFNG	0,14097	0,578408
ZNF302	Primary	CRISPRa	CD8	IFNG	0,10539	0,578763
CENPB	Primary	CRISPRa	CD8	IFNG	-0,079127	0,579149
C20orf194	Primary	CRISPRa	CD8	IFNG	0,15967	0,579288
LENG9	Primary	CRISPRa	CD8	IFNG	-0,3797	0,579765
DPPA2	Primary	CRISPRa	CD8	IFNG	-0,12233	0,579765
BOLA3	Primary	CRISPRa	CD8	IFNG	-0,33897	0,580623
SLTM	Primary	CRISPRa	CD8	IFNG	-0,23526	0,580623
MED31	Primary	CRISPRa	CD8	IFNG	-0,37465	0,582389
PROX1	Primary	CRISPRa	CD8	IFNG	-0,23274	0,582389
DHX57	Primary	CRISPRa	CD8	IFNG	-0,19592	0,582389
TUB	Primary	CRISPRa	CD8	IFNG	-0,077437	0,582389
POU5F1	Primary	CRISPRa	CD8	IFNG	-0,060405	0,582389
ZNF607	Primary	CRISPRa	CD8	IFNG	-0,032441	0,582389
SLC2A4RG	Primary	CRISPRa	CD8	IFNG	0,0061823	0,582389
HOXA7	Primary	CRISPRa	CD8	IFNG	0,012592	0,582389
MTA1	Primary	CRISPRa	CD8	IFNG	0,042765	0,582389
ZNF836	Primary	CRISPRa	CD8	IFNG	0,061044	0,582389
XRCC6	Primary	CRISPRa	CD8	IFNG	0,095676	0,582389
HOXB7	Primary	CRISPRa	CD8	IFNG	0,10509	0,582389
VPS36	Primary	CRISPRa	CD8	IFNG	0,12699	0,582389
ING4	Primary	CRISPRa	CD8	IFNG	0,14239	0,582389
TRIB3	Primary	CRISPRa	CD8	IFNG	0,14435	0,582389
PBRM1	Primary	CRISPRa	CD8	IFNG	0,14764	0,582389
ZFPM1	Primary	CRISPRa	CD8	IFNG	0,15631	0,582389
ZNF235	Primary	CRISPRa	CD8	IFNG	0,2836	0,582389

CHD1L	Primary	CRISPRa	CD8	IFNG	-0,082265	0,583219
FUBP3	Primary	CRISPRa	CD8	IFNG	0,042509	0,583219
RERE	Primary	CRISPRa	CD8	IFNG	0,089081	0,583219
ZC3H14	Primary	CRISPRa	CD8	IFNG	0,18347	0,583219
FANCD2	Primary	CRISPRa	CD8	IFNG	0,12659	0,583383
TLE1	Primary	CRISPRa	CD8	IFNG	-0,086722	0,585347
POGK	Primary	CRISPRa	CD8	IFNG	-0,1727	0,585551
ZIM3	Primary	CRISPRa	CD8	IFNG	-0,37476	0,586112
ZNRF1	Primary	CRISPRa	CD8	IFNG	-0,36057	0,586112
CTH	Primary	CRISPRa	CD8	IFNG	-0,35759	0,586112
ZNF703	Primary	CRISPRa	CD8	IFNG	-0,33675	0,586112
ZNF93	Primary	CRISPRa	CD8	IFNG	-0,31986	0,586112
NACC2	Primary	CRISPRa	CD8	IFNG	-0,29271	0,586112
HDGF	Primary	CRISPRa	CD8	IFNG	-0,28864	0,586112
ZNF682	Primary	CRISPRa	CD8	IFNG	-0,25459	0,586112
FAM83G	Primary	CRISPRa	CD8	IFNG	-0,25216	0,586112
MSX1	Primary	CRISPRa	CD8	IFNG	-0,22937	0,586112
YBX1	Primary	CRISPRa	CD8	IFNG	-0,21476	0,586112
NFKBIB	Primary	CRISPRa	CD8	IFNG	-0,19055	0,586112
DMRT1	Primary	CRISPRa	CD8	IFNG	-0,16769	0,586112
E2F1	Primary	CRISPRa	CD8	IFNG	-0,16732	0,586112
RNF24	Primary	CRISPRa	CD8	IFNG	-0,15746	0,586112
TEAD3	Primary	CRISPRa	CD8	IFNG	-0,15035	0,586112
ISL1	Primary	CRISPRa	CD8	IFNG	-0,14182	0,586112
NFIB	Primary	CRISPRa	CD8	IFNG	-0,13993	0,586112
IRF7	Primary	CRISPRa	CD8	IFNG	-0,13245	0,586112
UBE3A	Primary	CRISPRa	CD8	IFNG	-0,13111	0,586112
ZNF649	Primary	CRISPRa	CD8	IFNG	-0,12083	0,586112
IRF5	Primary	CRISPRa	CD8	IFNG	-0,11547	0,586112
TRIM50	Primary	CRISPRa	CD8	IFNG	-0,08294	0,586112
ZNF260	Primary	CRISPRa	CD8	IFNG	-0,079326	0,586112
BTG1	Primary	CRISPRa	CD8	IFNG	-0,068743	0,586112
DNAJA3	Primary	CRISPRa	CD8	IFNG	-0,065421	0,586112
SNAI1	Primary	CRISPRa	CD8	IFNG	-0,060374	0,586112
ZFX	Primary	CRISPRa	CD8	IFNG	-0,04879	0,586112
ZNF341	Primary	CRISPRa	CD8	IFNG	-0,040474	0,586112
LMCD1	Primary	CRISPRa	CD8	IFNG	-0,030053	0,586112
FOXR1	Primary	CRISPRa	CD8	IFNG	-0,015482	0,586112
CDK5	Primary	CRISPRa	CD8	IFNG	0,031363	0,586112
ARID4B	Primary	CRISPRa	CD8	IFNG	0,049887	0,586112
ZNF345	Primary	CRISPRa	CD8	IFNG	0,052319	0,586112
ZFYVE26	Primary	CRISPRa	CD8	IFNG	0,061842	0,586112
ZNF32	Primary	CRISPRa	CD8	IFNG	0,10268	0,586112
ANP32A	Primary	CRISPRa	CD8	IFNG	0,11924	0,586112
TP63	Primary	CRISPRa	CD8	IFNG	-0,25393	0,586183
PCBP1	Primary	CRISPRa	CD8	IFNG	-0,27014	0,587547
TAF12	Primary	CRISPRa	CD8	IFNG	-0,16257	0,587547
GTF2I	Primary	CRISPRa	CD8	IFNG	-0,18019	0,58774
TFAP2E	Primary	CRISPRa	CD8	IFNG	-0,07678	0,58774
ZNF23	Primary	CRISPRa	CD8	IFNG	-0,076385	0,58774
MED6	Primary	CRISPRa	CD8	IFNG	-0,038612	0,589077
NANOG	Primary	CRISPRa	CD8	IFNG	-0,090273	0,590694
SGSM2	Primary	CRISPRa	CD8	IFNG	-0,34804	0,593194
PRAMEF10	Primary	CRISPRa	CD8	IFNG	-0,49642	0,59437
ANKRD49	Primary	CRISPRa	CD8	IFNG	-0,092626	0,596838

TGFB1I1	Primary	CRISPRa	CD8	IFNG	-0,20248	0,597163
GLIS1	Primary	CRISPRa	CD8	IFNG	-0,097528	0,597163
HAT1	Primary	CRISPRa	CD8	IFNG	-0,041903	0,597163
HOXB9	Primary	CRISPRa	CD8	IFNG	0,017963	0,597163
PDCD4	Primary	CRISPRa	CD8	IFNG	0,019443	0,597163
ZBTB33	Primary	CRISPRa	CD8	IFNG	0,029904	0,597163
ZNF221	Primary	CRISPRa	CD8	IFNG	0,049946	0,597163
ADNP	Primary	CRISPRa	CD8	IFNG	0,12251	0,597163
ZNF563	Primary	CRISPRa	CD8	IFNG	0,12277	0,597163
MXI1	Primary	CRISPRa	CD8	IFNG	0,13935	0,597163
RBM39	Primary	CRISPRa	CD8	IFNG	0,20286	0,597163
PARP15	Primary	CRISPRa	CD8	IFNG	0,23869	0,597163
DEPDC1	Primary	CRISPRa	CD8	IFNG	-0,058395	0,600092
ZNF541	Primary	CRISPRa	CD8	IFNG	0,015652	0,601305
HPCA	Primary	CRISPRa	CD8	IFNG	-0,32679	0,602228
NOTCH4	Primary	CRISPRa	CD8	IFNG	-0,28639	0,602228
MYRF	Primary	CRISPRa	CD8	IFNG	-0,012566	0,602228
ZNF107	Primary	CRISPRa	CD8	IFNG	0,018047	0,602228
KANK1	Primary	CRISPRa	CD8	IFNG	0,042722	0,602228
LZTR1	Primary	CRISPRa	CD8	IFNG	0,07657	0,602228
VPS25	Primary	CRISPRa	CD8	IFNG	0,079162	0,602228
NCOA1	Primary	CRISPRa	CD8	IFNG	0,079522	0,602228
PHF14	Primary	CRISPRa	CD8	IFNG	0,095001	0,602228
ZBTB38	Primary	CRISPRa	CD8	IFNG	0,13666	0,602228
ZNF879	Primary	CRISPRa	CD8	IFNG	0,13997	0,602228
MEOX2	Primary	CRISPRa	CD8	IFNG	0,15362	0,602228
LHX8	Primary	CRISPRa	CD8	IFNG	0,2096	0,602228
MEF2C	Primary	CRISPRa	CD8	IFNG	0,21237	0,602228
BOLA2	Primary	CRISPRa	CD8	IFNG	0,25838	0,602228
VAX1	Primary	CRISPRa	CD8	IFNG	0,2715	0,602228
SP9	Primary	CRISPRa	CD8	IFNG	0,27881	0,602228
ERF	Primary	CRISPRa	CD8	IFNG	0,30982	0,602228
MGA	Primary	CRISPRa	CD8	IFNG	0,25067	0,603229
MCRS1	Primary	CRISPRa	CD8	IFNG	-0,30724	0,603486
ZNF223	Primary	CRISPRa	CD8	IFNG	-0,161	0,603486
RIOX2	Primary	CRISPRa	CD8	IFNG	-0,1392	0,603486
ZNF664	Primary	CRISPRa	CD8	IFNG	-0,017515	0,603486
MED25	Primary	CRISPRa	CD8	IFNG	-0,0049746	0,603486
ZSCAN25	Primary	CRISPRa	CD8	IFNG	-0,0049439	0,603486
TWIST2	Primary	CRISPRa	CD8	IFNG	0,01407	0,603486
ATAD2	Primary	CRISPRa	CD8	IFNG	0,05111	0,603486
PRAMEF17	Primary	CRISPRa	CD8	IFNG	0,068065	0,603486
NFIA	Primary	CRISPRa	CD8	IFNG	0,088224	0,603486
FOXK2	Primary	CRISPRa	CD8	IFNG	0,10197	0,603486
CENPX	Primary	CRISPRa	CD8	IFNG	0,16731	0,603486
ZNF358	Primary	CRISPRa	CD8	IFNG	0,25952	0,603486
TAF9B	Primary	CRISPRa	CD8	IFNG	0,27334	0,603486
MTA2	Primary	CRISPRa	CD8	IFNG	0,31192	0,603486
TSNAX	Primary	CRISPRa	CD8	IFNG	-0,24874	0,604191
SUV39H1	Primary	CRISPRa	CD8	IFNG	-0,21676	0,604191
TACC1	Primary	CRISPRa	CD8	IFNG	-0,12862	0,604191
PRKCZ	Primary	CRISPRa	CD8	IFNG	-0,12755	0,604191
UBP1	Primary	CRISPRa	CD8	IFNG	-0,12353	0,604191
ZNF782	Primary	CRISPRa	CD8	IFNG	0,028959	0,604191
HDAC8	Primary	CRISPRa	CD8	IFNG	0,16819	0,604267

SS18L2	Primary	CRISPRa	CD8	IFNG	0,28884	0,604896
ZNF750	Primary	CRISPRa	CD8	IFNG	-0,30508	0,607402
CENPBD1	Primary	CRISPRa	CD8	IFNG	-0,30449	0,607402
ZNF775	Primary	CRISPRa	CD8	IFNG	-0,28843	0,607402
GTF2A2	Primary	CRISPRa	CD8	IFNG	-0,28566	0,607402
NR1H4	Primary	CRISPRa	CD8	IFNG	-0,27439	0,607402
PKD1	Primary	CRISPRa	CD8	IFNG	-0,26547	0,607402
RRN3	Primary	CRISPRa	CD8	IFNG	-0,26368	0,607402
SCML2	Primary	CRISPRa	CD8	IFNG	-0,2635	0,607402
BARHL1	Primary	CRISPRa	CD8	IFNG	-0,25224	0,607402
TSPYL2	Primary	CRISPRa	CD8	IFNG	-0,23703	0,607402
GNL3	Primary	CRISPRa	CD8	IFNG	-0,20533	0,607402
JADE1	Primary	CRISPRa	CD8	IFNG	-0,2012	0,607402
DNMT3L	Primary	CRISPRa	CD8	IFNG	-0,19866	0,607402
NEUROD4	Primary	CRISPRa	CD8	IFNG	-0,19039	0,607402
DNMT1	Primary	CRISPRa	CD8	IFNG	-0,17944	0,607402
USE1	Primary	CRISPRa	CD8	IFNG	-0,16717	0,607402
KLF1	Primary	CRISPRa	CD8	IFNG	-0,15323	0,607402
FOXN2	Primary	CRISPRa	CD8	IFNG	-0,14438	0,607402
MEIS1	Primary	CRISPRa	CD8	IFNG	-0,12288	0,607402
TSHZ2	Primary	CRISPRa	CD8	IFNG	-0,11943	0,607402
KDM5A	Primary	CRISPRa	CD8	IFNG	-0,10497	0,607402
PER2	Primary	CRISPRa	CD8	IFNG	-0,092832	0,607402
CREB3L2	Primary	CRISPRa	CD8	IFNG	-0,089296	0,607402
RARG	Primary	CRISPRa	CD8	IFNG	-0,08818	0,607402
POLR3F	Primary	CRISPRa	CD8	IFNG	-0,087988	0,607402
PTTG1IP	Primary	CRISPRa	CD8	IFNG	-0,084442	0,607402
CHCHD3	Primary	CRISPRa	CD8	IFNG	-0,083728	0,607402
GZF1	Primary	CRISPRa	CD8	IFNG	-0,075327	0,607402
SSH3	Primary	CRISPRa	CD8	IFNG	-0,062147	0,607402
NR2E3	Primary	CRISPRa	CD8	IFNG	-0,051381	0,607402
ZNF704	Primary	CRISPRa	CD8	IFNG	-0,041482	0,607402
PHC1	Primary	CRISPRa	CD8	IFNG	-0,03209	0,607402
ZNF792	Primary	CRISPRa	CD8	IFNG	-0,021598	0,607402
USP7	Primary	CRISPRa	CD8	IFNG	-0,020145	0,607402
KMT2C	Primary	CRISPRa	CD8	IFNG	-0,013707	0,607402
VPS72	Primary	CRISPRa	CD8	IFNG	-0,010021	0,607402
ZNF862	Primary	CRISPRa	CD8	IFNG	0,016306	0,607402
ZNF598	Primary	CRISPRa	CD8	IFNG	0,032532	0,607402
NFE2L1	Primary	CRISPRa	CD8	IFNG	0,046087	0,607402
LGALS12	Primary	CRISPRa	CD8	IFNG	0,052175	0,607402
ZNF436	Primary	CRISPRa	CD8	IFNG	0,060373	0,607402
ZNF354B	Primary	CRISPRa	CD8	IFNG	0,07081	0,607402
ZNF705D	Primary	CRISPRa	CD8	IFNG	0,072426	0,607402
LARP4B	Primary	CRISPRa	CD8	IFNG	0,094499	0,607402
PRAMEF27	Primary	CRISPRa	CD8	IFNG	-0,37036	0,609935
ZNF189	Primary	CRISPRa	CD8	IFNG	-0,2381	0,611663
CUL4B	Primary	CRISPRa	CD8	IFNG	-0,048818	0,61505
CCNH	Primary	CRISPRa	CD8	IFNG	0,067114	0,61505
ZNF765	Primary	CRISPRa	CD8	IFNG	0,087911	0,61505
DPRX	Primary	CRISPRa	CD8	IFNG	0,16898	0,61505
SERTAD3	Primary	CRISPRa	CD8	IFNG	0,24575	0,61505
SMAD2	Primary	CRISPRa	CD8	IFNG	-0,16794	0,616351
TENM2	Primary	CRISPRa	CD8	IFNG	-0,11895	0,616351
ACTN4	Primary	CRISPRa	CD8	IFNG	0,14595	0,616709

CNOT1	Primary	CRISPRa	CD8	IFNG	-0,32923	0,617154
KRBA2	Primary	CRISPRa	CD8	IFNG	-0,23994	0,617154
CPSF4L	Primary	CRISPRa	CD8	IFNG	-0,20013	0,617154
ZNF652	Primary	CRISPRa	CD8	IFNG	-0,11283	0,617154
NME2	Primary	CRISPRa	CD8	IFNG	-0,041484	0,617154
TBX5	Primary	CRISPRa	CD8	IFNG	-0,0041201	0,617154
ARID5B	Primary	CRISPRa	CD8	IFNG	-0,0032277	0,617154
ALX4	Primary	CRISPRa	CD8	IFNG	0,13488	0,617154
ZSCAN22	Primary	CRISPRa	CD8	IFNG	0,14335	0,617154
SSX7	Primary	CRISPRa	CD8	IFNG	0,15693	0,617154
LMO2	Primary	CRISPRa	CD8	IFNG	0,18642	0,617154
ZNF410	Primary	CRISPRa	CD8	IFNG	0,19291	0,617154
BOLA1	Primary	CRISPRa	CD8	IFNG	0,21069	0,617154
SHOX2	Primary	CRISPRa	CD8	IFNG	0,21592	0,617154
C1QBP	Primary	CRISPRa	CD8	IFNG	0,22657	0,617154
NCL	Primary	CRISPRa	CD8	IFNG	0,25558	0,617154
ELF2	Primary	CRISPRa	CD8	IFNG	0,28734	0,617154
CCDC124	Primary	CRISPRa	CD8	IFNG	0,31847	0,617154
RBM10	Primary	CRISPRa	CD8	IFNG	-0,31663	0,617699
PLXNB3	Primary	CRISPRa	CD8	IFNG	0,008854	0,617699
ZNF623	Primary	CRISPRa	CD8	IFNG	0,04746	0,617699
NKAP	Primary	CRISPRa	CD8	IFNG	-0,31033	0,617788
UBC	Primary	CRISPRa	CD8	IFNG	-0,23572	0,617788
WBP2NL	Primary	CRISPRa	CD8	IFNG	0,10956	0,623212
TLE3	Primary	CRISPRa	CD8	IFNG	-0,20276	0,62415
INO80C	Primary	CRISPRa	CD8	IFNG	0,081359	0,62415
LRPPRC	Primary	CRISPRa	CD8	IFNG	0,15383	0,625578
TRIM48	Primary	CRISPRa	CD8	IFNG	-0,16776	0,62738
ZNF446	Primary	CRISPRa	CD8	IFNG	0,21731	0,62917
MEN1	Primary	CRISPRa	CD8	IFNG	-0,21824	0,63048
TAF5L	Primary	CRISPRa	CD8	IFNG	-0,052702	0,63048
SRY	Primary	CRISPRa	CD8	IFNG	-0,047565	0,63048
TRIM41	Primary	CRISPRa	CD8	IFNG	0,012468	0,63048
IL16	Primary	CRISPRa	CD8	IFNG	0,12052	0,63048
PRAMEF2	Primary	CRISPRa	CD8	IFNG	0,26754	0,63048
EGR4	Primary	CRISPRa	CD8	IFNG	0,070359	0,630722
AKAP9	Primary	CRISPRa	CD8	IFNG	0,07684	0,631669
DTX2	Primary	CRISPRa	CD8	IFNG	0,11537	0,631669
CERS5	Primary	CRISPRa	CD8	IFNG	0,29686	0,631669
TRIM10	Primary	CRISPRa	CD8	IFNG	-0,27794	0,632428
EZH1	Primary	CRISPRa	CD8	IFNG	-0,020566	0,632428
DNAJC1	Primary	CRISPRa	CD8	IFNG	-0,28782	0,632559
DMRTC2	Primary	CRISPRa	CD8	IFNG	0,091751	0,632559
HES5	Primary	CRISPRa	CD8	IFNG	-0,18121	0,642423
EME2	Primary	CRISPRa	CD8	IFNG	0,084634	0,642423
TAF9	Primary	CRISPRa	CD8	IFNG	0,30862	0,642423
CREB3L3	Primary	CRISPRa	CD8	IFNG	-0,36981	0,642607
IRAK1	Primary	CRISPRa	CD8	IFNG	-0,3398	0,642607
NFIL3	Primary	CRISPRa	CD8	IFNG	-0,32924	0,642607
KLF13	Primary	CRISPRa	CD8	IFNG	-0,30512	0,642607
HMGA1	Primary	CRISPRa	CD8	IFNG	-0,19373	0,642607
ERCC2	Primary	CRISPRa	CD8	IFNG	-0,070289	0,642607
LCOR	Primary	CRISPRa	CD8	IFNG	0,029407	0,642607
MBNL2	Primary	CRISPRa	CD8	IFNG	-0,0038916	0,643029
YEATS2	Primary	CRISPRa	CD8	IFNG	0,026926	0,643029

CREBBP	Primary	CRISPRa	CD8	IFNG	0,093326	0,643029
RELB	Primary	CRISPRa	CD8	IFNG	0,24422	0,643029
OTX2	Primary	CRISPRa	CD8	IFNG	-0,20946	0,645884
ZNF467	Primary	CRISPRa	CD8	IFNG	-0,1762	0,645884
PQBP1	Primary	CRISPRa	CD8	IFNG	-0,096154	0,645884
TRIM38	Primary	CRISPRa	CD8	IFNG	0,12829	0,647218
POU5F1B	Primary	CRISPRa	CD8	IFNG	-0,36662	0,647418
OGT	Primary	CRISPRa	CD8	IFNG	-0,33937	0,647418
PAX7	Primary	CRISPRa	CD8	IFNG	-0,23034	0,647418
MTERF4	Primary	CRISPRa	CD8	IFNG	0,063737	0,647418
EDF1	Primary	CRISPRa	CD8	IFNG	0,1677	0,647418
MED9	Primary	CRISPRa	CD8	IFNG	-0,26987	0,647767
HES7	Primary	CRISPRa	CD8	IFNG	-0,22206	0,647767
ZNF451	Primary	CRISPRa	CD8	IFNG	-0,10786	0,647767
ZMIZ2	Primary	CRISPRa	CD8	IFNG	0,021816	0,647767
DYNLL1	Primary	CRISPRa	CD8	IFNG	-0,19767	0,648357
LPIN2	Primary	CRISPRa	CD8	IFNG	0,082887	0,648499
SLC26A10	Primary	CRISPRa	CD8	IFNG	0,30909	0,648736
URI1	Primary	CRISPRa	CD8	IFNG	-0,10963	0,6502
ZNF677	Primary	CRISPRa	CD8	IFNG	-0,035479	0,6502
OSR1	Primary	CRISPRa	CD8	IFNG	0,02379	0,6502
CBL	Primary	CRISPRa	CD8	IFNG	0,050674	0,6502
VENTX	Primary	CRISPRa	CD8	IFNG	0,057142	0,6502
PKM	Primary	CRISPRa	CD8	IFNG	0,1395	0,6502
ZNF414	Primary	CRISPRa	CD8	IFNG	0,14968	0,6502
PITX3	Primary	CRISPRa	CD8	IFNG	0,18265	0,6502
ZNF671	Primary	CRISPRa	CD8	IFNG	-0,047451	0,650255
OVOL2	Primary	CRISPRa	CD8	IFNG	0,020094	0,650255
ZNF557	Primary	CRISPRa	CD8	IFNG	0,16465	0,650255
EDRF1	Primary	CRISPRa	CD8	IFNG	0,29311	0,650255
PCGF2	Primary	CRISPRa	CD8	IFNG	-0,043388	0,650461
RAN	Primary	CRISPRa	CD8	IFNG	0,16411	0,650967
ADAMTS17	Primary	CRISPRa	CD8	IFNG	-0,24655	0,653938
ESRRB	Primary	CRISPRa	CD8	IFNG	-0,23092	0,653938
RAPGEF5	Primary	CRISPRa	CD8	IFNG	-0,19799	0,653938
NHLH1	Primary	CRISPRa	CD8	IFNG	-0,1664	0,653938
TIGD3	Primary	CRISPRa	CD8	IFNG	-0,09567	0,653938
HOXB1	Primary	CRISPRa	CD8	IFNG	-0,087618	0,653938
DNM2	Primary	CRISPRa	CD8	IFNG	-0,082128	0,653938
UBE2B	Primary	CRISPRa	CD8	IFNG	-0,037048	0,653938
RBM15B	Primary	CRISPRa	CD8	IFNG	0,020621	0,653938
ZFP14	Primary	CRISPRa	CD8	IFNG	0,022219	0,653938
DNAJB5	Primary	CRISPRa	CD8	IFNG	0,03114	0,653938
HDAC11	Primary	CRISPRa	CD8	IFNG	0,052666	0,653938
SIAH2	Primary	CRISPRa	CD8	IFNG	0,099013	0,653938
ATXN7L3	Primary	CRISPRa	CD8	IFNG	0,11	0,653938
ZNF317	Primary	CRISPRa	CD8	IFNG	0,1113	0,653938
GRIP1	Primary	CRISPRa	CD8	IFNG	0,13011	0,653938
ZNF709	Primary	CRISPRa	CD8	IFNG	0,13052	0,653938
CCNK	Primary	CRISPRa	CD8	IFNG	0,13561	0,653938
TCERG1L	Primary	CRISPRa	CD8	IFNG	0,15392	0,653938
FOXM1	Primary	CRISPRa	CD8	IFNG	0,15885	0,653938
SMARCA1	Primary	CRISPRa	CD8	IFNG	0,16966	0,653938
TRIM32	Primary	CRISPRa	CD8	IFNG	0,1742	0,653938
ZFHX4	Primary	CRISPRa	CD8	IFNG	0,18316	0,653938

RIT2	Primary	CRISPRa	CD8	IFNG	0,23421	0,653938
HHEX	Primary	CRISPRa	CD8	IFNG	0,25372	0,653938
SP140	Primary	CRISPRa	CD8	IFNG	0,25632	0,653938
HSF2	Primary	CRISPRa	CD8	IFNG	0,26516	0,653938
FEZF1	Primary	CRISPRa	CD8	IFNG	0,29271	0,653938
GSC2	Primary	CRISPRa	CD8	IFNG	0,29651	0,653938
KCNIP2	Primary	CRISPRa	CD8	IFNG	0,3488	0,653938
NR2F6	Primary	CRISPRa	CD8	IFNG	0,0032901	0,654548
ZNF586	Primary	CRISPRa	CD8	IFNG	0,12715	0,654548
DSP	Primary	CRISPRa	CD8	IFNG	0,30116	0,654548
CUL2	Primary	CRISPRa	CD8	IFNG	-0,01166	0,654922
MYT1L	Primary	CRISPRa	CD8	IFNG	0,092315	0,654922
RC3H2	Primary	CRISPRa	CD8	IFNG	0,18418	0,654922
LIN54	Primary	CRISPRa	CD8	IFNG	-0,12109	0,655806
FBN1	Primary	CRISPRa	CD8	IFNG	-0,07535	0,655806
WDHD1	Primary	CRISPRa	CD8	IFNG	-0,055821	0,655806
FOXJ2	Primary	CRISPRa	CD8	IFNG	0,038369	0,655806
JUND	Primary	CRISPRa	CD8	IFNG	0,34186	0,655806
MATR3	Primary	CRISPRa	CD8	IFNG	0,37844	0,655806
ZNF707	Primary	CRISPRa	CD8	IFNG	-0,37212	0,656823
ZFAND6	Primary	CRISPRa	CD8	IFNG	-0,33888	0,656823
MESP1	Primary	CRISPRa	CD8	IFNG	-0,31735	0,656823
MYF5	Primary	CRISPRa	CD8	IFNG	-0,29584	0,656823
ZNF845	Primary	CRISPRa	CD8	IFNG	-0,28532	0,656823
TOX	Primary	CRISPRa	CD8	IFNG	-0,28158	0,656823
ELL	Primary	CRISPRa	CD8	IFNG	-0,27755	0,656823
ZNF155	Primary	CRISPRa	CD8	IFNG	-0,27266	0,656823
ZFR2	Primary	CRISPRa	CD8	IFNG	-0,26885	0,656823
MED11	Primary	CRISPRa	CD8	IFNG	-0,25959	0,656823
ZNF507	Primary	CRISPRa	CD8	IFNG	-0,22118	0,656823
CREG1	Primary	CRISPRa	CD8	IFNG	-0,22089	0,656823
NR1I2	Primary	CRISPRa	CD8	IFNG	-0,19117	0,656823
RFXAP	Primary	CRISPRa	CD8	IFNG	-0,18831	0,656823
BBX	Primary	CRISPRa	CD8	IFNG	-0,1861	0,656823
ZNF766	Primary	CRISPRa	CD8	IFNG	-0,17108	0,656823
ACTR5	Primary	CRISPRa	CD8	IFNG	-0,15658	0,656823
BRMS1	Primary	CRISPRa	CD8	IFNG	-0,14853	0,656823
NACA	Primary	CRISPRa	CD8	IFNG	-0,14006	0,656823
INO80B	Primary	CRISPRa	CD8	IFNG	-0,13751	0,656823
BNC1	Primary	CRISPRa	CD8	IFNG	-0,12075	0,656823
AGO2	Primary	CRISPRa	CD8	IFNG	-0,096917	0,656823
DHFR	Primary	CRISPRa	CD8	IFNG	-0,090263	0,656823
NRG1	Primary	CRISPRa	CD8	IFNG	-0,084847	0,656823
AKAP8L	Primary	CRISPRa	CD8	IFNG	-0,082813	0,656823
PARP9	Primary	CRISPRa	CD8	IFNG	-0,075152	0,656823
TBX20	Primary	CRISPRa	CD8	IFNG	-0,0023193	0,656823
RB1	Primary	CRISPRa	CD8	IFNG	0,011985	0,656823
ZNF768	Primary	CRISPRa	CD8	IFNG	0,049039	0,656823
ZNF594	Primary	CRISPRa	CD8	IFNG	0,055467	0,656823
RUVBL2	Primary	CRISPRa	CD8	IFNG	0,20048	0,656823
CDK12	Primary	CRISPRa	CD8	IFNG	-0,12638	0,65794
ZNF573	Primary	CRISPRa	CD8	IFNG	-0,32646	0,661305
TOPORS	Primary	CRISPRa	CD8	IFNG	-0,24568	0,661305
BPNT1	Primary	CRISPRa	CD8	IFNG	-0,093769	0,661305
PER3	Primary	CRISPRa	CD8	IFNG	0,11419	0,661305

BRPF1	Primary	CRISPRa	CD8	IFNG	0,18359	0,661305
SERTAD1	Primary	CRISPRa	CD8	IFNG	0,2564	0,661305
TET2	Primary	CRISPRa	CD8	IFNG	0,26161	0,661305
CDK11A	Primary	CRISPRa	CD8	IFNG	0,29703	0,661305
PSMA6	Primary	CRISPRa	CD8	IFNG	0,31984	0,661305
BUD31	Primary	CRISPRa	CD8	IFNG	-0,31757	0,661648
IRF2BP1	Primary	CRISPRa	CD8	IFNG	-0,21218	0,661648
NFATC3	Primary	CRISPRa	CD8	IFNG	0,25311	0,661819
ZGPAT	Primary	CRISPRa	CD8	IFNG	0,23309	0,662483
POU6F2	Primary	CRISPRa	CD8	IFNG	0,18688	0,663054
CUL5	Primary	CRISPRa	CD8	IFNG	0,21253	0,666228
STAG1	Primary	CRISPRa	CD8	IFNG	-0,16654	0,666585
VSX2	Primary	CRISPRa	CD8	IFNG	-0,36551	0,668449
PRMT8	Primary	CRISPRa	CD8	IFNG	-0,30014	0,668449
KDM4B	Primary	CRISPRa	CD8	IFNG	-0,22933	0,668449
FHL1	Primary	CRISPRa	CD8	IFNG	-0,22462	0,668449
ATF7IP	Primary	CRISPRa	CD8	IFNG	-0,21765	0,668449
PELP1	Primary	CRISPRa	CD8	IFNG	-0,18219	0,668449
ZNF283	Primary	CRISPRa	CD8	IFNG	-0,14914	0,668449
CTCFL	Primary	CRISPRa	CD8	IFNG	-0,096484	0,668449
CCR7	Primary	CRISPRa	CD8	IFNG	-0,024357	0,668449
TRIM13	Primary	CRISPRa	CD8	IFNG	0,24096	0,670088
SLC4A10	Primary	CRISPRa	CD8	IFNG	0,2666	0,670088
U2AF1L4	Primary	CRISPRa	CD8	IFNG	0,32015	0,670088
PURB	Primary	CRISPRa	CD8	IFNG	-0,30497	0,670425
MSANTD4	Primary	CRISPRa	CD8	IFNG	-0,2317	0,670425
HINT1	Primary	CRISPRa	CD8	IFNG	0,023036	0,67106
ZNF597	Primary	CRISPRa	CD8	IFNG	-0,16592	0,671335
ARID2	Primary	CRISPRa	CD8	IFNG	0,038149	0,671335
JMJD6	Primary	CRISPRa	CD8	IFNG	-0,20042	0,672756
ZNF460	Primary	CRISPRa	CD8	IFNG	0,10897	0,672756
ZNF554	Primary	CRISPRa	CD8	IFNG	0,11036	0,672756
CDX1	Primary	CRISPRa	CD8	IFNG	0,13603	0,672756
DDX1	Primary	CRISPRa	CD8	IFNG	-0,28036	0,675016
ZNF621	Primary	CRISPRa	CD8	IFNG	-0,037077	0,675016
PCGF3	Primary	CRISPRa	CD8	IFNG	-0,0022496	0,675016
DBX1	Primary	CRISPRa	CD8	IFNG	0,22815	0,676072
XRN2	Primary	CRISPRa	CD8	IFNG	0,23601	0,676072
EID2	Primary	CRISPRa	CD8	IFNG	0,072783	0,67705
MRRF	Primary	CRISPRa	CD8	IFNG	-0,24167	0,677144
RPA2	Primary	CRISPRa	CD8	IFNG	-0,33588	0,678089
ZBTB17	Primary	CRISPRa	CD8	IFNG	0,29647	0,678089
SET	Primary	CRISPRa	CD8	IFNG	-0,38266	0,678192
TBX1	Primary	CRISPRa	CD8	IFNG	-0,29457	0,678192
UBE2L3	Primary	CRISPRa	CD8	IFNG	-0,29143	0,678192
KLHL40	Primary	CRISPRa	CD8	IFNG	-0,27559	0,678192
TAF11	Primary	CRISPRa	CD8	IFNG	-0,24324	0,678192
USP22	Primary	CRISPRa	CD8	IFNG	-0,22086	0,678192
GTF3C5	Primary	CRISPRa	CD8	IFNG	-0,20108	0,678192
REXO4	Primary	CRISPRa	CD8	IFNG	-0,17523	0,678192
PIKFYVE	Primary	CRISPRa	CD8	IFNG	-0,16781	0,678192
LHX2	Primary	CRISPRa	CD8	IFNG	-0,15002	0,678192
HOXA1	Primary	CRISPRa	CD8	IFNG	-0,13716	0,678192
RNF10	Primary	CRISPRa	CD8	IFNG	-0,12239	0,678192
FEM1A	Primary	CRISPRa	CD8	IFNG	-0,039579	0,678192

UHRF1	Primary	CRISPRa	CD8	IFNG	-0,031066	0,678192
RNF115	Primary	CRISPRa	CD8	IFNG	-0,0049421	0,678192
TADA3	Primary	CRISPRa	CD8	IFNG	0,1131	0,678192
SPIB	Primary	CRISPRa	CD8	IFNG	0,12291	0,678192
SAP30BP	Primary	CRISPRa	CD8	IFNG	0,16082	0,678192
DEPTOR	Primary	CRISPRa	CD8	IFNG	0,25088	0,6856
CBY1	Primary	CRISPRa	CD8	IFNG	-0,29822	0,686779
CHAMP1	Primary	CRISPRa	CD8	IFNG	-0,16972	0,686779
NFKBIL1	Primary	CRISPRa	CD8	IFNG	-0,15099	0,686779
ZFAND3	Primary	CRISPRa	CD8	IFNG	-0,074978	0,686779
PIH1D1	Primary	CRISPRa	CD8	IFNG	-0,045214	0,686779
KMT2B	Primary	CRISPRa	CD8	IFNG	-0,0021829	0,686779
CHTOP	Primary	CRISPRa	CD8	IFNG	0,06701	0,686779
E2F6	Primary	CRISPRa	CD8	IFNG	0,088085	0,686779
CORO1A	Primary	CRISPRa	CD8	IFNG	-0,18078	0,686926
HIVEP1	Primary	CRISPRa	CD8	IFNG	-0,13972	0,686926
ZNF572	Primary	CRISPRa	CD8	IFNG	0,21726	0,686926
ZNF665	Primary	CRISPRa	CD8	IFNG	-0,12024	0,68696
PTOV1	Primary	CRISPRa	CD8	IFNG	-0,08737	0,68696
ZNF534	Primary	CRISPRa	CD8	IFNG	-0,026616	0,687098
ZNF69	Primary	CRISPRa	CD8	IFNG	0,06805	0,687098
NEUROD6	Primary	CRISPRa	CD8	IFNG	0,1456	0,687098
ZNF483	Primary	CRISPRa	CD8	IFNG	-0,031609	0,687305
RNF125	Primary	CRISPRa	CD8	IFNG	0,14333	0,687305
ZNF480	Primary	CRISPRa	CD8	IFNG	0,21383	0,687305
EID2B	Primary	CRISPRa	CD8	IFNG	0,096334	0,687525
GCM1	Primary	CRISPRa	CD8	IFNG	0,13672	0,687525
CDK1	Primary	CRISPRa	CD8	IFNG	0,25101	0,687525
ZNF217	Primary	CRISPRa	CD8	IFNG	-0,14474	0,688357
DUSP26	Primary	CRISPRa	CD8	IFNG	0,13763	0,688357
ACTR8	Primary	CRISPRa	CD8	IFNG	0,015834	0,688683
ZNF691	Primary	CRISPRa	CD8	IFNG	0,20648	0,688683
ARID5A	Primary	CRISPRa	CD8	IFNG	0,054227	0,689409
TRIP13	Primary	CRISPRa	CD8	IFNG	-0,11814	0,691246
ATXN7	Primary	CRISPRa	CD8	IFNG	-0,37731	0,691952
ZIC5	Primary	CRISPRa	CD8	IFNG	-0,3477	0,691952
FGFR1	Primary	CRISPRa	CD8	IFNG	-0,31097	0,691952
ARC	Primary	CRISPRa	CD8	IFNG	-0,2782	0,691952
ZNF404	Primary	CRISPRa	CD8	IFNG	-0,25957	0,691952
SAV1	Primary	CRISPRa	CD8	IFNG	-0,25238	0,691952
S100A1	Primary	CRISPRa	CD8	IFNG	-0,2279	0,691952
ZMYM3	Primary	CRISPRa	CD8	IFNG	-0,22521	0,691952
PSMC1	Primary	CRISPRa	CD8	IFNG	-0,22194	0,691952
CNOT7	Primary	CRISPRa	CD8	IFNG	-0,16322	0,691952
PICALM	Primary	CRISPRa	CD8	IFNG	-0,15586	0,691952
NSD3	Primary	CRISPRa	CD8	IFNG	-0,12664	0,691952
ZNF620	Primary	CRISPRa	CD8	IFNG	-0,12005	0,691952
UCHL5	Primary	CRISPRa	CD8	IFNG	-0,10558	0,691952
ZNF662	Primary	CRISPRa	CD8	IFNG	-0,10145	0,691952
EHMT1	Primary	CRISPRa	CD8	IFNG	-0,097845	0,691952
CTBP1	Primary	CRISPRa	CD8	IFNG	-0,041874	0,691952
KLHL6	Primary	CRISPRa	CD8	IFNG	0,080646	0,691952
ZNF669	Primary	CRISPRa	CD8	IFNG	0,30329	0,692082
ZNF485	Primary	CRISPRa	CD8	IFNG	0,16381	0,692546
ZNF639	Primary	CRISPRa	CD8	IFNG	0,17987	0,692546

ZXDB	Primary	CRISPRa	CD8	IFNG	-0,045196	0,694769
GRHL1	Primary	CRISPRa	CD8	IFNG	0,029182	0,694769
ZNF257	Primary	CRISPRa	CD8	IFNG	0,035984	0,694769
CELF3	Primary	CRISPRa	CD8	IFNG	0,050167	0,694769
ZNF543	Primary	CRISPRa	CD8	IFNG	0,13105	0,694769
ANKRD30A	Primary	CRISPRa	CD8	IFNG	0,13631	0,694769
ZBED9	Primary	CRISPRa	CD8	IFNG	0,19726	0,694769
MIER2	Primary	CRISPRa	CD8	IFNG	0,27213	0,695447
SEMA4A	Primary	CRISPRa	CD8	IFNG	-0,23709	0,695543
ZNF680	Primary	CRISPRa	CD8	IFNG	-0,087636	0,695543
MICALL1	Primary	CRISPRa	CD8	IFNG	0,074035	0,695543
RBM15	Primary	CRISPRa	CD8	IFNG	-0,19144	0,695563
CERS4	Primary	CRISPRa	CD8	IFNG	-0,081207	0,695563
HTATSF1	Primary	CRISPRa	CD8	IFNG	0,11379	0,695563
LMX1B	Primary	CRISPRa	CD8	IFNG	-0,27167	0,695867
BCL6	Primary	CRISPRa	CD8	IFNG	-0,019221	0,695867
MXD1	Primary	CRISPRa	CD8	IFNG	-0,0016661	0,697326
RIOX1	Primary	CRISPRa	CD8	IFNG	-0,12128	0,697711
TRIM56	Primary	CRISPRa	CD8	IFNG	-0,18216	0,701085
NR0B2	Primary	CRISPRa	CD8	IFNG	-0,10056	0,701085
ZNF419	Primary	CRISPRa	CD8	IFNG	-0,053273	0,701085
GRHL2	Primary	CRISPRa	CD8	IFNG	-0,049843	0,701085
KLHL21	Primary	CRISPRa	CD8	IFNG	-0,03512	0,701085
MRPL28	Primary	CRISPRa	CD8	IFNG	0,06554	0,701085
TFAM	Primary	CRISPRa	CD8	IFNG	0,1144	0,701085
ZNF234	Primary	CRISPRa	CD8	IFNG	0,13699	0,701085
PRPF6	Primary	CRISPRa	CD8	IFNG	0,1725	0,701085
PER1	Primary	CRISPRa	CD8	IFNG	0,28319	0,701085
ZNF227	Primary	CRISPRa	CD8	IFNG	0,28952	0,701085
PRDM10	Primary	CRISPRa	CD8	IFNG	0,32393	0,701085
TFCP2	Primary	CRISPRa	CD8	IFNG	-0,18512	0,701714
PRAP1	Primary	CRISPRa	CD8	IFNG	-0,062339	0,701714
ZNF806	Primary	CRISPRa	CD8	IFNG	-0,024876	0,701714
DAB2	Primary	CRISPRa	CD8	IFNG	0,056536	0,701714
S100A8	Primary	CRISPRa	CD8	IFNG	0,058886	0,701714
ELOF1	Primary	CRISPRa	CD8	IFNG	0,09002	0,701714
ASCL3	Primary	CRISPRa	CD8	IFNG	0,11568	0,701714
UXT	Primary	CRISPRa	CD8	IFNG	0,11587	0,701714
SLC26A3	Primary	CRISPRa	CD8	IFNG	0,17783	0,701714
ZNF394	Primary	CRISPRa	CD8	IFNG	-0,11127	0,703795
FLNA	Primary	CRISPRa	CD8	IFNG	-0,09487	0,703795
TRIOBP	Primary	CRISPRa	CD8	IFNG	0,0075714	0,703795
SIN3A	Primary	CRISPRa	CD8	IFNG	-0,0033969	0,704256
MYPOP	Primary	CRISPRa	CD8	IFNG	0,21034	0,704256
PPP1R13L	Primary	CRISPRa	CD8	IFNG	0,25866	0,704256
SLC25A2	Primary	CRISPRa	CD8	IFNG	-0,014826	0,704468
MYCN	Primary	CRISPRa	CD8	IFNG	0,053471	0,704719
FRK	Primary	CRISPRa	CD8	IFNG	0,067403	0,704719
IRX6	Primary	CRISPRa	CD8	IFNG	0,15191	0,705227
TAF7	Primary	CRISPRa	CD8	IFNG	-0,048992	0,706351
IRAK3	Primary	CRISPRa	CD8	IFNG	-0,071953	0,707061
RBBP8	Primary	CRISPRa	CD8	IFNG	0,044172	0,707061
CAMK2A	Primary	CRISPRa	CD8	IFNG	0,12086	0,707061
TFAP4	Primary	CRISPRa	CD8	IFNG	0,17619	0,707061
EAPP	Primary	CRISPRa	CD8	IFNG	-0,23787	0,707364

SIX6	Primary	CRISPRa	CD8	IFNG	0,16715	0,707364
TGIF2LY	Primary	CRISPRa	CD8	IFNG	0,17288	0,707364
BOD1L1	Primary	CRISPRa	CD8	IFNG	0,2229	0,708242
TMEM260	Primary	CRISPRa	CD8	IFNG	-0,28189	0,709095
TAF6L	Primary	CRISPRa	CD8	IFNG	-0,2422	0,709095
PIK3R1	Primary	CRISPRa	CD8	IFNG	-0,2227	0,709095
HR	Primary	CRISPRa	CD8	IFNG	-0,18821	0,709095
HIPK1	Primary	CRISPRa	CD8	IFNG	-0,18548	0,709095
RNF103	Primary	CRISPRa	CD8	IFNG	-0,14787	0,709095
CCNA2	Primary	CRISPRa	CD8	IFNG	-0,12158	0,709095
PRAMEF25	Primary	CRISPRa	CD8	IFNG	-0,10531	0,709095
ZNF628	Primary	CRISPRa	CD8	IFNG	-0,10325	0,709095
RBX1	Primary	CRISPRa	CD8	IFNG	-0,093021	0,709095
HOXD8	Primary	CRISPRa	CD8	IFNG	-0,059724	0,709095
ZBTB7B	Primary	CRISPRa	CD8	IFNG	0,089748	0,709095
KAT8	Primary	CRISPRa	CD8	IFNG	-0,31579	0,709781
OSR2	Primary	CRISPRa	CD8	IFNG	-0,10118	0,710034
RNF141	Primary	CRISPRa	CD8	IFNG	-0,062975	0,710034
CAPN15	Primary	CRISPRa	CD8	IFNG	-0,047471	0,710034
HLA-DQB1	Primary	CRISPRa	CD8	IFNG	-0,043707	0,710034
ZNF730	Primary	CRISPRa	CD8	IFNG	0,041577	0,710034
USP16	Primary	CRISPRa	CD8	IFNG	0,061527	0,710034
NFAT5	Primary	CRISPRa	CD8	IFNG	0,29026	0,710034
MTF2	Primary	CRISPRa	CD8	IFNG	0,25711	0,710489
ZNF653	Primary	CRISPRa	CD8	IFNG	0,034878	0,710773
ZRSR2	Primary	CRISPRa	CD8	IFNG	0,23301	0,710773
ANP32E	Primary	CRISPRa	CD8	IFNG	-0,35909	0,711668
PAX1	Primary	CRISPRa	CD8	IFNG	-0,29093	0,711668
ZNF43	Primary	CRISPRa	CD8	IFNG	-0,25089	0,711668
FOXN1	Primary	CRISPRa	CD8	IFNG	-0,22713	0,711668
TCEAL3	Primary	CRISPRa	CD8	IFNG	-0,19346	0,711668
SPDEF	Primary	CRISPRa	CD8	IFNG	-0,16271	0,711668
ZNF629	Primary	CRISPRa	CD8	IFNG	-0,1334	0,711668
ZNF287	Primary	CRISPRa	CD8	IFNG	-0,1081	0,711668
FOXG1	Primary	CRISPRa	CD8	IFNG	-0,012093	0,711668
TCEA2	Primary	CRISPRa	CD8	IFNG	0,051534	0,711668
PRAMEF6	Primary	CRISPRa	CD8	IFNG	0,13201	0,711668
ZBTB40	Primary	CRISPRa	CD8	IFNG	0,13765	0,711668
AURKB	Primary	CRISPRa	CD8	IFNG	0,23687	0,711668
SCX	Primary	CRISPRa	CD8	IFNG	0,24009	0,711668
NR4A2	Primary	CRISPRa	CD8	IFNG	-0,22214	0,71289
SP7	Primary	CRISPRa	CD8	IFNG	-0,34041	0,717018
LBH	Primary	CRISPRa	CD8	IFNG	-0,30644	0,717018
DDX5	Primary	CRISPRa	CD8	IFNG	-0,29845	0,717018
PRICKLE3	Primary	CRISPRa	CD8	IFNG	-0,28153	0,717018
MXD4	Primary	CRISPRa	CD8	IFNG	-0,28152	0,717018
MBD6	Primary	CRISPRa	CD8	IFNG	-0,25965	0,717018
MED21	Primary	CRISPRa	CD8	IFNG	-0,24758	0,717018
ZNF789	Primary	CRISPRa	CD8	IFNG	-0,22355	0,717018
TWIST1	Primary	CRISPRa	CD8	IFNG	-0,20477	0,717018
NKX3-1	Primary	CRISPRa	CD8	IFNG	-0,20248	0,717018
CSRP2	Primary	CRISPRa	CD8	IFNG	-0,20123	0,717018
FOXD4L3	Primary	CRISPRa	CD8	IFNG	-0,19192	0,717018
ZNF516	Primary	CRISPRa	CD8	IFNG	-0,18479	0,717018
CNOT4	Primary	CRISPRa	CD8	IFNG	-0,18258	0,717018

ANKRD2	Primary	CRISPRa	CD8	IFNG	-0,18033	0,717018
LOXL2	Primary	CRISPRa	CD8	IFNG	-0,17927	0,717018
OLIG2	Primary	CRISPRa	CD8	IFNG	-0,16949	0,717018
ARID3C	Primary	CRISPRa	CD8	IFNG	-0,16016	0,717018
CLOCK	Primary	CRISPRa	CD8	IFNG	-0,13822	0,717018
PSMD9	Primary	CRISPRa	CD8	IFNG	-0,13769	0,717018
ZNF85	Primary	CRISPRa	CD8	IFNG	-0,13731	0,717018
RNF113A	Primary	CRISPRa	CD8	IFNG	-0,1281	0,717018
LARP1	Primary	CRISPRa	CD8	IFNG	-0,09718	0,717018
ZFP3	Primary	CRISPRa	CD8	IFNG	-0,094478	0,717018
PCBD1	Primary	CRISPRa	CD8	IFNG	-0,078074	0,717018
LPXN	Primary	CRISPRa	CD8	IFNG	-0,076265	0,717018
USP47	Primary	CRISPRa	CD8	IFNG	-0,071023	0,717018
HNRNPK	Primary	CRISPRa	CD8	IFNG	-0,063144	0,717018
PCSK6	Primary	CRISPRa	CD8	IFNG	-0,047234	0,717018
HIF1AN	Primary	CRISPRa	CD8	IFNG	-0,041702	0,717018
TRIM27	Primary	CRISPRa	CD8	IFNG	-0,038766	0,717018
MEAF6	Primary	CRISPRa	CD8	IFNG	-0,037733	0,717018
KCMF1	Primary	CRISPRa	CD8	IFNG	-0,022671	0,717018
GTF3C4	Primary	CRISPRa	CD8	IFNG	-0,015054	0,717018
RNF20	Primary	CRISPRa	CD8	IFNG	-0,013392	0,717018
COPS5	Primary	CRISPRa	CD8	IFNG	-0,009618	0,717018
ZNF496	Primary	CRISPRa	CD8	IFNG	0,0064973	0,717018
VEGFA	Primary	CRISPRa	CD8	IFNG	0,052744	0,717018
OLIG1	Primary	CRISPRa	CD8	IFNG	0,062828	0,717018
HSFX1	Primary	CRISPRa	CD8	IFNG	0,063056	0,717018
NELFA	Primary	CRISPRa	CD8	IFNG	0,067817	0,717018
BCL6B	Primary	CRISPRa	CD8	IFNG	0,068602	0,717018
CITED4	Primary	CRISPRa	CD8	IFNG	0,070741	0,717018
ATF1	Primary	CRISPRa	CD8	IFNG	0,14993	0,717018
CSRP3	Primary	CRISPRa	CD8	IFNG	0,15647	0,717018
AFDN	Primary	CRISPRa	CD8	IFNG	0,18492	0,717808
CCND1	Primary	CRISPRa	CD8	IFNG	-0,096614	0,71812
NPAS1	Primary	CRISPRa	CD8	IFNG	-0,023408	0,71812
TIGD7	Primary	CRISPRa	CD8	IFNG	-0,021958	0,718778
MBD4	Primary	CRISPRa	CD8	IFNG	0,04398	0,718778
PHTF2	Primary	CRISPRa	CD8	IFNG	0,072294	0,718778
ZNF844	Primary	CRISPRa	CD8	IFNG	0,094351	0,718778
TAF1L	Primary	CRISPRa	CD8	IFNG	0,0986	0,718778
SKAP1	Primary	CRISPRa	CD8	IFNG	-0,011	0,719872
AUTS2	Primary	CRISPRa	CD8	IFNG	0,039779	0,719872
ZNF148	Primary	CRISPRa	CD8	IFNG	-0,15444	0,72003
LMX1A	Primary	CRISPRa	CD8	IFNG	-0,079496	0,72003
STAT5A	Primary	CRISPRa	CD8	IFNG	-0,085313	0,721111
NKX6-3	Primary	CRISPRa	CD8	IFNG	-0,020922	0,721111
ZNF587B	Primary	CRISPRa	CD8	IFNG	0,0090987	0,721111
ZNF396	Primary	CRISPRa	CD8	IFNG	0,059787	0,721111
TRAF6	Primary	CRISPRa	CD8	IFNG	0,070029	0,721111
KLF9	Primary	CRISPRa	CD8	IFNG	0,078777	0,721111
PHF12	Primary	CRISPRa	CD8	IFNG	0,10894	0,721111
BCLAF1	Primary	CRISPRa	CD8	IFNG	0,12587	0,721111
RNF144A	Primary	CRISPRa	CD8	IFNG	0,22587	0,721111
ELK4	Primary	CRISPRa	CD8	IFNG	0,11588	0,722809
KAT7	Primary	CRISPRa	CD8	IFNG	0,093346	0,723131
DMRTA1	Primary	CRISPRa	CD8	IFNG	-0,27009	0,724369

HOMEZ	Primary	CRISPRa	CD8	IFNG	-0,16805	0,724369
AIM2	Primary	CRISPRa	CD8	IFNG	-0,067026	0,724369
NR0B1	Primary	CRISPRa	CD8	IFNG	-0,062276	0,724369
SSH2	Primary	CRISPRa	CD8	IFNG	-0,056927	0,724369
VHL	Primary	CRISPRa	CD8	IFNG	0,10603	0,724369
ENO1	Primary	CRISPRa	CD8	IFNG	-0,25485	0,725063
GON4L	Primary	CRISPRa	CD8	IFNG	-0,031201	0,725063
HNF1A	Primary	CRISPRa	CD8	IFNG	-0,020012	0,725063
NONO	Primary	CRISPRa	CD8	IFNG	0,01575	0,726331
ZNF26	Primary	CRISPRa	CD8	IFNG	-0,1606	0,72722
ETV7	Primary	CRISPRa	CD8	IFNG	-0,14967	0,72722
HRAS	Primary	CRISPRa	CD8	IFNG	-0,09646	0,72722
FHL5	Primary	CRISPRa	CD8	IFNG	-0,085552	0,72722
PIAS2	Primary	CRISPRa	CD8	IFNG	0,061341	0,72722
SPAG8	Primary	CRISPRa	CD8	IFNG	0,069855	0,72722
TAF13	Primary	CRISPRa	CD8	IFNG	0,095861	0,72722
SMARCC2	Primary	CRISPRa	CD8	IFNG	0,18732	0,72722
SIX1	Primary	CRISPRa	CD8	IFNG	0,33282	0,72722
MBD2	Primary	CRISPRa	CD8	IFNG	-0,18075	0,72802
VGLL3	Primary	CRISPRa	CD8	IFNG	-0,030319	0,72802
ZNF843	Primary	CRISPRa	CD8	IFNG	-0,17869	0,729042
ARX	Primary	CRISPRa	CD8	IFNG	-0,11266	0,729042
ZNF605	Primary	CRISPRa	CD8	IFNG	-0,069723	0,729042
ZNF30	Primary	CRISPRa	CD8	IFNG	-0,035261	0,729042
ENG	Primary	CRISPRa	CD8	IFNG	-0,023832	0,729042
MID2	Primary	CRISPRa	CD8	IFNG	0,014768	0,729042
STON1	Primary	CRISPRa	CD8	IFNG	0,040745	0,729042
NR6A1	Primary	CRISPRa	CD8	IFNG	0,051872	0,729042
PITX2	Primary	CRISPRa	CD8	IFNG	0,12298	0,729042
PRMT7	Primary	CRISPRa	CD8	IFNG	0,13855	0,729042
ZNF835	Primary	CRISPRa	CD8	IFNG	0,14988	0,729042
ZNF33A	Primary	CRISPRa	CD8	IFNG	0,15481	0,729042
XPC	Primary	CRISPRa	CD8	IFNG	0,23343	0,729042
ZNF705G	Primary	CRISPRa	CD8	IFNG	0,24074	0,729042
SAFB	Primary	CRISPRa	CD8	IFNG	0,28002	0,729042
BARX2	Primary	CRISPRa	CD8	IFNG	-0,037667	0,731172
ZNF322	Primary	CRISPRa	CD8	IFNG	-0,11934	0,731357
SNAPC5	Primary	CRISPRa	CD8	IFNG	-0,019544	0,731357
HLA-DRB3	Primary	CRISPRa	CD8	IFNG	0,17607	0,731357
HMG20A	Primary	CRISPRa	CD8	IFNG	0,19198	0,731357
ASXL1	Primary	CRISPRa	CD8	IFNG	0,2225	0,731357
PRDM2	Primary	CRISPRa	CD8	IFNG	-0,28894	0,732729
MAZ	Primary	CRISPRa	CD8	IFNG	-0,25077	0,732729
ZNF385A	Primary	CRISPRa	CD8	IFNG	-0,21289	0,732729
NOC3L	Primary	CRISPRa	CD8	IFNG	-0,12441	0,732729
POLR2L	Primary	CRISPRa	CD8	IFNG	0,054346	0,732729
PRAMEF11	Primary	CRISPRa	CD8	IFNG	0,055212	0,737004
REPIN1	Primary	CRISPRa	CD8	IFNG	0,045468	0,737734
NDN	Primary	CRISPRa	CD8	IFNG	-0,29655	0,739448
PTTG1	Primary	CRISPRa	CD8	IFNG	-0,17154	0,739448
SHOX	Primary	CRISPRa	CD8	IFNG	-0,11276	0,739448
RPRD1A	Primary	CRISPRa	CD8	IFNG	0,077557	0,739448
SOX6	Primary	CRISPRa	CD8	IFNG	-0,10454	0,740141
ZNF500	Primary	CRISPRa	CD8	IFNG	-0,0024903	0,740141
SSX5	Primary	CRISPRa	CD8	IFNG	0,124	0,740141

MALT1	Primary	CRISPRa	CD8	IFNG	0,14837	0,740141
NFXL1	Primary	CRISPRa	CD8	IFNG	-0,20861	0,741265
HCFC2	Primary	CRISPRa	CD8	IFNG	-0,032426	0,74299
NR2F2	Primary	CRISPRa	CD8	IFNG	-0,24098	0,743036
ZIC4	Primary	CRISPRa	CD8	IFNG	-0,23618	0,743036
MTERF2	Primary	CRISPRa	CD8	IFNG	-0,22781	0,743036
DYDC1	Primary	CRISPRa	CD8	IFNG	-0,075034	0,743036
SSH1	Primary	CRISPRa	CD8	IFNG	-0,07162	0,743036
SSX3	Primary	CRISPRa	CD8	IFNG	-0,16346	0,744889
ZRANB2	Primary	CRISPRa	CD8	IFNG	-0,12652	0,747134
APTX	Primary	CRISPRa	CD8	IFNG	-0,083079	0,747134
SPI1	Primary	CRISPRa	CD8	IFNG	-0,064156	0,747134
ACTR6	Primary	CRISPRa	CD8	IFNG	-0,022051	0,747134
SORBS2	Primary	CRISPRa	CD8	IFNG	0,1085	0,747134
HMGB1	Primary	CRISPRa	CD8	IFNG	0,14657	0,747134
TEF	Primary	CRISPRa	CD8	IFNG	0,23516	0,747134
MTOR	Primary	CRISPRa	CD8	IFNG	-0,10984	0,748638
MED4	Primary	CRISPRa	CD8	IFNG	-0,10605	0,748638
SERPIND1	Primary	CRISPRa	CD8	IFNG	-0,060921	0,748638
CRIP2	Primary	CRISPRa	CD8	IFNG	0,020848	0,748638
ZNF70	Primary	CRISPRa	CD8	IFNG	0,21909	0,748638
SMURF2	Primary	CRISPRa	CD8	IFNG	-0,3442	0,750736
SOX11	Primary	CRISPRa	CD8	IFNG	-0,29921	0,750736
ZNF512B	Primary	CRISPRa	CD8	IFNG	-0,29891	0,750736
THRA	Primary	CRISPRa	CD8	IFNG	-0,29525	0,750736
PRKDC	Primary	CRISPRa	CD8	IFNG	-0,28213	0,750736
PPM1A	Primary	CRISPRa	CD8	IFNG	-0,26147	0,750736
ZBTB48	Primary	CRISPRa	CD8	IFNG	-0,20717	0,750736
PLRG1	Primary	CRISPRa	CD8	IFNG	-0,19958	0,750736
PHF21B	Primary	CRISPRa	CD8	IFNG	-0,17523	0,750736
ZNF492	Primary	CRISPRa	CD8	IFNG	-0,1709	0,750736
RLF	Primary	CRISPRa	CD8	IFNG	-0,14476	0,750736
PROX2	Primary	CRISPRa	CD8	IFNG	-0,1385	0,750736
TLE2	Primary	CRISPRa	CD8	IFNG	-0,12667	0,750736
SARNP	Primary	CRISPRa	CD8	IFNG	-0,072072	0,750736
ZNF256	Primary	CRISPRa	CD8	IFNG	-0,050039	0,750736
LIN28A	Primary	CRISPRa	CD8	IFNG	0,01253	0,750736
NMI	Primary	CRISPRa	CD8	IFNG	0,14566	0,750736
SALL3	Primary	CRISPRa	CD8	IFNG	-0,1753	0,751479
ZHX2	Primary	CRISPRa	CD8	IFNG	-0,021755	0,751715
BCL11B	Primary	CRISPRa	CD8	IFNG	-0,2176	0,755092
MAPK9	Primary	CRISPRa	CD8	IFNG	-0,11046	0,755092
ZNF714	Primary	CRISPRa	CD8	IFNG	-0,050456	0,755092
MEIS2	Primary	CRISPRa	CD8	IFNG	-0,057941	0,755543
ZNF746	Primary	CRISPRa	CD8	IFNG	-0,17066	0,756051
HAND1	Primary	CRISPRa	CD8	IFNG	-0,11683	0,756051
BTBD3	Primary	CRISPRa	CD8	IFNG	0,016401	0,757639
ZBTB44	Primary	CRISPRa	CD8	IFNG	0,061805	0,757639
ZBED4	Primary	CRISPRa	CD8	IFNG	0,18862	0,757639
PHB2	Primary	CRISPRa	CD8	IFNG	0,23564	0,758199
ZNF208	Primary	CRISPRa	CD8	IFNG	-0,15684	0,758204
ZSCAN29	Primary	CRISPRa	CD8	IFNG	0,086772	0,758452
KDM1A	Primary	CRISPRa	CD8	IFNG	-0,24059	0,758795
OTOP3	Primary	CRISPRa	CD8	IFNG	0,058893	0,7588
TRMT1	Primary	CRISPRa	CD8	IFNG	0,098799	0,758996

AGO1	Primary	CRISPRa	CD8	IFNG	-0,27124	0,760174
NKX6-2	Primary	CRISPRa	CD8	IFNG	-0,17311	0,76021
UBB	Primary	CRISPRa	CD8	IFNG	-0,11513	0,76021
TPR	Primary	CRISPRa	CD8	IFNG	0,035625	0,76021
PLXNA2	Primary	CRISPRa	CD8	IFNG	-0,39299	0,76134
MAFG	Primary	CRISPRa	CD8	IFNG	-0,36278	0,76134
MYOCD	Primary	CRISPRa	CD8	IFNG	-0,26419	0,76134
MBD3L1	Primary	CRISPRa	CD8	IFNG	-0,1963	0,76134
N4BP2L2	Primary	CRISPRa	CD8	IFNG	-0,15296	0,76134
TULP4	Primary	CRISPRa	CD8	IFNG	-0,14154	0,76134
ZNF135	Primary	CRISPRa	CD8	IFNG	-0,13999	0,76134
ZC3H3	Primary	CRISPRa	CD8	IFNG	-0,13531	0,76134
ZNF8	Primary	CRISPRa	CD8	IFNG	-0,10331	0,76134
E2F4	Primary	CRISPRa	CD8	IFNG	-0,08194	0,76134
NUCKS1	Primary	CRISPRa	CD8	IFNG	-0,029056	0,76134
SNIP1	Primary	CRISPRa	CD8	IFNG	-0,014279	0,76134
EAF1	Primary	CRISPRa	CD8	IFNG	-0,013779	0,76134
RBBP5	Primary	CRISPRa	CD8	IFNG	0,038769	0,76134
DUSP22	Primary	CRISPRa	CD8	IFNG	0,042957	0,76134
IFI16	Primary	CRISPRa	CD8	IFNG	0,086312	0,76134
CNBP	Primary	CRISPRa	CD8	IFNG	-0,27722	0,761653
ZNF268	Primary	CRISPRa	CD8	IFNG	-0,26508	0,761653
ANKRD33	Primary	CRISPRa	CD8	IFNG	-0,23559	0,761653
IKZF4	Primary	CRISPRa	CD8	IFNG	-0,21152	0,761653
GTF2H5	Primary	CRISPRa	CD8	IFNG	-0,16524	0,761653
ZNF518A	Primary	CRISPRa	CD8	IFNG	-0,12132	0,761653
ZNF225	Primary	CRISPRa	CD8	IFNG	-0,11952	0,761653
ZNF692	Primary	CRISPRa	CD8	IFNG	-0,1155	0,761653
ARHGAP5	Primary	CRISPRa	CD8	IFNG	-0,11436	0,761653
LBX1	Primary	CRISPRa	CD8	IFNG	-0,10534	0,761653
NSD1	Primary	CRISPRa	CD8	IFNG	-0,104	0,761653
MKRN2	Primary	CRISPRa	CD8	IFNG	-0,063247	0,761653
EN1	Primary	CRISPRa	CD8	IFNG	-0,054732	0,761653
TRAFD1	Primary	CRISPRa	CD8	IFNG	-0,032442	0,761653
YY2	Primary	CRISPRa	CD8	IFNG	-0,022967	0,761653
ZNF551	Primary	CRISPRa	CD8	IFNG	-0,013521	0,761653
ZMYM5	Primary	CRISPRa	CD8	IFNG	0,0048178	0,761653
UFL1	Primary	CRISPRa	CD8	IFNG	0,02117	0,761653
NFATC2IP	Primary	CRISPRa	CD8	IFNG	0,023877	0,761653
CDR2	Primary	CRISPRa	CD8	IFNG	0,025123	0,761653
CHCHD2	Primary	CRISPRa	CD8	IFNG	0,069223	0,761653
NPM2	Primary	CRISPRa	CD8	IFNG	0,1197	0,761653
ZNF114	Primary	CRISPRa	CD8	IFNG	-0,13762	0,76197
RNF166	Primary	CRISPRa	CD8	IFNG	0,016002	0,76197
ZNF527	Primary	CRISPRa	CD8	IFNG	0,039791	0,763591
YWHAB	Primary	CRISPRa	CD8	IFNG	0,14738	0,763591
PPARA	Primary	CRISPRa	CD8	IFNG	-0,14218	0,764344
ASCC1	Primary	CRISPRa	CD8	IFNG	0,085806	0,764463
ARIH2	Primary	CRISPRa	CD8	IFNG	-0,12076	0,764491
TTLL5	Primary	CRISPRa	CD8	IFNG	-0,071567	0,764491
PNRC1	Primary	CRISPRa	CD8	IFNG	-0,06569	0,764491
CNOT8	Primary	CRISPRa	CD8	IFNG	0,18104	0,764491
INPP5K	Primary	CRISPRa	CD8	IFNG	0,004825	0,764625
ZBTB24	Primary	CRISPRa	CD8	IFNG	0,043028	0,764625
TRIM5	Primary	CRISPRa	CD8	IFNG	0,042133	0,765408

KCNIP3	Primary	CRISPRa	CD8	IFNG	-0,2386	0,76561
WAC	Primary	CRISPRa	CD8	IFNG	-0,085964	0,76561
ATMIN	Primary	CRISPRa	CD8	IFNG	-0,048762	0,76561
BEND6	Primary	CRISPRa	CD8	IFNG	0,000069877	0,76561
ZNF91	Primary	CRISPRa	CD8	IFNG	0,0033812	0,76561
SIRT3	Primary	CRISPRa	CD8	IFNG	0,010495	0,76561
ZNF732	Primary	CRISPRa	CD8	IFNG	0,037269	0,76561
ZMAT1	Primary	CRISPRa	CD8	IFNG	0,087465	0,76561
PBX3	Primary	CRISPRa	CD8	IFNG	0,17091	0,76561
CERS6	Primary	CRISPRa	CD8	IFNG	0,28263	0,76561
TET1	Primary	CRISPRa	CD8	IFNG	-0,20164	0,766218
IRF2BP2	Primary	CRISPRa	CD8	IFNG	-0,19806	0,766218
BBS7	Primary	CRISPRa	CD8	IFNG	-0,1477	0,766218
CUL4A	Primary	CRISPRa	CD8	IFNG	-0,12526	0,766218
ZNF324B	Primary	CRISPRa	CD8	IFNG	-0,11365	0,766218
RBM5	Primary	CRISPRa	CD8	IFNG	-0,016074	0,766218
HEXIM1	Primary	CRISPRa	CD8	IFNG	-0,0083988	0,766218
ZNF521	Primary	CRISPRa	CD8	IFNG	0,043647	0,766218
RXRG	Primary	CRISPRa	CD8	IFNG	0,1212	0,766218
KLF6	Primary	CRISPRa	CD8	IFNG	0,12353	0,766218
CEP290	Primary	CRISPRa	CD8	IFNG	0,25785	0,766218
ZNF585A	Primary	CRISPRa	CD8	IFNG	0,27205	0,766218
TIGD2	Primary	CRISPRa	CD8	IFNG	-0,29584	0,770485
ZNF440	Primary	CRISPRa	CD8	IFNG	-0,17268	0,770485
ARID3A	Primary	CRISPRa	CD8	IFNG	-0,15677	0,770485
TAF5	Primary	CRISPRa	CD8	IFNG	-0,12128	0,770485
MBD3L2	Primary	CRISPRa	CD8	IFNG	-0,11407	0,770485
ZNF606	Primary	CRISPRa	CD8	IFNG	-0,10249	0,770485
CCDC71	Primary	CRISPRa	CD8	IFNG	-0,093098	0,770485
MTERF1	Primary	CRISPRa	CD8	IFNG	-0,081882	0,770485
RNF4	Primary	CRISPRa	CD8	IFNG	0,0096283	0,770485
CDK7	Primary	CRISPRa	CD8	IFNG	0,015449	0,770485
KBTBD7	Primary	CRISPRa	CD8	IFNG	0,016135	0,770485
SND1	Primary	CRISPRa	CD8	IFNG	0,023309	0,770485
ZNF45	Primary	CRISPRa	CD8	IFNG	0,046261	0,770485
MED24	Primary	CRISPRa	CD8	IFNG	0,051654	0,770485
BTF3	Primary	CRISPRa	CD8	IFNG	0,057511	0,770485
TNNI2	Primary	CRISPRa	CD8	IFNG	0,12803	0,770485
MAF	Primary	CRISPRa	CD8	IFNG	0,14388	0,770485
MED12L	Primary	CRISPRa	CD8	IFNG	0,039323	0,771495
MEF2D	Primary	CRISPRa	CD8	IFNG	0,087285	0,771495
HP1BP3	Primary	CRISPRa	CD8	IFNG	0,21352	0,771495
USF2	Primary	CRISPRa	CD8	IFNG	0,23368	0,771495
MZF1	Primary	CRISPRa	CD8	IFNG	0,031874	0,771608
LHX1	Primary	CRISPRa	CD8	IFNG	-0,17091	0,77198
ZNF79	Primary	CRISPRa	CD8	IFNG	-0,14583	0,77198
GTF2IRD1	Primary	CRISPRa	CD8	IFNG	0,13761	0,77198
WWP2	Primary	CRISPRa	CD8	IFNG	-0,18419	0,773452
PPP2R3B	Primary	CRISPRa	CD8	IFNG	0,072322	0,773452
PRAMEF9	Primary	CRISPRa	CD8	IFNG	-0,07634	0,77444
PHIP	Primary	CRISPRa	CD8	IFNG	-0,12617	0,77742
TERF2	Primary	CRISPRa	CD8	IFNG	-0,11985	0,77742
ZSCAN4	Primary	CRISPRa	CD8	IFNG	0,14746	0,77742
ZNF544	Primary	CRISPRa	CD8	IFNG	0,090424	0,778029
RBL1	Primary	CRISPRa	CD8	IFNG	-0,17298	0,778351

NIF3L1	Primary	CRISPRa	CD8	IFNG	0,07071	0,778351
JRK	Primary	CRISPRa	CD8	IFNG	0,16382	0,778351
MED10	Primary	CRISPRa	CD8	IFNG	0,027988	0,778712
ACTN2	Primary	CRISPRa	CD8	IFNG	0,12539	0,778712
CREB3L4	Primary	CRISPRa	CD8	IFNG	-0,25325	0,77929
DDB2	Primary	CRISPRa	CD8	IFNG	-0,2125	0,77929
ZNF667	Primary	CRISPRa	CD8	IFNG	-0,01174	0,780579
TRIP4	Primary	CRISPRa	CD8	IFNG	0,026898	0,780579
SCRT1	Primary	CRISPRa	CD8	IFNG	-0,030075	0,780635
RGS20	Primary	CRISPRa	CD8	IFNG	-0,021973	0,780635
ZNF540	Primary	CRISPRa	CD8	IFNG	0,012932	0,780635
ZNF420	Primary	CRISPRa	CD8	IFNG	-0,064587	0,782146
DPF2	Primary	CRISPRa	CD8	IFNG	-0,19832	0,784408
ESX1	Primary	CRISPRa	CD8	IFNG	-0,40357	0,785206
DLX1	Primary	CRISPRa	CD8	IFNG	-0,33964	0,785206
DMRT3	Primary	CRISPRa	CD8	IFNG	-0,3214	0,785206
BAZ1B	Primary	CRISPRa	CD8	IFNG	-0,32	0,785206
AFF1	Primary	CRISPRa	CD8	IFNG	-0,26127	0,785206
POLR3GL	Primary	CRISPRa	CD8	IFNG	-0,26112	0,785206
HELLS	Primary	CRISPRa	CD8	IFNG	-0,25131	0,785206
EED	Primary	CRISPRa	CD8	IFNG	-0,23243	0,785206
HAND2	Primary	CRISPRa	CD8	IFNG	-0,22534	0,785206
ABL1	Primary	CRISPRa	CD8	IFNG	-0,21814	0,785206
ZDHHC19	Primary	CRISPRa	CD8	IFNG	-0,21631	0,785206
SIRT5	Primary	CRISPRa	CD8	IFNG	-0,21074	0,785206
MED14	Primary	CRISPRa	CD8	IFNG	-0,19168	0,785206
HLF	Primary	CRISPRa	CD8	IFNG	-0,17712	0,785206
MAF1	Primary	CRISPRa	CD8	IFNG	-0,17634	0,785206
ZNF230	Primary	CRISPRa	CD8	IFNG	-0,15712	0,785206
CC2D1B	Primary	CRISPRa	CD8	IFNG	-0,11234	0,785206
GTF2F2	Primary	CRISPRa	CD8	IFNG	-0,11193	0,785206
MCIDAS	Primary	CRISPRa	CD8	IFNG	-0,10059	0,785206
RALY	Primary	CRISPRa	CD8	IFNG	-0,074991	0,785206
POU4F1	Primary	CRISPRa	CD8	IFNG	-0,063718	0,785206
NR5A1	Primary	CRISPRa	CD8	IFNG	-0,057065	0,785206
ZNF684	Primary	CRISPRa	CD8	IFNG	-0,05349	0,785206
ZNF182	Primary	CRISPRa	CD8	IFNG	-0,0088045	0,785206
BRMS1L	Primary	CRISPRa	CD8	IFNG	-0,0018743	0,785206
TRIM72	Primary	CRISPRa	CD8	IFNG	-0,0017465	0,785206
EYA4	Primary	CRISPRa	CD8	IFNG	0,0067514	0,785206
ERG	Primary	CRISPRa	CD8	IFNG	0,0095632	0,785206
CCDC62	Primary	CRISPRa	CD8	IFNG	0,011353	0,785206
PAX3	Primary	CRISPRa	CD8	IFNG	0,013765	0,785206
EYA3	Primary	CRISPRa	CD8	IFNG	0,016152	0,785206
SUDS3	Primary	CRISPRa	CD8	IFNG	0,049619	0,785206
ZNF382	Primary	CRISPRa	CD8	IFNG	0,073747	0,785206
MLIP	Primary	CRISPRa	CD8	IFNG	0,19557	0,785206
LYAR	Primary	CRISPRa	CD8	IFNG	0,1962	0,785206
MED8	Primary	CRISPRa	CD8	IFNG	0,1393	0,785354
ZNF490	Primary	CRISPRa	CD8	IFNG	-0,1658	0,785698
NOTCH2	Primary	CRISPRa	CD8	IFNG	-0,035507	0,78572
ZMYM4	Primary	CRISPRa	CD8	IFNG	-0,10581	0,787408
MLLT3	Primary	CRISPRa	CD8	IFNG	-0,052107	0,787408
ARL2BP	Primary	CRISPRa	CD8	IFNG	0,0004693	0,787408
PRAMEF18	Primary	CRISPRa	CD8	IFNG	0,032625	0,787408

ZIK1	Primary	CRISPRa	CD8	IFNG	0,0927	0,787408
MAMSTR	Primary	CRISPRa	CD8	IFNG	0,09666	0,787408
EXOC2	Primary	CRISPRa	CD8	IFNG	0,1042	0,787408
SSBP3	Primary	CRISPRa	CD8	IFNG	0,12856	0,787408
LDB1	Primary	CRISPRa	CD8	IFNG	0,26326	0,787408
RPS6KA4	Primary	CRISPRa	CD8	IFNG	-0,10913	0,787549
MAEL	Primary	CRISPRa	CD8	IFNG	-0,13027	0,78871
FOXJ3	Primary	CRISPRa	CD8	IFNG	0,072689	0,78871
RFX4	Primary	CRISPRa	CD8	IFNG	0,00057775	0,789789
ORC2	Primary	CRISPRa	CD8	IFNG	-0,13079	0,791421
ZNF37A	Primary	CRISPRa	CD8	IFNG	0,11824	0,791421
ING3	Primary	CRISPRa	CD8	IFNG	-0,19428	0,791528
ZNF165	Primary	CRISPRa	CD8	IFNG	-0,133	0,791528
SSX4	Primary	CRISPRa	CD8	IFNG	0,0090038	0,791528
NR3C1	Primary	CRISPRa	CD8	IFNG	0,028891	0,791528
TRIM49	Primary	CRISPRa	CD8	IFNG	-0,0887	0,793656
HNRNPU	Primary	CRISPRa	CD8	IFNG	-0,02902	0,793656
MKRN3	Primary	CRISPRa	CD8	IFNG	0,059246	0,793656
CREB1	Primary	CRISPRa	CD8	IFNG	0,099718	0,793656
DCAF6	Primary	CRISPRa	CD8	IFNG	-0,17979	0,794536
HDAC1	Primary	CRISPRa	CD8	IFNG	-0,16226	0,794536
ZNF397	Primary	CRISPRa	CD8	IFNG	-0,10349	0,794536
CHD8	Primary	CRISPRa	CD8	IFNG	-0,037727	0,794536
EAF2	Primary	CRISPRa	CD8	IFNG	0,013051	0,794536
THAP6	Primary	CRISPRa	CD8	IFNG	-0,016283	0,797585
SP5	Primary	CRISPRa	CD8	IFNG	0,16251	0,798017
POU2F3	Primary	CRISPRa	CD8	IFNG	0,18955	0,798017
SNW1	Primary	CRISPRa	CD8	IFNG	-0,1615	0,799482
ZFP91	Primary	CRISPRa	CD8	IFNG	0,08425	0,799482
NRL	Primary	CRISPRa	CD8	IFNG	0,14227	0,799482
SMYD5	Primary	CRISPRa	CD8	IFNG	-0,26263	0,799517
NUFIP1	Primary	CRISPRa	CD8	IFNG	-0,23205	0,799517
MED17	Primary	CRISPRa	CD8	IFNG	-0,17779	0,799517
PLXNA3	Primary	CRISPRa	CD8	IFNG	-0,076574	0,799517
TCF24	Primary	CRISPRa	CD8	IFNG	-0,049077	0,799517
HOXB5	Primary	CRISPRa	CD8	IFNG	-0,20729	0,802615
ZNF646	Primary	CRISPRa	CD8	IFNG	-0,17038	0,802615
EGR3	Primary	CRISPRa	CD8	IFNG	-0,13656	0,802615
BRF2	Primary	CRISPRa	CD8	IFNG	-0,11118	0,802615
ZBTB12	Primary	CRISPRa	CD8	IFNG	-0,086639	0,802615
ZNF609	Primary	CRISPRa	CD8	IFNG	-0,069317	0,802615
TOP1	Primary	CRISPRa	CD8	IFNG	-0,064038	0,802615
WDR5	Primary	CRISPRa	CD8	IFNG	-0,040882	0,802615
JUNB	Primary	CRISPRa	CD8	IFNG	-0,028903	0,802615
INO80D	Primary	CRISPRa	CD8	IFNG	-0,013714	0,802615
ZNF783	Primary	CRISPRa	CD8	IFNG	0,010901	0,802615
ZNF708	Primary	CRISPRa	CD8	IFNG	0,034611	0,802615
WWC1	Primary	CRISPRa	CD8	IFNG	0,041379	0,802615
FOXP2	Primary	CRISPRa	CD8	IFNG	0,068362	0,802615
PKNOX2	Primary	CRISPRa	CD8	IFNG	0,085172	0,802615
LBX2	Primary	CRISPRa	CD8	IFNG	0,092218	0,802615
PKIA	Primary	CRISPRa	CD8	IFNG	0,13512	0,802615
LRIF1	Primary	CRISPRa	CD8	IFNG	0,19272	0,802615
GLMP	Primary	CRISPRa	CD8	IFNG	-0,096119	0,802964
ZNF676	Primary	CRISPRa	CD8	IFNG	-0,014837	0,802964

RBCK1	Primary	CRISPRa	CD8	IFNG	0,02809	0,802964
BEND3	Primary	CRISPRa	CD8	IFNG	0,12848	0,802964
STOX2	Primary	CRISPRa	CD8	IFNG	-0,022848	0,802975
TRIM34	Primary	CRISPRa	CD8	IFNG	-0,01396	0,802975
ZNF560	Primary	CRISPRa	CD8	IFNG	0,022937	0,802975
UBE2N	Primary	CRISPRa	CD8	IFNG	0,034638	0,802975
DACH2	Primary	CRISPRa	CD8	IFNG	0,094344	0,802975
RECQL5	Primary	CRISPRa	CD8	IFNG	0,18447	0,802975
ASCL5	Primary	CRISPRa	CD8	IFNG	-0,26	0,803357
PRAMEF4	Primary	CRISPRa	CD8	IFNG	-0,20204	0,803357
ZNF462	Primary	CRISPRa	CD8	IFNG	-0,19064	0,803357
NR1H2	Primary	CRISPRa	CD8	IFNG	-0,14189	0,803357
ZNF131	Primary	CRISPRa	CD8	IFNG	-0,14144	0,803357
ZNF205	Primary	CRISPRa	CD8	IFNG	-0,094685	0,803357
PGR	Primary	CRISPRa	CD8	IFNG	-0,057187	0,803357
MED13	Primary	CRISPRa	CD8	IFNG	-0,027503	0,803357
FOXP3	Primary	CRISPRa	CD8	IFNG	0,0018384	0,803357
ZFAT	Primary	CRISPRa	CD8	IFNG	0,062863	0,803357
TFDP2	Primary	CRISPRa	CD8	IFNG	0,15878	0,803389
BAHCC1	Primary	CRISPRa	CD8	IFNG	-0,078727	0,803889
HDAC2	Primary	CRISPRa	CD8	IFNG	0,04419	0,803889
ZNF157	Primary	CRISPRa	CD8	IFNG	0,062966	0,803889
SNCA	Primary	CRISPRa	CD8	IFNG	0,065172	0,803889
USP39	Primary	CRISPRa	CD8	IFNG	-0,10772	0,804848
PRAMEF14	Primary	CRISPRa	CD8	IFNG	0,0027965	0,804848
SAP18	Primary	CRISPRa	CD8	IFNG	-0,10838	0,805049
KLHL13	Primary	CRISPRa	CD8	IFNG	-0,048663	0,805049
MDM2	Primary	CRISPRa	CD8	IFNG	0,10669	0,805049
CDC73	Primary	CRISPRa	CD8	IFNG	-0,031478	0,808891
PRAMEF7	Primary	CRISPRa	CD8	IFNG	-0,060701	0,809542
LIMD1	Primary	CRISPRa	CD8	IFNG	-0,055729	0,809542
ZNF830	Primary	CRISPRa	CD8	IFNG	0,13697	0,809542
ZBTB11	Primary	CRISPRa	CD8	IFNG	0,095769	0,810055
SLC30A9	Primary	CRISPRa	CD8	IFNG	0,11262	0,810055
PRMT1	Primary	CRISPRa	CD8	IFNG	0,13494	0,810055
UNCX	Primary	CRISPRa	CD8	IFNG	-0,14158	0,810772
PRAMEF13	Primary	CRISPRa	CD8	IFNG	-0,23918	0,81283
HMG20B	Primary	CRISPRa	CD8	IFNG	-0,22592	0,81283
MEIS3	Primary	CRISPRa	CD8	IFNG	-0,13864	0,81283
SMAD7	Primary	CRISPRa	CD8	IFNG	-0,094855	0,81283
SPZ1	Primary	CRISPRa	CD8	IFNG	-0,088984	0,81283
PSMC2	Primary	CRISPRa	CD8	IFNG	-0,060483	0,81283
CSDC2	Primary	CRISPRa	CD8	IFNG	-0,036217	0,81283
SIAH1	Primary	CRISPRa	CD8	IFNG	0,057526	0,81283
PHF20	Primary	CRISPRa	CD8	IFNG	0,071075	0,81283
ZAR1	Primary	CRISPRa	CD8	IFNG	-0,16399	0,812962
DHRS7B	Primary	CRISPRa	CD8	IFNG	-0,07227	0,812962
NELFE	Primary	CRISPRa	CD8	IFNG	0,0082105	0,814401
E2F2	Primary	CRISPRa	CD8	IFNG	-0,10717	0,815373
ZNF274	Primary	CRISPRa	CD8	IFNG	-0,082053	0,815373
FAM171B	Primary	CRISPRa	CD8	IFNG	-0,06161	0,815373
ZNF479	Primary	CRISPRa	CD8	IFNG	0,207	0,815373
ALX1	Primary	CRISPRa	CD8	IFNG	0,25921	0,815373
ZBTB22	Primary	CRISPRa	CD8	IFNG	-0,20303	0,81619
ZNF711	Primary	CRISPRa	CD8	IFNG	-0,22829	0,817227

FOXB1	Primary	CRISPRa	CD8	IFNG	-0,20863	0,817227
TRIM40	Primary	CRISPRa	CD8	IFNG	-0,13996	0,817227
KDM4D	Primary	CRISPRa	CD8	IFNG	-0,12039	0,817227
GTF3A	Primary	CRISPRa	CD8	IFNG	-0,047866	0,817227
ZNF432	Primary	CRISPRa	CD8	IFNG	-0,036833	0,817622
CIITA	Primary	CRISPRa	CD8	IFNG	0,0067596	0,819876
ZNF292	Primary	CRISPRa	CD8	IFNG	0,10319	0,819876
PELI1	Primary	CRISPRa	CD8	IFNG	-0,1309	0,821309
ZNF117	Primary	CRISPRa	CD8	IFNG	-0,021038	0,821309
HOXD12	Primary	CRISPRa	CD8	IFNG	0,073928	0,821309
ZNF98	Primary	CRISPRa	CD8	IFNG	0,075225	0,821309
THAP2	Primary	CRISPRa	CD8	IFNG	-0,047616	0,824441
ZNF177	Primary	CRISPRa	CD8	IFNG	-0,038969	0,824441
L3MBTL3	Primary	CRISPRa	CD8	IFNG	-0,082817	0,826335
SETD3	Primary	CRISPRa	CD8	IFNG	-0,092425	0,826408
NUDT5	Primary	CRISPRa	CD8	IFNG	0,018344	0,826408
HBP1	Primary	CRISPRa	CD8	IFNG	-0,060757	0,828957
BASP1	Primary	CRISPRa	CD8	IFNG	-0,15428	0,829672
PTEN	Primary	CRISPRa	CD8	IFNG	-0,064219	0,830528
NAA16	Primary	CRISPRa	CD8	IFNG	0,015369	0,830528
ZNF626	Primary	CRISPRa	CD8	IFNG	-0,2175	0,830777
PSPC1	Primary	CRISPRa	CD8	IFNG	-0,13605	0,830777
COPS2	Primary	CRISPRa	CD8	IFNG	0,0022683	0,830777
FOSL2	Primary	CRISPRa	CD8	IFNG	0,021164	0,830777
TRIP6	Primary	CRISPRa	CD8	IFNG	0,042736	0,830777
LIN28B	Primary	CRISPRa	CD8	IFNG	0,084873	0,830777
CCNT1	Primary	CRISPRa	CD8	IFNG	0,15955	0,830777
ZFP2	Primary	CRISPRa	CD8	IFNG	-0,30849	0,836616
UNK	Primary	CRISPRa	CD8	IFNG	-0,26737	0,836616
PHOX2B	Primary	CRISPRa	CD8	IFNG	-0,2401	0,836616
RASSF7	Primary	CRISPRa	CD8	IFNG	-0,13865	0,836616
NPAS3	Primary	CRISPRa	CD8	IFNG	-0,1284	0,836616
ZNF154	Primary	CRISPRa	CD8	IFNG	0,026642	0,836616
TRIM39	Primary	CRISPRa	CD8	IFNG	-0,17904	0,836705
HSPA8	Primary	CRISPRa	CD8	IFNG	-0,072079	0,836705
ZNF248	Primary	CRISPRa	CD8	IFNG	-0,023754	0,836705
CHD5	Primary	CRISPRa	CD8	IFNG	0,17974	0,836705
HES2	Primary	CRISPRa	CD8	IFNG	0,12435	0,838409
CSNK2A1	Primary	CRISPRa	CD8	IFNG	0,27405	0,838409
NKX2-4	Primary	CRISPRa	CD8	IFNG	-0,039185	0,838613
DDX17	Primary	CRISPRa	CD8	IFNG	0,07467	0,838849
NCALD	Primary	CRISPRa	CD8	IFNG	-0,074841	0,842733
BTBD1	Primary	CRISPRa	CD8	IFNG	-0,064594	0,842733
NR2C2	Primary	CRISPRa	CD8	IFNG	-0,12857	0,843561
BNC2	Primary	CRISPRa	CD8	IFNG	-0,006	0,843561
EHMT2	Primary	CRISPRa	CD8	IFNG	0,03135	0,843561
ZNF839	Primary	CRISPRa	CD8	IFNG	-0,25066	0,844191
HSBP1L1	Primary	CRISPRa	CD8	IFNG	-0,11154	0,844191
CTDSP1	Primary	CRISPRa	CD8	IFNG	-0,10073	0,844191
POLE3	Primary	CRISPRa	CD8	IFNG	-0,020138	0,844191
SPIC	Primary	CRISPRa	CD8	IFNG	0,0057831	0,844191
ZNF780B	Primary	CRISPRa	CD8	IFNG	0,02152	0,844191
PCGF5	Primary	CRISPRa	CD8	IFNG	0,03411	0,844191
RGCC	Primary	CRISPRa	CD8	IFNG	0,053991	0,844191
EID3	Primary	CRISPRa	CD8	IFNG	0,078106	0,844191

SKOR2	Primary	CRISPRa	CD8	IFNG	0,080391	0,844191
NR1I3	Primary	CRISPRa	CD8	IFNG	0,096176	0,844191
CDK5R1	Primary	CRISPRa	CD8	IFNG	0,11271	0,844191
PCGF6	Primary	CRISPRa	CD8	IFNG	0,11306	0,844191
NUFIP2	Primary	CRISPRa	CD8	IFNG	0,22736	0,844191
NELFB	Primary	CRISPRa	CD8	IFNG	-0,29679	0,844374
TAF6	Primary	CRISPRa	CD8	IFNG	-0,23623	0,844374
NUP85	Primary	CRISPRa	CD8	IFNG	-0,23201	0,844374
CBX2	Primary	CRISPRa	CD8	IFNG	-0,10998	0,844374
MYF6	Primary	CRISPRa	CD8	IFNG	-0,037127	0,844374
JADE2	Primary	CRISPRa	CD8	IFNG	-0,026713	0,844374
ZNF366	Primary	CRISPRa	CD8	IFNG	0,0015313	0,844374
ZFP82	Primary	CRISPRa	CD8	IFNG	0,0091446	0,844374
HMGXB4	Primary	CRISPRa	CD8	IFNG	0,035793	0,844374
ZNF133	Primary	CRISPRa	CD8	IFNG	-0,3807	0,845241
ZNF197	Primary	CRISPRa	CD8	IFNG	-0,16447	0,845241
ZNF285	Primary	CRISPRa	CD8	IFNG	-0,13728	0,845241
CEBPZ	Primary	CRISPRa	CD8	IFNG	-0,11365	0,845241
ZNF143	Primary	CRISPRa	CD8	IFNG	-0,05895	0,845241
TP53BP1	Primary	CRISPRa	CD8	IFNG	-0,022286	0,845241
HMGXB3	Primary	CRISPRa	CD8	IFNG	0,062402	0,845241
RFX3	Primary	CRISPRa	CD8	IFNG	0,095	0,845241
ZNF350	Primary	CRISPRa	CD8	IFNG	-0,14448	0,84536
TBX22	Primary	CRISPRa	CD8	IFNG	-0,061395	0,84536
ITCH	Primary	CRISPRa	CD8	IFNG	-0,31999	0,84673
MYC	Primary	CRISPRa	CD8	IFNG	-0,27153	0,84673
SLC6A3	Primary	CRISPRa	CD8	IFNG	-0,27149	0,84673
ZNF28	Primary	CRISPRa	CD8	IFNG	-0,17399	0,84673
ZNF695	Primary	CRISPRa	CD8	IFNG	-0,15952	0,84673
SIRT6	Primary	CRISPRa	CD8	IFNG	-0,10536	0,84673
BATF2	Primary	CRISPRa	CD8	IFNG	-0,0959	0,84673
DGKQ	Primary	CRISPRa	CD8	IFNG	-0,074656	0,84673
DVL1	Primary	CRISPRa	CD8	IFNG	-0,05473	0,84673
OTX1	Primary	CRISPRa	CD8	IFNG	-0,047232	0,84673
ZNF383	Primary	CRISPRa	CD8	IFNG	-0,23727	0,848595
TEAD2	Primary	CRISPRa	CD8	IFNG	-0,094446	0,848595
SETD2	Primary	CRISPRa	CD8	IFNG	-0,13728	0,848908
TBX4	Primary	CRISPRa	CD8	IFNG	0,12142	0,848908
CRTC2	Primary	CRISPRa	CD8	IFNG	-0,19264	0,851068
TCFL5	Primary	CRISPRa	CD8	IFNG	-0,0028274	0,852501
TDP2	Primary	CRISPRa	CD8	IFNG	0,094119	0,852501
PSMD10	Primary	CRISPRa	CD8	IFNG	-0,22306	0,854407
TAF1B	Primary	CRISPRa	CD8	IFNG	-0,10625	0,854407
ZNF470	Primary	CRISPRa	CD8	IFNG	-0,1036	0,854407
ZNF174	Primary	CRISPRa	CD8	IFNG	-0,08972	0,854407
PRDM4	Primary	CRISPRa	CD8	IFNG	-0,073002	0,854407
HNF4G	Primary	CRISPRa	CD8	IFNG	-0,067034	0,854407
ZNF613	Primary	CRISPRa	CD8	IFNG	-0,052452	0,854407
MSGN1	Primary	CRISPRa	CD8	IFNG	-0,034993	0,854407
ZNF821	Primary	CRISPRa	CD8	IFNG	-0,031727	0,854407
L3MBTL1	Primary	CRISPRa	CD8	IFNG	-0,0043395	0,854407
ZNF790	Primary	CRISPRa	CD8	IFNG	0,0021176	0,854407
BLOC1S1	Primary	CRISPRa	CD8	IFNG	0,010753	0,854407
CDK11B	Primary	CRISPRa	CD8	IFNG	0,022606	0,854407
ZNF567	Primary	CRISPRa	CD8	IFNG	0,056877	0,854407

CBX7	Primary	CRISPRa	CD8	IFNG	0,060135	0,854407
TADA2A	Primary	CRISPRa	CD8	IFNG	0,070549	0,854407
ZNF229	Primary	CRISPRa	CD8	IFNG	0,077528	0,854407
ZNF286B	Primary	CRISPRa	CD8	IFNG	0,11568	0,854407
ZNF442	Primary	CRISPRa	CD8	IFNG	0,12114	0,854407
RNF168	Primary	CRISPRa	CD8	IFNG	0,15142	0,854407
GTF2E2	Primary	CRISPRa	CD8	IFNG	0,1628	0,854407
FOXD4L5	Primary	CRISPRa	CD8	IFNG	0,16444	0,854407
EGR1	Primary	CRISPRa	CD8	IFNG	0,18012	0,854407
ZNF426	Primary	CRISPRa	CD8	IFNG	0,20533	0,854407
BCL11A	Primary	CRISPRa	CD8	IFNG	0,20735	0,854407
APBB1	Primary	CRISPRa	CD8	IFNG	0,0038498	0,854785
PUF60	Primary	CRISPRa	CD8	IFNG	0,23425	0,856453
ZMYND11	Primary	CRISPRa	CD8	IFNG	0,060321	0,857171
OPTN	Primary	CRISPRa	CD8	IFNG	-0,087435	0,857888
ELK1	Primary	CRISPRa	CD8	IFNG	0,086858	0,857888
FOXO1	Primary	CRISPRa	CD8	IFNG	-0,22392	0,858538
ZNF75A	Primary	CRISPRa	CD8	IFNG	-0,0012819	0,858538
ZBED2	Primary	CRISPRa	CD8	IFNG	0,024362	0,861455
BRCA1	Primary	CRISPRa	CD8	IFNG	-0,34263	0,861638
ILK	Primary	CRISPRa	CD8	IFNG	-0,073377	0,861638
IKBKG	Primary	CRISPRa	CD8	IFNG	-0,26112	0,862287
INSM1	Primary	CRISPRa	CD8	IFNG	-0,16137	0,862287
SAP130	Primary	CRISPRa	CD8	IFNG	-0,12789	0,862287
PLEKHA4	Primary	CRISPRa	CD8	IFNG	-0,093787	0,862287
SETD1A	Primary	CRISPRa	CD8	IFNG	-0,068599	0,862287
INO80	Primary	CRISPRa	CD8	IFNG	-0,039813	0,862287
TAF2	Primary	CRISPRa	CD8	IFNG	-0,024982	0,862287
HOXA3	Primary	CRISPRa	CD8	IFNG	0,047933	0,862287
PEX2	Primary	CRISPRa	CD8	IFNG	-0,23493	0,862289
FUBP1	Primary	CRISPRa	CD8	IFNG	-0,14051	0,862289
SCML1	Primary	CRISPRa	CD8	IFNG	0,093193	0,862289
VDR	Primary	CRISPRa	CD8	IFNG	-0,23894	0,86499
ZFR	Primary	CRISPRa	CD8	IFNG	-0,17878	0,86499
TARDBP	Primary	CRISPRa	CD8	IFNG	-0,17516	0,86499
CNOT10	Primary	CRISPRa	CD8	IFNG	-0,16372	0,86499
ZNF335	Primary	CRISPRa	CD8	IFNG	-0,15051	0,86499
HSF5	Primary	CRISPRa	CD8	IFNG	-0,14947	0,86499
PKN2	Primary	CRISPRa	CD8	IFNG	-0,029083	0,86499
HSBP1	Primary	CRISPRa	CD8	IFNG	0,023322	0,86499
GTF2A1L	Primary	CRISPRa	CD8	IFNG	0,029167	0,86499
KLF5	Primary	CRISPRa	CD8	IFNG	0,041352	0,86499
ZKSCAN3	Primary	CRISPRa	CD8	IFNG	0,10072	0,86499
ZNF121	Primary	CRISPRa	CD8	IFNG	-0,010544	0,867509
BDP1	Primary	CRISPRa	CD8	IFNG	-0,19769	0,868199
MAPK3	Primary	CRISPRa	CD8	IFNG	-0,0064171	0,868199
ZSCAN32	Primary	CRISPRa	CD8	IFNG	0,0031454	0,868199
PEX14	Primary	CRISPRa	CD8	IFNG	0,0067451	0,868199
PCBP3	Primary	CRISPRa	CD8	IFNG	-0,098493	0,869481
INO80E	Primary	CRISPRa	CD8	IFNG	0,022672	0,869481
RNF113B	Primary	CRISPRa	CD8	IFNG	0,037401	0,87015
ASF1A	Primary	CRISPRa	CD8	IFNG	0,085421	0,87015
ZNF552	Primary	CRISPRa	CD8	IFNG	0,12397	0,872974
ZNF273	Primary	CRISPRa	CD8	IFNG	-0,19849	0,876503
HOXC9	Primary	CRISPRa	CD8	IFNG	-0,16819	0,876503

CDR2L	Primary	CRISPRa	CD8	IFNG	-0,14262	0,876503
ZNF311	Primary	CRISPRa	CD8	IFNG	-0,11054	0,876503
SHPRH	Primary	CRISPRa	CD8	IFNG	-0,070418	0,876503
CRY1	Primary	CRISPRa	CD8	IFNG	-0,051831	0,876503
HOXA9	Primary	CRISPRa	CD8	IFNG	-0,047001	0,876503
SOX3	Primary	CRISPRa	CD8	IFNG	-0,028039	0,876503
ZNF493	Primary	CRISPRa	CD8	IFNG	-0,013669	0,876503
CNOT2	Primary	CRISPRa	CD8	IFNG	0,015061	0,876503
ZNF827	Primary	CRISPRa	CD8	IFNG	0,075385	0,876503
CTNNB1	Primary	CRISPRa	CD8	IFNG	0,075464	0,876503
PAX9	Primary	CRISPRa	CD8	IFNG	0,079971	0,876503
ZNF799	Primary	CRISPRa	CD8	IFNG	0,085232	0,876503
NKX1-2	Primary	CRISPRa	CD8	IFNG	0,10241	0,876503
ZNF184	Primary	CRISPRa	CD8	IFNG	0,11135	0,876503
HEATR1	Primary	CRISPRa	CD8	IFNG	0,12442	0,876503
ZXDC	Primary	CRISPRa	CD8	IFNG	0,14255	0,876503
RCVRN	Primary	CRISPRa	CD8	IFNG	0,17015	0,876503
SMAD5	Primary	CRISPRa	CD8	IFNG	0,18601	0,876503
HES1	Primary	CRISPRa	CD8	IFNG	0,20467	0,876503
DMAP1	Primary	CRISPRa	CD8	IFNG	0,22403	0,876503
ADRB2	Primary	CRISPRa	CD8	IFNG	0,23553	0,876503
HOXC5	Primary	CRISPRa	CD8	IFNG	0,2566	0,876503
RFX2	Primary	CRISPRa	CD8	IFNG	-0,17393	0,876711
NFYC	Primary	CRISPRa	CD8	IFNG	-0,16396	0,876711
PRAMEF1	Primary	CRISPRa	CD8	IFNG	-0,13444	0,876711
CPSF4	Primary	CRISPRa	CD8	IFNG	0,0030195	0,876711
ZNF76	Primary	CRISPRa	CD8	IFNG	0,041037	0,876711
ESRRG	Primary	CRISPRa	CD8	IFNG	0,049986	0,876711
MAD2L2	Primary	CRISPRa	CD8	IFNG	0,19605	0,876711
HNRNPUL1	Primary	CRISPRa	CD8	IFNG	-0,27332	0,878841
NFYA	Primary	CRISPRa	CD8	IFNG	-0,19887	0,878841
CUX1	Primary	CRISPRa	CD8	IFNG	-0,19725	0,878841
ZNF616	Primary	CRISPRa	CD8	IFNG	-0,18181	0,878841
ZNF581	Primary	CRISPRa	CD8	IFNG	-0,17694	0,878841
NDUFA13	Primary	CRISPRa	CD8	IFNG	-0,17242	0,878841
EXOSC9	Primary	CRISPRa	CD8	IFNG	-0,17208	0,878841
ZNF770	Primary	CRISPRa	CD8	IFNG	-0,16044	0,878841
DDX39B	Primary	CRISPRa	CD8	IFNG	-0,1569	0,878841
LRRK2	Primary	CRISPRa	CD8	IFNG	-0,15145	0,878841
MYBBP1A	Primary	CRISPRa	CD8	IFNG	-0,14091	0,878841
ZNF574	Primary	CRISPRa	CD8	IFNG	-0,13166	0,878841
PLXNB2	Primary	CRISPRa	CD8	IFNG	-0,129	0,878841
LTF	Primary	CRISPRa	CD8	IFNG	-0,12566	0,878841
ZIC3	Primary	CRISPRa	CD8	IFNG	-0,12163	0,878841
ATXN3L	Primary	CRISPRa	CD8	IFNG	-0,12093	0,878841
NLRP12	Primary	CRISPRa	CD8	IFNG	-0,11834	0,878841
ELP4	Primary	CRISPRa	CD8	IFNG	-0,10559	0,878841
NR5A2	Primary	CRISPRa	CD8	IFNG	-0,080752	0,878841
RBM26	Primary	CRISPRa	CD8	IFNG	-0,036995	0,878841
BIRC5	Primary	CRISPRa	CD8	IFNG	-0,030857	0,878841
UBE2D2	Primary	CRISPRa	CD8	IFNG	-0,029437	0,878841
SOX14	Primary	CRISPRa	CD8	IFNG	-0,0052864	0,878841
L3MBTL2	Primary	CRISPRa	CD8	IFNG	-0,0050707	0,878841
MKRN1	Primary	CRISPRa	CD8	IFNG	0,013081	0,878841
RBM6	Primary	CRISPRa	CD8	IFNG	0,021082	0,878841

ZNF771	Primary	CRISPRa	CD8	IFNG	0,021298	0,878841
FER	Primary	CRISPRa	CD8	IFNG	0,035902	0,878841
JAZF1	Primary	CRISPRa	CD8	IFNG	0,060826	0,878841
TBPL2	Primary	CRISPRa	CD8	IFNG	0,082616	0,878841
TRIM11	Primary	CRISPRa	CD8	IFNG	0,11574	0,878841
BATF3	Primary	CRISPRa	CD8	IFNG	0,12578	0,878841
HOXC11	Primary	CRISPRa	CD8	IFNG	0,14491	0,878841
IGHMBP2	Primary	CRISPRa	CD8	IFNG	0,16438	0,878841
OVOL3	Primary	CRISPRa	CD8	IFNG	0,18165	0,878841
HNRNPC	Primary	CRISPRa	CD8	IFNG	0,23517	0,878841
MBTD1	Primary	CRISPRa	CD8	IFNG	0,12231	0,879319
WDTC1	Primary	CRISPRa	CD8	IFNG	-0,067879	0,879748
KIN	Primary	CRISPRa	CD8	IFNG	0,077888	0,879748
CRY2	Primary	CRISPRa	CD8	IFNG	-0,28709	0,880705
EEA1	Primary	CRISPRa	CD8	IFNG	-0,24155	0,880705
HIP1	Primary	CRISPRa	CD8	IFNG	-0,1688	0,880705
CIDEA	Primary	CRISPRa	CD8	IFNG	-0,11868	0,880705
DEPDC1B	Primary	CRISPRa	CD8	IFNG	-0,0005119	0,880705
RHOA	Primary	CRISPRa	CD8	IFNG	0,026346	0,880705
RNF13	Primary	CRISPRa	CD8	IFNG	-0,20072	0,881231
AFF3	Primary	CRISPRa	CD8	IFNG	0,14866	0,881334
PRRX2	Primary	CRISPRa	CD8	IFNG	-0,28958	0,88135
SUPT7L	Primary	CRISPRa	CD8	IFNG	-0,086177	0,881888
AR	Primary	CRISPRa	CD8	IFNG	-0,20093	0,883502
ZSCAN26	Primary	CRISPRa	CD8	IFNG	-0,19887	0,883502
IRAK2	Primary	CRISPRa	CD8	IFNG	-0,1959	0,883502
ZNF146	Primary	CRISPRa	CD8	IFNG	-0,14872	0,883502
HINFP	Primary	CRISPRa	CD8	IFNG	-0,11587	0,883502
PHF5A	Primary	CRISPRa	CD8	IFNG	-0,10456	0,883502
ZNF728	Primary	CRISPRa	CD8	IFNG	-0,10393	0,883502
LARP7	Primary	CRISPRa	CD8	IFNG	-0,19638	0,883969
ZNF529	Primary	CRISPRa	CD8	IFNG	-0,070457	0,884425
ZNF705E	Primary	CRISPRa	CD8	IFNG	-0,066624	0,884425
DOT1L	Primary	CRISPRa	CD8	IFNG	-0,060029	0,884425
DMRTC1B	Primary	CRISPRa	CD8	IFNG	-0,033316	0,884425
ALYREF	Primary	CRISPRa	CD8	IFNG	-0,031536	0,884425
AXIN1	Primary	CRISPRa	CD8	IFNG	0,036121	0,884425
RAX	Primary	CRISPRa	CD8	IFNG	0,037174	0,884425
ELL3	Primary	CRISPRa	CD8	IFNG	0,038641	0,884425
ESF1	Primary	CRISPRa	CD8	IFNG	0,045563	0,884425
RNF6	Primary	CRISPRa	CD8	IFNG	0,049574	0,884425
TBP	Primary	CRISPRa	CD8	IFNG	0,055286	0,884425
PXN	Primary	CRISPRa	CD8	IFNG	0,063128	0,884425
ERBB4	Primary	CRISPRa	CD8	IFNG	0,071616	0,884425
BHLHA15	Primary	CRISPRa	CD8	IFNG	0,073935	0,884425
ZZZ3	Primary	CRISPRa	CD8	IFNG	0,077301	0,884425
CDK5RAP3	Primary	CRISPRa	CD8	IFNG	0,080527	0,884425
ALPK3	Primary	CRISPRa	CD8	IFNG	0,082153	0,884425
GLI4	Primary	CRISPRa	CD8	IFNG	0,10298	0,884425
KRBA1	Primary	CRISPRa	CD8	IFNG	0,11178	0,884425
FHIT	Primary	CRISPRa	CD8	IFNG	0,131	0,884425
ZNF224	Primary	CRISPRa	CD8	IFNG	0,13147	0,884425
IKZF2	Primary	CRISPRa	CD8	IFNG	0,1824	0,884425
ZNF763	Primary	CRISPRa	CD8	IFNG	0,18764	0,884425
MED19	Primary	CRISPRa	CD8	IFNG	0,20292	0,884425

KLF11	Primary	CRISPRa	CD8	IFNG	0,089308	0,884562
MEFV	Primary	CRISPRa	CD8	IFNG	-0,051985	0,885289
LHX4	Primary	CRISPRa	CD8	IFNG	-0,04059	0,885643
NR3C2	Primary	CRISPRa	CD8	IFNG	-0,12303	0,885932
ZNF699	Primary	CRISPRa	CD8	IFNG	0,081582	0,885932
COMMD6	Primary	CRISPRa	CD8	IFNG	0,11054	0,885932
TRAK2	Primary	CRISPRa	CD8	IFNG	-0,21678	0,886883
ZNF195	Primary	CRISPRa	CD8	IFNG	-0,2194	0,88735
ZNF415	Primary	CRISPRa	CD8	IFNG	0,094432	0,88735
UBTFL1	Primary	CRISPRa	CD8	IFNG	-0,21515	0,887383
PHOX2A	Primary	CRISPRa	CD8	IFNG	-0,19077	0,887383
TBL1X	Primary	CRISPRa	CD8	IFNG	0,0076599	0,887383
GRHL3	Primary	CRISPRa	CD8	IFNG	-0,12701	0,887922
HOXA5	Primary	CRISPRa	CD8	IFNG	-0,073525	0,888366
SMARCC1	Primary	CRISPRa	CD8	IFNG	0,00499	0,888366
STAT3	Primary	CRISPRa	CD8	IFNG	-0,024576	0,888574
TLE6	Primary	CRISPRa	CD8	IFNG	0,0042295	0,888574
NEUROG1	Primary	CRISPRa	CD8	IFNG	0,074924	0,888574
ZFP62	Primary	CRISPRa	CD8	IFNG	-0,29559	0,889039
MBD3	Primary	CRISPRa	CD8	IFNG	-0,27037	0,889039
ZNF428	Primary	CRISPRa	CD8	IFNG	-0,25275	0,889039
PRAMEF8	Primary	CRISPRa	CD8	IFNG	-0,23169	0,889039
ZNF19	Primary	CRISPRa	CD8	IFNG	-0,22936	0,889039
IRF2BPL	Primary	CRISPRa	CD8	IFNG	-0,22383	0,889039
TSTD1	Primary	CRISPRa	CD8	IFNG	-0,19361	0,889039
NRIP1	Primary	CRISPRa	CD8	IFNG	-0,18925	0,889039
CTDP1	Primary	CRISPRa	CD8	IFNG	-0,17816	0,889039
NACA2	Primary	CRISPRa	CD8	IFNG	-0,17511	0,889039
THRAP3	Primary	CRISPRa	CD8	IFNG	-0,17214	0,889039
ZNF837	Primary	CRISPRa	CD8	IFNG	-0,17071	0,889039
MED16	Primary	CRISPRa	CD8	IFNG	-0,16608	0,889039
ESR2	Primary	CRISPRa	CD8	IFNG	-0,1648	0,889039
CASK	Primary	CRISPRa	CD8	IFNG	-0,16326	0,889039
MAPK8IP1	Primary	CRISPRa	CD8	IFNG	-0,1628	0,889039
HOXA13	Primary	CRISPRa	CD8	IFNG	-0,16275	0,889039
CDX4	Primary	CRISPRa	CD8	IFNG	-0,16222	0,889039
DUS3L	Primary	CRISPRa	CD8	IFNG	-0,15423	0,889039
CTNND1	Primary	CRISPRa	CD8	IFNG	-0,15163	0,889039
TCF20	Primary	CRISPRa	CD8	IFNG	-0,14368	0,889039
CRYM	Primary	CRISPRa	CD8	IFNG	-0,14132	0,889039
ZNF627	Primary	CRISPRa	CD8	IFNG	-0,14124	0,889039
SUPT20HL2	Primary	CRISPRa	CD8	IFNG	-0,13769	0,889039
PRDM15	Primary	CRISPRa	CD8	IFNG	-0,12602	0,889039
ETV5	Primary	CRISPRa	CD8	IFNG	-0,12528	0,889039
CNOT9	Primary	CRISPRa	CD8	IFNG	-0,11804	0,889039
ZNF169	Primary	CRISPRa	CD8	IFNG	-0,11382	0,889039
ZNF696	Primary	CRISPRa	CD8	IFNG	-0,11126	0,889039
HOXB4	Primary	CRISPRa	CD8	IFNG	-0,10998	0,889039
THAP7	Primary	CRISPRa	CD8	IFNG	-0,10915	0,889039
PABPC1L	Primary	CRISPRa	CD8	IFNG	-0,095395	0,889039
CTNND2	Primary	CRISPRa	CD8	IFNG	-0,093473	0,889039
ICE2	Primary	CRISPRa	CD8	IFNG	-0,083035	0,889039
HMGB2	Primary	CRISPRa	CD8	IFNG	-0,066062	0,889039
POU3F2	Primary	CRISPRa	CD8	IFNG	-0,06334	0,889039
ZNF282	Primary	CRISPRa	CD8	IFNG	-0,05609	0,889039

CCNC	Primary	CRISPRa	CD8	IFNG	-0,029585	0,889039
MED28	Primary	CRISPRa	CD8	IFNG	-0,027227	0,889039
ZNF645	Primary	CRISPRa	CD8	IFNG	-0,02488	0,889039
SOX1	Primary	CRISPRa	CD8	IFNG	-0,018566	0,889039
UBR2	Primary	CRISPRa	CD8	IFNG	-0,018199	0,889039
SLC39A10	Primary	CRISPRa	CD8	IFNG	-0,016043	0,889039
ZNF232	Primary	CRISPRa	CD8	IFNG	-0,013639	0,889039
PTF1A	Primary	CRISPRa	CD8	IFNG	-0,013531	0,889039
HEY2	Primary	CRISPRa	CD8	IFNG	-0,01293	0,889039
NANOGNB	Primary	CRISPRa	CD8	IFNG	0,0039912	0,889039
TMF1	Primary	CRISPRa	CD8	IFNG	0,017233	0,889039
ZNF391	Primary	CRISPRa	CD8	IFNG	0,019496	0,889039
TAF7L	Primary	CRISPRa	CD8	IFNG	0,064051	0,889039
ZNF689	Primary	CRISPRa	CD8	IFNG	0,066093	0,889039
MAX	Primary	CRISPRa	CD8	IFNG	0,08501	0,889039
SRFBP1	Primary	CRISPRa	CD8	IFNG	0,091116	0,889039
ZNF142	Primary	CRISPRa	CD8	IFNG	0,093115	0,889039
ZNF71	Primary	CRISPRa	CD8	IFNG	0,094266	0,889039
GPBP1L1	Primary	CRISPRa	CD8	IFNG	0,10665	0,889039
ZNF793	Primary	CRISPRa	CD8	IFNG	0,11207	0,889039
TFDP3	Primary	CRISPRa	CD8	IFNG	0,12551	0,889039
UNKL	Primary	CRISPRa	CD8	IFNG	0,13477	0,889039
PAXBP1	Primary	CRISPRa	CD8	IFNG	-0,089741	0,889858
TAX1BP1	Primary	CRISPRa	CD8	IFNG	0,013331	0,889858
YY1AP1	Primary	CRISPRa	CD8	IFNG	0,022962	0,889858
CREBRF	Primary	CRISPRa	CD8	IFNG	0,068295	0,889858
MAPK12	Primary	CRISPRa	CD8	IFNG	0,078304	0,889858
RING1	Primary	CRISPRa	CD8	IFNG	0,13518	0,889858
POU4F3	Primary	CRISPRa	CD8	IFNG	0,0094915	0,889974
ZNF575	Primary	CRISPRa	CD8	IFNG	0,073789	0,889974
HMGN3	Primary	CRISPRa	CD8	IFNG	0,10688	0,889974
CSDE1	Primary	CRISPRa	CD8	IFNG	0,10942	0,889974
PIDD1	Primary	CRISPRa	CD8	IFNG	0,11583	0,889974
PSMD12	Primary	CRISPRa	CD8	IFNG	-0,15045	0,890069
ZNF548	Primary	CRISPRa	CD8	IFNG	-0,11219	0,890069
PPP3CA	Primary	CRISPRa	CD8	IFNG	-0,10345	0,890069
ZNF215	Primary	CRISPRa	CD8	IFNG	-0,061597	0,890069
ZNF253	Primary	CRISPRa	CD8	IFNG	-0,033799	0,890069
DNTTIP2	Primary	CRISPRa	CD8	IFNG	0,026312	0,890069
CECR2	Primary	CRISPRa	CD8	IFNG	0,087761	0,890069
GTF3C1	Primary	CRISPRa	CD8	IFNG	0,12617	0,890069
CREBZF	Primary	CRISPRa	CD8	IFNG	0,13149	0,890069
ZC3H4	Primary	CRISPRa	CD8	IFNG	0,15082	0,890069
DSCAM	Primary	CRISPRa	CD8	IFNG	-0,18167	0,890158
NCOA5	Primary	CRISPRa	CD8	IFNG	0,068167	0,890338
SAP30L	Primary	CRISPRa	CD8	IFNG	-0,33839	0,892353
ZC3H12A	Primary	CRISPRa	CD8	IFNG	-0,0042226	0,892848
PRKCI	Primary	CRISPRa	CD8	IFNG	-0,25275	0,893072
PHF10	Primary	CRISPRa	CD8	IFNG	-0,1257	0,893072
CBLL1	Primary	CRISPRa	CD8	IFNG	-0,14697	0,895198
HTATIP2	Primary	CRISPRa	CD8	IFNG	-0,097853	0,895303
HES6	Primary	CRISPRa	CD8	IFNG	0,045938	0,895303
FGD1	Primary	CRISPRa	CD8	IFNG	0,034447	0,895901
ZNF101	Primary	CRISPRa	CD8	IFNG	-0,17547	0,897057
SETD4	Primary	CRISPRa	CD8	IFNG	-0,024422	0,897057

PHB	Primary	CRISPRa	CD8	IFNG	-0,13978	0,897059
GPATCH8	Primary	CRISPRa	CD8	IFNG	-0,088063	0,897059
FHL2	Primary	CRISPRa	CD8	IFNG	-0,014972	0,897059
CDY2A	Primary	CRISPRa	CD8	IFNG	-0,058768	0,898449
SOX9	Primary	CRISPRa	CD8	IFNG	-0,053354	0,89868
EYA1	Primary	CRISPRa	CD8	IFNG	-0,17062	0,8996
THOC5	Primary	CRISPRa	CD8	IFNG	-0,11559	0,8996
ADGRA1	Primary	CRISPRa	CD8	IFNG	-0,025215	0,8996
GTF3C2	Primary	CRISPRa	CD8	IFNG	0,053393	0,8996
BAG1	Primary	CRISPRa	CD8	IFNG	0,069529	0,8996
MIER1	Primary	CRISPRa	CD8	IFNG	0,12015	0,8996
ZNF263	Primary	CRISPRa	CD8	IFNG	-0,057365	0,899762
TCEAL4	Primary	CRISPRa	CD8	IFNG	0,10569	0,900015
ZNF438	Primary	CRISPRa	CD8	IFNG	0,20521	0,900015
ZNF25	Primary	CRISPRa	CD8	IFNG	0,10929	0,900097
TAX1BP3	Primary	CRISPRa	CD8	IFNG	0,16495	0,900097
ZNF226	Primary	CRISPRa	CD8	IFNG	0,19326	0,900097
ACTL6B	Primary	CRISPRa	CD8	IFNG	-0,13776	0,904664
ZNF83	Primary	CRISPRa	CD8	IFNG	0,14527	0,905956
EBF4	Primary	CRISPRa	CD8	IFNG	-0,081716	0,908383
MED27	Primary	CRISPRa	CD8	IFNG	0,023269	0,908383
ZNF565	Primary	CRISPRa	CD8	IFNG	-0,16752	0,909151
ZNF2	Primary	CRISPRa	CD8	IFNG	-0,052782	0,909151
GRHPR	Primary	CRISPRa	CD8	IFNG	0,059743	0,909151
VGLL2	Primary	CRISPRa	CD8	IFNG	0,017098	0,91155
CENPT	Primary	CRISPRa	CD8	IFNG	0,13573	0,912374
GTF2A1	Primary	CRISPRa	CD8	IFNG	0,23604	0,913768
HSPA1A	Primary	CRISPRa	CD8	IFNG	-0,073421	0,918412
PAXIP1	Primary	CRISPRa	CD8	IFNG	-0,030416	0,919859
ZNF200	Primary	CRISPRa	CD8	IFNG	-0,23403	0,920044
DUX4	Primary	CRISPRa	CD8	IFNG	-0,20786	0,920044
HSPH1	Primary	CRISPRa	CD8	IFNG	0,09601	0,920044
SNAPC2	Primary	CRISPRa	CD8	IFNG	0,19107	0,920044
EFCAB6	Primary	CRISPRa	CD8	IFNG	-0,012929	0,920675
PDX1	Primary	CRISPRa	CD8	IFNG	0,13675	0,921092
OTP	Primary	CRISPRa	CD8	IFNG	-0,043237	0,921357
ZNF407	Primary	CRISPRa	CD8	IFNG	-0,11144	0,922557
PRB4	Primary	CRISPRa	CD8	IFNG	-0,076402	0,922613
ZBTB18	Primary	CRISPRa	CD8	IFNG	-0,15263	0,922931
NFATC4	Primary	CRISPRa	CD8	IFNG	0,00037537	0,922931
SMARCD2	Primary	CRISPRa	CD8	IFNG	0,030416	0,922931
CGGBP1	Primary	CRISPRa	CD8	IFNG	0,15352	0,922931
NUP35	Primary	CRISPRa	CD8	IFNG	0,24291	0,922931
HIF1A	Primary	CRISPRa	CD8	IFNG	-0,17739	0,923343
KDM1B	Primary	CRISPRa	CD8	IFNG	-0,063367	0,923343
SIRT2	Primary	CRISPRa	CD8	IFNG	-0,17535	0,924586
HIC2	Primary	CRISPRa	CD8	IFNG	0,037804	0,924586
USP2	Primary	CRISPRa	CD8	IFNG	-0,080182	0,924605
GTF2IRD2	Primary	CRISPRa	CD8	IFNG	-0,11054	0,92465
ZNF185	Primary	CRISPRa	CD8	IFNG	-0,038242	0,925818
ISX	Primary	CRISPRa	CD8	IFNG	0,05911	0,925818
RPAP2	Primary	CRISPRa	CD8	IFNG	-0,019663	0,927456
RBM22	Primary	CRISPRa	CD8	IFNG	0,052959	0,927456
COPS3	Primary	CRISPRa	CD8	IFNG	0,18551	0,927456
LZTS1	Primary	CRISPRa	CD8	IFNG	-0,24775	0,927459

KDM6A	Primary	CRISPRa	CD8	IFNG	-0,16641	0,927459
TERF1	Primary	CRISPRa	CD8	IFNG	-0,10998	0,927459
SOX5	Primary	CRISPRa	CD8	IFNG	-0,082967	0,927459
SFR1	Primary	CRISPRa	CD8	IFNG	-0,073861	0,927459
MGMT	Primary	CRISPRa	CD8	IFNG	-0,040663	0,927459
FLII	Primary	CRISPRa	CD8	IFNG	-0,010803	0,927459
HOXD10	Primary	CRISPRa	CD8	IFNG	0,0032752	0,927459
BPTF	Primary	CRISPRa	CD8	IFNG	0,077851	0,927459
SP100	Primary	CRISPRa	CD8	IFNG	0,010201	0,927793
FOXS1	Primary	CRISPRa	CD8	IFNG	-0,15148	0,928449
HELT	Primary	CRISPRa	CD8	IFNG	-0,050161	0,929484
RHOXF2B	Primary	CRISPRa	CD8	IFNG	-0,0094543	0,929484
SNX6	Primary	CRISPRa	CD8	IFNG	-0,26275	0,93144
RWDD3	Primary	CRISPRa	CD8	IFNG	-0,18959	0,93144
CLU	Primary	CRISPRa	CD8	IFNG	-0,10406	0,93144
TNP1	Primary	CRISPRa	CD8	IFNG	-0,088776	0,93144
PPP1R12A	Primary	CRISPRa	CD8	IFNG	-0,071711	0,93144
ST18	Primary	CRISPRa	CD8	IFNG	-0,040308	0,93144
MED26	Primary	CRISPRa	CD8	IFNG	-0,024812	0,93144
ZNF284	Primary	CRISPRa	CD8	IFNG	-0,00031523	0,93144
ELF4	Primary	CRISPRa	CD8	IFNG	0,0015196	0,93144
ZNF658	Primary	CRISPRa	CD8	IFNG	0,06728	0,93144
ZFP1	Primary	CRISPRa	CD8	IFNG	0,08285	0,93144
USF1	Primary	CRISPRa	CD8	IFNG	0,093145	0,931886
COPS4	Primary	CRISPRa	CD8	IFNG	0,087747	0,932663
BRD3	Primary	CRISPRa	CD8	IFNG	0,17383	0,932849
SSB	Primary	CRISPRa	CD8	IFNG	-0,0037917	0,933615
ZNF92	Primary	CRISPRa	CD8	IFNG	-0,12438	0,933646
NCOA6	Primary	CRISPRa	CD8	IFNG	-0,10117	0,933646
ERN1	Primary	CRISPRa	CD8	IFNG	-0,056409	0,933646
HDAC9	Primary	CRISPRa	CD8	IFNG	-0,05263	0,933646
RAG1	Primary	CRISPRa	CD8	IFNG	-0,034386	0,933646
TCF25	Primary	CRISPRa	CD8	IFNG	-0,032856	0,933646
ZNF687	Primary	CRISPRa	CD8	IFNG	0,015212	0,933646
ZSCAN20	Primary	CRISPRa	CD8	IFNG	0,016901	0,933646
TAF1A	Primary	CRISPRa	CD8	IFNG	0,020205	0,933646
MAGED1	Primary	CRISPRa	CD8	IFNG	0,022102	0,933646
KLHL41	Primary	CRISPRa	CD8	IFNG	0,022644	0,933646
HOPX	Primary	CRISPRa	CD8	IFNG	0,023002	0,933646
TFB2M	Primary	CRISPRa	CD8	IFNG	0,049009	0,933646
ZHX1	Primary	CRISPRa	CD8	IFNG	0,067242	0,933646
ZNF264	Primary	CRISPRa	CD8	IFNG	0,069767	0,933646
ZFP36L1	Primary	CRISPRa	CD8	IFNG	0,075316	0,933646
HEXIM2	Primary	CRISPRa	CD8	IFNG	0,081121	0,933646
ZNF367	Primary	CRISPRa	CD8	IFNG	0,11036	0,933646
HIVEP3	Primary	CRISPRa	CD8	IFNG	0,14211	0,933646
HSF1	Primary	CRISPRa	CD8	IFNG	0,23539	0,933646
TRIM47	Primary	CRISPRa	CD8	IFNG	-0,04859	0,933785
ZNF286A	Primary	CRISPRa	CD8	IFNG	0,13115	0,934082
RFX1	Primary	CRISPRa	CD8	IFNG	-0,13114	0,934294
MSC	Primary	CRISPRa	CD8	IFNG	-0,24192	0,934945
GTF2B	Primary	CRISPRa	CD8	IFNG	-0,088917	0,934945
CDC6	Primary	CRISPRa	CD8	IFNG	0,17752	0,93499
NEUROD1	Primary	CRISPRa	CD8	IFNG	-0,12595	0,935562
PRDX5	Primary	CRISPRa	CD8	IFNG	-0,048014	0,935562

PSMC6	Primary	CRISPRa	CD8	IFNG	-0,027808	0,935562
SREBF2	Primary	CRISPRa	CD8	IFNG	0,0037928	0,935562
ZNF568	Primary	CRISPRa	CD8	IFNG	0,026852	0,935562
POLR3G	Primary	CRISPRa	CD8	IFNG	0,080382	0,935562
KIAA0040	Primary	CRISPRa	CD8	IFNG	-0,040958	0,93658
MKX	Primary	CRISPRa	CD8	IFNG	-0,034417	0,937071
WWOX	Primary	CRISPRa	CD8	IFNG	0,044598	0,937098
BTBD6	Primary	CRISPRa	CD8	IFNG	0,13382	0,937427
ZNF433	Primary	CRISPRa	CD8	IFNG	-0,15404	0,937999
SKI	Primary	CRISPRa	CD8	IFNG	-0,11811	0,937999
NAB2	Primary	CRISPRa	CD8	IFNG	-0,24217	0,938371
ZNF512	Primary	CRISPRa	CD8	IFNG	-0,23064	0,938371
RBPJL	Primary	CRISPRa	CD8	IFNG	-0,20751	0,938371
HOXD3	Primary	CRISPRa	CD8	IFNG	-0,12336	0,938371
ZNF654	Primary	CRISPRa	CD8	IFNG	-0,068842	0,938371
MED20	Primary	CRISPRa	CD8	IFNG	-0,059641	0,938371
ATOH8	Primary	CRISPRa	CD8	IFNG	0,053861	0,938371
ZNF764	Primary	CRISPRa	CD8	IFNG	0,073159	0,938371
PSEN1	Primary	CRISPRa	CD8	IFNG	0,095477	0,938371
PAK6	Primary	CRISPRa	CD8	IFNG	0,12941	0,938371
GMEB2	Primary	CRISPRa	CD8	IFNG	0,053461	0,939897
RYBP	Primary	CRISPRa	CD8	IFNG	0,096232	0,939897
TRIM37	Primary	CRISPRa	CD8	IFNG	-0,13809	0,940077
ZNF579	Primary	CRISPRa	CD8	IFNG	0,064584	0,940077
SETD6	Primary	CRISPRa	CD8	IFNG	0,14026	0,940077
COPRS	Primary	CRISPRa	CD8	IFNG	-0,088486	0,940177
KDM6B	Primary	CRISPRa	CD8	IFNG	0,0042656	0,940177
TRMT1L	Primary	CRISPRa	CD8	IFNG	0,021722	0,941738
ATOH7	Primary	CRISPRa	CD8	IFNG	-0,10213	0,942906
GSX2	Primary	CRISPRa	CD8	IFNG	0,10057	0,943606
CENPU	Primary	CRISPRa	CD8	IFNG	-0,086537	0,943736
MBD5	Primary	CRISPRa	CD8	IFNG	-0,043351	0,94705
TBX6	Primary	CRISPRa	CD8	IFNG	0,23147	0,94705
IRF9	Primary	CRISPRa	CD8	IFNG	-0,23607	0,947298
UBA3	Primary	CRISPRa	CD8	IFNG	-0,23256	0,947298
DUXA	Primary	CRISPRa	CD8	IFNG	-0,21617	0,947298
TAF8	Primary	CRISPRa	CD8	IFNG	-0,15558	0,947298
ARID3B	Primary	CRISPRa	CD8	IFNG	-0,14311	0,947298
ARHGAP35	Primary	CRISPRa	CD8	IFNG	-0,10708	0,947298
ZNF491	Primary	CRISPRa	CD8	IFNG	-0,06013	0,947298
DPF3	Primary	CRISPRa	CD8	IFNG	-0,040936	0,947298
ZNF641	Primary	CRISPRa	CD8	IFNG	-0,03991	0,947298
ZFP90	Primary	CRISPRa	CD8	IFNG	-0,02828	0,947298
PKHD1L1	Primary	CRISPRa	CD8	IFNG	-0,021198	0,947298
HOXD9	Primary	CRISPRa	CD8	IFNG	-0,01738	0,947298
ZNF735	Primary	CRISPRa	CD8	IFNG	-0,0053265	0,947298
IRF6	Primary	CRISPRa	CD8	IFNG	-0,0030849	0,947298
DAPK3	Primary	CRISPRa	CD8	IFNG	0,0060473	0,947298
WASL	Primary	CRISPRa	CD8	IFNG	0,054137	0,947298
PPP3R1	Primary	CRISPRa	CD8	IFNG	0,1375	0,947298
THYN1	Primary	CRISPRa	CD8	IFNG	-0,06378	0,94771
ZNF251	Primary	CRISPRa	CD8	IFNG	0,03973	0,94771
SGK1	Primary	CRISPRa	CD8	IFNG	-0,12914	0,948033
CHRAC1	Primary	CRISPRa	CD8	IFNG	0,12151	0,948033
ZNF280B	Primary	CRISPRa	CD8	IFNG	-0,18568	0,94863

PRDM5	Primary	CRISPRa	CD8	IFNG	-0,12753	0,949252
RTF1	Primary	CRISPRa	CD8	IFNG	-0,10737	0,949252
AKT2	Primary	CRISPRa	CD8	IFNG	-0,047887	0,949252
ZNF48	Primary	CRISPRa	CD8	IFNG	-0,045085	0,949252
PAX8	Primary	CRISPRa	CD8	IFNG	0,015945	0,949252
SMARCAD1	Primary	CRISPRa	CD8	IFNG	0,020043	0,949252
SMURF1	Primary	CRISPRa	CD8	IFNG	0,083492	0,949252
MMS19	Primary	CRISPRa	CD8	IFNG	0,17533	0,949252
TRIM66	Primary	CRISPRa	CD8	IFNG	-0,25819	0,949298
PA2G4	Primary	CRISPRa	CD8	IFNG	-0,00068941	0,951195
ZNF354A	Primary	CRISPRa	CD8	IFNG	-0,21417	0,952016
COMMD1	Primary	CRISPRa	CD8	IFNG	-0,16898	0,952016
TIGD5	Primary	CRISPRa	CD8	IFNG	-0,14193	0,952016
DMC1	Primary	CRISPRa	CD8	IFNG	-0,093286	0,952016
RXRB	Primary	CRISPRa	CD8	IFNG	-0,082038	0,952016
ETV3L	Primary	CRISPRa	CD8	IFNG	-0,080282	0,952016
NCOA7	Primary	CRISPRa	CD8	IFNG	-0,076615	0,952016
TTF2	Primary	CRISPRa	CD8	IFNG	-0,073846	0,952016
USP21	Primary	CRISPRa	CD8	IFNG	-0,053118	0,952016
TBX18	Primary	CRISPRa	CD8	IFNG	-0,026981	0,952016
ZNF528	Primary	CRISPRa	CD8	IFNG	-0,026701	0,952016
ZNF213	Primary	CRISPRa	CD8	IFNG	-0,02458	0,952016
TARBP1	Primary	CRISPRa	CD8	IFNG	0,030803	0,952016
AKIRIN1	Primary	CRISPRa	CD8	IFNG	0,032922	0,952016
SUV39H2	Primary	CRISPRa	CD8	IFNG	0,04372	0,952016
GTF2IRD2B	Primary	CRISPRa	CD8	IFNG	0,064607	0,952016
ANP32B	Primary	CRISPRa	CD8	IFNG	0,065416	0,952016
RCOR1	Primary	CRISPRa	CD8	IFNG	0,071427	0,952016
CCDC59	Primary	CRISPRa	CD8	IFNG	0,075213	0,952016
MYOD1	Primary	CRISPRa	CD8	IFNG	0,077391	0,952016
RB1CC1	Primary	CRISPRa	CD8	IFNG	0,099335	0,952016
E2F8	Primary	CRISPRa	CD8	IFNG	0,11887	0,952016
HES4	Primary	CRISPRa	CD8	IFNG	0,12276	0,952016
NOC2L	Primary	CRISPRa	CD8	IFNG	0,15545	0,952016
HDAC10	Primary	CRISPRa	CD8	IFNG	0,042132	0,95255
VEZF1	Primary	CRISPRa	CD8	IFNG	0,11075	0,95255
ZFP57	Primary	CRISPRa	CD8	IFNG	-0,16623	0,952728
TRIM31	Primary	CRISPRa	CD8	IFNG	-0,15854	0,952728
ZBTB47	Primary	CRISPRa	CD8	IFNG	-0,0090459	0,952728
FBXW7	Primary	CRISPRa	CD8	IFNG	0,038167	0,952903
ZNF813	Primary	CRISPRa	CD8	IFNG	0,17213	0,954945
SIN3B	Primary	CRISPRa	CD8	IFNG	0,0039708	0,956416
FERD3L	Primary	CRISPRa	CD8	IFNG	0,16557	0,956416
ZNF132	Primary	CRISPRa	CD8	IFNG	0,079315	0,958621
BRD8	Primary	CRISPRa	CD8	IFNG	0,091468	0,960208
ASCC3	Primary	CRISPRa	CD8	IFNG	0,058172	0,961258
ZNF749	Primary	CRISPRa	CD8	IFNG	0,10496	0,961258
MED13L	Primary	CRISPRa	CD8	IFNG	0,036652	0,962083
TRIM29	Primary	CRISPRa	CD8	IFNG	-0,11195	0,962278
NR1D1	Primary	CRISPRa	CD8	IFNG	0,048439	0,962278
ZNF584	Primary	CRISPRa	CD8	IFNG	0,070858	0,962278
SSU72	Primary	CRISPRa	CD8	IFNG	0,087845	0,962278
POLR2A	Primary	CRISPRa	CD8	IFNG	-0,0031574	0,962302
PKHD1	Primary	CRISPRa	CD8	IFNG	0,049131	0,963203
MRGBP	Primary	CRISPRa	CD8	IFNG	0,20366	0,963656

ZNF805	Primary	CRISPRa	CD8	IFNG	-0,14001	0,963853
CHMP1A	Primary	CRISPRa	CD8	IFNG	0,0076468	0,963853
ZNF281	Primary	CRISPRa	CD8	IFNG	0,011386	0,963853
ABRA	Primary	CRISPRa	CD8	IFNG	0,036158	0,963853
NR1H3	Primary	CRISPRa	CD8	IFNG	0,070984	0,963853
ETV6	Primary	CRISPRa	CD8	IFNG	0,089642	0,963853
ZFP36L2	Primary	CRISPRa	CD8	IFNG	-0,086676	0,964578
GMNN	Primary	CRISPRa	CD8	IFNG	-0,017227	0,965067
TONSL	Primary	CRISPRa	CD8	IFNG	0,012327	0,965067
HCK	Primary	CRISPRa	CD8	IFNG	0,062612	0,965067
IRF1	Primary	CRISPRa	CD8	IFNG	-0,15422	0,965564
SFSWAP	Primary	CRISPRa	CD8	IFNG	-0,073926	0,965564
ZNF75D	Primary	CRISPRa	CD8	IFNG	-0,029453	0,965564
TNIP2	Primary	CRISPRa	CD8	IFNG	0,0063522	0,965564
CSNK2A2	Primary	CRISPRa	CD8	IFNG	0,0068378	0,965564
CRIP1	Primary	CRISPRa	CD8	IFNG	0,022851	0,965564
RGS7	Primary	CRISPRa	CD8	IFNG	0,12273	0,965564
ZNF556	Primary	CRISPRa	CD8	IFNG	0,1686	0,965564
ZNF880	Primary	CRISPRa	CD8	IFNG	-0,043786	0,965609
DYRK1B	Primary	CRISPRa	CD8	IFNG	0,058312	0,967781
PSIP1	Primary	CRISPRa	CD8	IFNG	-0,31134	0,968345
RNF138	Primary	CRISPRa	CD8	IFNG	-0,16093	0,968345
TSHZ3	Primary	CRISPRa	CD8	IFNG	-0,05525	0,968345
CTNNBIP1	Primary	CRISPRa	CD8	IFNG	0,067868	0,968345
ZNF280C	Primary	CRISPRa	CD8	IFNG	0,14068	0,968345
SAMD11	Primary	CRISPRa	CD8	IFNG	-0,22199	0,969144
AKNA	Primary	CRISPRa	CD8	IFNG	0,00098539	0,970522
TTLL4	Primary	CRISPRa	CD8	IFNG	0,016697	0,971502
ZNF469	Primary	CRISPRa	CD8	IFNG	-0,077911	0,971723
STRN3	Primary	CRISPRa	CD8	IFNG	0,19516	0,972119
ZNF846	Primary	CRISPRa	CD8	IFNG	-0,080878	0,972608
CHAF1B	Primary	CRISPRa	CD8	IFNG	-0,044943	0,972608
POU6F1	Primary	CRISPRa	CD8	IFNG	0,030288	0,972608
CNOT6L	Primary	CRISPRa	CD8	IFNG	0,10487	0,973718
SDR16C5	Primary	CRISPRa	CD8	IFNG	0,069975	0,975009
VGLL1	Primary	CRISPRa	CD8	IFNG	0,20472	0,975009
FOXI1	Primary	CRISPRa	CD8	IFNG	0,11821	0,975513
ZSCAN18	Primary	CRISPRa	CD8	IFNG	-0,098035	0,979409
SCML4	Primary	CRISPRa	CD8	IFNG	0,062039	0,979409
MED15	Primary	CRISPRa	CD8	IFNG	-0,25193	0,979465
BRD1	Primary	CRISPRa	CD8	IFNG	-0,17041	0,979465
ZNF331	Primary	CRISPRa	CD8	IFNG	-0,18401	0,982321
ZNF365	Primary	CRISPRa	CD8	IFNG	-0,19232	0,985405
GPS2	Primary	CRISPRa	CD8	IFNG	0,040365	0,985405
EHF	Primary	CRISPRa	CD8	IFNG	0,12497	0,985405
PAX4	Primary	CRISPRa	CD8	IFNG	-0,13112	0,985686
ZBTB34	Primary	CRISPRa	CD8	IFNG	-0,041639	0,985686
ASCL1	Primary	CRISPRa	CD8	IFNG	-0,0072419	0,985686
ZNF688	Primary	CRISPRa	CD8	IFNG	0,059834	0,985686
ZNF112	Primary	CRISPRa	CD8	IFNG	0,15869	0,985686
IKZF5	Primary	CRISPRa	CD8	IFNG	-0,045218	0,986083
ZNF582	Primary	CRISPRa	CD8	IFNG	-0,052691	0,987354
RAD51	Primary	CRISPRa	CD8	IFNG	-0,0019735	0,987354
SNAPC3	Primary	CRISPRa	CD8	IFNG	0,055744	0,98754
RIOK2	Primary	CRISPRa	CD8	IFNG	-0,10967	0,988075

PBX4	Primary	CRISPRa	CD8	IFNG	-0,031033	0,988075
PREB	Primary	CRISPRa	CD8	IFNG	0,055048	0,988075
KRTAP5-9	Primary	CRISPRa	CD8	IFNG	-0,22309	0,990725
ARID1B	Primary	CRISPRa	CD8	IFNG	0,0061064	0,992548
SFRP4	Primary	CRISPRa	CD8	IFNG	-0,1555	0,992751
ZNF488	Primary	CRISPRa	CD8	IFNG	-0,12222	0,992751
THAP8	Primary	CRISPRa	CD8	IFNG	-0,10896	0,992751
MEOX1	Primary	CRISPRa	CD8	IFNG	-0,1054	0,992751
TP73	Primary	CRISPRa	CD8	IFNG	-0,29861	0,99325
MNDA	Primary	CRISPRa	CD8	IFNG	-0,066236	0,99325
ZNF716	Primary	CRISPRa	CD8	IFNG	-0,11179	0,994657
RRP1B	Primary	CRISPRa	CD8	IFNG	-0,19797	0,994827
SCAI	Primary	CRISPRa	CD8	IFNG	-0,15912	0,994827
RPS6KA5	Primary	CRISPRa	CD8	IFNG	-0,1332	0,994827
ZNF571	Primary	CRISPRa	CD8	IFNG	-0,12487	0,994827
ZNF454	Primary	CRISPRa	CD8	IFNG	-0,10011	0,994827
ABT1	Primary	CRISPRa	CD8	IFNG	-0,089619	0,994827
SOX30	Primary	CRISPRa	CD8	IFNG	-0,086409	0,994827
NR1D2	Primary	CRISPRa	CD8	IFNG	-0,022968	0,994827
NOD2	Primary	CRISPRa	CD8	IFNG	0,037495	0,994827
ZNF737	Primary	CRISPRa	CD8	IFNG	0,064506	0,994827
GLYR1	Primary	CRISPRa	CD8	IFNG	0,076784	0,994827
ZNF10	Primary	CRISPRa	CD8	IFNG	0,090784	0,994827
PLAG1	Primary	CRISPRa	CD8	IFNG	0,10839	0,994827
GFI1B	Primary	CRISPRa	CD8	IFNG	0,10914	0,994827
MDM4	Primary	CRISPRa	CD8	IFNG	0,11437	0,994827
ZNF510	Primary	CRISPRa	CD8	IFNG	0,24253	0,994827
ZBTB4	Primary	CRISPRa	CD8	IFNG	0,065098	0,99602
ZFP36	Primary	CRISPRa	CD8	IFNG	-0,14376	0,999153
TADA1	Primary	CRISPRa	CD8	IFNG	-0,085292	0,999153
RITA1	Primary	CRISPRa	CD8	IFNG	0,15575	0,999153
RARA	Primary	CRISPRa	CD8	IFNG	0,011203	0,999313
SP2	Primary	CRISPRa	CD8	IFNG	-0,1147	1
RGS11	Primary	CRISPRa	CD8	IFNG	-0,071247	1
PAWR	Primary	CRISPRa	CD8	IFNG	-0,057548	1
ZNF549	Primary	CRISPRa	CD8	IFNG	-0,0369	1
STRAP	Primary	CRISPRa	CD8	IFNG	0,003259	1
DLX2	Primary	CRISPRa	CD8	IFNG	0,021521	1
TDRD3	Primary	CRISPRa	CD8	IFNG	0,10282	1
PHF19	Primary	CRISPRa	CD8	IFNG	0,10862	1
ZBED5	Primary	CRISPRa	CD8	IFNG	0,12953	1

Supplementary Table 2. Expression levels (assessed by RNA-seq) of the top negative hits identified in the CRISPRa screen in CD8$^+$ T cells cultured for 4 d under different conditions: No Cytokine (NC), IL-2, IL-2 + LDHi, IL-21, IL-21 + LDHi[23]

Symbol	*NC.1*	*IL2.1*	*IL21.1*	*IL2.LDHi.1*	*IL21.LDHi.1*	*NC.2*	*IL2.2*	*IL21.2*	*IL2.LDHi.2*	*IL21.LDHi.2*
Jmjd1c	29,18	24,85	26,76	25,44	23,01	30,84	26,28	31,25	23,89	23,99
Ikzf3	141,54	38,89	98,92	72,10	47,18	122,59	41,31	117,32	70,59	53,98
Foxf1	0,02	0,04	0,00	0,00	0,01	0,00	0,05	0,06	0,00	0,01
Foxl2	0,00	0,00	0,00	0,00	0,01	0,00	0,00	0,00	0,00	0,02

Gata3	11,66	17,12	6,57	12,08	3,64	9,58	14,66	7,69	11,85	3,33
Ebf2	0,01	0,00	0,00	0,00	0,01	0,01	0,00	0,02	0,00	0,00
Gata6	0,02	0,00	0,00	0,03	0,00	0,00	0,00	0,00	0,01	0,00
Cebpb	4,65	4,84	3,66	2,14	1,34	5,04	6,32	3,36	2,63	2,32
Foxa3	0,04	0,01	0,00	0,01	0,01	0,00	0,03	0,11	0,03	0,00
Trim28	70,52	97,25	62,17	85,44	67,63	62,03	108,48	46,59	92,58	72,43
Ikzf1	141,70	127,46	171,59	160,13	186,52	161,05	124,53	188,37	163,31	182,43
Pou2af1	6,54	2,11	14,40	4,89	10,65	7,20	2,15	18,03	5,63	8,15
Foxf2	0,00	0,01	0,00	0,01	0,01	0,00	0,00	0,03	0,00	0,00
Lmo4	14,31	13,51	10,59	14,13	48,98	20,04	13,51	22,25	15,38	42,92

Supplementary Table 3. Changes in gene expression between pmel-1 Thy1.1$^+$ and Lmo4-Thy1.1$^+$ CD8$^+$ T cells. Gene expression was evaluated by RNA-seq of pmel-1 CD62L$^-$KLRG1$^-$ T cells collected 5 d after transfer of 10^5 pmel-1 Thy1.1$^+$ and Lmo4-Thy1.1$^+$ CD8$^+$ T cells into wild-type mice

Gene	*WT1*	*WT2*	*WT3*	*WT4*	*Lmo4OE2*	*Lmo4OE3*	*Lmo4OE4*	*Lmo4OE5*	*logFC*	*logCPM*	*PValue*	*FDR*
Lmo4	10,14	11,53	11,16	10,01	483,55	504,63	503,71	476,99	5,53	8,75	0	0
Lars2	19,04	143,42	45,47	82,27	123,54	157,63	124,97	90,24	0,77	8,58	9,18E-30	4,31E-26
Slc40a1	12,51	6,67	5,60	7,54	5,45	7,23	1,99	1,07	-1,05	4,34	2,83E-25	8,86E-22
Vcam1	14,18	8,31	6,71	7,20	6,41	8,67	2,45	1,22	-0,97	4,55	1,33E-23	3,14E-20
Csf1r	8,62	5,94	4,69	4,93	4,42	5,51	1,82	0,79	-0,96	4,15	1,08E-19	2,04E-16
Hsph1	42,93	41,67	48,37	37,28	67,57	64,08	53,43	71,65	0,60	7,54	1,66E-19	2,60E-16
Aspm	5,00	6,10	5,25	5,17	2,76	2,52	4,15	3,76	-0,71	5,42	2,28E-19	3,06E-16
Hmox1	23,07	20,90	17,52	16,24	13,35	15,70	8,01	5,90	-0,86	4,57	3,09E-19	3,64E-16
Mrc1	4,41	2,75	2,54	2,31	2,09	2,69	0,69	0,45	-1,03	3,57	2,19E-17	2,08E-14
Hist1h3b	208,42	290,82	271,05	204,60	148,86	165,85	199,72	145,29	-0,56	6,39	2,21E-17	2,08E-14
Rpl38	230,70	411,71	429,79	190,68	444,70	482,91	428,30	487,09	0,56	7,16	2,66E-17	2,27E-14
Fosb	2,49	1,95	1,38	4,61	4,18	3,74	5,43	6,98	0,92	3,91	7,29E-17	5,71E-14
Hpgd	5,19	3,68	2,81	2,71	1,68	2,32	0,66	0,72	-1,44	2,09	9,33E-17	6,75E-14
Hist1h3c	144,60	226,35	219,28	151,08	110,70	123,01	157,39	112,76	-0,55	6,22	2,68E-16	1,80E-13
Cd74	19,08	15,48	10,43	9,81	9,52	11,86	5,58	2,27	-0,92	3,90	3,92E-16	2,46E-13
Ncapg2	5,86	8,97	5,67	6,65	3,60	3,87	5,37	4,37	-0,67	5,20	8,80E-16	5,17E-13
Ppp1r15a	28,24	31,63	25,25	27,05	42,31	39,30	37,54	43,18	0,53	6,33	1,88E-15	1,04E-12
Ccna2	17,23	30,02	22,37	21,35	12,44	13,26	19,48	15,68	-0,58	5,74	3,09E-15	1,62E-12
Rrm2	22,93	39,12	25,72	29,78	18,14	18,00	23,33	19,52	-0,58	5,74	3,91E-15	1,93E-12
Hist1h1b	106,07	163,87	134,26	109,60	79,39	81,87	106,55	88,79	-0,53	6,19	8,11E-15	3,64E-12
Trf	7,77	5,09	4,99	4,77	4,04	4,93	1,69	0,70	-1,00	3,30	8,13E-15	3,64E-12
Emr4	2,56	1,81	1,14	1,31	1,17	1,01	0,34	0,21	-1,33	2,08	1,08E-14	4,61E-12
Marcks	3,99	2,62	2,76	2,50	1,95	2,70	0,81	0,48	-1,00	3,21	2,78E-14	1,14E-11
Sirpa	5,05	3,44	3,65	3,35	2,95	3,43	1,16	0,66	-0,92	3,55	3,56E-14	1,40E-11
Mpeg1	4,93	3,64	2,68	2,61	2,58	3,35	0,97	0,46	-0,93	3,53	3,92E-14	1,48E-11
Hist1h3e	151,18	198,17	221,12	157,48	121,43	129,93	144,60	106,77	-0,52	5,98	4,34E-14	1,57E-11
Nlrp1a	3,78	5,74	4,64	3,35	6,86	7,11	6,52	7,75	0,69	4,80	4,72E-14	1,64E-11
Sdc3	8,04	5,47	4,87	4,93	4,85	5,42	2,57	1,34	-0,72	4,54	6,26E-14	2,10E-11
Casc5	6,88	8,29	6,97	7,21	4,02	4,07	5,94	5,32	-0,60	5,31	6,66E-14	2,16E-11
C1qb	12,79	8,72	9,26	7,16	5,79	7,87	2,95	1,54	-1,06	2,88	8,01E-14	2,51E-11
Hist1h3d	151,31	213,67	196,27	164,52	119,55	123,44	144,93	118,57	-0,52	5,98	1,37E-13	4,17E-11
Rpl36	178,41	335,58	367,82	157,82	334,89	399,32	307,55	400,04	0,48	6,98	1,75E-13	5,15E-11
Fcna	7,80	4,99	5,10	3,72	3,14	4,90	1,24	0,38	-1,16	2,35	4,89E-13	1,39E-10
Rpl11	298,69	463,50	383,85	277,61	487,40	474,28	450,81	565,11	0,48	7,98	1,18E-12	3,28E-10
Tgm2	3,12	2,57	2,11	1,71	1,49	1,94	0,72	0,38	-1,08	2,63	1,25E-12	3,36E-10

Zfp488	69,87	36,25	37,27	45,78	34,04	34,65	35,54	33,35	-0,46	7,46	1,64E-12	4,27E-10
Kif11	16,37	23,06	20,33	20,04	12,95	13,08	17,15	14,59	-0,47	6,37	1,95E-12	4,95E-10
C1qc	17,86	13,16	10,32	9,12	9,55	12,67	3,14	2,07	-0,89	3,36	2,37E-12	5,85E-10
Rps21	201,31	354,45	380,46	193,12	365,65	423,14	341,38	411,60	0,46	7,03	2,59E-12	6,23E-10
Kif14	1,96	3,01	2,14	2,40	1,17	1,17	1,92	1,45	-0,74	4,09	3,52E-12	8,28E-10
Zfp36	47,90	64,92	60,71	45,95	76,96	67,91	75,65	78,88	0,45	6,84	4,11E-12	9,42E-10
Tnfaip3	135,07	117,22	66,06	119,33	141,89	135,47	145,90	182,25	0,47	9,17	6,57E-12	1,47E-09
Ccnb2	20,82	37,24	29,03	23,86	15,10	15,89	23,22	20,48	-0,57	5,16	6,83E-12	1,49E-09
Dnaja1	30,49	33,69	34,30	29,43	43,75	43,37	37,75	50,03	0,45	7,74	9,17E-12	1,96E-09
Emr1	4,12	2,27	1,92	2,02	2,12	2,10	0,66	0,24	-1,02	2,66	1,10E-11	2,30E-09
Hist1h3h	109,24	157,66	157,16	106,81	85,70	97,04	104,76	88,10	-0,49	5,78	1,17E-11	2,39E-09
Kif15	7,15	10,71	9,10	7,17	4,75	5,23	7,56	5,43	-0,57	5,10	1,36E-11	2,73E-09
Fxyd5	139,35	225,22	193,52	128,62	235,99	222,32	230,59	246,43	0,45	7,89	1,97E-11	3,84E-09
Rpl29	337,40	492,00	500,56	302,69	573,50	534,95	566,37	558,77	0,45	8,42	2,00E-11	3,84E-09
Fth1	101,38	169,65	153,00	84,38	171,46	180,93	155,15	177,36	0,44	7,14	2,67E-11	5,02E-09
Rpl21	66,64	127,67	114,14	63,06	119,87	122,31	117,12	143,83	0,44	7,67	2,88E-11	5,30E-09
Socs3	8,46	10,25	8,58	9,07	13,39	11,87	12,52	16,55	0,57	4,96	4,42E-11	7,99E-09
Hist1h3g	89,23	136,96	133,01	86,61	68,91	75,77	96,06	72,50	-0,50	5,54	5,46E-11	9,69E-09
Nr4a2	17,65	11,77	7,21	14,81	18,60	16,36	18,46	19,48	0,48	5,64	6,29E-11	1,09E-08
Rpl19	195,83	326,36	331,00	195,48	332,75	355,07	349,69	376,11	0,44	7,86	7,76E-11	1,33E-08
Mki67	39,89	54,39	47,09	41,56	30,46	28,38	41,49	34,43	-0,44	8,64	8,93E-11	1,50E-08
Rpl36a	88,14	156,44	138,08	86,54	159,52	146,40	152,08	179,07	0,45	6,08	1,05E-10	1,73E-08
Top2a	39,86	62,65	49,76	49,45	34,28	34,00	43,35	38,63	-0,43	7,84	1,56E-10	2,53E-08
Nusap1	8,00	13,48	12,40	10,37	6,32	6,38	9,02	7,72	-0,58	4,76	1,79E-10	2,85E-08
Hmmr	8,46	12,12	9,71	9,98	5,76	5,60	9,07	7,24	-0,54	5,05	1,84E-10	2,88E-08
Slc11a1	2,81	1,62	1,64	1,32	1,18	1,25	0,55	0,26	-1,19	1,62	2,24E-10	3,46E-08
Cit	5,52	7,53	5,70	5,34	3,80	3,96	4,80	4,19	-0,53	5,14	2,83E-10	4,29E-08
Syk	2,19	1,38	1,19	1,30	1,03	1,08	0,69	0,35	-0,96	2,56	5,27E-10	7,87E-08
C1qa	8,60	8,33	5,33	4,58	4,69	6,43	1,76	0,87	-0,98	2,47	5,66E-10	8,31E-08
Tmsb10	498,20	1003,68	909,48	452,23	868,40	940,13	943,24	1076,22	0,42	9,06	6,87E-10	9,94E-08
Brca1	2,42	3,87	2,67	3,15	1,80	1,95	2,29	1,68	-0,66	4,05	1,03E-09	1,46E-07
Kntc1	2,55	3,03	2,58	2,63	1,37	1,67	1,93	1,81	-0,68	3,93	1,16E-09	1,62E-07
Stip1	33,64	40,21	38,12	31,39	50,96	45,28	41,26	51,34	0,40	6,50	1,17E-09	1,62E-07
Mafb	2,59	1,43	1,45	1,45	1,08	1,68	0,47	0,22	-1,02	2,14	1,38E-09	1,89E-07
Asb2	2,44	2,10	2,64	1,49	1,36	1,44	0,59	0,85	-1,01	2,09	1,58E-09	2,12E-07
Hist1h2ak	106,67	153,38	143,18	97,57	76,85	94,61	101,55	85,98	-0,47	5,39	1,65E-09	2,18E-07
Hist2h3c2	48,60	85,67	75,10	47,01	44,88	43,51	55,59	45,25	-0,43	5,82	1,94E-09	2,53E-07
Cenpf	4,05	5,46	4,90	4,33	2,99	2,83	4,30	3,44	-0,46	5,49	2,03E-09	2,62E-07
Rpl23	284,58	462,06	415,59	274,16	475,78	465,04	440,76	521,61	0,41	8,79	2,26E-09	2,88E-07
Ccr3	5,85	5,21	4,88	5,32	4,25	3,97	2,70	2,39	-0,68	3,82	2,32E-09	2,91E-07
Rpl23a	692,27	1170,29	1107,10	637,43	1154,97	1181,63	1131,95	1305,68	0,41	9,19	2,58E-09	3,20E-07
Sik1	22,21	21,55	14,37	21,24	24,84	23,08	28,00	28,20	0,38	6,70	2,69E-09	3,28E-07
Rpl10a	201,71	287,31	264,91	185,91	314,81	286,80	305,78	324,62	0,39	7,82	3,78E-09	4,56E-07
Uhrf1	12,96	23,56	15,44	15,99	11,46	12,19	14,10	12,64	-0,44	5,72	3,94E-09	4,69E-07
Prr11	6,73	7,84	7,24	7,24	4,26	4,25	5,55	5,58	-0,57	4,54	4,18E-09	4,92E-07
Hist1h2bk	72,42	108,17	118,40	76,06	59,62	65,98	70,78	64,02	-0,51	4,91	4,42E-09	5,14E-07
Dusp1	27,07	25,44	23,33	23,51	33,81	30,74	31,77	37,02	0,42	5,83	4,98E-09	5,72E-07
Depdc1a	4,91	6,30	4,70	5,31	3,07	2,73	4,26	3,42	-0,66	3,85	5,11E-09	5,79E-07
Hist1h3a	85,21	123,16	114,05	84,20	65,02	77,36	86,72	68,47	-0,45	5,55	5,20E-09	5,82E-07
Axl	11,36	9,39	7,74	7,58	7,10	8,35	5,42	5,25	-0,47	5,31	5,53E-09	6,12E-07
Plbd1	2,71	2,31	1,49	1,79	1,16	1,84	0,76	0,18	-1,11	1,62	5,70E-09	6,23E-07
Espl1	3,98	5,55	4,46	4,61	2,93	3,10	3,70	3,07	-0,54	4,70	5,87E-09	6,35E-07
Rps12	211,51	390,26	381,93	180,04	368,53	368,61	359,44	412,50	0,38	7,44	7,01E-09	7,49E-07
Lyz2	5,26	2,46	3,31	3,53	2,36	2,67	1,25	0,42	-1,11	1,50	7,43E-09	7,85E-07
Rps28	219,77	362,23	327,96	193,28	353,93	342,64	338,22	393,52	0,38	6,69	7,97E-09	8,33E-07

Kif20a	6,38	10,24	8,14	9,12	5,42	5,04	7,03	5,93	-0,54	4,68	9,60E-09	9,91E-07
Hist1h3i	124,88	173,81	173,28	123,04	103,95	113,59	125,02	107,55	-0,40	5,97	1,21E-08	1,23E-06
Hist2h2ac	127,78	171,15	166,83	124,22	110,10	103,34	124,33	100,21	-0,42	5,64	1,44E-08	1,45E-06
Hist1h2ae	51,72	78,10	68,91	45,76	37,46	46,37	49,98	42,87	-0,46	5,21	1,50E-08	1,49E-06
Clspn	4,05	6,58	4,16	4,08	2,63	3,05	3,69	3,36	-0,58	4,30	1,50E-08	1,49E-06
Rrm1	18,49	25,00	17,63	20,77	14,38	15,59	17,49	15,46	-0,39	6,18	1,52E-08	1,49E-06
Pbk	2,86	4,17	2,53	2,68	1,28	1,87	1,57	1,53	-0,99	1,95	1,74E-08	1,69E-06
Hist1h2ap	92,66	161,98	137,88	86,71	78,06	88,07	104,67	79,31	-0,45	5,34	1,91E-08	1,83E-06
Hist1h2ao	70,95	124,33	106,35	66,40	60,18	67,73	80,29	60,83	-0,44	5,35	1,99E-08	1,89E-06
Hist2h4	83,59	75,62	85,60	74,96	56,50	52,84	67,84	42,51	-0,53	4,55	2,07E-08	1,95E-06
Nhsl2	9,21	7,75	7,06	10,01	6,10	5,97	8,51	5,92	-0,37	6,62	2,19E-08	2,03E-06
Grk1	7,73	4,07	4,14	4,84	3,85	3,40	4,30	3,44	-0,48	5,06	2,31E-08	2,12E-06
Ckap2l	6,10	8,87	7,87	6,80	4,13	4,11	6,41	5,30	-0,57	4,28	2,33E-08	2,12E-06
Atn1	2,99	3,44	4,22	2,19	4,52	5,25	3,83	5,57	0,60	4,14	2,46E-08	2,22E-06
Tpx2	7,01	12,75	8,97	7,72	5,23	5,47	8,00	7,65	-0,47	5,10	2,52E-08	2,25E-06
Ccnb1	8,08	11,53	8,90	9,97	5,98	5,96	7,65	6,41	-0,57	4,22	3,28E-08	2,91E-06
Gltscr1	19,42	22,85	23,38	18,65	27,27	26,11	26,66	27,84	0,36	7,01	3,44E-08	3,02E-06
Hist1h2ag	69,19	115,83	106,77	72,98	57,40	67,00	80,63	60,66	-0,45	5,21	3,54E-08	3,08E-06
Rpl41	512,93	732,37	614,81	530,96	774,73	731,24	738,76	841,04	0,37	8,27	4,40E-08	3,79E-06
Thy1	787,16	1049,08	934,85	789,00	1171,66	1129,52	1189,44	1121,32	0,37	10,79	4,46E-08	3,81E-06
Hist1h2af	72,66	114,72	119,11	78,98	60,54	67,04	79,14	70,24	-0,47	5,01	4,65E-08	3,94E-06
Sf3a2	24,02	39,35	32,48	25,69	39,81	38,61	40,17	40,58	0,39	5,88	4,85E-08	4,07E-06
Ndufa13	8,90	17,26	17,57	9,70	19,19	18,92	19,12	20,24	0,56	4,36	5,65E-08	4,70E-06
Per1	27,46	26,20	21,73	24,78	31,78	29,38	33,02	33,69	0,35	7,06	6,20E-08	5,11E-06
Hist1h2bm	43,79	70,87	65,28	43,37	34,33	35,44	41,35	39,21	-0,56	4,14	7,28E-08	5,95E-06
Hist1h1d	60,85	79,81	90,38	56,15	53,29	59,45	60,30	51,55	-0,35	7,57	8,10E-08	6,49E-06
Rps9	363,35	518,44	475,81	370,71	534,60	546,51	526,80	613,45	0,36	8,44	8,14E-08	6,49E-06
Zc3h12a	17,96	17,38	14,73	17,45	21,67	21,82	20,99	24,30	0,39	5,79	8,14E-08	6,49E-06
Lgmn	4,37	3,16	2,83	1,78	1,86	2,98	1,04	0,66	-0,90	2,13	8,49E-08	6,71E-06
Ptgs1	2,50	1,52	1,52	1,56	1,38	1,13	0,84	0,40	-0,92	1,97	8,95E-08	7,00E-06
Hist2h3c1	26,55	48,95	44,36	26,28	26,00	26,31	32,81	26,59	-0,38	5,87	9,02E-08	7,00E-06
Hist1h2ai	80,14	127,57	107,56	76,36	59,12	71,66	82,83	71,88	-0,45	5,05	1,01E-07	7,77E-06
Hist1h2be	24,52	31,78	32,87	22,68	19,93	20,81	23,55	21,76	-0,37	5,95	1,06E-07	8,11E-06
Trp53	32,20	39,82	37,97	33,70	48,48	46,12	42,73	46,43	0,36	6,26	1,22E-07	9,25E-06
Hist1h2bj	54,03	94,54	76,70	53,02	40,65	51,83	53,50	48,69	-0,51	4,49	1,28E-07	9,66E-06
Spic	3,64	2,52	2,92	2,21	2,01	2,47	0,36	0,66	-1,03	1,41	1,51E-07	1,13E-05
Rgs10	8,80	9,80	10,38	6,95	11,65	14,16	11,83	19,17	0,67	3,36	1,53E-07	1,13E-05
Nuf2	4,22	6,56	5,86	5,34	2,76	3,35	4,25	3,64	-0,65	3,43	1,59E-07	1,17E-05
Fau	485,17	679,77	661,48	491,46	801,33	701,48	730,00	730,40	0,36	8,92	1,78E-07	1,30E-05
Adam4	4,61	1,43	1,30	1,49	1,38	1,12	1,17	1,17	-0,89	2,03	2,30E-07	1,66E-05
Ccl5	3563,69	4415,49	4136,15	3480,90	5509,59	4890,44	4799,06	4686,53	0,35	11,20	2,81E-07	2,02E-05
Lyn	3,50	2,35	2,30	2,00	1,82	2,42	1,16	0,73	-0,73	2,81	3,07E-07	2,19E-05
Hist1h2bn	300,48	451,61	444,06	299,99	254,31	281,25	350,82	301,64	-0,33	7,00	3,30E-07	2,33E-05
Smc2	14,67	20,53	18,06	18,19	12,96	13,29	15,83	14,54	-0,34	6,41	3,48E-07	2,44E-05
Hist1h1a	45,10	73,74	58,49	46,34	37,90	41,68	49,23	38,21	-0,42	5,19	3,50E-07	2,44E-05
Olfr613	20,07	9,38	9,32	12,35	9,25	9,62	11,07	9,94	-0,37	5,87	3,64E-07	2,52E-05
Iqgap3	1,22	1,63	1,58	1,17	0,71	0,69	1,10	0,79	-0,75	2,65	3,81E-07	2,62E-05
Cd5l	4,02	2,69	2,92	2,33	2,01	3,36	0,94	0,44	-0,83	2,25	3,90E-07	2,66E-05
Tcf7	247,12	305,19	289,84	265,54	346,87	333,52	355,52	370,85	0,35	9,46	3,94E-07	2,66E-05
Pdcd5	6,50	16,72	17,23	5,88	16,82	16,95	16,62	21,65	0,68	3,26	4,37E-07	2,94E-05
Plk1	9,32	16,75	10,47	11,42	7,68	6,70	10,28	9,66	-0,49	4,51	4,44E-07	2,94E-05
Ier2	54,21	59,47	60,71	58,79	70,47	68,25	74,78	79,28	0,33	6,65	4,44E-07	2,94E-05
Junb	137,84	155,36	158,20	155,33	193,31	185,80	183,06	205,04	0,34	8,30	4,80E-07	3,16E-05
Ctla4	80,69	78,24	55,87	76,20	84,56	84,78	87,70	108,21	0,32	7,31	5,50E-07	3,59E-05
Nr4a1	17,04	16,51	11,61	17,23	21,36	18,60	21,84	20,22	0,38	5,50	5,70E-07	3,70E-05

Gmfg	91,95	142,59	140,63	83,10	145,07	146,23	138,06	142,76	0,33	7,02	5,95E-07	3,83E-05
Bub1b	6,82	11,39	8,43	8,74	5,22	5,86	8,04	6,81	-0,45	4,81	5,98E-07	3,83E-05
Mcm5	18,91	27,83	20,31	21,15	17,14	15,84	19,15	17,55	-0,34	6,08	6,22E-07	3,95E-05
Cep55	5,66	8,32	7,23	6,52	3,94	4,00	5,62	5,52	-0,54	4,01	6,47E-07	4,09E-05
Zfp36l1	76,95	90,43	87,19	80,17	109,22	99,53	100,71	112,13	0,33	8,14	6,62E-07	4,15E-05
Tuba1b	78,39	96,92	72,90	88,59	65,53	61,31	72,58	70,60	-0,32	6,89	6,68E-07	4,16E-05
Diap3	6,69	8,40	6,16	7,07	4,66	4,79	5,76	5,04	-0,49	4,42	6,85E-07	4,24E-05
E2f7	1,27	2,19	1,68	1,73	0,86	1,06	1,19	1,18	-0,68	2,93	8,68E-07	5,33E-05
Pole	4,37	6,16	4,92	5,23	3,99	3,32	4,55	3,59	-0,42	5,01	9,07E-07	5,54E-05
Hist1h2ad	81,64	132,06	109,25	80,97	66,01	73,84	83,41	80,06	-0,41	5,11	9,36E-07	5,67E-05
Colec12	24,26	15,12	16,80	17,18	14,43	13,77	15,99	13,08	-0,36	5,76	9,80E-07	5,90E-05
Rpl28	456,56	702,20	587,25	424,30	684,75	641,94	678,10	720,25	0,33	8,25	9,88E-07	5,92E-05
Sgol2	2,28	3,66	2,79	2,88	1,73	1,51	2,64	1,96	-0,57	3,69	9,97E-07	5,93E-05
Lmnb1	52,46	74,35	64,60	55,55	45,16	48,29	54,39	50,34	-0,32	7,30	1,02E-06	6,00E-05
Hist1h4f	75,07	112,31	115,18	79,05	53,09	72,02	80,62	71,20	-0,45	4,67	1,02E-06	6,01E-05
Vps13c	19,51	12,84	13,43	18,07	13,50	11,73	13,71	12,37	-0,32	7,38	1,12E-06	6,52E-05
Hist1h2ah	83,73	124,23	111,68	85,65	65,59	80,32	86,46	72,48	-0,41	5,10	1,26E-06	7,29E-05
Prkdc	18,73	11,46	13,39	15,56	11,98	11,11	13,30	11,16	-0,32	7,40	1,27E-06	7,33E-05
Kif4	4,69	7,13	5,34	5,33	3,23	3,91	4,64	4,53	-0,47	4,51	1,38E-06	7,93E-05
Macf1	181,10	102,25	118,08	134,74	113,29	96,52	115,37	101,70	-0,33	11,47	1,45E-06	8,27E-05
H2-Ab1	3,63	3,70	2,85	3,00	2,24	2,66	1,52	0,66	-0,90	1,62	1,48E-06	8,40E-05
Hist2h3b	159,90	240,74	217,90	149,61	150,22	138,15	175,86	146,49	-0,32	6,14	1,51E-06	8,50E-05
Edf1	34,05	70,25	66,72	37,97	63,35	68,30	66,58	73,58	0,39	5,33	1,53E-06	8,59E-05
E2f8	4,42	8,15	5,84	4,86	3,72	4,00	4,80	3,98	-0,50	4,20	1,59E-06	8,78E-05
Prnp	53,39	30,45	33,47	34,06	31,84	29,48	33,25	27,59	-0,31	7,00	1,59E-06	8,78E-05
Hist1h3f	93,35	141,21	151,33	93,72	90,12	98,30	108,00	89,03	-0,31	6,76	1,66E-06	9,11E-05
Crtc2	26,93	30,53	32,91	27,57	38,28	35,80	34,80	37,58	0,32	6,44	1,70E-06	9,32E-05
Rpl7a	480,26	671,86	583,51	471,38	700,89	663,63	677,61	722,40	0,33	9,07	1,72E-06	9,35E-05
Hist1h2ab	78,09	154,86	123,73	79,27	70,91	87,72	98,34	81,64	-0,36	5,61	1,74E-06	9,41E-05
Lclat1	10,08	12,10	12,01	9,23	8,27	9,00	7,26	8,88	-0,37	5,42	1,77E-06	9,50E-05
Tyr	2,25	1,05	1,14	1,35	0,94	0,72	0,86	0,76	-0,83	1,93	1,88E-06	0,0001
Fbrs	41,12	50,62	53,92	42,87	60,62	58,67	54,84	59,05	0,31	7,13	1,92E-06	0,0001
Fancd2	1,51	2,15	1,31	1,90	0,84	1,11	1,23	1,13	-0,70	2,76	1,93E-06	0,0001
Cenpe	5,28	9,08	7,89	5,49	4,75	4,67	6,21	5,90	-0,36	5,58	1,98E-06	0,0001
Plxnb2	1,72	1,29	1,19	1,21	0,90	1,16	0,91	0,43	-0,68	2,85	2,02E-06	0,0001
Srgn	159,16	223,46	203,15	147,36	213,88	222,47	243,27	229,33	0,31	7,59	2,22E-06	0,0001
Arhgap19	5,35	7,95	7,03	6,62	4,53	4,33	5,72	5,61	-0,41	4,92	2,36E-06	0,0001
Wfikkn2	8,54	10,17	8,00	9,76	9,09	11,88	13,45	13,58	0,39	5,17	2,41E-06	0,0001
Rpl18	661,67	804,97	725,08	645,52	892,24	886,06	834,95	929,21	0,32	9,08	2,44E-06	0,0001
Uba52	384,26	599,69	590,39	377,28	602,87	623,53	570,28	628,33	0,32	8,08	2,54E-06	0,0001
Rps23	587,52	729,98	638,48	506,68	810,26	761,60	684,71	814,84	0,32	8,59	2,61E-06	0,0001
Kif18b	4,98	8,67	6,83	6,01	4,95	3,93	5,68	4,40	-0,48	4,24	2,69E-06	0,0001
Hist1h2ac	16,02	26,46	24,28	15,18	13,86	16,91	17,17	15,60	-0,36	5,50	2,86E-06	0,0001
Fos	8,40	6,51	5,87	9,67	9,88	9,12	11,60	12,05	0,47	4,28	2,98E-06	0,0001
Shfm1	23,85	46,21	46,80	24,97	45,65	52,02	42,81	54,21	0,48	4,37	3,19E-06	0,0002
Hist1h2bc	53,99	82,80	79,37	51,46	48,76	53,22	53,70	51,31	-0,36	5,43	3,19E-06	0,0002
Tyms	23,46	15,21	14,84	17,80	14,92	13,72	14,70	13,60	-0,33	5,93	3,37E-06	0,0002
H2-Aa	5,90	4,72	3,18	2,48	3,06	4,24	1,57	0,32	-0,84	1,79	3,41E-06	0,0002
Trip13	1,96	3,33	3,09	2,66	1,54	1,51	2,06	1,44	-0,74	2,32	3,45E-06	0,0002
Cdca8	11,35	17,18	12,21	12,27	8,44	8,86	10,61	10,22	-0,48	4,21	3,49E-06	0,0002
Blm	3,36	3,89	3,34	3,41	2,08	2,60	2,61	2,50	-0,52	3,86	3,62E-06	0,0002
Rpl24	341,62	440,05	485,94	319,47	494,18	497,79	450,20	524,53	0,31	8,24	3,73E-06	0,0002
Nucks1	43,08	50,05	44,57	49,97	35,00	35,89	40,90	39,82	-0,31	8,01	3,79E-06	0,0002
Eef1b2	63,43	84,02	73,88	61,64	84,83	86,79	83,59	93,06	0,30	7,25	3,80E-06	0,0002
Rps24	496,65	633,28	635,62	380,67	700,20	668,70	636,61	661,19	0,31	9,04	3,85E-06	0,0002

Hook3	14,96	10,31	11,30	13,94	10,31	9,73	11,07	9,97	-0,30	7,20	3,90E-06	0,0002
Rpl32	319,03	423,95	443,95	278,05	445,53	466,71	416,81	476,87	0,31	7,69	4,27E-06	0,0002
Jun	11,58	10,69	14,93	10,11	15,90	15,21	12,84	16,52	0,37	5,43	4,34E-06	0,0002
Bard1	5,93	7,14	5,47	6,84	4,38	4,71	5,35	4,83	-0,41	4,93	4,56E-06	0,0002
Cox6c	35,72	73,17	70,88	38,80	63,98	73,62	70,77	78,00	0,41	4,99	4,58E-06	0,0002
Neil3	4,27	6,24	4,20	4,44	2,54	2,97	3,71	3,49	-0,60	3,17	4,86E-06	0,0002
Srp9	24,81	33,90	33,66	24,48	33,73	38,08	36,77	40,24	0,36	5,53	4,92E-06	0,0002
Cdk1	4,66	8,21	6,58	6,43	4,02	4,25	5,32	4,76	-0,50	3,98	4,93E-06	0,0002
Cdca2	4,18	5,31	4,87	4,39	3,70	2,50	3,77	3,24	-0,50	3,94	5,11E-06	0,0002
Dlgap5	6,57	11,33	9,41	7,99	6,34	5,81	6,62	7,19	-0,44	4,50	5,19E-06	0,0002
Myo9a	3,94	2,80	2,83	3,08	2,57	2,40	2,56	2,17	-0,39	5,07	5,71E-06	0,0003
Dnajb1	29,17	34,11	34,46	29,63	40,35	38,90	35,80	41,85	0,30	6,33	5,74E-06	0,0003
Hist1h2an	61,36	88,16	84,22	57,52	47,62	54,35	61,34	52,62	-0,42	4,63	5,88E-06	0,0003
Gps2	33,88	42,66	37,75	28,21	45,60	43,61	45,10	46,03	0,34	5,63	6,36E-06	0,0003
Csrnp1	21,70	18,64	14,40	23,52	25,61	22,47	23,75	25,85	0,31	6,00	6,67E-06	0,0003
Spag5	5,81	9,44	6,26	7,39	4,94	4,67	6,46	5,50	-0,43	4,60	6,79E-06	0,0003
Arpc3	108,84	153,49	145,42	99,92	154,19	147,69	156,12	161,78	0,29	6,90	7,29E-06	0,0003
Gtse1	3,73	5,02	4,93	4,11	2,83	3,07	3,67	2,42	-0,56	3,33	7,73E-06	0,0003
Nckap5l	9,56	11,07	13,03	10,09	14,99	13,78	11,59	13,97	0,32	5,90	8,48E-06	0,0004
Mbd6	20,71	27,10	29,10	20,66	29,56	30,03	30,47	28,83	0,29	6,78	8,83E-06	0,0004
Htt	15,44	12,16	12,29	14,59	11,29	10,61	12,03	10,70	-0,29	7,35	8,83E-06	0,0004
Safb	25,27	31,16	34,26	24,45	33,91	35,42	34,10	36,85	0,29	6,67	9,45E-06	0,0004
Cd24a	3,80	2,29	2,03	1,92	1,45	1,78	1,65	1,01	-0,78	1,88	9,67E-06	0,0004
Bub1	2,84	4,95	3,55	3,60	1,93	2,17	3,25	3,23	-0,50	3,79	1,08E-05	0,0004
Fcer1g	8,37	7,67	7,33	3,80	6,02	5,74	2,83	1,05	-0,77	1,82	1,08E-05	0,0004
Ect2	5,83	6,76	6,65	6,88	4,00	4,58	5,59	5,32	-0,42	4,54	1,08E-05	0,0004
S100a11	105,35	175,80	162,12	102,54	150,67	155,64	192,87	169,03	0,30	6,26	1,09E-05	0,0005
Dnah8	28,70	17,04	19,70	21,73	19,30	16,94	18,14	16,72	-0,29	8,17	1,11E-05	0,0005
Sbds	18,76	26,64	23,15	18,93	27,78	27,35	26,25	30,84	0,36	5,21	1,21E-05	0,0005
Lcor	11,77	6,22	6,67	8,00	6,86	5,97	6,44	6,08	-0,37	5,08	1,22E-05	0,0005
Cox4i1	152,86	208,22	192,62	153,67	211,51	209,16	201,33	238,11	0,28	7,06	1,23E-05	0,0005
Pnn	13,13	18,76	19,57	13,77	17,49	20,59	19,21	23,12	0,31	5,98	1,25E-05	0,0005
Cfp	10,00	7,49	8,81	7,43	6,61	9,02	4,29	3,21	-0,54	3,43	1,25E-05	0,0005
Anln	3,80	4,11	3,35	3,31	2,52	2,22	3,44	2,40	-0,46	4,10	1,28E-05	0,0005
Bzrap1	3,99	3,37	3,45	3,82	2,42	2,57	3,61	2,41	-0,41	4,61	1,32E-05	0,0005
Nek2	3,09	5,67	3,64	4,91	2,11	2,76	3,20	4,12	-0,53	3,57	1,54E-05	0,0006
Rps17	178,35	248,34	238,42	173,06	230,10	262,42	228,92	295,27	0,28	6,78	1,56E-05	0,0006
Rpl31	118,04	160,16	155,93	108,79	160,94	159,14	150,37	189,25	0,28	7,56	1,69E-05	0,0007
Myl12b	149,99	229,43	184,51	151,38	215,12	209,62	219,47	225,18	0,28	7,54	1,75E-05	0,0007
Fignl1	4,49	5,72	4,93	4,58	3,24	3,71	3,14	3,83	-0,51	3,64	1,81E-05	0,0007
H2-Eb1	2,50	2,73	2,32	2,06	1,42	2,60	1,31	0,27	-0,79	1,68	1,88E-05	0,0007
Ccr7	19,22	20,42	19,73	21,45	24,44	23,11	23,13	31,06	0,33	5,50	1,98E-05	0,0008
Kif22	14,95	18,50	15,03	16,91	12,26	10,89	13,73	13,59	-0,38	4,90	1,99E-05	0,0008
Atm	23,70	16,90	18,03	21,04	16,59	15,24	17,49	16,29	-0,28	7,76	2,21E-05	0,0009
Aurka	4,60	7,64	4,52	4,76	3,34	3,09	4,29	3,92	-0,57	3,12	2,28E-05	0,0009
Pfdn5	70,43	94,04	95,13	63,21	100,52	105,66	89,93	100,04	0,30	5,93	2,29E-05	0,0009
Cdc20	9,92	15,25	13,04	13,77	7,98	8,47	12,24	10,04	-0,43	4,34	2,33E-05	0,0009
Rps15	633,47	896,20	933,20	619,02	932,61	963,39	907,16	955,91	0,29	8,80	2,35E-05	0,0009
Rsad2	3,25	3,03	2,77	2,60	1,93	2,21	1,82	2,01	-0,55	3,22	2,40E-05	0,0009
Sart1	13,10	17,63	20,23	12,58	18,26	18,07	19,99	20,35	0,28	6,48	2,43E-05	0,0009
Stx4a	21,03	26,27	30,78	19,86	29,40	31,83	28,12	34,50	0,35	5,24	2,44E-05	0,0009
Zfand2a	17,44	14,01	10,38	18,60	18,23	18,12	17,76	21,28	0,30	5,73	2,49E-05	0,0009
Mastl	1,57	2,01	1,22	2,00	0,97	1,15	1,46	0,91	-0,62	2,74	2,56E-05	0,0010
Ldb1	95,89	106,13	113,96	94,44	129,11	127,05	114,97	127,14	0,28	8,02	2,62E-05	0,0010
Stil	2,40	3,45	2,25	2,67	1,77	1,67	2,33	1,90	-0,50	3,63	2,65E-05	0,0010

Rpl26	265,88	310,83	298,17	258,17	332,31	348,76	320,49	367,27	0,27	7,41	2,76E-05	0,0010
Parpbp	2,28	3,61	2,74	2,61	1,70	1,53	2,49	1,92	-0,56	3,10	2,77E-05	0,0010
Cd81	4,16	2,78	3,05	2,29	2,38	3,52	1,05	0,42	-0,73	1,90	2,85E-05	0,0010
Pif1	2,44	3,66	2,98	2,98	1,74	1,81	2,53	2,23	-0,54	3,23	2,90E-05	0,0011
Hist1h2bg	133,98	211,88	216,97	126,61	123,27	146,06	160,71	139,01	-0,27	6,59	2,97E-05	0,0011
Rps27	731,14	930,99	1123,63	688,31	1097,75	1110,68	971,41	1037,79	0,28	8,38	3,00E-05	0,0011
Rps27rt	733,26	933,68	1126,89	690,30	1100,93	1113,90	974,23	1040,80	0,28	8,38	3,00E-05	0,0011
Ncapd2	30,55	42,50	33,60	34,92	28,80	26,98	31,27	30,57	-0,27	7,19	3,41E-05	0,0012
Lyst	46,95	31,44	34,64	38,03	32,32	29,38	33,61	29,00	-0,28	8,67	3,46E-05	0,0012
Cln3	34,42	29,99	32,25	31,19	41,88	40,39	35,74	36,16	0,27	6,46	3,72E-05	0,0013
Birc6	94,24	60,33	64,33	80,75	64,67	56,58	65,26	60,20	-0,28	10,07	3,78E-05	0,0013
Gzmm	29,15	35,21	34,34	23,75	39,61	36,86	37,88	38,28	0,33	5,47	3,80E-05	0,0013
Gen1	2,41	3,10	2,62	2,84	1,53	1,92	1,87	2,08	-0,58	2,92	3,91E-05	0,0014
Gramd1a	111,33	109,53	138,38	115,84	150,26	148,21	131,26	145,82	0,28	8,46	4,00E-05	0,0014
Hist1h4a	61,70	110,11	101,24	66,32	55,30	65,40	71,74	64,70	-0,39	4,53	4,13E-05	0,0014
Vps13b	33,50	22,75	22,24	27,94	22,22	20,86	24,09	20,84	-0,28	8,34	4,40E-05	0,0015
Mis18bp1	4,03	4,60	4,33	3,52	2,43	2,43	4,12	2,98	-0,46	3,83	4,56E-05	0,0016
Nfkbia	52,69	59,78	46,12	53,72	63,76	64,77	54,06	73,32	0,26	6,53	4,58E-05	0,0016
Vps13d	37,26	23,02	24,98	31,43	25,57	22,54	25,86	22,46	-0,28	8,72	4,98E-05	0,0017
Hspbap1	2,33	2,27	2,48	2,37	1,49	1,67	1,91	1,48	-0,52	3,20	5,09E-05	0,0017
Hist1h2bl	34,67	57,62	52,13	36,94	30,60	33,06	35,87	32,72	-0,45	3,89	5,14E-05	0,0018
Dusp7	30,27	29,61	38,10	31,46	39,37	38,19	37,13	40,23	0,27	6,84	5,17E-05	0,0018
Uqcrh	89,61	109,41	109,99	92,59	114,57	123,18	119,91	131,48	0,29	5,93	5,19E-05	0,0018
F2rl1	5,03	5,53	4,56	6,46	7,20	7,24	7,03	7,65	0,42	4,15	5,29E-05	0,0018
Vmn1r58	12,41	8,81	8,75	8,23	7,63	6,67	7,89	6,96	-0,39	4,50	5,36E-05	0,0018
Sh3bgrl3	194,22	354,00	319,16	194,05	308,23	309,33	332,00	325,53	0,27	7,69	5,54E-05	0,0019
Cdca5	4,35	5,25	2,98	5,09	1,99	2,17	4,36	3,50	-0,59	2,85	5,59E-05	0,0019
Apoe	9,15	7,91	9,22	5,29	6,26	8,46	3,70	3,12	-0,54	3,04	5,72E-05	0,0019
Hist1h2bb	48,44	77,59	68,10	45,89	35,85	45,75	51,32	51,16	-0,38	4,63	5,73E-05	0,0019
Ska1	1,34	1,82	1,49	1,40	0,73	0,85	1,22	0,83	-0,74	1,71	5,95E-05	0,0020
Arrb2	108,72	117,27	100,99	102,23	132,75	121,72	129,28	132,47	0,27	7,88	6,33E-05	0,0021
Rbm17	20,32	29,36	25,34	19,91	29,37	28,44	30,13	30,35	0,32	5,36	6,48E-05	0,0021
Ckap5	28,46	31,22	29,79	30,72	23,71	23,40	28,21	24,99	-0,26	7,50	6,60E-05	0,0022
Ndufb7	18,96	40,09	30,16	16,28	34,87	34,41	31,86	40,56	0,43	4,06	6,67E-05	0,0022
Cd3g	137,99	193,58	173,33	142,50	185,98	190,93	190,79	207,76	0,26	7,51	6,73E-05	0,0022
Slc25a40	17,23	13,47	14,08	15,84	11,55	11,65	13,60	11,66	-0,33	5,25	6,76E-05	0,0022
Ppargc1b	3,22	3,10	2,77	3,03	4,46	3,75	3,68	4,82	0,46	3,75	7,14E-05	0,0023
Herc2	37,80	25,51	28,26	34,67	26,88	23,70	28,22	25,96	-0,27	8,79	7,24E-05	0,0023
Neurl1b	1,26	1,84	1,45	1,77	0,87	0,80	1,42	1,30	-0,54	3,06	7,28E-05	0,0023
Cwc15	38,02	54,66	48,19	35,84	55,24	52,92	50,45	56,65	0,29	5,82	7,54E-05	0,0024
Ccnf	6,71	10,56	7,63	7,99	6,25	5,25	7,52	6,26	-0,38	4,50	7,74E-05	0,0025
Rpl13a	635,72	801,83	728,91	644,94	864,06	861,32	779,04	881,98	0,27	9,63	7,87E-05	0,0025
Cbx7	24,42	25,88	28,70	26,12	32,57	31,22	30,63	31,33	0,26	6,39	8,28E-05	0,0026
Ubr4	62,71	39,12	45,56	54,78	45,97	38,34	44,40	39,26	-0,27	9,52	8,36E-05	0,0026
Kif2c	4,21	6,94	4,51	4,63	2,84	3,28	4,24	4,44	-0,47	3,64	8,37E-05	0,0026
Rps27a	200,73	263,48	275,76	177,20	271,09	279,27	260,19	286,23	0,26	7,69	8,38E-05	0,0026
Dagla	2,33	2,32	2,60	1,89	1,66	1,54	1,81	1,49	-0,48	3,45	8,49E-05	0,0026
Pnpla2	21,75	26,78	26,95	21,86	29,08	27,84	30,53	29,55	0,27	6,14	8,72E-05	0,0027
Slc14a1	8,01	7,55	6,26	7,67	6,31	5,16	5,83	5,64	-0,37	4,67	8,78E-05	0,0027
Snrpe	52,39	72,41	65,55	45,05	69,43	71,37	76,13	79,44	0,34	5,04	9,20E-05	0,0028
Snrpg	64,63	76,81	76,04	52,78	87,80	82,56	84,68	87,11	0,35	4,92	9,69E-05	0,0030
Rps29	444,37	623,39	579,79	419,17	586,79	608,43	586,61	689,07	0,26	7,79	9,70E-05	0,0030
Tmem45b	7,16	3,89	3,60	5,32	3,47	3,58	3,14	3,42	-0,57	2,75	0,0001	0,0031
Rpl37	172,63	210,61	228,08	173,74	233,39	245,10	204,33	252,44	0,26	7,54	0,0001	0,0033
Cox5b	84,39	118,51	103,71	78,42	117,20	110,68	116,26	121,03	0,28	5,92	0,0001	0,0033

Atad5	2,62	3,52	2,74	2,66	2,12	2,04	2,37	2,23	-0,40	4,21	0,0001	0,0033
Mcm10	1,79	3,67	2,14	2,23	1,47	1,60	1,90	1,83	-0,55	2,88	0,0001	0,0033
Paf1	29,87	31,29	27,07	28,17	35,84	33,74	34,10	36,93	0,27	5,98	0,0001	0,0033
Rbm3	28,64	42,06	37,70	29,08	38,43	40,48	37,64	46,93	0,25	6,77	0,0001	0,0033
Hist1h2bq	7,76	11,48	10,97	7,51	6,67	7,05	7,51	7,09	-0,40	4,12	0,0001	0,0033
Klrc2	98,59	46,20	56,85	60,80	54,73	57,62	56,23	44,30	-0,31	5,42	0,0001	0,0033
Ccdc117	15,22	17,57	14,43	16,62	19,80	17,97	17,15	22,40	0,27	5,91	0,0001	0,0034
Alms1	2,42	1,86	1,47	1,69	1,57	1,38	1,27	1,38	-0,42	4,03	0,0001	0,0034
Foxp4	21,20	26,04	27,75	22,79	28,54	28,09	30,60	28,88	0,25	6,75	0,0001	0,0035
Pik3c2a	13,52	9,40	10,58	12,16	9,85	9,52	9,61	9,34	-0,25	6,40	0,0001	0,0035
H2-Ke6	23,35	28,67	33,45	24,92	34,63	35,28	31,18	38,03	0,35	4,91	0,0001	0,0036
Ahsa2	8,74	7,19	8,58	8,03	11,16	10,30	8,76	10,57	0,33	5,05	0,0001	0,0036
Birc5	5,26	9,34	5,98	5,35	4,22	4,26	5,82	5,55	-0,39	4,29	0,0001	0,0036
Ubald1	49,77	57,21	59,70	50,02	67,30	63,65	61,75	65,39	0,26	6,36	0,0001	0,0037
Uqcrb	41,25	61,87	58,47	37,92	66,20	60,70	65,26	60,29	0,35	4,84	0,0001	0,0038
Mat2a	49,83	47,92	47,66	50,05	60,52	56,38	52,12	63,15	0,25	7,23	0,0001	0,0038
Pou5f2	5,75	1,76	1,56	1,69	1,30	1,52	2,05	1,81	-0,72	1,65	0,0001	0,0038
H2afx	46,90	73,74	75,22	51,09	46,89	52,38	58,56	48,31	-0,25	6,26	0,0001	0,0039
Treml4	2,27	1,83	1,57	1,80	1,45	2,05	0,70	0,26	-0,76	1,42	0,0001	0,0039
Rad51ap1	2,39	3,42	2,22	2,94	1,34	1,81	1,95	2,00	-0,65	2,08	0,0001	0,0039
Cbx5	19,70	20,59	18,76	21,47	16,48	16,33	17,98	17,13	-0,25	7,37	0,0001	0,0042
Atp8b4	98,53	80,92	84,00	89,71	73,89	74,53	76,38	70,64	-0,26	8,81	0,0001	0,0042
Foxm1	8,20	12,35	9,90	9,09	7,47	7,39	9,45	7,67	-0,31	5,29	0,0002	0,0043
Phf1	35,42	34,76	42,32	33,25	45,10	46,92	39,36	41,14	0,25	6,60	0,0002	0,0045
Tppp3	2,92	7,04	6,74	4,88	1,60	3,94	5,32	3,09	-0,62	2,18	0,0002	0,0046
Mafk	35,34	31,45	27,15	37,07	37,33	37,99	36,69	43,62	0,24	6,67	0,0002	0,0046
Hist2h2aa1	134,33	220,95	205,17	140,31	141,73	139,29	160,79	147,82	-0,24	6,54	0,0002	0,0046
Kctd12	2,09	1,38	1,30	1,53	1,16	1,54	1,03	0,72	-0,51	3,04	0,0002	0,0047
Ltb	196,65	195,27	213,24	202,98	243,49	242,65	234,89	239,78	0,25	7,92	0,0002	0,0048
Mospd3	22,09	26,19	22,34	19,96	29,35	27,33	28,22	27,28	0,31	5,23	0,0002	0,0048
Nr1h3	2,13	1,48	1,89	1,88	1,17	1,65	1,09	0,61	-0,70	1,56	0,0002	0,0048
Bak1	42,68	59,41	48,80	43,40	58,03	55,09	58,65	58,32	0,24	6,73	0,0002	0,0048
Prdm1	13,89	13,09	13,15	14,49	12,14	11,47	12,70	9,30	-0,26	6,01	0,0002	0,0048
Apobr	5,68	6,66	7,28	5,71	7,58	8,45	8,31	7,81	0,35	4,70	0,0002	0,0049
Hist1h2br	11,98	17,98	20,38	12,55	12,46	12,90	12,59	11,69	-0,32	4,89	0,0002	0,0050
Abracl	94,53	157,91	150,26	85,41	136,24	146,85	140,24	152,82	0,25	6,75	0,0002	0,0050
Lpp	7,69	5,45	6,13	6,99	5,78	5,71	5,54	5,17	-0,24	6,57	0,0002	0,0051
Kat8	9,18	10,11	10,76	9,53	11,16	13,81	13,02	13,99	0,40	4,12	0,0002	0,0052
Upf3a	5,84	10,14	10,13	6,23	9,24	10,46	10,63	13,03	0,44	3,74	0,0002	0,0054
Nbas	7,68	6,25	6,94	7,35	5,79	5,68	6,10	5,58	-0,29	5,54	0,0002	0,0054
Trp53inp2	9,91	9,31	6,78	9,56	11,42	10,17	11,07	11,31	0,29	5,30	0,0002	0,0055
Ttyh3	26,86	29,92	33,68	28,79	36,52	36,56	31,81	35,88	0,24	7,24	0,0002	0,0055
Timeless	2,88	4,68	3,41	3,67	2,49	2,80	3,03	2,67	-0,42	3,84	0,0002	0,0056
H2-Q4	301,45	293,00	320,58	269,15	360,56	358,64	319,41	371,20	0,25	9,18	0,0002	0,0056
Blvrb	3,46	3,85	2,84	3,12	2,04	2,62	1,42	1,89	-0,76	1,24	0,0002	0,0057
Grina	49,46	55,37	54,97	45,27	64,04	60,97	56,91	60,23	0,24	6,57	0,0002	0,0058
Dynll1	40,19	38,53	42,96	34,86	47,56	47,71	43,36	46,34	0,25	6,43	0,0002	0,0059
Snrpd2	36,49	48,30	40,89	33,26	46,73	55,44	49,50	52,41	0,36	4,48	0,0002	0,0059
Cdc6	1,73	2,57	1,38	1,84	1,11	1,06	1,83	1,31	-0,52	2,91	0,0002	0,0059
Hist2h2aa2	122,60	199,37	180,53	118,45	122,81	130,04	145,78	125,90	-0,24	6,56	0,0002	0,0059
Depdc1b	8,77	9,67	9,46	9,32	6,26	6,83	8,61	7,16	-0,37	4,38	0,0002	0,0059
Pom121	15,33	18,63	17,20	16,59	21,19	18,77	19,87	20,10	0,24	6,69	0,0002	0,0063
Mga	17,51	11,85	12,35	16,21	13,32	11,50	12,66	11,59	-0,24	7,54	0,0002	0,0063
Dtl	4,53	4,84	3,38	3,90	2,94	3,50	3,18	3,05	-0,41	3,95	0,0002	0,0064
Rps19bp1	3,93	3,90	4,33	3,96	5,60	6,92	5,96	6,20	0,62	2,13	0,0003	0,0066

Ncaph	7,22	11,93	10,22	9,21	6,92	6,47	9,25	7,57	-0,35	4,53	0,0003	0,0066
Dennd6a	10,63	9,41	10,40	10,69	8,30	8,74	8,93	8,52	-0,25	5,99	0,0003	0,0071
Egr1	10,88	12,19	10,90	11,25	13,88	12,78	14,60	14,25	0,29	5,28	0,0003	0,0071
Myo5a	3,76	3,61	3,40	3,39	2,97	2,80	3,04	2,71	-0,30	5,23	0,0003	0,0072
AU041133	4,26	2,40	3,02	3,37	2,16	2,31	2,59	2,12	-0,51	2,88	0,0003	0,0073
Amigo1	1,88	1,73	2,08	1,90	3,02	2,32	2,28	2,56	0,43	3,65	0,0003	0,0073
Cdca3	8,52	15,25	11,25	10,45	7,23	7,85	9,12	10,24	-0,40	3,90	0,0003	0,0074
Melk	1,91	2,91	2,43	2,09	1,45	1,80	1,73	1,36	-0,56	2,52	0,0003	0,0074
Rrbp1	9,18	12,52	11,54	8,59	12,86	11,71	12,08	13,29	0,26	5,90	0,0003	0,0075
Spc25	4,70	7,47	5,86	5,11	3,43	3,92	4,74	4,35	-0,50	2,97	0,0003	0,0075
Arrdc3	12,88	11,49	12,37	14,13	11,54	10,64	10,50	9,35	-0,28	5,57	0,0003	0,0075
Tmem245	12,43	8,30	9,19	10,42	9,03	8,25	8,53	8,12	-0,25	6,00	0,0003	0,0076
Cdkn3	6,09	8,62	7,59	6,47	4,40	4,43	5,76	4,48	-0,59	2,22	0,0003	0,0076
Plk3	9,49	8,78	6,63	7,69	10,63	10,30	11,01	9,82	0,35	4,48	0,0003	0,0077
Ubl5	24,49	28,13	23,80	19,85	30,40	27,46	30,42	27,63	0,27	5,69	0,0003	0,0080
Brip1	3,16	3,27	2,41	2,98	2,06	2,19	2,57	2,35	-0,38	4,20	0,0003	0,0080
Zfp518a	14,77	11,71	12,83	14,62	11,02	11,61	12,58	10,59	-0,24	6,41	0,0003	0,0080
Rps18	400,84	501,66	574,28	397,97	537,56	585,91	491,36	596,70	0,24	8,06	0,0003	0,0082
Aurkb	9,81	12,52	9,62	9,62	6,93	7,52	9,00	8,72	-0,38	4,18	0,0003	0,0082
Rps6	485,89	566,53	478,14	432,05	599,35	554,97	559,22	609,75	0,24	9,55	0,0003	0,0084
Rnasek	52,78	71,23	69,94	47,54	75,81	70,55	74,89	71,82	0,29	5,38	0,0004	0,0086
Shcbp1	3,64	5,10	3,86	3,93	1,92	3,05	3,88	2,92	-0,50	2,92	0,0004	0,0086
Chaf1a	4,53	6,89	5,15	4,88	4,04	4,16	4,53	3,66	-0,39	3,97	0,0004	0,0089
Tgfb1	51,68	68,99	68,47	52,85	72,12	68,64	67,95	74,89	0,23	7,11	0,0004	0,0089
Pola1	11,59	12,66	11,99	10,21	9,62	9,50	10,49	9,23	-0,26	5,83	0,0004	0,0090
Ccl6	2,35	1,71	1,78	2,29	1,50	1,44	1,17	0,86	-0,71	1,28	0,0004	0,0090
Tanc2	2,50	1,94	1,86	2,30	1,72	1,83	2,02	1,22	-0,35	4,52	0,0004	0,0090
Ddx60	4,35	3,33	3,28	3,67	3,03	3,16	2,66	2,56	-0,36	4,29	0,0004	0,0092
Tuba1c	47,44	60,68	44,06	56,30	43,83	41,28	46,76	46,19	-0,23	6,58	0,0004	0,0096
Kif18a	3,79	4,58	3,59	4,13	2,78	3,23	2,86	3,19	-0,43	3,58	0,0004	0,0096
S100a13	25,65	39,62	30,29	22,01	36,35	37,13	37,02	38,06	0,34	4,58	0,0004	0,0097
Nbeal1	4,78	3,20	3,30	3,96	3,12	3,01	3,41	3,04	-0,28	5,40	0,0004	0,0097
Tgif2	2,01	1,84	1,56	1,72	2,14	2,58	2,47	3,17	0,52	2,65	0,0004	0,0097
Thada	20,38	13,67	16,40	18,09	15,10	14,71	15,32	13,39	-0,23	6,97	0,0004	0,0098
Acp2	5,30	5,17	4,21	4,54	3,69	3,95	4,19	3,23	-0,36	4,32	0,0004	0,0098
Txk	30,15	29,54	26,12	27,91	23,17	23,22	26,24	23,03	-0,25	5,89	0,0004	0,0099
Pim2	36,63	38,47	36,19	42,57	46,17	45,39	43,76	45,57	0,23	6,42	0,0004	0,0100
Esco2	3,17	5,58	3,62	3,20	2,42	2,64	3,38	3,00	-0,45	3,30	0,0004	0,0100
Cnot3	41,05	45,55	44,96	36,54	51,07	48,30	48,71	48,59	0,23	7,05	0,0004	0,0102
Rgs1	47,44	44,00	36,83	39,30	49,40	45,87	45,16	59,00	0,24	5,94	0,0004	0,0102
Epg5	12,39	8,85	9,66	11,04	9,31	8,95	8,94	8,60	-0,23	6,56	0,0004	0,0102
Asf1b	9,76	14,62	9,23	9,41	8,26	7,25	9,06	8,48	-0,39	3,94	0,0004	0,0102
Pygo2	19,58	21,11	22,71	20,10	23,87	24,13	21,93	28,72	0,24	6,05	0,0005	0,0104
Ncapg	7,66	10,14	9,51	8,98	6,42	7,42	8,36	7,08	-0,31	4,92	0,0005	0,0104
Ndufa6	46,88	63,45	68,23	44,48	65,69	72,42	59,27	75,09	0,30	5,12	0,0005	0,0104
Fam64a	2,81	4,01	3,29	3,75	1,53	1,96	2,97	2,80	-0,59	2,10	0,0005	0,0104
Rpl31-ps12	34,36	46,48	47,48	32,72	47,56	50,69	48,68	56,53	0,35	4,47	0,0005	0,0107
Msl1	37,75	40,17	41,58	38,03	46,61	45,64	41,55	50,75	0,23	7,54	0,0005	0,0108
Sepsecs	7,47	5,40	7,07	7,31	5,57	4,76	5,24	4,73	-0,42	3,52	0,0005	0,0109
Utp3	12,19	19,44	17,96	14,09	17,95	18,41	19,34	23,30	0,32	4,84	0,0005	0,0110
Lrba	36,50	26,88	26,76	30,43	26,11	24,45	26,92	25,16	-0,23	8,11	0,0005	0,0111
Cd69	23,80	27,50	22,94	24,94	28,26	24,38	33,13	34,11	0,27	5,48	0,0005	0,0111
Magt1	25,13	22,88	22,50	26,02	20,61	20,47	20,62	20,88	-0,23	6,66	0,0005	0,0112
Tecr	48,96	63,87	61,22	44,27	65,75	62,70	66,21	62,33	0,24	6,13	0,0005	0,0112
Nf1	1,77	1,80	1,70	1,71	1,38	1,21	1,42	1,44	-0,36	4,20	0,0005	0,0113

Dennd4a	39,24	29,81	29,87	36,78	29,30	28,41	32,50	25,37	-0,23	8,09	0,0005	0,0114
Eif3g	46,96	60,48	56,32	45,64	59,18	64,01	60,79	64,02	0,25	5,94	0,0005	0,0114
Ralgapa2	27,08	20,03	19,83	23,73	19,88	18,72	20,57	18,26	-0,23	7,66	0,0005	0,0114
Cks1b	14,20	21,69	15,74	14,77	10,97	10,12	15,05	13,40	-0,43	3,46	0,0005	0,0114
Ttk	2,28	3,71	2,67	3,16	2,04	1,77	2,36	2,30	-0,49	2,90	0,0005	0,0114
Hist1h4b	80,38	147,18	134,28	87,85	83,84	85,74	93,71	100,37	-0,30	4,98	0,0005	0,0114
Cd72	6,33	7,04	5,54	6,69	8,76	9,02	7,70	8,95	0,41	3,53	0,0005	0,0114
Plxnc1	26,80	22,61	22,86	23,24	20,61	21,55	21,00	18,61	-0,22	7,29	0,0005	0,0116
Klrc1	261,27	165,38	208,22	230,11	186,94	194,30	190,83	163,11	-0,23	8,63	0,0005	0,0120
Zfp831	29,78	22,99	23,99	27,09	24,29	22,54	21,84	19,98	-0,23	7,88	0,0006	0,0125
Ctla2a	121,90	131,35	140,51	116,32	145,81	145,56	143,48	161,36	0,23	7,57	0,0006	0,0125
Use1	31,87	40,14	47,51	28,54	43,39	47,45	39,57	47,20	0,28	5,44	0,0006	0,0125
Cenpi	1,56	2,26	1,80	1,81	0,98	1,12	1,72	1,26	-0,55	2,31	0,0006	0,0126
Hsp90ab1	213,31	258,93	234,29	228,68	268,34	268,68	259,82	302,82	0,23	9,32	0,0006	0,0126
Gtf2ird2	4,15	3,53	4,04	3,68	5,64	4,72	4,12	5,49	0,38	3,95	0,0006	0,0126
Zfp524	11,90	13,30	13,69	11,80	15,46	15,59	16,80	17,68	0,38	4,02	0,0006	0,0127
Ube3c	18,66	17,34	18,49	19,33	15,59	15,09	16,71	15,73	-0,23	6,43	0,0006	0,0129
Herc1	38,48	25,90	26,53	33,17	28,38	23,24	27,46	26,54	-0,23	8,77	0,0006	0,0130
Fgl2	22,13	19,23	21,88	22,77	18,55	18,15	18,91	17,64	-0,23	6,23	0,0006	0,0130
Sapcd2	1,03	1,57	1,45	1,10	0,72	0,73	1,03	0,86	-0,61	1,74	0,0006	0,0130
Trmt112	28,45	31,91	32,90	24,47	34,73	36,95	38,63	33,32	0,29	5,08	0,0006	0,0131
Ddx23	25,63	28,32	30,31	26,68	30,67	34,75	30,78	33,40	0,23	6,40	0,0006	0,0133
Zdhhc21	14,14	12,34	12,76	13,97	11,26	11,36	11,57	11,46	-0,22	6,76	0,0006	0,0133
Rpl14	189,01	238,74	226,46	180,45	240,66	246,67	221,86	266,36	0,23	7,73	0,0006	0,0137
Cd7	73,63	81,99	81,84	83,55	97,14	88,12	99,53	89,81	0,22	6,50	0,0006	0,0137
Rhog	85,33	113,83	117,39	89,30	117,23	116,98	120,22	117,89	0,22	7,12	0,0006	0,0137
Slc35a3	17,17	16,02	16,23	20,15	14,03	15,38	14,79	14,96	-0,24	6,02	0,0007	0,0141
Ccl3	19,22	17,25	17,84	12,66	25,05	22,00	21,44	18,16	0,38	3,94	0,0007	0,0141
Dcaf17	8,33	6,21	6,12	7,27	5,73	5,79	6,18	5,75	-0,26	5,64	0,0007	0,0141
Ndnl2	9,11	10,89	9,65	9,02	12,37	11,95	11,91	13,87	0,37	3,97	0,0007	0,0144
Midn	34,51	45,13	45,17	37,90	45,93	47,57	46,42	49,51	0,22	7,35	0,0007	0,0144
Hsd17b11	18,69	19,87	20,21	20,06	26,26	22,77	22,07	24,46	0,28	5,22	0,0007	0,0146
Vps37b	35,87	37,30	36,29	38,67	41,23	43,90	40,72	46,83	0,22	6,66	0,0007	0,0146
Sgol1	2,39	3,53	2,46	3,00	1,86	1,73	2,38	2,45	-0,45	3,17	0,0007	0,0148
Lxn	15,23	13,15	17,93	13,29	18,95	18,82	18,13	19,71	0,36	4,21	0,0007	0,0148
Eme1	2,57	3,83	2,97	3,08	2,10	1,94	2,18	2,51	-0,52	2,57	0,0007	0,0148
Cdc45	3,67	6,01	3,80	4,00	2,69	2,89	4,32	2,89	-0,46	3,04	0,0007	0,0148
Gpsm3	119,41	132,24	126,54	118,66	150,44	142,51	140,87	145,18	0,22	7,50	0,0007	0,0150
Pnrc1	148,08	155,40	149,64	145,06	181,20	170,77	167,74	180,39	0,23	8,29	0,0007	0,0150
Ier5	37,27	37,98	43,32	36,83	44,26	47,11	40,69	48,55	0,22	7,10	0,0007	0,0152
Zwilch	1,94	2,92	1,70	2,34	1,31	1,57	1,83	1,53	-0,54	2,43	0,0008	0,0160
Cd27	114,78	124,20	134,71	111,79	144,03	140,59	137,90	143,18	0,22	7,69	0,0008	0,0161
Snrnp70	87,11	92,39	94,22	76,77	102,74	101,87	97,51	105,16	0,22	7,28	0,0008	0,0162
Stmn1	40,41	61,72	40,42	38,95	34,10	35,36	41,68	40,79	-0,26	5,47	0,0008	0,0167
Emg1	58,84	57,12	48,33	56,07	66,74	64,41	62,00	66,52	0,23	5,98	0,0008	0,0170
Cpt1a	20,66	28,39	19,97	33,18	21,75	18,82	24,61	23,04	-0,22	6,68	0,0009	0,0174
Mdm1	4,63	5,32	6,21	4,57	3,67	4,05	3,95	4,24	-0,37	3,84	0,0009	0,0174
Rpl9	445,55	510,07	546,03	426,35	562,47	582,04	517,64	590,88	0,23	8,57	0,0009	0,0178
Wdr92	13,78	15,64	16,40	14,22	16,85	17,33	17,16	19,51	0,24	5,81	0,0009	0,0179
Ubxn1	50,62	70,45	56,49	55,20	69,81	64,96	66,28	71,98	0,23	6,03	0,0009	0,0186
Slc8b1	11,01	10,13	9,67	11,24	13,17	13,16	11,30	13,56	0,28	5,08	0,0009	0,0187
Gnrh1	2,56	3,00	1,27	2,16	4,62	4,34	3,48	3,13	0,73	0,83	0,0009	0,0187
B3gntl1	9,27	7,00	6,63	7,83	6,10	6,27	6,26	5,80	-0,34	4,30	0,0009	0,0187
Selplg	370,18	430,71	380,46	366,09	470,26	443,20	467,56	427,84	0,23	10,09	0,0009	0,0188
Rps25	198,17	231,99	240,71	165,74	232,99	248,95	225,81	261,33	0,22	7,27	0,0010	0,0195

Mex3a	1,00	1,04	1,02	0,89	1,27	1,66	1,03	1,54	0,48	2,80	0,0010	0,0196
Rpl15	195,62	246,66	251,66	178,50	255,58	248,72	249,97	263,79	0,22	8,77	0,0010	0,0199
Mybl2	3,26	4,73	3,91	3,07	2,50	2,40	3,36	3,17	-0,39	3,61	0,0010	0,0201
Dusp5	98,15	92,92	80,32	93,99	106,87	96,62	109,24	111,15	0,21	6,84	0,0010	0,0202
Atp5j2	25,11	41,40	40,25	22,92	37,52	40,77	36,26	49,47	0,35	4,14	0,0010	0,0202
Tob2	26,76	29,82	27,18	27,36	33,58	31,19	30,33	33,64	0,21	6,91	0,0010	0,0204
Dnajb9	32,63	26,86	22,67	30,45	33,40	31,82	33,91	33,85	0,23	5,85	0,0011	0,0207
Rgs19	43,53	47,93	44,33	42,30	52,98	50,62	51,26	53,07	0,22	6,14	0,0011	0,0207
Cenpn	1,91	3,33	3,64	2,36	1,36	1,65	2,54	1,99	-0,55	2,04	0,0011	0,0210
Zrsr1	3,40	3,41	3,56	2,82	4,63	4,06	4,19	3,88	0,35	4,09	0,0011	0,0212
Ndufc2	17,51	21,73	20,00	16,70	23,19	24,78	27,00	22,67	0,37	3,90	0,0011	0,0213
Rbm38	67,61	80,20	80,92	69,57	84,69	88,75	80,54	91,17	0,21	7,16	0,0011	0,0213
Rad51	2,28	4,47	3,32	3,05	1,51	2,78	2,48	2,57	-0,50	2,59	0,0011	0,0214
Il2ra	15,43	12,75	12,77	13,39	11,98	11,14	12,22	10,82	-0,24	5,80	0,0011	0,0217
C2cd5	20,29	20,90	19,63	19,99	17,44	16,98	17,71	17,49	-0,22	6,37	0,0011	0,0218
Sfrs18	30,49	34,11	32,23	29,42	36,81	35,78	35,51	38,00	0,21	7,28	0,0011	0,0219
Spc24	4,92	6,14	5,26	4,98	2,97	4,48	3,74	4,03	-0,49	2,63	0,0012	0,0220
Tnrc6b	41,42	30,58	30,17	38,38	32,51	27,50	31,47	29,17	-0,22	9,14	0,0012	0,0220
D8Ertd738e	45,79	52,42	48,07	50,37	62,03	57,54	56,19	61,45	0,27	5,17	0,0012	0,0220
Pik3ap1	43,33	38,10	38,48	43,26	37,46	35,24	38,25	30,04	-0,21	6,64	0,0012	0,0220
Rps15a	50,90	53,17	55,52	43,34	58,86	60,60	56,14	60,24	0,22	8,14	0,0012	0,0220
Hist2h2ab	21,77	31,67	30,08	20,84	18,94	20,00	19,18	19,13	-0,42	3,15	0,0012	0,0222
Pou2f2	20,80	24,46	24,74	19,75	27,17	25,31	24,64	26,96	0,22	6,33	0,0012	0,0223
Nanos1	1,95	1,82	2,46	1,69	2,40	2,58	2,51	3,06	0,44	3,19	0,0012	0,0227
Atxn2l	105,72	116,08	118,61	103,13	132,06	130,01	128,88	125,52	0,22	8,80	0,0012	0,0227
Zfp664	16,27	17,45	18,95	18,00	20,36	20,21	20,14	21,33	0,22	6,29	0,0012	0,0229
Frat2	13,09	13,79	14,47	12,96	16,60	15,91	15,26	18,00	0,28	5,02	0,0012	0,0230
Serpina3f	1,33	1,33	1,38	1,76	0,80	1,25	0,89	0,83	-0,63	1,46	0,0012	0,0230
Tcirg1	41,92	35,72	44,71	37,64	47,56	49,88	41,39	45,87	0,21	7,03	0,0012	0,0232
Ascc3	26,32	20,36	21,49	23,06	19,95	18,68	20,55	19,74	-0,21	7,31	0,0012	0,0232
Ccdc92	9,05	8,25	10,10	8,93	10,93	9,78	11,69	12,59	0,32	4,53	0,0013	0,0233
Gzma	566,69	486,55	504,30	572,54	483,66	458,58	476,82	411,22	-0,22	8,76	0,0013	0,0234
Leng1	3,00	4,03	3,68	3,79	4,86	4,60	4,92	4,99	0,42	3,26	0,0013	0,0235
Lig1	7,66	13,12	7,83	8,52	7,27	6,98	8,93	7,18	-0,30	4,75	0,0013	0,0236
Gna12	9,87	8,21	9,71	9,31	6,27	8,04	7,99	6,71	-0,35	3,96	0,0013	0,0237
Sdf2	22,77	26,78	20,96	21,81	29,42	27,77	26,50	28,37	0,27	5,03	0,0013	0,0237
Fkbp4	34,25	33,81	32,99	31,90	40,88	38,89	35,30	39,31	0,22	6,29	0,0013	0,0237
Usp14	12,78	11,00	12,07	13,01	10,74	10,58	10,07	9,80	-0,25	5,56	0,0013	0,0238
Tceb2	71,79	107,66	110,77	65,54	98,67	100,96	112,52	107,03	0,25	5,62	0,0013	0,0240
Mtmr10	2,78	2,89	2,78	2,76	2,08	2,00	2,53	2,04	-0,37	3,70	0,0013	0,0244
Atr	9,79	7,16	7,34	8,71	6,72	7,32	7,55	6,69	-0,23	5,95	0,0014	0,0246
Sh3bp1	52,15	63,09	62,91	51,36	66,08	65,28	62,65	70,69	0,21	6,88	0,0014	0,0247
Taf1d	23,24	25,12	25,83	18,04	26,16	28,26	26,07	30,40	0,27	5,12	0,0014	0,0249
Rpl17	556,87	717,52	665,53	524,56	750,96	707,53	683,89	721,54	0,22	9,01	0,0014	0,0254
Rmi2	2,17	2,15	2,20	2,12	1,42	1,66	1,69	1,53	-0,46	2,81	0,0014	0,0254
H2-Oa	5,20	7,80	7,84	6,17	8,98	8,55	8,44	10,28	0,44	3,08	0,0014	0,0256
Gtf2a1	23,14	21,11	22,63	24,68	18,83	19,74	21,75	19,07	-0,21	6,93	0,0014	0,0257
Sh2d2a	81,42	81,06	74,95	79,41	95,76	90,90	91,49	90,05	0,22	8,67	0,0014	0,0259
Rpl7	543,43	654,00	657,13	556,39	684,52	695,65	663,60	756,94	0,22	9,25	0,0014	0,0259
Zfp740	24,12	26,71	24,64	25,23	27,61	29,15	27,96	31,60	0,21	6,67	0,0014	0,0259
Zfp407	16,73	12,57	12,22	13,08	11,74	11,38	12,78	11,45	-0,21	6,66	0,0015	0,0260
Flt3l	47,30	51,74	49,35	43,70	57,63	57,55	56,09	54,03	0,23	5,81	0,0015	0,0260
Mdn1	8,42	4,92	5,08	7,09	5,79	5,01	5,70	5,66	-0,21	6,74	0,0015	0,0264
Safb2	27,52	29,66	31,74	25,58	31,78	32,98	31,68	35,53	0,21	6,66	0,0015	0,0265
Slc25a22	9,65	9,62	11,02	9,73	12,84	11,66	11,86	12,05	0,28	4,95	0,0015	0,0266

Camta2	18,74	19,52	20,59	18,41	23,08	22,65	21,94	21,43	0,21	6,60	0,0015	0,0269
Dgkh	10,96	6,36	6,53	6,90	6,66	6,50	6,66	5,42	-0,29	4,80	0,0015	0,0269
Epas1	3,56	3,63	3,29	3,06	3,86	3,88	5,26	3,87	0,32	4,36	0,0015	0,0272
Exoc6	25,34	22,67	21,59	22,57	19,35	19,10	21,45	18,95	-0,23	5,87	0,0015	0,0272
Gimap1	57,13	75,97	83,45	61,48	75,16	76,22	77,83	90,63	0,21	6,81	0,0015	0,0272
Far1	31,51	29,47	32,08	33,10	26,87	28,19	28,11	26,30	-0,20	7,00	0,0016	0,0273
Hint1	60,53	93,16	77,17	59,84	77,68	87,03	85,29	94,14	0,25	5,52	0,0016	0,0275
Kdm6b	15,66	18,09	16,95	15,87	18,98	18,34	18,55	20,83	0,20	6,90	0,0016	0,0275
Zfp458	2,12	1,92	1,82	1,97	1,23	1,52	1,84	1,02	-0,49	2,56	0,0016	0,0276
Tfe3	7,96	9,34	9,16	8,44	10,60	10,32	10,44	10,68	0,27	5,05	0,0016	0,0278
Zbtb37	10,30	6,89	6,77	8,83	6,59	7,20	7,41	5,86	-0,29	4,87	0,0016	0,0278
Ppp1r18	91,62	112,25	104,99	90,00	116,46	114,55	110,62	120,58	0,21	8,42	0,0016	0,0278
Rpl13	534,86	668,27	719,73	551,53	703,05	746,24	662,47	757,74	0,21	9,02	0,0016	0,0279
Mybl1	1,07	1,25	1,46	1,10	0,69	0,67	1,01	0,93	-0,55	1,87	0,0016	0,0280
Raph1	5,45	4,67	4,51	4,96	4,37	3,70	4,27	4,13	-0,25	5,36	0,0016	0,0280
Ahsa1	41,24	48,45	47,00	41,94	53,75	52,21	48,91	52,96	0,22	6,00	0,0016	0,0282
Chordc1	37,05	36,09	38,51	39,16	41,95	43,39	38,50	50,15	0,21	6,49	0,0016	0,0282
Cd84	29,98	20,56	21,81	23,27	22,19	19,96	21,17	19,39	-0,21	6,30	0,0017	0,0284
Slc26a11	14,06	12,34	13,77	13,86	16,53	16,00	14,84	17,00	0,25	5,32	0,0017	0,0284
Higd2a	48,59	62,44	51,99	46,63	64,85	57,61	67,47	61,50	0,26	5,15	0,0017	0,0286
Ccr2	238,72	217,15	254,33	248,87	217,28	216,43	208,11	185,28	-0,21	9,65	0,0017	0,0289
Lnpep	182,08	138,71	141,92	182,44	141,55	131,11	145,78	138,11	-0,21	9,60	0,0017	0,0289
Iws1	14,20	11,06	11,38	12,57	11,21	10,44	10,80	10,31	-0,20	6,79	0,0017	0,0289
Braf	11,36	8,23	8,77	9,93	8,65	7,87	8,64	8,06	-0,21	6,44	0,0017	0,0290
Zfp41	3,34	3,16	3,16	3,92	2,92	2,46	2,51	2,54	-0,38	3,50	0,0017	0,0291
Cdk2ap2	77,24	85,64	80,97	72,55	92,09	92,91	92,25	88,63	0,21	6,28	0,0017	0,0291
Dnttip2	21,10	26,23	24,05	21,51	27,81	25,37	28,02	27,07	0,22	5,92	0,0017	0,0291
Rps14	741,35	746,18	821,98	717,10	904,74	884,47	788,48	927,31	0,21	8,93	0,0018	0,0303
Ralgapa1	19,05	14,40	15,62	16,66	14,90	13,87	14,82	13,58	-0,20	7,01	0,0018	0,0306
Mcm7	26,38	36,08	29,13	29,63	25,75	25,46	26,79	26,59	-0,22	6,08	0,0018	0,0306
Klrc3	24,17	12,14	17,32	18,48	14,92	14,52	13,63	12,03	-0,39	3,41	0,0018	0,0306
Mfng	52,42	49,46	51,41	50,64	56,72	60,60	57,31	60,07	0,20	6,65	0,0018	0,0307
Trdmt1	3,26	3,20	2,65	2,75	2,15	2,14	2,43	1,99	-0,45	2,78	0,0019	0,0311
Trim39	17,56	17,25	17,53	16,88	20,79	19,11	19,94	20,94	0,22	5,86	0,0019	0,0312
Cacybp	18,61	20,09	23,92	17,41	24,21	23,49	20,26	26,20	0,25	5,53	0,0019	0,0312
Slfn5	12,40	10,06	10,80	11,28	10,29	10,00	9,24	8,76	-0,22	5,96	0,0019	0,0313
Rpl18a	495,50	585,95	602,87	497,74	628,17	623,17	618,50	655,49	0,21	9,57	0,0019	0,0316
Runx3	79,73	82,76	87,23	71,85	94,39	90,26	90,81	96,20	0,21	8,40	0,0019	0,0317
Hist3h2bb-ps	14,03	18,44	18,91	17,19	10,73	12,89	13,67	12,87	-0,44	2,79	0,0019	0,0317
Kif1c	14,25	16,50	17,21	16,16	18,08	18,79	16,82	19,95	0,20	6,87	0,0019	0,0318
Tnip2	3,78	4,41	4,52	3,59	5,25	5,18	4,97	6,09	0,41	3,24	0,0019	0,0318
Prickle3	7,90	8,52	8,24	7,99	11,19	9,48	10,11	9,52	0,31	4,45	0,0020	0,0322
Slc17a9	23,02	20,21	23,50	23,34	27,12	25,84	24,59	27,83	0,23	5,75	0,0020	0,0322
Nup205	12,21	13,05	10,90	12,39	9,73	10,60	11,04	10,67	-0,21	6,14	0,0020	0,0324
Il18r1	59,71	56,60	51,58	50,53	41,78	49,37	55,09	43,41	-0,20	7,73	0,0020	0,0327
Rrs1	6,34	7,68	7,67	6,49	8,49	8,59	8,73	9,64	0,34	4,04	0,0020	0,0327
Vim	402,09	513,82	469,91	432,05	347,01	398,70	418,00	407,92	-0,21	9,60	0,0020	0,0327
Mfap1b	22,24	28,28	28,07	25,08	29,64	31,64	29,86	30,12	0,23	5,73	0,0020	0,0329
Slfn3	9,01	9,61	7,03	8,26	6,70	6,88	6,73	6,40	-0,36	3,79	0,0020	0,0330
Ost4	35,29	55,35	55,47	36,49	54,70	54,15	55,74	54,03	0,27	5,01	0,0020	0,0332
Cyth2	21,54	24,22	23,46	22,16	25,57	25,42	27,35	27,80	0,22	5,97	0,0020	0,0332
Spata5	22,82	18,26	17,06	18,69	15,67	17,87	17,29	14,86	-0,23	5,70	0,0021	0,0333
Gtf3c3	12,62	12,61	11,80	13,23	10,52	11,33	10,61	9,61	-0,26	5,12	0,0021	0,0333
Stk32c	3,87	4,13	3,21	3,30	2,66	2,42	2,60	3,04	-0,45	2,80	0,0021	0,0333
Nsa2	58,55	73,60	69,36	61,23	72,32	73,11	75,02	81,71	0,20	7,57	0,0021	0,0333

Arsb	36,58	41,54	37,13	36,74	32,91	32,62	37,07	29,80	-0,20	7,15	0,0021	0,0333
Llph	12,56	14,04	12,45	12,24	15,22	17,04	15,43	16,82	0,33	4,09	0,0021	0,0333
Ahnak	584,75	394,51	408,13	497,61	436,99	344,26	463,25	384,98	-0,21	12,96	0,0021	0,0333
Rnf40	26,92	33,76	34,88	29,83	37,43	35,97	34,05	36,36	0,20	7,13	0,0021	0,0335
Prr14	41,55	50,43	51,39	42,68	53,98	53,37	53,69	52,30	0,20	6,83	0,0021	0,0337
Dhx38	19,18	22,95	21,74	19,87	23,90	23,31	23,97	25,00	0,20	6,56	0,0021	0,0340
Pqbp1	19,69	23,65	22,24	17,94	24,36	24,23	24,04	28,41	0,28	4,84	0,0022	0,0343
Nfkb2	26,83	26,59	25,55	25,01	29,79	31,58	26,63	31,55	0,20	6,49	0,0022	0,0345
Zfp277	30,64	20,57	21,85	22,36	19,95	20,41	21,52	19,92	-0,22	5,77	0,0022	0,0352
Cdk11b	23,83	24,53	22,79	21,00	26,59	25,92	27,32	26,96	0,21	6,01	0,0022	0,0354
Orai1	14,32	14,98	16,07	12,40	18,86	16,24	16,36	18,06	0,28	4,90	0,0022	0,0355
Traf4	7,34	7,25	7,65	7,04	9,14	9,57	8,04	8,99	0,29	4,62	0,0023	0,0356
Clip1	27,47	28,86	30,33	26,60	32,96	32,24	29,07	35,54	0,20	7,11	0,0023	0,0356
Glce	2,09	2,45	1,68	2,41	1,49	1,62	2,17	1,29	-0,41	3,16	0,0023	0,0357
Irs2	2,09	1,51	1,77	1,54	2,49	2,61	1,83	2,28	0,42	3,04	0,0023	0,0357
Hist1h4j	58,78	93,46	90,63	60,82	56,81	59,58	67,23	61,68	-0,30	4,41	0,0023	0,0357
Xcl1	1,38	1,56	1,51	0,78	2,74	2,91	1,45	2,46	0,89	0,07	0,0023	0,0357
St8sia4	39,69	34,85	39,89	43,43	34,23	34,05	34,88	34,18	-0,20	7,64	0,0023	0,0359
Cep250	18,69	21,73	24,69	18,02	23,94	24,19	22,24	24,91	0,20	7,48	0,0023	0,0366
Hspd1	45,35	54,58	50,20	46,57	53,85	53,25	55,23	63,07	0,20	6,95	0,0024	0,0367
Xpo1	41,67	40,65	41,18	43,02	35,15	36,50	37,88	35,44	-0,20	7,65	0,0024	0,0369
Atp1b1	0,95	1,19	1,13	0,87	1,43	1,48	1,14	2,04	0,56	1,78	0,0024	0,0369
Ate1	12,14	10,83	11,89	12,57	10,15	10,02	11,06	9,45	-0,22	5,78	0,0024	0,0373
Gfpt1	31,13	28,42	28,15	31,70	26,09	26,40	27,70	23,95	-0,20	7,45	0,0024	0,0376
Vamp2	59,13	54,92	50,30	55,40	65,67	58,18	64,83	63,19	0,19	7,00	0,0025	0,0380
Gpsm2	4,74	6,27	5,23	4,18	3,39	3,96	4,65	4,26	-0,33	4,00	0,0025	0,0380
Tesc	5,00	5,98	4,82	4,53	8,22	6,85	5,69	7,35	0,46	2,56	0,0025	0,0381
Ceacam16	3,24	3,69	3,82	3,54	5,03	4,28	4,36	5,63	0,44	2,81	0,0025	0,0384
Setx	65,56	54,40	54,25	65,39	51,77	49,03	54,76	52,31	-0,21	9,26	0,0025	0,0386
Ndufa2	27,00	34,84	35,97	27,69	34,45	39,17	38,99	41,50	0,31	4,40	0,0025	0,0386
Zgpat	44,52	40,70	53,17	40,94	54,15	52,18	46,77	51,83	0,20	6,78	0,0025	0,0386
Cd300a	1,91	1,19	1,43	1,08	1,31	0,97	0,87	0,90	-0,46	2,49	0,0025	0,0386
Ltn1	22,30	19,99	20,73	23,78	18,76	18,77	19,95	18,34	-0,20	7,30	0,0025	0,0388
Gltscr2	190,71	229,39	256,68	200,79	250,71	257,98	248,91	252,70	0,20	8,52	0,0026	0,0392
Xrn1	53,08	44,10	43,61	49,02	42,33	39,59	41,29	42,06	-0,20	7,93	0,0026	0,0395
Mea1	16,61	19,29	17,00	14,61	22,20	19,72	20,38	21,68	0,32	4,17	0,0026	0,0395
Syf2	61,98	81,31	81,01	62,29	79,04	80,98	79,20	88,63	0,20	6,62	0,0026	0,0395
Ticrr	2,85	3,71	2,47	2,91	2,22	2,14	2,49	2,86	-0,31	4,29	0,0026	0,0395
Zyx	192,22	262,22	281,27	198,73	270,29	268,16	271,89	265,69	0,20	9,26	0,0027	0,0400
Klf6	87,29	87,68	78,69	102,74	95,93	89,89	106,15	118,74	0,20	8,66	0,0027	0,0402
Rps11	726,49	898,48	875,48	683,70	961,05	902,07	844,46	959,14	0,20	9,01	0,0027	0,0402
Mycbp2	50,02	32,73	34,64	42,67	36,68	32,23	34,93	35,16	-0,20	9,15	0,0027	0,0402
Rrp1	43,94	51,54	51,52	44,96	52,80	54,95	53,70	58,17	0,20	6,69	0,0027	0,0402
Cab39l	15,72	16,39	16,19	17,79	13,50	13,62	15,89	13,36	-0,23	5,54	0,0027	0,0402
Hic1	3,16	3,28	4,62	3,54	4,10	5,03	4,08	4,89	0,33	4,12	0,0027	0,0404
Hypk	3,72	6,57	7,52	4,30	8,19	8,67	6,31	8,03	0,54	2,04	0,0027	0,0404
Ube3a	33,65	26,39	28,52	30,47	24,53	26,39	26,52	26,65	-0,19	7,15	0,0027	0,0406
Arl6ip4	15,92	21,97	18,00	14,73	19,36	23,19	20,09	23,65	0,29	4,55	0,0028	0,0411
Whsc1	13,23	12,61	11,61	12,12	10,44	10,93	11,35	10,59	-0,20	6,50	0,0028	0,0414
Syvn1	15,16	17,27	16,92	15,87	19,53	17,87	18,89	19,16	0,21	5,94	0,0028	0,0416
Rps3	291,33	318,75	295,04	292,63	341,45	348,31	322,26	366,70	0,20	9,24	0,0028	0,0416
Rad18	5,60	6,01	5,04	5,63	3,35	4,35	4,94	5,00	-0,35	3,76	0,0028	0,0417
Tmie	1,32	1,53	1,79	1,35	2,54	1,84	1,70	2,29	0,51	2,17	0,0028	0,0418
Smdt1	38,76	62,33	52,38	37,63	52,44	59,34	55,88	61,14	0,26	4,95	0,0028	0,0418
Polr2g	20,82	26,54	21,14	22,37	29,89	27,63	26,47	27,47	0,29	4,47	0,0029	0,0420

Zkscan8	3,50	2,79	2,43	3,36	2,64	2,60	2,66	2,07	-0,29	4,61	0,0029	0,0420
Dync2h1	2,90	1,86	1,85	1,89	1,63	1,71	1,83	1,89	-0,28	4,77	0,0029	0,0422
Cwc27	5,34	5,05	5,87	3,49	3,54	3,90	3,64	3,73	-0,40	3,01	0,0029	0,0422
Dnajc7	43,27	46,46	49,45	43,79	51,72	51,49	50,43	55,31	0,19	6,83	0,0029	0,0429
Rtcb	41,85	46,53	40,76	44,42	46,96	49,90	49,26	52,67	0,19	6,53	0,0030	0,0434
Picalm	131,21	128,46	127,17	132,57	110,28	113,29	117,44	110,69	-0,20	8,99	0,0030	0,0435
H2-Q8	448,61	417,45	436,00	410,84	515,70	512,72	448,63	492,58	0,20	8,86	0,0030	0,0436
Plk4	7,58	9,42	7,55	8,17	6,04	6,62	7,71	6,76	-0,28	4,73	0,0030	0,0438
H2-Q6	462,28	430,02	449,23	423,21	531,16	528,09	462,16	507,49	0,20	8,86	0,0030	0,0439
Rfxank	9,99	9,72	10,17	9,44	11,36	12,41	11,59	11,02	0,24	5,31	0,0030	0,0440
Ybx1	53,81	81,15	71,05	52,21	68,63	72,57	75,51	77,97	0,19	7,24	0,0031	0,0453
Hist1h4m	92,16	124,88	141,50	97,58	87,22	100,39	107,84	90,88	-0,23	5,41	0,0032	0,0455
Jkamp	10,15	10,17	10,05	11,76	9,12	8,21	9,65	7,19	-0,30	4,24	0,0032	0,0457
Vmn2r96	8,90	5,46	5,49	6,13	5,49	5,20	4,67	5,28	-0,34	3,78	0,0032	0,0459
Wdr89	9,54	11,16	15,39	9,69	12,95	14,48	11,83	14,52	0,25	5,21	0,0032	0,0462
Kmt2c	29,13	17,83	19,97	24,08	22,22	17,88	19,70	19,50	-0,20	8,48	0,0032	0,0463
Wbp2	42,06	50,04	49,37	43,57	51,22	53,10	54,89	52,12	0,19	6,48	0,0032	0,0465
Bloc1s1	21,97	23,97	24,07	17,38	28,01	27,39	24,27	30,49	0,34	3,78	0,0033	0,0466
Fbl	21,36	31,46	28,89	21,87	30,48	27,30	28,56	36,75	0,25	5,04	0,0033	0,0467
Rara	41,54	49,48	51,95	40,15	54,01	50,74	53,81	50,29	0,19	7,37	0,0033	0,0467
Dynlrb1	56,82	90,44	83,68	60,61	84,42	78,36	93,12	81,78	0,22	5,76	0,0033	0,0472
Hist1h4n	119,11	161,47	182,17	126,51	112,39	130,31	139,70	117,18	-0,23	5,40	0,0034	0,0477
Mbd2	112,03	126,97	125,60	110,50	134,31	130,20	138,27	140,82	0,20	7,88	0,0034	0,0480
Prc1	15,13	21,68	18,23	18,25	15,90	14,51	17,22	15,41	-0,22	5,69	0,0034	0,0480
Tcf19	11,04	16,50	12,85	12,17	10,94	10,68	11,14	10,27	-0,29	4,41	0,0034	0,0480
Chst2	7,84	8,00	9,08	7,87	6,62	7,66	6,74	7,00	-0,22	5,57	0,0034	0,0481
Atf4	98,01	100,14	100,75	98,69	113,42	105,98	113,94	120,66	0,19	7,53	0,0034	0,0486
Thoc2	36,68	29,63	31,12	33,66	27,96	27,79	30,92	27,95	-0,19	7,87	0,0035	0,0490
Rps10	517,18	650,00	668,10	496,66	670,97	673,93	635,78	691,93	0,20	8,49	0,0035	0,0492
Pbx2	16,74	18,00	19,41	16,68	21,29	20,05	18,66	22,08	0,22	5,75	0,0035	0,0493
Rpl8	494,40	645,39	653,32	493,97	635,19	652,83	613,61	721,21	0,20	9,05	0,0035	0,0497
Txndc17	8,14	12,17	12,16	8,78	11,31	13,17	12,40	14,16	0,32	4,07	0,0036	0,0497
Huwe1	66,36	45,27	47,09	60,18	51,00	43,19	50,93	45,75	-0,20	9,55	0,0036	0,0498
Prr5l	4,33	4,46	4,16	4,19	3,58	3,64	3,06	3,55	-0,31	4,06	0,0036	0,0498
Socs1	8,87	8,75	10,52	6,92	9,77	12,91	8,48	12,97	0,35	3,73	0,0036	0,0500
Furin	28,99	30,15	31,31	30,11	33,79	34,91	33,86	34,80	0,19	7,11	0,0036	0,0500
Eif3k	73,30	89,71	94,27	71,58	95,00	91,63	94,01	94,55	0,20	6,36	0,0036	0,0500
Psmc3	43,24	52,78	46,21	43,46	51,60	52,14	51,15	57,49	0,19	6,35	0,0036	0,0504
Nedd1	12,08	11,26	12,39	12,75	9,89	10,50	10,51	10,32	-0,23	5,31	0,0037	0,0506
Klf2	249,63	340,73	349,85	261,53	347,32	345,45	334,31	350,26	0,20	9,19	0,0037	0,0509
Entpd1	13,87	13,52	13,05	12,54	12,96	11,07	11,57	10,01	-0,22	5,69	0,0037	0,0509
Hsp90aa1	83,60	93,90	91,78	84,85	101,49	101,25	96,08	106,24	0,19	8,08	0,0037	0,0509
Nudc	16,16	25,10	20,43	17,91	24,82	22,25	24,00	24,09	0,26	4,89	0,0037	0,0512
Sod1	119,65	152,39	121,72	117,89	148,79	137,84	143,56	153,92	0,19	6,48	0,0037	0,0513
Cdk6	25,74	20,30	18,38	24,20	21,93	18,01	18,75	17,79	-0,22	5,68	0,0038	0,0515
Wscd2	1,64	1,41	1,34	1,89	1,29	1,31	1,19	0,82	-0,46	2,40	0,0038	0,0515
Rad54l2	17,93	17,13	15,85	19,86	16,09	14,51	16,37	15,22	-0,19	7,28	0,0038	0,0520
Cdc25c	1,65	1,97	1,80	1,87	0,84	1,12	1,75	1,33	-0,54	1,61	0,0038	0,0520
Hist1h4h	108,40	149,58	160,85	113,86	101,62	125,11	129,46	104,02	-0,20	5,89	0,0039	0,0526
Tnfrsf25	0,77	0,89	0,83	1,47	1,45	1,82	1,42	1,45	0,60	1,12	0,0039	0,0528
Tpcn1	18,29	18,00	18,62	17,42	22,17	19,19	19,51	21,54	0,19	6,49	0,0039	0,0528
Calcoco1	23,38	27,30	27,63	24,64	30,04	29,35	28,38	29,82	0,19	6,28	0,0039	0,0533
Setd8	22,46	27,26	26,70	23,19	27,41	28,08	27,11	31,35	0,20	6,19	0,0040	0,0539
Tmem167	10,76	8,41	8,94	9,82	8,02	8,50	8,49	8,33	-0,19	6,59	0,0040	0,0539
Ireb2	26,04	22,34	23,51	26,72	20,76	21,10	22,69	22,17	-0,19	7,07	0,0040	0,0542

Lair1	16,25	14,41	13,41	15,54	13,37	12,64	12,24	13,10	-0,22	5,61	0,0040	0,0542
Rps8	443,24	569,21	556,30	463,23	536,99	618,24	506,04	664,81	0,20	8,66	0,0040	0,0545
Tmem63a	19,98	20,93	20,91	23,45	24,85	25,09	23,70	23,93	0,19	6,21	0,0041	0,0549
Bhlhe40	82,07	73,80	54,71	68,03	81,28	74,96	84,34	77,62	0,19	7,86	0,0042	0,0562
Zc3h15	30,14	41,81	39,19	31,26	40,77	39,67	38,99	43,17	0,20	6,23	0,0042	0,0564
Ptp4a1	40,96	35,63	34,81	40,89	41,59	42,28	41,94	47,59	0,19	7,40	0,0042	0,0566
Ubxn4	27,45	27,08	29,04	26,46	30,62	31,54	30,04	32,82	0,19	6,91	0,0042	0,0568
Smg1	74,03	47,46	52,54	65,48	53,48	47,80	54,92	53,14	-0,19	9,77	0,0042	0,0568
Rnf6	21,47	27,56	26,01	21,83	25,79	26,75	26,21	31,51	0,19	6,44	0,0043	0,0569
Ebna1bp2	7,93	8,59	7,99	6,59	9,48	9,60	8,79	9,56	0,27	4,67	0,0043	0,0569
Hist1h4k	76,44	120,95	111,24	71,19	71,71	89,78	78,58	75,64	-0,26	4,76	0,0043	0,0569
Il18	4,94	4,81	3,93	4,25	3,43	2,68	3,46	3,03	-0,52	1,76	0,0043	0,0569
Crip2	5,05	5,55	4,67	3,85	3,17	3,71	3,66	3,64	-0,43	2,59	0,0043	0,0569
Eri2	5,44	4,49	4,85	5,56	4,00	3,95	4,57	3,94	-0,31	4,04	0,0043	0,0569
Aif1	2,14	1,68	1,08	1,06	0,98	1,90	0,47	0,17	-0,80	0,17	0,0043	0,0572
Ndufb3	16,99	24,69	24,71	12,72	21,92	24,53	24,41	28,83	0,35	3,58	0,0043	0,0572
Bms1	17,38	20,14	20,40	17,96	20,69	21,51	21,19	22,94	0,19	6,44	0,0044	0,0580
Cnpy4	5,07	6,22	4,78	5,56	6,84	6,76	6,73	7,36	0,34	3,49	0,0044	0,0583
Myl12a	106,76	156,44	145,50	106,69	146,27	145,19	145,90	150,00	0,19	7,94	0,0044	0,0583
Lamtor2	26,41	34,33	33,95	23,19	36,09	33,70	37,77	36,39	0,30	4,23	0,0044	0,0584
Ptbp2	13,97	8,14	9,59	10,65	8,29	9,39	9,08	9,09	-0,24	5,04	0,0044	0,0584
Fnip2	1,68	1,24	1,20	1,40	1,10	1,21	1,00	0,97	-0,38	3,13	0,0045	0,0586
Copg2	9,60	8,90	8,31	10,35	7,78	8,07	8,42	7,31	-0,24	5,11	0,0045	0,0593
Hspe1	30,08	38,67	35,83	27,07	38,43	37,72	39,49	41,49	0,26	4,80	0,0046	0,0602
Itga1	13,06	10,16	10,51	14,56	10,72	9,44	11,93	10,21	-0,20	6,09	0,0047	0,0619
Eef1d	24,69	32,12	27,69	24,49	29,54	31,04	29,93	33,57	0,19	6,38	0,0048	0,0620
Hcst	92,67	96,35	115,54	81,32	110,58	125,72	103,44	107,34	0,22	5,52	0,0048	0,0620
Pltp	1,54	2,04	1,94	2,04	2,50	2,59	3,12	2,30	0,48	2,08	0,0048	0,0621
Ndufb10	31,24	36,58	37,38	30,11	39,84	38,48	42,68	41,76	0,27	4,57	0,0048	0,0625
Il7r	69,90	60,84	66,99	78,99	72,89	76,79	85,70	79,77	0,19	7,89	0,0048	0,0625
Slc36a1	14,58	14,20	14,22	15,30	16,94	16,71	15,73	17,02	0,19	6,36	0,0048	0,0625
Pou6f1	24,87	26,36	25,67	27,35	31,64	27,02	28,17	31,48	0,18	6,99	0,0048	0,0625
Ssh3	6,20	5,77	5,79	5,39	7,15	7,19	6,86	7,24	0,30	4,15	0,0048	0,0626
Os9	54,74	65,75	56,85	56,99	68,34	67,65	65,26	65,68	0,19	7,99	0,0049	0,0628
Dpy19l4	6,77	5,62	5,17	7,18	5,02	5,01	5,19	4,96	-0,30	4,08	0,0049	0,0630
Ccl27a	0,49	1,67	0,75	0,61	1,37	1,77	1,44	1,46	0,73	0,25	0,0049	0,0636
Rexo4	21,61	25,52	26,00	21,60	27,44	27,32	24,44	29,58	0,20	5,86	0,0050	0,0636
Tbxa2r	20,49	21,98	28,34	20,40	26,93	26,75	24,25	27,39	0,22	5,58	0,0050	0,0640
Mms22l	10,49	8,81	8,43	8,43	7,96	7,65	7,36	7,91	-0,23	5,23	0,0050	0,0646
Rin3	47,77	54,38	54,52	50,78	60,41	56,82	60,36	58,23	0,19	7,74	0,0051	0,0653
Rps26	523,62	678,55	685,42	479,50	640,18	681,93	685,99	685,67	0,19	8,15	0,0051	0,0653
Phf14	19,34	16,01	15,71	14,57	13,90	14,55	14,76	14,70	-0,18	6,84	0,0051	0,0654
Zfp703	5,10	7,18	7,53	5,28	7,94	7,61	6,68	7,90	0,28	4,52	0,0052	0,0659
Zfp622	20,55	25,56	25,68	22,36	25,45	26,74	26,39	28,73	0,19	6,14	0,0052	0,0661
Parp3	18,87	20,12	22,27	17,84	21,72	25,51	21,62	22,00	0,21	5,81	0,0052	0,0665
Zranb3	1,23	1,62	1,19	1,27	0,94	0,81	1,26	0,90	-0,45	2,31	0,0052	0,0665
H2-Ke2	11,75	22,83	21,83	11,73	17,95	21,09	21,03	24,43	0,33	3,78	0,0053	0,0667
Spdl1	1,62	3,32	2,34	1,60	0,75	1,63	2,04	2,07	-0,46	2,28	0,0053	0,0667
Clk2	38,63	42,03	46,18	39,08	47,76	47,74	44,46	47,95	0,18	6,68	0,0053	0,0667
Mrps15	13,40	17,14	16,64	10,14	17,29	17,13	17,33	18,99	0,32	3,92	0,0053	0,0670
Fanci	1,60	2,15	1,58	1,93	1,25	1,29	1,57	1,47	-0,39	2,91	0,0053	0,0670
Ddrgk1	19,67	23,99	23,96	19,33	25,95	26,95	24,54	26,38	0,26	4,72	0,0053	0,0670
Rnf126	17,00	20,03	23,66	19,21	24,12	23,48	22,58	23,30	0,24	5,15	0,0054	0,0673
Anxa2	129,87	171,13	127,19	143,50	111,29	119,90	138,55	134,56	-0,18	7,53	0,0054	0,0673
Gabpb1	7,08	5,74	5,78	6,04	4,71	5,37	5,12	5,00	-0,29	4,19	0,0054	0,0675

Strn3	18,03	14,82	16,22	16,53	14,20	14,10	14,81	14,26	-0,19	6,00	0,0054	0,0675
Map7d1	39,21	47,79	48,26	38,64	50,33	47,87	46,82	51,85	0,18	7,29	0,0055	0,0683
Cdk16	18,26	16,79	18,06	16,63	21,33	20,42	18,89	19,43	0,20	5,84	0,0055	0,0683
Nars	26,82	30,99	28,19	26,31	32,05	32,00	30,39	33,29	0,19	6,32	0,0055	0,0683
Ckap2	4,56	6,39	5,64	5,34	3,49	3,58	5,06	5,38	-0,32	3,68	0,0055	0,0687
Uqcr11	19,87	38,22	40,78	20,81	37,79	37,55	38,63	33,13	0,33	3,87	0,0055	0,0689
Rb1cc1	30,61	26,19	28,00	30,37	25,05	25,43	26,79	24,28	-0,18	7,58	0,0056	0,0692
Dedd	12,03	11,35	11,00	11,16	14,07	13,03	13,16	13,34	0,23	5,09	0,0056	0,0698
Atp8a1	9,23	6,52	6,79	7,49	6,78	6,91	6,15	6,35	-0,20	5,85	0,0057	0,0700
Fbxl2	5,48	3,76	4,52	4,72	4,12	3,96	3,74	2,97	-0,32	3,74	0,0057	0,0705
Zfp292	33,39	24,95	26,76	28,59	25,25	24,03	25,67	25,10	-0,18	8,06	0,0057	0,0705
Ly6e	197,50	237,60	214,56	188,16	240,34	232,99	249,44	231,38	0,19	9,00	0,0057	0,0705
Mbnl3	14,21	12,69	12,43	15,05	12,22	11,04	11,90	12,94	-0,18	6,80	0,0057	0,0706
Rpl12	603,78	678,34	601,81	526,92	703,43	678,31	635,69	728,29	0,19	8,68	0,0057	0,0706
Srsf5	206,87	227,57	209,96	227,16	239,04	242,48	250,49	260,30	0,19	8,59	0,0058	0,0717
Orc3	11,61	8,95	10,04	9,92	9,02	8,80	8,93	8,62	-0,20	5,90	0,0058	0,0717
Dda1	30,53	38,43	40,03	33,82	41,80	39,06	41,59	39,19	0,18	6,44	0,0059	0,0721
Zfp935	14,82	12,91	13,85	14,02	12,51	11,54	12,20	10,87	-0,24	4,99	0,0059	0,0721
Zfp236	20,27	16,79	17,55	19,49	17,20	16,08	16,42	15,80	-0,18	7,37	0,0059	0,0726
Gpd2	10,77	9,43	9,20	10,57	9,53	8,08	9,59	7,60	-0,20	5,75	0,0060	0,0730
Tsc22d4	62,35	70,29	75,80	61,56	76,80	79,25	71,20	78,28	0,18	7,49	0,0060	0,0735
Hist1h2bf	34,67	56,98	55,10	33,07	32,52	34,64	41,47	36,36	-0,30	3,94	0,0060	0,0737
Ctdnep1	38,70	47,97	52,09	40,19	49,85	49,13	50,83	53,00	0,19	6,27	0,0061	0,0745
Klrg1	11,25	12,61	11,99	14,34	9,90	10,01	13,81	7,07	-0,30	3,96	0,0061	0,0747
Lactb2	19,33	19,56	22,20	20,40	16,58	17,83	19,30	15,73	-0,23	5,15	0,0062	0,0749
Itpr1	19,88	17,23	17,18	18,30	16,26	15,25	16,77	15,91	-0,18	7,40	0,0062	0,0749
Ik	29,33	40,46	38,19	32,57	37,16	39,55	38,69	44,19	0,19	6,23	0,0062	0,0753
Unc119	17,03	19,36	19,79	17,42	23,04	23,40	20,02	21,20	0,26	4,70	0,0063	0,0759
Usp34	44,54	32,32	35,87	39,87	35,18	30,84	34,19	34,00	-0,19	8,77	0,0063	0,0760
Pign	9,12	6,83	6,75	8,44	6,55	6,72	6,89	6,89	-0,21	5,63	0,0063	0,0760
Polq	1,40	1,64	1,27	1,47	1,05	0,98	1,31	1,27	-0,34	3,48	0,0063	0,0760
Hist1h2bp	27,10	39,27	37,25	27,82	25,86	25,87	29,04	26,65	-0,28	4,15	0,0064	0,0767
Fbxl4	5,08	3,89	4,35	5,16	3,97	3,74	4,10	2,82	-0,34	3,41	0,0064	0,0769
Il4ra	21,67	22,05	21,52	23,52	25,12	23,91	25,16	26,12	0,18	6,91	0,0064	0,0770
Zmym4	7,98	6,38	6,71	7,09	6,64	6,03	5,62	6,08	-0,21	5,53	0,0064	0,0772
Nolc1	8,30	10,42	11,17	8,38	10,80	11,48	10,06	12,18	0,23	5,25	0,0065	0,0772
Ngly1	43,65	40,85	40,36	46,90	38,19	36,00	38,63	39,33	-0,18	6,88	0,0065	0,0775
Zdhhc2	17,12	16,70	16,47	17,47	14,04	15,91	14,18	14,12	-0,22	5,30	0,0065	0,0778
Prr13	132,00	160,10	146,43	131,34	159,25	157,86	169,08	158,52	0,18	7,55	0,0065	0,0779
Exoc4	27,87	23,80	23,25	24,23	22,14	21,14	23,17	21,22	-0,18	6,44	0,0066	0,0781
Dock5	49,64	40,55	42,60	47,98	41,40	37,88	43,20	36,62	-0,18	8,78	0,0066	0,0784
Cdan1	10,71	10,28	10,87	9,96	12,19	11,77	11,55	12,00	0,19	6,16	0,0066	0,0784
Sytl1	12,86	13,67	15,18	12,46	15,78	16,57	15,68	15,99	0,25	4,83	0,0066	0,0788
Chek1	1,28	1,70	1,20	1,37	1,01	1,13	1,08	0,84	-0,46	2,06	0,0067	0,0788
Ptpn6	84,00	85,70	91,59	77,00	99,03	95,02	89,68	98,95	0,18	7,65	0,0067	0,0792
Rps20	293,56	330,45	340,41	297,81	326,37	378,25	332,01	389,18	0,18	7,40	0,0067	0,0796
Trim65	13,53	12,37	15,44	12,97	16,45	15,25	14,17	16,82	0,21	5,48	0,0068	0,0802
Gpcpd1	33,82	26,79	27,35	30,10	25,19	26,71	28,35	24,36	-0,18	6,69	0,0069	0,0809
Ankrd32	6,50	5,25	5,31	6,07	4,81	5,36	4,66	4,35	-0,28	4,31	0,0069	0,0814
Chtf18	1,84	3,11	2,53	2,21	1,57	1,93	1,93	1,94	-0,40	2,73	0,0069	0,0815
Ubn2	17,95	11,97	12,39	15,39	13,14	12,24	13,27	12,40	-0,18	7,64	0,0070	0,0822
Exoc2	36,98	35,09	31,62	34,00	29,92	29,47	32,57	30,13	-0,18	7,11	0,0070	0,0822
Tbck	19,02	13,49	14,51	18,00	14,90	13,72	14,93	13,13	-0,20	5,69	0,0070	0,0822
Rpe	27,61	24,88	25,82	27,35	22,35	24,08	21,96	24,51	-0,19	6,03	0,0070	0,0822
Fam129b	5,66	6,75	5,94	4,94	4,15	5,69	4,81	4,64	-0,27	4,30	0,0071	0,0828

Lrpap1	10,65	10,94	9,63	10,36	12,62	11,89	11,62	12,71	0,23	5,05	0,0071	0,0829
Tmem41b	6,26	6,99	6,59	6,79	5,14	5,62	5,70	5,76	-0,26	4,47	0,0072	0,0836
Trib1	3,04	4,39	3,24	3,19	4,09	3,82	4,75	4,39	0,29	3,98	0,0072	0,0836
Hist1h4c	79,18	119,06	138,82	79,84	86,19	92,04	91,09	81,50	-0,23	4,89	0,0072	0,0841
Fnip1	8,82	7,37	7,65	8,34	6,74	7,15	7,34	6,70	-0,21	5,56	0,0072	0,0841
Bcor	19,30	21,22	21,34	20,07	23,44	22,23	22,31	24,44	0,17	7,24	0,0073	0,0843
Hnrnpc	104,74	96,17	98,79	111,57	87,32	87,67	98,40	89,87	-0,18	8,11	0,0073	0,0844
Otud1	7,48	6,36	4,90	7,19	7,89	7,83	7,41	8,51	0,27	4,21	0,0073	0,0850
Wdhd1	8,49	8,74	7,79	7,53	6,77	6,52	7,39	7,05	-0,23	4,98	0,0074	0,0850
Map1lc3a	3,79	3,10	3,53	3,57	4,45	4,00	3,87	6,77	0,45	2,16	0,0074	0,0850
Hspa8	914,31	935,60	961,12	923,82	1079,83	1024,40	997,71	1137,13	0,18	11,03	0,0074	0,0850
Ddit3	6,26	7,65	8,58	7,43	9,93	9,43	8,81	10,51	0,38	2,92	0,0074	0,0854
Anp32a	52,55	64,19	54,56	53,72	63,90	61,17	63,74	64,94	0,17	6,97	0,0075	0,0866
Asah1	13,61	14,39	12,81	14,07	11,53	11,77	11,46	11,80	-0,24	4,84	0,0076	0,0869
Med31	2,16	2,03	1,95	1,69	2,48	2,52	3,25	2,94	0,51	1,54	0,0076	0,0869
Tsen54	7,00	7,38	8,92	7,01	9,36	8,61	9,12	9,71	0,29	4,06	0,0077	0,0878
Ccdc82	50,37	40,37	41,74	41,49	38,59	38,46	39,43	37,70	-0,17	7,57	0,0078	0,0889
Ubfd1	14,51	12,08	12,72	14,81	15,55	14,50	14,76	16,64	0,18	6,13	0,0078	0,0889
Tmsb15b2	2,91	4,32	4,17	2,95	4,36	5,70	4,27	5,96	0,51	1,61	0,0078	0,0889
Glcci1	20,06	20,51	19,78	21,99	17,96	18,04	19,01	18,11	-0,17	6,91	0,0078	0,0889
Nedd8	48,94	62,93	52,94	48,54	63,46	55,48	64,78	65,33	0,22	5,13	0,0078	0,0890
Narf	18,16	17,86	17,38	18,35	20,78	19,22	20,44	20,63	0,18	6,40	0,0078	0,0890
Chm	16,28	14,75	15,89	16,07	13,07	14,83	14,30	13,38	-0,18	6,17	0,0078	0,0890
Ncapd3	18,70	17,55	16,51	17,58	16,64	14,68	16,13	14,96	-0,17	6,51	0,0079	0,0893
Hnrnpm	44,07	50,26	48,93	41,04	48,99	51,26	51,86	55,39	0,17	6,96	0,0079	0,0894
Lactb	7,45	9,36	8,66	8,23	10,38	9,48	9,59	11,28	0,27	4,25	0,0079	0,0895
Intu	3,68	2,05	1,90	2,77	2,49	1,96	2,20	1,87	-0,30	3,93	0,0080	0,0898
Fam126b	4,33	3,36	2,86	4,06	3,36	2,75	3,19	3,16	-0,24	4,89	0,0080	0,0898
Hist1h2bh	35,51	60,45	63,29	37,97	37,04	39,27	41,83	42,85	-0,27	4,08	0,0080	0,0902
Calcrl	6,04	5,59	5,37	6,73	4,48	5,14	5,20	5,24	-0,25	4,70	0,0080	0,0903
Armc7	95,41	99,21	92,05	96,85	110,13	107,59	107,38	108,21	0,18	7,84	0,0081	0,0910
Ash1l	32,96	21,61	24,01	26,28	25,18	22,23	23,15	22,21	-0,18	8,12	0,0081	0,0910
Pbrm1	43,20	40,74	41,03	46,75	38,07	37,36	39,31	37,05	-0,18	8,36	0,0081	0,0911
Ccdc59	13,89	17,18	14,48	15,10	16,68	19,07	17,69	20,15	0,27	4,19	0,0081	0,0913
Bag3	5,05	6,82	6,46	6,30	8,23	7,05	6,64	7,92	0,28	4,16	0,0082	0,0914
Rgs2	6,43	4,92	3,93	6,26	6,76	6,18	5,82	7,48	0,26	4,19	0,0082	0,0915
Gnptg	48,92	47,10	46,94	45,89	54,40	55,90	53,61	50,88	0,19	5,96	0,0082	0,0917
Rbm8a	10,06	14,71	12,18	11,19	13,27	14,91	13,16	14,88	0,22	5,10	0,0082	0,0918
Asxl2	35,72	26,91	27,91	32,46	29,49	26,03	27,96	25,42	-0,18	8,03	0,0083	0,0918
Cfdp1	15,84	23,11	21,64	15,38	22,59	20,32	22,50	24,55	0,25	4,66	0,0083	0,0918
Arhgap11a	8,35	12,73	9,05	9,80	7,77	8,18	8,85	9,99	-0,21	5,55	0,0083	0,0923
Hsd17b10	16,79	19,47	18,89	18,08	25,08	19,30	23,07	20,96	0,28	4,22	0,0083	0,0925
Nfkbiz	48,31	39,26	35,10	36,44	45,97	45,17	42,20	45,98	0,17	7,35	0,0083	0,0925
Rere	15,57	17,24	16,09	16,73	18,71	18,02	18,85	18,29	0,17	7,03	0,0084	0,0925
Ncl	42,99	48,78	43,81	42,71	48,51	48,10	50,06	55,16	0,18	8,62	0,0084	0,0926
BC037034	35,54	34,92	42,72	36,50	42,31	44,90	40,52	40,53	0,17	6,66	0,0084	0,0929
Dhfr	1,74	2,08	1,68	1,75	1,55	1,35	1,55	1,23	-0,35	3,11	0,0084	0,0929
Phf11a	23,62	27,87	21,58	25,10	21,70	21,25	22,70	18,27	-0,23	4,95	0,0085	0,0933
Chid1	5,98	4,32	5,20	5,58	4,44	4,41	4,74	3,95	-0,26	4,35	0,0085	0,0933
Anapc1	27,48	25,98	24,97	28,74	24,10	22,76	25,50	22,64	-0,17	7,82	0,0085	0,0939
Hmga1	45,23	53,09	52,90	45,71	57,73	52,37	53,08	58,31	0,17	6,71	0,0086	0,0939
Rpl6	467,60	563,30	554,10	460,05	575,33	577,07	547,69	614,10	0,18	9,41	0,0086	0,0940
Prr14l	31,14	24,68	26,58	30,35	26,31	23,49	25,51	24,53	-0,18	8,13	0,0086	0,0940
Tnfrsf22	8,53	8,96	8,73	11,06	10,55	10,30	12,33	11,31	0,25	4,55	0,0086	0,0940
Ranbp2	53,23	41,22	40,56	50,98	41,43	38,12	44,02	40,84	-0,18	8,70	0,0086	0,0940

Rpl34	350,55	379,02	410,05	305,60	413,26	420,85	374,71	421,31	0,18	7,92	0,0086	0,0943
Fbxo5	10,15	13,91	9,21	9,88	8,19	8,36	10,08	9,20	-0,28	4,17	0,0087	0,0943
Usf1	28,84	33,64	31,11	30,05	36,22	35,41	33,18	35,86	0,19	5,92	0,0087	0,0943
Map3k14	16,84	16,05	15,64	16,47	19,57	18,88	17,32	17,81	0,18	6,18	0,0087	0,0948
Myeov2	29,54	43,41	39,08	28,32	41,94	47,16	39,39	41,45	0,28	4,10	0,0088	0,0956
Ifng	62,73	55,46	50,22	48,83	63,70	59,85	60,49	62,10	0,18	6,13	0,0089	0,0961
Hmga1-rs1	56,15	65,80	65,59	56,58	71,41	64,68	65,93	72,40	0,17	6,70	0,0089	0,0962
Rbfa	22,72	25,73	28,39	26,55	28,12	29,99	30,45	31,22	0,22	5,23	0,0089	0,0966
Ska3	3,03	3,49	2,47	3,34	2,28	2,18	2,65	2,34	-0,40	2,65	0,0090	0,0968
Gpr52	3,35	1,90	2,44	1,81	1,51	1,67	1,80	1,50	-0,54	1,15	0,0090	0,0968
Mavs	12,36	14,17	12,97	12,52	15,29	15,58	14,29	14,82	0,20	5,44	0,0090	0,0968
Atp7a	6,69	5,72	5,74	7,07	5,54	5,46	5,82	5,21	-0,20	5,60	0,0090	0,0968
Ubb	523,24	659,93	580,90	530,40	658,33	659,82	665,44	611,26	0,18	9,48	0,0090	0,0968
Utp14a	13,55	17,74	13,50	13,31	15,57	16,66	17,09	18,13	0,21	5,26	0,0090	0,0970
Tmsb15l	2,67	4,06	3,69	2,63	3,88	5,28	3,82	5,24	0,49	1,73	0,0091	0,0973
Atp6v0b	33,29	29,33	35,13	32,00	39,44	38,24	36,70	36,31	0,22	5,13	0,0091	0,0973
Ppcdc	10,75	11,21	9,58	9,52	12,06	12,20	11,60	12,32	0,23	4,95	0,0091	0,0976
Cherp	28,04	30,60	31,58	26,04	33,15	32,53	32,98	31,90	0,17	6,87	0,0091	0,0976
Ppm1m	28,42	28,71	29,69	26,69	31,78	33,50	31,55	32,60	0,19	5,78	0,0091	0,0977
Imp3	28,19	33,09	32,51	29,67	33,12	37,10	36,21	38,25	0,23	4,92	0,0093	0,0989
Atp5j	39,57	67,82	73,98	35,77	55,63	63,61	60,08	69,05	0,21	5,46	0,0093	0,0991
Wbp4	8,12	10,43	10,63	8,74	10,89	11,16	10,30	11,62	0,22	5,15	0,0093	0,0993
Rpl34-ps1	531,74	575,74	622,83	463,98	627,45	637,74	567,58	638,96	0,17	7,91	0,0094	0,1000
Tcta	5,88	4,45	6,04	5,75	3,78	4,45	4,96	4,07	-0,35	3,00	0,0094	0,1000
Dvl2	13,23	15,31	14,63	14,52	18,06	16,44	15,38	16,40	0,20	5,51	0,0094	0,1000
Exosc3	14,22	24,69	22,96	15,93	20,97	23,34	22,88	25,31	0,26	4,47	0,0094	0,1000
Exoc1	18,45	18,24	17,03	17,21	14,33	17,40	16,34	14,25	-0,19	5,81	0,0094	0,1000
Farp1	2,26	2,03	2,30	1,96	1,51	1,94	1,79	1,50	-0,34	3,21	0,0094	0,1000
Hs6st1	6,71	6,97	6,48	6,66	8,31	7,87	7,37	8,10	0,24	4,78	0,0095	0,1003
Dmxl1	14,64	9,87	10,53	12,97	10,97	10,69	10,89	10,23	-0,17	7,12	0,0096	0,1009
Acin1	69,35	73,57	75,84	66,13	82,79	79,03	76,12	83,65	0,18	8,49	0,0096	0,1009
Rpl27a	232,50	313,70	304,46	233,22	303,03	311,07	290,86	317,48	0,17	8,32	0,0096	0,1015
Setd1b	26,31	28,67	30,78	27,58	34,07	29,49	31,83	32,31	0,17	8,06	0,0097	0,1015
Lrrc8b	4,14	5,73	5,33	4,69	3,73	4,08	4,47	3,83	-0,30	3,68	0,0097	0,1015
Lrrn4cl	4,22	2,64	3,15	3,55	3,35	2,46	2,60	2,18	-0,35	2,98	0,0097	0,1016
Mad2l1	11,38	15,40	9,98	13,67	10,10	9,78	11,45	11,01	-0,27	4,33	0,0098	0,1028
Cox6a1	67,92	88,36	84,81	63,75	84,19	82,52	95,15	88,09	0,21	5,45	0,0098	0,1032
Rb1	25,37	22,53	22,10	24,28	21,04	21,02	21,46	20,47	-0,17	6,69	0,0099	0,1041
Ppp2r5b	10,41	9,72	10,76	9,81	12,50	12,58	11,32	11,20	0,23	4,91	0,0100	0,1045
Ngdn	23,22	30,34	28,53	24,80	29,69	29,60	28,11	36,69	0,22	5,12	0,0100	0,1045
Casc4	10,14	9,23	8,51	8,94	8,20	8,07	8,04	7,49	-0,21	5,17	0,0100	0,1045
Pik3ip1	32,42	34,74	33,86	37,51	40,70	40,27	33,64	41,40	0,17	6,37	0,0100	0,1045
Clasp2	15,88	14,82	15,62	16,52	14,14	13,69	14,18	13,92	-0,17	6,56	0,0101	0,1049
Sltm	27,08	29,02	29,72	24,30	30,82	30,27	28,93	33,50	0,17	6,75	0,0101	0,1050
Yrdc	14,45	14,13	11,20	14,20	15,23	18,03	14,11	17,03	0,24	4,54	0,0101	0,1051
Als2cl	47,56	40,39	46,66	41,59	50,70	49,86	45,82	51,89	0,17	7,92	0,0103	0,1064
Nrm	19,03	22,66	19,70	21,40	17,57	17,07	20,25	15,68	-0,23	4,82	0,0103	0,1067
Etv6	17,70	17,25	14,88	17,29	20,21	17,92	18,11	19,20	0,16	6,63	0,0104	0,1074
Ccnl2	73,05	69,36	80,40	66,24	81,96	82,65	77,81	82,07	0,17	7,55	0,0104	0,1074
Plagl2	15,45	17,94	16,56	17,58	18,88	18,20	18,92	19,86	0,17	6,60	0,0104	0,1075
Zkscan14	5,40	8,29	7,21	6,09	8,64	8,27	7,72	8,22	0,29	3,90	0,0105	0,1078
Gabarap	101,70	107,67	101,40	96,58	123,09	113,11	109,66	110,98	0,17	6,92	0,0105	0,1078
Sqstm1	97,11	103,94	98,97	102,60	112,75	110,33	111,35	118,36	0,17	7,74	0,0105	0,1085
Lman1	9,17	10,77	10,37	10,38	8,11	8,86	9,38	8,66	-0,22	5,08	0,0106	0,1085
Tmem106a	2,04	2,11	1,89	1,73	1,89	1,58	1,10	1,14	-0,44	1,98	0,0106	0,1085

Zzef1	31,24	23,74	25,58	29,60	26,19	23,18	24,51	23,97	-0,17	8,18	0,0106	0,1088
Vps13a	31,95	23,69	23,84	26,93	23,11	22,35	24,32	24,78	-0,17	8,13	0,0107	0,1091
Gas7	2,81	3,43	2,61	3,27	2,42	2,34	3,03	2,38	-0,26	4,32	0,0107	0,1091
Slc41a1	10,86	11,72	12,60	12,11	14,04	13,46	12,43	13,69	0,18	5,88	0,0107	0,1091
Slc3a2	47,26	45,57	39,13	46,14	50,84	48,16	50,63	50,30	0,16	7,06	0,0107	0,1091
Taok2	37,29	37,26	40,38	35,01	44,02	42,50	38,77	43,15	0,17	7,71	0,0107	0,1097
Cuta	42,33	46,66	45,69	35,22	51,27	46,48	49,11	50,52	0,22	5,03	0,0108	0,1098
Aamp	43,95	47,15	47,23	44,83	49,97	52,79	50,47	52,35	0,17	6,47	0,0108	0,1102
Nab2	14,12	14,65	18,91	14,64	16,26	19,66	16,22	19,21	0,21	5,43	0,0108	0,1104
Atg7	11,99	10,90	10,03	11,49	9,91	9,77	9,68	9,28	-0,21	5,35	0,0109	0,1108
Tmem214	15,41	14,25	17,09	14,40	18,02	17,69	17,95	16,25	0,20	5,50	0,0110	0,1115
Ccr5	163,98	152,35	154,17	168,82	148,12	142,65	143,13	133,41	-0,17	8,79	0,0111	0,1121
Nsd1	68,50	51,06	55,69	67,95	56,93	50,56	55,37	52,94	-0,17	9,52	0,0111	0,1121
Banf1	44,45	47,77	41,31	49,08	38,17	38,01	43,72	40,05	-0,20	5,57	0,0111	0,1123
Gzmk	151,71	174,99	171,47	135,15	155,75	136,45	147,44	124,99	-0,16	6,89	0,0112	0,1128
Atad2b	26,30	21,01	22,05	24,66	20,68	20,28	21,97	20,91	-0,17	7,49	0,0112	0,1130
Hist1h4i	40,73	64,61	61,81	41,00	42,30	45,78	46,42	41,46	-0,23	4,68	0,0112	0,1132
Lta	2,63	2,59	2,05	1,81	3,14	3,06	3,28	2,86	0,43	1,95	0,0112	0,1132
Wiz	14,06	16,56	15,43	14,17	17,18	16,62	16,81	17,31	0,17	6,09	0,0113	0,1138
Jmjd6	15,64	20,80	20,41	18,55	21,72	20,48	20,85	24,32	0,22	5,09	0,0113	0,1139
Dnajc13	28,48	24,58	25,40	28,41	23,82	22,61	24,79	24,05	-0,17	7,60	0,0114	0,1141
Gpi1	135,95	152,77	134,24	133,67	161,27	148,69	159,22	157,95	0,17	8,72	0,0114	0,1141
Hexim1	19,16	22,54	23,36	21,55	23,18	25,31	22,79	26,02	0,17	6,29	0,0115	0,1154
Zdhhc17	11,17	8,14	9,52	9,70	7,90	8,63	8,55	8,44	-0,20	5,36	0,0115	0,1155
AA467197	3,43	2,53	1,77	1,69	3,36	4,41	3,26	2,86	0,53	1,01	0,0115	0,1155
Prr12	22,95	23,58	24,64	24,04	28,74	26,67	24,59	26,68	0,17	7,44	0,0116	0,1158
Cdc27	21,17	20,83	19,74	21,46	19,33	17,84	19,19	17,98	-0,16	6,84	0,0116	0,1158
Atrnl1	1,81	1,69	1,98	1,41	1,24	1,58	1,48	1,20	-0,31	3,34	0,0116	0,1159
D14Abb1e	35,05	28,13	28,11	32,11	27,59	27,84	27,91	26,62	-0,17	7,79	0,0117	0,1165
Alyref	20,93	28,96	26,98	21,87	29,49	25,41	27,99	32,08	0,22	4,92	0,0117	0,1165
Bud31	44,37	42,82	43,60	41,31	50,47	48,66	47,98	52,70	0,22	5,04	0,0117	0,1166
Cx3cr1	91,33	84,02	90,26	91,51	85,89	77,48	88,30	65,83	-0,17	8,31	0,0117	0,1166
Nr1h2	49,11	53,64	58,37	48,86	57,56	58,55	61,37	57,35	0,17	6,81	0,0118	0,1167
E2f2	31,26	38,06	33,63	31,93	29,15	30,93	30,45	29,95	-0,16	7,24	0,0118	0,1172
Chmp7	15,73	16,35	16,08	15,75	17,98	18,49	17,11	19,51	0,19	5,54	0,0119	0,1173
Nup160	10,56	10,62	10,53	10,42	9,58	9,04	9,47	9,04	-0,18	5,82	0,0119	0,1178
Matk	2,40	2,20	2,72	2,70	3,41	4,15	2,87	2,67	0,39	2,55	0,0119	0,1179
Tmem203	5,97	7,94	7,76	7,03	9,84	9,15	9,19	8,39	0,36	2,93	0,0120	0,1181
Mfsd10	11,65	13,49	12,47	10,57	14,69	14,01	15,28	12,84	0,24	4,59	0,0121	0,1189
Atp5e	44,82	49,48	53,45	38,85	53,00	63,04	49,57	55,45	0,25	4,40	0,0123	0,1206
Mipol1	1,65	1,25	1,30	1,21	0,98	0,94	0,94	0,82	-0,56	0,79	0,0123	0,1208
Hist2h2bb	51,74	114,91	89,77	52,51	69,90	59,58	66,40	70,65	-0,20	5,15	0,0123	0,1209
Tmem115	17,61	19,16	18,46	18,15	22,79	22,12	18,75	20,45	0,20	5,43	0,0123	0,1209
Pde4dip	3,18	3,45	3,22	3,23	3,95	3,76	3,68	3,88	0,22	4,90	0,0123	0,1209
Hdgfrp2	22,78	26,87	27,94	21,61	28,19	28,42	26,91	28,48	0,18	5,89	0,0123	0,1209
Chd9	9,80	8,01	7,99	9,34	8,13	7,45	8,05	7,79	-0,16	6,58	0,0124	0,1214
Ager	1,98	2,46	2,60	2,02	3,05	2,15	3,40	3,54	0,44	1,99	0,0124	0,1214
Bsdc1	24,27	23,31	24,26	22,85	26,71	26,41	27,15	26,36	0,17	6,07	0,0125	0,1216
Ppp1r37	16,09	14,25	16,17	14,69	17,75	17,43	17,45	17,07	0,19	5,61	0,0125	0,1218
Surf2	10,73	14,67	14,82	12,00	15,60	16,45	14,51	16,20	0,27	4,04	0,0125	0,1219
Nsg2	13,04	13,70	13,20	12,18	11,91	14,76	12,89	21,04	0,22	4,99	0,0125	0,1219
Serpinb6a	10,60	8,89	9,95	9,04	7,26	9,75	6,92	7,75	-0,28	3,86	0,0126	0,1219
Ccdc69	19,97	21,41	22,53	17,38	23,44	25,24	21,60	24,06	0,22	4,97	0,0126	0,1219
Rplp1	821,96	996,78	1117,46	851,80	1042,80	1090,92	1034,73	1089,89	0,17	8,88	0,0126	0,1219
Dync1li2	17,20	17,55	18,80	18,01	19,87	19,90	19,26	21,06	0,16	6,46	0,0128	0,1239

Traf3ip3	106,46	113,59	111,56	103,34	124,14	117,72	118,72	127,17	0,17	7,94	0,0129	0,1249
Slc39a11	2,44	2,91	2,00	2,11	2,84	3,38	2,60	3,30	0,34	2,92	0,0129	0,1251
Pfdn2	8,51	11,90	6,39	8,83	10,51	12,55	9,20	14,24	0,35	2,72	0,0129	0,1251
Zfp457	19,56	9,89	10,28	13,44	12,79	10,19	13,02	9,47	-0,23	4,72	0,0130	0,1253
Sharpin	44,86	43,52	49,39	40,57	49,95	50,64	48,49	50,53	0,17	6,36	0,0130	0,1255
Ogfr	41,79	49,54	44,47	45,63	50,11	50,58	47,05	55,20	0,16	6,78	0,0130	0,1255
Zfp933	6,09	4,11	4,12	5,14	3,92	3,90	4,20	4,35	-0,26	4,26	0,0131	0,1256
Ythdf3	46,83	38,99	40,14	44,34	36,71	38,86	38,35	38,18	-0,16	7,70	0,0131	0,1260
H2afj	15,22	20,12	21,22	16,72	18,98	21,95	21,74	21,61	0,21	5,17	0,0131	0,1260
Atp6v1g1	19,32	23,81	24,57	23,01	26,49	27,47	24,67	27,48	0,23	4,76	0,0131	0,1260
Ssb	52,17	65,53	62,28	54,34	60,11	65,85	64,49	71,32	0,16	7,02	0,0132	0,1260
Dync1h1	68,48	54,39	55,94	67,94	59,40	49,55	57,94	52,65	-0,17	9,71	0,0132	0,1260
Ahdc1	18,64	18,34	20,18	17,28	22,06	20,54	18,78	21,73	0,16	7,02	0,0132	0,1260
Ndufa4	54,12	68,93	64,58	47,54	63,05	73,11	69,95	66,57	0,22	4,97	0,0132	0,1262
Nfil3	2,87	2,90	1,47	2,88	3,26	2,78	3,33	3,97	0,35	2,61	0,0132	0,1262
Snrpf	19,47	24,77	18,03	18,94	22,54	22,00	25,80	27,08	0,25	4,20	0,0133	0,1262
Ensa	35,38	35,01	33,37	35,85	39,30	39,84	37,10	40,23	0,16	6,40	0,0133	0,1262
Hdac4	11,85	11,47	11,22	12,37	10,52	10,15	10,66	9,69	-0,19	5,44	0,0133	0,1262
Rpl4	779,70	973,10	990,39	815,46	971,99	999,45	968,95	1059,81	0,17	10,39	0,0133	0,1262
Ndufa3	56,38	73,30	58,53	51,84	71,26	69,29	70,77	72,30	0,24	4,53	0,0134	0,1268
Zmynd11	30,14	31,09	33,15	27,58	33,70	32,90	34,27	35,27	0,16	7,05	0,0135	0,1276
Arfgef2	14,68	13,58	14,48	15,14	12,69	12,61	13,63	12,90	-0,16	6,91	0,0136	0,1293
Scnm1	14,23	15,01	16,16	13,55	17,76	17,79	17,08	18,72	0,28	3,84	0,0137	0,1293
Dzip3	8,24	7,04	7,98	7,87	7,02	6,70	7,11	6,34	-0,19	5,39	0,0137	0,1295
Zfp830	7,54	7,16	6,92	7,55	8,83	7,98	8,34	9,09	0,23	4,71	0,0137	0,1297
Efemp2	1,07	0,74	0,95	0,57	1,29	1,07	1,14	1,35	0,57	0,97	0,0137	0,1297
Marc2	23,29	26,62	22,85	22,13	27,53	25,12	26,38	29,14	0,19	5,59	0,0137	0,1297
Ppm1d	9,85	12,02	11,40	9,89	12,77	11,75	12,50	12,82	0,21	5,08	0,0138	0,1297
Mrfap1	65,31	78,29	72,52	67,68	76,81	80,67	75,18	84,26	0,16	6,94	0,0138	0,1297
Pggt1b	14,99	12,95	13,90	13,64	11,48	11,43	13,04	12,15	-0,20	5,15	0,0138	0,1298
Tep1	11,72	9,10	9,62	11,36	9,90	9,76	9,33	8,37	-0,16	6,34	0,0138	0,1298
Ppp1r7	13,28	11,67	12,43	12,85	10,41	10,99	12,11	10,41	-0,19	5,43	0,0138	0,1298
Mak16	21,97	27,89	25,67	22,31	28,22	26,40	26,97	29,71	0,19	5,61	0,0139	0,1298
Ap1s3	43,26	30,43	28,38	31,80	31,31	27,19	33,20	28,23	-0,16	6,51	0,0139	0,1298
Lsmd1	12,18	24,03	19,72	13,06	19,52	22,95	21,39	21,58	0,32	3,34	0,0139	0,1298
Pou2f1	4,80	3,73	4,25	4,65	4,14	3,47	3,98	3,79	-0,18	5,74	0,0139	0,1300
Hnrnph1	82,03	86,24	92,11	77,51	91,94	93,88	89,62	102,35	0,16	7,64	0,0140	0,1306
Plgrkt	49,98	52,03	54,97	47,46	58,23	57,55	57,03	59,98	0,19	5,53	0,0140	0,1306
Mnt	17,66	21,59	19,65	19,07	22,38	21,86	21,80	21,09	0,16	6,57	0,0141	0,1315
Mphosph10	9,06	9,39	9,88	9,17	11,27	10,98	10,91	11,03	0,24	4,50	0,0141	0,1315
Vav3	7,52	5,80	6,98	6,73	5,83	5,55	5,90	6,01	-0,21	4,97	0,0142	0,1324
Hnrnpa1	102,74	128,24	109,87	104,82	116,61	124,43	117,28	140,67	0,16	7,86	0,0143	0,1326
Tubb4b	57,72	74,86	64,72	64,23	58,24	52,49	61,52	61,97	-0,16	6,63	0,0143	0,1328
Atg16l2	26,24	25,07	32,91	25,92	32,03	32,64	29,29	29,63	0,18	5,98	0,0144	0,1334
Alg6	2,42	2,42	2,03	2,02	1,67	1,91	1,57	1,76	-0,37	2,64	0,0144	0,1334
Relt	11,35	13,12	12,66	12,57	14,56	14,81	12,99	14,73	0,20	5,24	0,0144	0,1334
Rhof	69,24	69,38	73,83	66,03	83,86	77,09	76,40	73,34	0,16	7,30	0,0144	0,1334
Dnm1l	26,80	27,53	22,83	26,49	22,43	23,34	24,56	22,65	-0,16	6,65	0,0145	0,1338
Fam57a	2,70	3,00	2,34	2,27	2,54	1,30	1,17	2,18	-0,52	1,09	0,0146	0,1344
Mdh1	32,61	46,18	40,72	34,16	38,30	45,54	41,67	46,47	0,16	6,32	0,0146	0,1344
Dcun1d5	31,61	33,66	39,21	32,91	38,87	38,30	38,03	41,19	0,19	5,47	0,0146	0,1346
Slc7a14	4,55	2,81	2,21	3,22	2,62	2,72	2,93	2,74	-0,23	4,73	0,0147	0,1349
Scai	7,17	4,44	5,21	5,72	4,92	5,08	5,16	4,81	-0,18	5,83	0,0147	0,1349
Eif1	316,37	325,69	280,27	333,56	340,68	330,98	356,65	380,91	0,17	8,66	0,0147	0,1349
Apaf1	29,06	26,80	28,43	31,14	25,87	25,04	26,48	25,98	-0,16	7,49	0,0147	0,1350

Hmgn2	88,10	106,45	83,18	89,74	74,69	83,81	85,84	85,45	-0,16	6,77	0,0148	0,1353
Rqcd1	17,55	19,91	18,36	20,78	17,52	16,86	16,68	16,91	-0,17	5,89	0,0148	0,1356
Hells	9,19	11,82	10,34	10,72	8,85	9,03	9,55	8,82	-0,22	4,89	0,0150	0,1369
Zc3h6	2,09	2,52	2,58	2,16	1,94	1,99	1,81	1,80	-0,30	3,38	0,0151	0,1375
Smco1	8,95	5,84	6,12	7,28	5,23	5,85	6,31	5,12	-0,33	3,02	0,0151	0,1377
Zfp934	2,08	1,38	1,82	1,82	1,41	1,40	1,38	1,06	-0,43	1,81	0,0153	0,1392
Nop56	32,28	35,95	34,88	30,53	38,62	36,82	37,04	37,44	0,17	6,07	0,0154	0,1400
Gpr183	48,69	37,93	37,29	44,93	47,62	44,69	46,73	49,36	0,16	7,04	0,0155	0,1408
Mctp2	27,37	20,43	21,60	23,08	21,09	20,63	21,50	19,79	-0,16	6,99	0,0155	0,1408
Prpsap1	25,16	27,97	27,64	24,65	30,52	29,42	28,41	30,91	0,18	5,72	0,0156	0,1413
Map4k2	125,07	118,12	135,14	112,68	146,42	140,54	130,59	131,85	0,16	8,33	0,0156	0,1416
Phc3	32,88	22,94	24,57	29,49	25,24	22,95	26,01	24,05	-0,16	8,17	0,0156	0,1416
Zeb2	31,40	27,59	30,34	29,64	28,21	26,68	27,90	23,58	-0,16	8,00	0,0157	0,1419
Cd52	763,81	976,43	937,80	744,86	982,64	961,52	964,72	925,14	0,16	8,83	0,0157	0,1423
Hnrnpu	90,13	127,95	124,02	99,04	117,34	120,61	122,11	134,05	0,16	8,75	0,0157	0,1423
Myc	9,29	10,36	10,01	7,54	10,64	10,27	11,90	10,72	0,23	4,61	0,0158	0,1427
Bin2	272,14	316,59	323,68	265,89	327,12	331,52	321,14	340,03	0,16	9,27	0,0158	0,1427
H2-K1	1505,76	1404,31	1468,65	1486,31	1702,01	1720,35	1531,93	1619,39	0,16	11,32	0,0158	0,1427
Ikbke	57,08	58,39	58,52	54,30	64,70	64,03	58,20	67,82	0,16	7,60	0,0158	0,1427
Grcc10	64,32	80,64	86,73	63,39	79,14	85,92	87,20	82,72	0,19	5,48	0,0159	0,1430
Arl4a	7,20	8,19	8,02	7,08	8,11	8,92	9,61	8,63	0,21	4,93	0,0159	0,1433
Rab19	23,96	26,38	24,70	25,20	28,27	27,08	29,11	30,78	0,20	5,16	0,0160	0,1436
Thra	2,31	1,70	2,19	2,23	3,18	2,80	2,34	2,58	0,38	2,48	0,0160	0,1436
Irf2	56,42	67,30	62,06	55,86	66,32	66,14	68,74	68,04	0,16	7,31	0,0160	0,1436
Prpf38b	46,40	50,26	46,10	44,33	52,70	51,37	50,56	53,89	0,16	7,22	0,0160	0,1436
Cetn3	5,96	12,67	15,03	7,45	11,43	13,78	11,03	13,53	0,31	3,52	0,0161	0,1440
Exosc5	15,61	15,59	16,24	14,84	16,86	21,35	18,89	17,08	0,25	4,15	0,0161	0,1440
Cd46	3,00	1,58	2,88	2,47	2,20	1,04	2,43	1,35	-0,46	1,39	0,0161	0,1440
Prcc	28,52	30,39	30,08	28,28	32,78	32,22	32,04	34,63	0,17	6,00	0,0161	0,1440
Naca	45,46	50,27	52,46	42,85	51,46	54,59	50,44	57,27	0,16	8,48	0,0162	0,1440
H2-Q10	57,76	44,81	50,33	53,03	62,68	60,13	53,63	53,67	0,16	6,33	0,0163	0,1448
Ing2	4,98	5,14	5,58	5,11	6,68	5,48	5,92	6,79	0,26	4,02	0,0163	0,1448
Homez	1,96	2,02	2,07	2,20	1,72	1,73	1,73	1,52	-0,30	3,43	0,0164	0,1460
Apol7b	10,59	11,51	11,85	11,30	13,00	13,19	14,21	12,22	0,22	4,78	0,0165	0,1463
Ppip5k2	20,32	20,51	19,79	22,42	18,10	18,48	19,86	18,17	-0,16	6,78	0,0166	0,1468
Rpl22	25,40	32,38	30,29	26,23	29,03	33,86	29,63	35,56	0,17	6,08	0,0166	0,1468
Dcdc2c	15,47	7,96	10,42	10,67	9,30	10,29	8,99	8,42	-0,27	3,87	0,0167	0,1477
Nop16	1,79	2,57	3,16	2,01	2,95	3,28	2,85	3,25	0,41	2,27	0,0168	0,1483
Appl2	5,16	5,61	6,84	5,58	7,17	6,86	6,69	6,67	0,25	4,23	0,0168	0,1483
Ggt1	8,25	11,39	8,37	7,42	5,53	7,75	9,59	6,85	-0,26	4,05	0,0169	0,1488
Pdcd4	123,60	141,26	139,08	123,31	142,61	140,37	152,43	153,98	0,16	8,40	0,0169	0,1494
Elovl1	30,49	36,17	36,90	33,30	36,54	36,93	39,80	40,00	0,17	6,04	0,0170	0,1494
Dnajb11	15,45	24,14	19,29	14,38	20,54	19,44	21,23	21,71	0,18	5,63	0,0171	0,1501
Frmd8	70,73	70,55	75,63	75,11	83,78	82,16	75,00	84,98	0,16	7,93	0,0172	0,1510
Car5b	14,15	16,54	14,56	14,91	13,34	12,27	13,22	14,32	-0,18	5,61	0,0172	0,1510
Btg1	259,91	244,34	252,00	257,44	286,41	281,54	261,24	305,28	0,16	10,39	0,0173	0,1515
Stag1	29,91	26,72	27,41	27,03	24,17	24,85	26,06	24,72	-0,15	7,31	0,0173	0,1515
Ubtf	47,75	52,48	57,54	49,36	59,53	60,11	53,14	58,33	0,16	8,01	0,0173	0,1515
Pglyrp1	40,67	44,04	39,99	37,37	47,64	49,34	48,00	42,64	0,21	4,90	0,0173	0,1518
Josd1	10,21	10,12	9,36	10,56	11,55	11,33	10,97	12,35	0,19	5,21	0,0174	0,1518
Lrif1	12,47	11,59	11,88	10,08	10,14	10,00	10,07	10,03	-0,19	5,29	0,0174	0,1518
Serinc3	137,52	133,26	125,14	140,45	116,72	114,32	127,71	120,91	-0,16	8,87	0,0174	0,1518
Pcf11	35,52	35,84	35,50	36,37	38,73	37,45	39,94	43,66	0,16	7,78	0,0174	0,1518
Slc4a7	45,16	42,93	41,28	46,82	39,25	38,22	41,89	38,43	-0,16	8,27	0,0176	0,1530
Ranbp3	31,84	34,32	36,02	32,29	38,44	37,54	36,36	37,23	0,16	6,59	0,0176	0,1530

Cirbp	21,29	24,27	21,84	21,20	18,70	18,69	18,18	20,48	-0,22	4,69	0,0176	0,1532
Rpl3	467,97	546,64	510,58	496,10	545,57	543,11	539,45	632,03	0,16	9,51	0,0177	0,1538
Nabp2	27,60	34,94	27,33	27,64	35,25	32,42	34,40	33,30	0,20	5,07	0,0177	0,1538
Ap4e1	9,94	9,41	8,48	9,86	8,26	8,61	8,50	8,20	-0,17	5,86	0,0177	0,1538
Chmp2a	37,96	50,12	45,30	35,81	47,25	47,17	50,79	47,23	0,19	5,39	0,0178	0,1545
Txn2	42,34	45,38	38,95	42,38	51,55	44,60	47,28	47,00	0,17	5,85	0,0179	0,1547
BC005624	17,03	22,33	19,73	18,65	23,23	23,71	22,26	21,01	0,21	4,81	0,0179	0,1549
S100a4	257,18	337,15	293,00	241,04	287,38	311,16	339,28	316,67	0,15	7,22	0,0181	0,1566
Ccdc107	5,72	8,01	9,18	6,14	8,83	8,54	8,31	10,94	0,36	2,76	0,0182	0,1569
Ehd4	8,32	8,97	8,15	8,47	7,46	7,53	7,32	6,89	-0,22	4,74	0,0182	0,1570
Polr2l	6,56	10,12	10,75	7,04	10,20	10,79	10,24	9,74	0,27	3,98	0,0182	0,1572
Fcgrt	41,63	42,78	44,89	39,22	36,69	40,61	40,46	32,74	-0,16	6,11	0,0183	0,1575
Zfp36l2	353,49	406,98	391,77	339,44	402,38	396,95	410,75	457,45	0,16	10,45	0,0183	0,1578
Nop14	10,11	11,54	11,17	11,98	12,47	12,64	13,39	13,05	0,20	5,03	0,0184	0,1579
Cmklr1	15,21	15,83	14,73	14,84	13,20	12,18	15,21	12,61	-0,19	5,34	0,0185	0,1592
Tbx6	5,80	6,40	6,51	5,63	8,13	7,08	6,88	7,47	0,29	3,55	0,0186	0,1599
Ybey	2,19	2,19	2,28	2,84	1,76	1,86	2,34	1,76	-0,30	3,29	0,0187	0,1600
Eif3a	50,60	66,02	63,09	56,45	63,48	64,62	64,83	70,56	0,16	8,34	0,0187	0,1602
Dbi	13,35	26,53	23,44	13,73	20,46	24,72	23,20	24,53	0,28	3,66	0,0187	0,1602
Ubox5	4,34	3,34	4,16	4,71	3,41	3,62	4,02	2,74	-0,26	3,88	0,0188	0,1608
Mapk8	5,18	3,94	4,04	4,72	3,82	3,76	4,22	3,54	-0,23	4,58	0,0188	0,1608
Cstad	1,51	1,32	2,55	1,68	1,21	1,05	1,61	0,61	-0,57	0,29	0,0189	0,1615
Spopl	16,13	12,36	13,47	12,22	11,22	11,60	12,47	12,07	-0,19	5,18	0,0191	0,1627
Timm13	12,05	13,64	15,13	10,09	14,22	14,93	14,97	16,11	0,26	4,09	0,0191	0,1627
Oxct1	17,98	19,72	19,94	21,21	18,65	17,87	16,94	16,99	-0,16	6,02	0,0191	0,1628
Spns1	16,76	17,59	18,93	17,80	20,45	21,84	17,94	19,91	0,18	5,68	0,0192	0,1630
Sell	2,49	2,43	2,97	1,96	1,74	2,04	1,86	1,90	-0,37	2,33	0,0192	0,1630
Pfas	6,18	6,02	5,81	6,11	5,33	4,71	6,07	4,96	-0,19	5,17	0,0192	0,1633
Ccm2	54,58	51,31	57,70	50,99	61,84	61,53	55,72	59,10	0,15	6,73	0,0193	0,1635
Foxo3	26,04	24,68	26,48	28,45	31,96	26,80	31,52	27,37	0,16	6,34	0,0193	0,1635
Lgals1	344,29	519,72	418,00	337,41	415,35	430,18	485,29	475,75	0,16	8,42	0,0193	0,1635
Grasp	1,96	2,77	2,30	1,87	2,54	2,90	2,52	3,59	0,37	2,40	0,0193	0,1635
Sae1	23,95	26,81	25,16	23,96	26,53	27,94	28,20	29,93	0,17	5,72	0,0194	0,1635
Rcbtb2	12,70	11,18	12,43	12,37	10,90	10,30	11,37	10,07	-0,19	5,28	0,0194	0,1641
Sf3b4	26,81	29,60	29,54	27,02	30,68	29,66	32,48	34,58	0,18	5,68	0,0196	0,1655
Tada2b	9,72	10,43	10,55	10,31	11,22	11,38	11,58	12,44	0,19	5,38	0,0196	0,1655
Zfp459	5,70	4,71	5,23	5,01	4,78	4,01	4,72	3,77	-0,25	3,98	0,0197	0,1657
Mxd3	4,12	7,51	5,97	5,85	3,97	4,50	5,52	4,57	-0,34	2,78	0,0197	0,1657
Pabpn1	75,09	88,53	81,65	79,47	91,11	88,82	86,40	94,31	0,15	7,26	0,0197	0,1657
Cep89	2,75	2,96	2,84	2,46	2,10	2,28	2,28	1,99	-0,35	2,67	0,0198	0,1661
Cd86	12,13	10,27	10,62	10,53	9,18	10,58	9,35	8,36	-0,22	4,69	0,0198	0,1663
Psmc5	25,08	36,38	26,14	25,80	29,35	32,03	31,22	36,96	0,19	5,29	0,0199	0,1668
Ifih1	12,81	11,67	11,16	11,35	10,24	10,91	10,46	10,37	-0,17	5,94	0,0199	0,1668
H2-Ob	2,50	2,77	3,40	3,43	3,46	4,21	2,92	4,34	0,31	3,19	0,0200	0,1668
Clasp1	15,00	12,76	12,13	13,55	12,56	11,54	11,92	12,15	-0,15	6,64	0,0200	0,1668
Traf1	86,50	77,48	88,35	84,80	95,62	95,23	89,51	94,52	0,15	7,69	0,0200	0,1668
Id3	4,32	5,14	4,27	4,63	6,05	5,50	3,91	8,46	0,37	2,38	0,0200	0,1668
Srrt	65,11	69,77	67,46	58,63	72,48	71,07	69,20	77,47	0,15	7,70	0,0201	0,1675
Pvr	15,02	14,64	13,62	14,36	17,68	16,54	15,23	15,95	0,18	5,48	0,0202	0,1681
Chpt1	6,17	6,61	6,28	6,92	5,51	5,60	5,83	5,13	-0,24	4,29	0,0203	0,1686
Git1	20,80	25,00	25,34	22,49	26,70	26,25	25,03	25,94	0,15	6,50	0,0203	0,1688
Tnfaip8l2	42,46	51,10	53,44	42,83	54,68	54,96	50,66	52,52	0,17	5,82	0,0203	0,1689
Pld3	76,33	78,38	77,18	73,66	89,51	82,86	86,15	80,77	0,15	7,45	0,0204	0,1692
Rpgrip1l	1,32	1,01	1,40	1,42	0,98	0,93	1,28	0,94	-0,31	3,02	0,0205	0,1696
Banp	9,25	7,04	8,60	8,20	9,78	9,37	8,47	9,72	0,18	5,60	0,0205	0,1696

Lnp	4,59	4,21	3,96	4,67	3,73	4,13	3,77	3,66	-0,19	5,17	0,0205	0,1696
Ino80d	27,70	19,54	20,26	26,08	22,61	19,48	21,70	20,27	-0,16	8,23	0,0205	0,1696
Sf1	78,87	78,39	76,40	78,95	89,84	83,66	85,60	89,38	0,16	8,49	0,0205	0,1696
Mrpl2	8,14	11,38	8,69	8,43	10,80	11,00	11,62	11,49	0,29	3,39	0,0206	0,1699
Oxa1l	21,71	27,77	26,87	24,98	28,39	29,31	28,33	27,04	0,16	6,09	0,0206	0,1701
Zfp781	2,56	2,04	2,53	2,39	1,85	2,29	1,74	1,80	-0,30	3,13	0,0206	0,1701
Tnks1bp1	6,07	6,28	5,46	5,65	6,99	7,09	6,03	6,71	0,19	5,18	0,0207	0,1704
Zfhx2	9,83	9,76	10,67	9,05	11,80	10,25	11,17	10,37	0,15	6,50	0,0208	0,1705
Vegfb	1,46	1,99	1,55	1,72	3,15	1,81	2,34	1,89	0,45	1,44	0,0208	0,1705
Acaca	9,03	10,11	8,78	10,16	8,92	8,33	8,84	8,19	-0,15	6,35	0,0208	0,1705
Ift80	9,20	8,81	8,25	10,12	7,62	7,94	7,84	8,49	-0,20	5,13	0,0208	0,1705
Sept11	68,59	70,39	71,34	68,98	57,98	59,26	69,18	64,28	-0,16	8,37	0,0208	0,1705
Azin1	29,22	30,22	28,16	33,16	24,64	28,67	28,13	27,51	-0,15	7,17	0,0208	0,1705
Tfip11	25,45	25,79	25,79	25,66	28,59	27,85	27,82	29,73	0,15	6,59	0,0209	0,1712
Samm50	23,81	32,95	27,92	25,53	30,60	31,56	28,85	33,42	0,17	5,62	0,0210	0,1719
Gcc2	15,24	14,31	14,55	14,08	13,20	13,05	13,39	12,76	-0,15	6,49	0,0211	0,1721
Srsf10	17,38	17,72	17,53	18,96	19,96	18,79	20,74	20,52	0,16	6,02	0,0211	0,1721
Cdc14a	10,38	9,90	9,15	10,70	8,23	8,41	9,62	9,19	-0,18	5,41	0,0211	0,1723
Slc38a9	6,49	5,22	5,61	5,92	5,34	5,22	5,02	5,02	-0,17	5,61	0,0212	0,1726
Smpd1	27,93	25,56	29,37	27,55	32,38	30,83	30,46	29,31	0,16	6,14	0,0212	0,1726
Xpo4	14,23	10,27	9,77	12,16	9,79	10,07	11,05	9,96	-0,19	5,24	0,0212	0,1726
Filip1l	2,18	2,25	3,04	1,83	2,93	3,24	2,38	2,72	0,31	3,35	0,0213	0,1734
Nat6	3,88	4,19	3,79	3,53	4,31	5,22	4,75	4,78	0,30	3,13	0,0214	0,1736
Klk8	26,82	30,06	27,04	25,85	34,95	31,97	27,75	30,28	0,19	5,28	0,0214	0,1736
Nxf1	61,82	52,47	51,77	57,33	65,84	62,25	59,46	60,89	0,15	7,90	0,0215	0,1742
Tob1	32,48	37,62	38,53	36,97	39,75	42,02	39,62	40,16	0,15	6,46	0,0215	0,1742
Usp9x	29,40	23,00	23,15	28,65	24,19	20,77	24,35	24,39	-0,15	8,20	0,0217	0,1754
Akap11	9,09	7,34	7,87	9,50	7,48	7,52	8,08	7,33	-0,16	6,24	0,0217	0,1754
Sav1	13,82	11,93	14,24	13,74	15,01	15,20	14,94	16,08	0,19	5,18	0,0217	0,1754
Evi2b	51,76	59,37	62,17	51,92	63,40	60,87	65,43	60,31	0,15	7,71	0,0218	0,1757
Eef1g	186,93	219,48	187,81	191,81	216,88	218,26	213,66	226,12	0,15	8,34	0,0219	0,1766
Rnf44	58,80	66,97	67,86	62,28	71,34	71,23	69,98	71,93	0,15	8,08	0,0220	0,1766
Lrrc58	38,93	35,39	35,92	41,71	32,66	33,60	36,31	34,04	-0,15	8,28	0,0220	0,1766
Abhd15	1,17	1,24	1,72	1,30	1,72	1,86	1,77	1,58	0,39	2,35	0,0220	0,1766
Fryl	110,84	89,33	89,87	107,48	94,54	83,46	89,72	89,11	-0,16	10,08	0,0220	0,1766
Cry1	10,90	10,84	12,42	11,36	12,14	12,36	12,66	14,65	0,19	5,20	0,0220	0,1766
Cpne3	52,76	50,04	52,21	59,92	48,40	48,14	49,50	47,25	-0,15	8,17	0,0221	0,1771
Cenpm	2,71	3,66	2,43	2,12	1,57	2,13	2,15	2,30	-0,44	1,56	0,0221	0,1772
Slc35c1	31,01	37,11	35,59	34,00	38,51	38,29	37,20	38,56	0,15	6,83	0,0222	0,1775
Rbm41	10,80	9,05	8,77	9,26	8,79	8,41	8,25	8,21	-0,17	5,65	0,0222	0,1779
Fam210a	5,40	4,19	5,02	5,63	4,57	4,06	4,60	4,67	-0,18	5,53	0,0223	0,1781
Loxl2	2,47	1,66	1,81	2,20	1,80	1,53	1,63	1,69	-0,29	3,27	0,0223	0,1781
Crtc3	16,28	18,36	19,28	18,47	20,06	19,78	19,92	20,46	0,15	6,61	0,0223	0,1781
BC055324	1,14	1,75	1,23	1,60	1,06	0,95	1,53	0,83	-0,40	1,92	0,0224	0,1781
Wrn	24,93	21,90	21,60	23,39	20,15	20,02	21,40	21,36	-0,15	7,12	0,0224	0,1781
Chd3	126,97	120,88	133,90	125,85	150,30	139,40	132,01	143,58	0,16	9,93	0,0224	0,1781
Vps37a	14,90	12,05	13,00	14,27	12,43	12,37	11,95	12,08	-0,15	6,36	0,0224	0,1781
Ddx3x	65,84	71,14	63,12	67,89	72,40	70,76	74,16	80,86	0,15	8,34	0,0224	0,1783
Zdhhc9	6,53	7,31	7,86	6,04	7,64	8,19	8,02	8,42	0,23	4,50	0,0225	0,1786
Kpna2	34,03	40,98	34,76	36,38	32,55	28,87	36,27	33,62	-0,16	6,15	0,0225	0,1786
Gimap6	344,85	363,66	350,94	346,12	389,84	375,57	386,59	412,73	0,15	9,23	0,0227	0,1798
Tmc4	1,66	1,84	1,29	1,99	2,11	2,13	2,09	2,55	0,36	2,26	0,0227	0,1798
Emp1	25,40	28,26	24,18	27,04	20,37	20,72	28,94	24,26	-0,16	6,14	0,0227	0,1799
Nudt4	24,86	25,89	27,98	27,45	22,78	23,61	25,42	23,73	-0,15	6,35	0,0228	0,1799
Trappc9	8,59	6,48	6,33	7,61	6,26	6,47	6,58	6,08	-0,20	5,00	0,0228	0,1799

Med13	53,64	39,56	39,70	51,23	43,81	38,46	43,21	39,98	-0,15	9,01	0,0228	0,1799
Tbc1d7	4,07	4,47	4,35	4,47	3,48	2,64	4,07	3,26	-0,36	2,30	0,0228	0,1799
Rab3ip	8,29	9,66	7,91	8,91	9,68	10,54	9,16	11,03	0,21	4,67	0,0228	0,1799
Uchl5	5,98	8,02	8,74	6,41	8,62	7,97	9,20	8,79	0,26	3,89	0,0228	0,1799
Sart3	15,64	15,58	14,95	15,33	17,92	17,34	16,19	17,42	0,16	5,87	0,0230	0,1810
Gigyf2	19,69	20,29	20,22	19,18	22,76	21,45	20,70	22,97	0,15	6,91	0,0231	0,1814
Tbl1xr1	69,35	66,89	64,21	79,10	63,43	60,58	64,98	62,25	-0,15	9,08	0,0231	0,1814
Phldb3	6,19	6,96	7,25	6,77	8,37	8,12	7,74	7,85	0,24	4,09	0,0231	0,1814
Slc7a6os	16,66	19,18	17,12	14,57	19,81	19,69	18,93	19,46	0,21	4,80	0,0232	0,1816
Phf6	19,14	17,78	18,41	20,79	16,55	16,11	17,70	18,20	-0,15	6,30	0,0232	0,1816
Cep192	24,39	22,52	21,82	23,77	22,64	19,52	21,03	20,30	-0,15	7,48	0,0232	0,1818
Zfp276	9,67	9,14	10,59	11,01	12,22	11,53	10,46	11,16	0,17	5,71	0,0233	0,1818
Ptpn4	51,44	43,70	46,44	52,98	46,59	43,67	43,37	41,73	-0,15	7,77	0,0233	0,1818
Lpcat4	46,08	46,04	50,86	42,64	52,12	51,36	50,51	51,45	0,15	6,54	0,0233	0,1820
Ccdc15	2,76	2,53	3,70	2,04	2,09	2,02	2,38	2,36	-0,29	3,11	0,0233	0,1820
Dram2	10,35	8,14	8,03	9,84	7,92	7,57	8,12	7,71	-0,22	4,53	0,0233	0,1820
Snrnp25	4,43	6,71	5,23	6,19	7,50	6,84	6,55	8,09	0,35	2,47	0,0234	0,1820
Acd	18,76	18,74	16,79	15,97	20,17	20,86	19,98	20,24	0,21	4,76	0,0234	0,1820
Vipr1	5,52	4,77	4,86	4,41	6,14	5,47	5,24	5,78	0,21	4,70	0,0234	0,1822
Pin4	7,43	9,39	8,36	7,33	10,05	9,44	11,18	11,46	0,38	2,19	0,0236	0,1834
Btaf1	15,81	13,43	13,73	14,38	13,34	12,61	12,60	13,28	-0,15	6,86	0,0236	0,1835
Fan1	4,19	3,36	3,16	3,67	3,16	3,28	2,94	2,55	-0,28	3,53	0,0237	0,1835
Rmdn1	3,56	2,14	3,38	2,75	2,39	2,34	2,52	1,87	-0,36	2,30	0,0237	0,1835
Pibf1	6,65	4,24	5,13	4,50	4,12	4,84	4,57	3,74	-0,25	3,96	0,0237	0,1835
Mpi	4,11	3,85	3,71	3,74	5,29	5,73	3,51	4,65	0,31	2,95	0,0237	0,1835
Ccne2	1,94	3,07	1,64	2,13	1,92	1,86	1,81	1,43	-0,35	2,65	0,0241	0,1860
Taf7	12,29	11,92	11,28	11,72	12,17	13,20	14,23	13,90	0,18	5,38	0,0241	0,1861
Osbpl3	21,43	19,44	18,28	20,82	18,02	19,23	19,36	15,73	-0,15	7,01	0,0241	0,1863
Park7	27,71	46,84	39,17	33,99	39,40	41,51	44,25	42,95	0,19	5,16	0,0243	0,1871
Nfat5	27,66	17,44	20,30	21,69	20,45	19,04	19,77	19,21	-0,15	8,12	0,0243	0,1874
Sun1	23,79	27,02	23,29	26,01	21,77	22,64	24,22	21,91	-0,15	6,62	0,0244	0,1875
Atl3	34,86	33,86	32,61	39,00	31,60	30,96	31,55	32,51	-0,15	7,76	0,0244	0,1875
Rnf26	13,70	15,02	14,37	14,98	12,62	12,25	13,01	12,81	-0,20	4,95	0,0244	0,1875
Slc25a4	59,23	72,00	68,41	62,60	71,81	70,88	70,03	78,37	0,15	6,26	0,0244	0,1876
Pspc1	18,37	14,65	13,94	12,57	12,01	13,30	13,23	13,64	-0,19	5,05	0,0245	0,1880
Erc1	2,98	2,60	2,49	2,49	2,05	2,25	2,62	2,14	-0,22	4,43	0,0246	0,1883
Qprt	15,59	10,89	13,19	13,80	11,32	11,74	11,57	10,29	-0,25	3,88	0,0246	0,1883
Polh	12,12	14,47	13,34	13,95	12,09	11,83	11,63	11,62	-0,19	5,03	0,0247	0,1889
Ndufb11	41,19	47,46	46,68	35,98	46,05	50,20	45,93	51,85	0,18	5,29	0,0247	0,1889
Tspan32	19,86	16,59	20,80	21,77	15,70	17,88	21,01	14,32	-0,19	4,97	0,0249	0,1897
Ggh	12,98	12,45	11,55	12,94	9,38	11,36	10,99	10,45	-0,25	3,94	0,0249	0,1897
Prkce	4,98	3,31	3,66	4,10	3,63	3,45	3,71	3,05	-0,22	4,55	0,0249	0,1897
Rpl36al	126,08	160,86	156,40	128,98	149,96	156,11	162,29	166,03	0,15	6,29	0,0249	0,1897
Tmem168	17,62	14,82	15,87	16,87	13,89	15,36	15,39	14,00	-0,15	6,14	0,0249	0,1897
Btla	10,79	10,15	9,88	9,11	8,38	8,24	9,25	8,96	-0,20	4,92	0,0250	0,1906
Arhgef39	0,96	1,39	1,40	1,84	2,15	1,52	1,74	2,20	0,44	1,50	0,0251	0,1906
Ddx5	400,26	422,64	449,26	426,46	465,31	468,88	468,14	485,85	0,15	10,62	0,0251	0,1910
Pskh1	13,48	14,52	14,22	15,57	13,21	12,84	14,04	11,13	-0,17	5,47	0,0251	0,1910
Odc1	40,96	42,35	34,01	39,27	42,69	44,31	44,55	41,94	0,14	6,72	0,0252	0,1910
Tagap	39,57	47,78	41,51	43,23	46,26	44,68	48,41	51,00	0,14	7,12	0,0252	0,1911
Polr2j	23,63	33,45	35,67	20,50	32,75	29,49	35,95	34,11	0,24	4,17	0,0253	0,1920
Hid1	61,83	56,86	61,29	60,29	74,65	66,50	63,03	61,88	0,15	7,68	0,0254	0,1925
Slc38a2	53,01	57,32	50,04	56,96	58,32	56,77	56,25	69,77	0,15	8,05	0,0254	0,1925
Gnpda1	32,76	30,51	32,56	34,00	29,22	30,71	30,58	26,33	-0,15	6,15	0,0255	0,1930
Afg3l2	17,94	17,40	16,58	17,08	19,71	19,52	19,03	18,98	0,16	5,81	0,0256	0,1931

Phax	20,34	25,76	22,78	19,27	24,16	23,90	24,94	26,40	0,17	5,48	0,0256	0,1931
Tmem248	19,37	18,75	18,04	19,66	21,17	20,32	21,09	21,68	0,15	6,20	0,0256	0,1931
Ndufa1	31,02	43,94	39,52	27,55	38,66	42,41	39,14	45,96	0,23	4,25	0,0256	0,1931
Arhgap27	25,60	25,62	26,88	25,39	29,07	30,83	26,86	27,59	0,14	6,96	0,0256	0,1931
Slc26a2	7,68	7,48	7,81	8,14	6,72	6,64	7,58	6,11	-0,20	4,81	0,0257	0,1935
Dnajc21	9,27	9,69	10,00	9,34	9,79	11,75	10,86	12,22	0,22	4,42	0,0258	0,1937
Hace1	12,55	9,81	10,94	13,17	10,03	10,37	10,72	10,04	-0,18	5,38	0,0258	0,1937
Zbtb18	2,56	2,52	2,77	3,24	3,68	3,57	2,83	3,10	0,25	3,92	0,0258	0,1937
Chrac1	9,61	11,29	12,11	9,16	14,00	13,02	12,16	11,86	0,29	3,33	0,0258	0,1937
Cenpa	38,03	41,93	37,56	43,09	34,21	34,33	38,41	36,37	-0,17	5,67	0,0260	0,1943
Mrs2	22,76	21,00	22,01	23,46	19,71	19,91	21,32	18,27	-0,17	5,51	0,0260	0,1943
Ipo11	8,33	7,40	7,86	8,16	7,12	7,55	7,03	6,09	-0,19	5,00	0,0260	0,1943
Jtb	36,80	41,28	38,58	37,48	44,47	43,53	39,19	46,56	0,17	5,50	0,0260	0,1943
Kif23	9,30	14,09	11,60	10,09	9,30	8,84	11,25	10,28	-0,18	5,18	0,0260	0,1943
Wnk1	101,10	83,56	81,92	98,47	86,39	76,80	84,76	80,77	-0,15	9,94	0,0261	0,1944
Mlxip	24,52	23,51	23,02	23,59	26,43	24,72	25,96	27,59	0,15	7,51	0,0261	0,1945
Fam177a	9,76	12,30	10,44	10,11	11,59	10,99	11,48	14,05	0,17	5,45	0,0261	0,1946
Dxo	15,55	14,82	14,33	14,12	17,71	16,05	17,58	16,87	0,21	4,56	0,0262	0,1948
Sirt2	34,76	37,62	37,77	32,06	39,56	40,08	38,21	39,99	0,15	6,13	0,0262	0,1949
Fam129a	54,61	56,66	54,04	56,83	51,36	49,64	51,05	48,64	-0,15	7,70	0,0262	0,1951
Gpr174	36,23	30,57	32,34	36,33	30,85	31,64	30,09	30,01	-0,14	7,39	0,0263	0,1951
Zfp182	11,75	8,35	9,48	9,82	8,34	9,54	9,24	8,13	-0,16	5,79	0,0263	0,1952
Stard10	23,75	23,32	27,23	21,04	27,87	27,46	27,63	25,81	0,20	4,94	0,0264	0,1959
Scrn3	3,00	2,79	3,03	3,01	2,33	2,53	2,46	2,32	-0,29	3,13	0,0264	0,1960
Creb1	35,20	32,35	33,40	36,76	30,16	30,36	32,45	31,30	-0,15	8,11	0,0265	0,1961
Polr2i	10,07	13,57	11,38	8,17	13,91	14,97	11,78	12,48	0,30	3,08	0,0265	0,1962
Tmem251	12,82	11,92	15,54	11,72	14,46	16,01	12,89	17,61	0,24	4,09	0,0266	0,1965
Tbc1d8b	10,85	9,88	9,61	10,56	8,94	9,10	8,83	9,79	-0,16	5,84	0,0267	0,1969
Hmgn1	14,13	19,40	17,81	13,77	20,33	19,06	15,89	20,41	0,22	4,41	0,0267	0,1971
Ube2v2	7,61	6,56	8,03	7,47	6,44	6,84	6,63	6,29	-0,17	5,36	0,0267	0,1971
Mbd3	32,94	40,83	43,80	34,56	38,61	45,37	41,74	43,25	0,16	6,00	0,0268	0,1971
Pea15a	39,01	38,76	41,04	39,25	45,30	41,39	42,36	45,52	0,14	6,69	0,0268	0,1972
Herc4	47,72	41,73	41,26	45,69	40,92	39,75	39,44	39,60	-0,14	7,41	0,0269	0,1977
Atp10d	34,47	27,99	26,84	29,75	27,08	27,34	28,19	25,20	-0,14	7,42	0,0270	0,1985
Hinfp	8,66	11,29	11,08	10,81	12,03	12,07	11,78	12,53	0,21	4,57	0,0271	0,1985
Atp2b1	85,11	80,06	78,53	86,40	71,87	71,74	81,04	72,86	-0,15	9,13	0,0271	0,1985
Troap	1,75	3,07	2,63	1,88	1,29	1,87	2,04	2,03	-0,36	2,24	0,0271	0,1985
Bloc1s2	18,36	19,94	20,77	20,33	22,16	23,48	22,68	24,49	0,23	4,28	0,0272	0,1995
Gnb4	2,31	1,80	2,13	2,60	1,58	1,89	1,90	1,60	-0,35	2,46	0,0272	0,1995
Pja1	11,94	11,56	12,12	11,51	12,59	13,27	14,12	13,63	0,19	5,09	0,0275	0,2009
Hivep2	43,82	37,00	38,51	45,58	38,97	34,24	39,34	36,16	-0,15	8,58	0,0275	0,2009
Phf12	30,44	31,16	31,33	29,40	34,84	33,99	32,73	33,46	0,14	7,14	0,0275	0,2011
Tomm7	19,72	30,89	26,69	17,73	26,65	29,89	24,32	28,02	0,20	4,83	0,0276	0,2012
Rrp9	7,10	8,51	8,49	7,15	8,20	10,46	9,16	9,43	0,26	3,73	0,0276	0,2013
Dtwd1	2,63	3,28	2,96	2,37	1,95	1,99	2,27	2,28	-0,40	1,75	0,0276	0,2013
Rad54l	1,81	3,00	1,81	2,47	1,73	1,41	2,27	1,90	-0,33	2,69	0,0277	0,2021
Mvb12a	25,83	32,95	34,46	30,06	32,13	36,43	35,18	36,10	0,19	5,13	0,0278	0,2021
Rps3a1	598,17	699,45	686,76	597,03	705,73	706,76	689,93	760,35	0,15	9,33	0,0278	0,2021
Ehd3	65,46	67,27	68,56	67,64	74,50	72,06	73,09	78,04	0,15	8,02	0,0279	0,2021
Magi3	2,70	2,23	2,48	2,13	1,92	2,06	2,02	2,05	-0,24	3,87	0,0279	0,2021
Ctc1	3,44	3,98	3,09	3,58	3,09	2,73	3,20	2,84	-0,26	3,77	0,0279	0,2021
Cct8	54,34	65,20	58,38	59,78	62,30	64,79	65,32	70,06	0,14	7,23	0,0279	0,2021
Mrpl48	8,02	10,35	8,19	8,44	10,63	11,38	10,31	10,50	0,28	3,23	0,0281	0,2034
Gimap5	66,41	70,92	69,75	69,90	76,99	76,26	75,10	77,30	0,14	7,15	0,0282	0,2041
Tmem259	38,97	40,25	41,52	36,00	44,51	43,92	41,48	43,06	0,14	6,52	0,0283	0,2047

Ube2m	39,89	50,75	55,50	39,30	52,19	52,48	49,12	51,77	0,16	5,98	0,0283	0,2047
Atp11c	13,10	11,84	11,46	13,08	11,31	10,85	11,32	11,19	-0,15	6,16	0,0284	0,2048
Chkb	22,27	20,60	22,87	21,54	25,40	25,49	22,20	25,37	0,18	5,35	0,0284	0,2049
N4bp2l2	20,79	14,48	14,06	17,80	15,67	14,83	15,89	14,51	-0,14	7,17	0,0284	0,2050
Chpf2	22,30	20,50	27,68	22,64	25,35	26,99	23,95	26,29	0,15	6,51	0,0286	0,2059
Klhdc3	31,96	34,22	32,53	33,73	37,21	36,08	35,53	37,97	0,15	6,22	0,0286	0,2062
Cd209c	2,41	1,45	1,10	1,52	1,53	1,07	1,44	0,77	-0,45	1,21	0,0287	0,2062
Lamc1	15,46	16,01	14,79	16,60	14,73	13,61	14,45	14,24	-0,14	6,84	0,0287	0,2064
Slc16a6	14,94	10,75	12,09	12,93	11,12	10,55	12,33	11,29	-0,16	5,66	0,0287	0,2064
Ifi27l2a	31,84	38,98	43,94	36,35	32,67	40,00	31,88	25,59	-0,21	4,54	0,0288	0,2064
Cnot4	13,75	10,71	10,05	11,39	10,39	9,96	11,23	9,75	-0,16	5,94	0,0290	0,2074
Rps5	555,46	605,76	600,26	537,05	622,52	626,41	637,95	660,20	0,15	8,81	0,0290	0,2074
Zbtb7b	18,68	18,73	19,68	17,00	21,16	21,44	20,29	19,13	0,15	6,17	0,0290	0,2074
Heatr2	12,84	10,57	13,95	12,47	10,83	10,46	12,49	10,22	-0,17	5,33	0,0290	0,2074
Nol12	4,78	6,49	5,84	5,26	7,25	6,02	7,13	6,33	0,26	3,63	0,0290	0,2074
Map3k7	20,71	20,68	19,42	21,57	18,97	17,99	20,27	17,51	-0,14	6,82	0,0290	0,2074
Samd4b	15,65	17,42	17,47	16,62	19,40	17,76	19,05	18,06	0,15	6,28	0,0291	0,2077
Tet2	19,51	15,35	15,18	17,10	15,73	15,29	15,66	14,24	-0,14	7,20	0,0292	0,2080
Arhgap33	1,19	1,73	1,72	1,25	1,35	1,09	1,08	1,11	-0,33	2,54	0,0292	0,2081
Narfl	6,17	6,29	6,59	6,22	7,54	7,12	7,93	7,01	0,23	4,14	0,0293	0,2083
Tnpo2	24,68	25,13	25,89	26,40	28,20	27,21	27,14	30,04	0,14	7,04	0,0293	0,2083
Ip6k2	13,82	16,50	15,56	12,38	17,56	16,38	15,90	16,76	0,20	4,85	0,0293	0,2087
Evl	147,48	161,68	152,84	152,92	177,76	166,42	165,34	171,44	0,15	8,47	0,0294	0,2089
Itpr2	33,81	24,06	26,08	27,50	26,63	24,05	25,89	24,14	-0,15	8,29	0,0294	0,2089
Snx10	25,79	26,17	26,45	24,35	21,49	24,40	24,37	22,16	-0,15	5,97	0,0295	0,2092
Scfd2	9,69	6,79	7,73	7,40	6,93	6,94	6,78	6,93	-0,20	4,82	0,0295	0,2092
Tgif1	11,53	11,48	10,83	11,40	13,11	11,80	13,01	14,70	0,21	4,41	0,0295	0,2092
Zfp937	4,38	3,54	3,18	3,16	3,15	3,25	3,00	2,97	-0,21	4,53	0,0298	0,2111
Gnl3	10,86	10,94	8,05	8,81	10,10	10,75	12,40	11,92	0,21	4,35	0,0299	0,2112
Evi2a-evi2b	47,54	54,40	57,16	47,41	57,93	55,58	59,37	55,11	0,14	7,75	0,0299	0,2114
Nsun3	7,32	5,14	5,63	6,31	5,38	4,99	5,74	3,68	-0,30	2,91	0,0300	0,2120
Ftsj3	12,45	14,78	13,93	12,13	14,57	15,39	13,80	16,32	0,17	5,35	0,0300	0,2121
Akap8l	23,77	23,11	25,06	22,72	28,80	26,79	23,71	26,41	0,16	5,70	0,0301	0,2125
Gadd45a	3,28	3,44	3,71	2,44	4,29	3,75	3,89	4,49	0,37	2,20	0,0302	0,2129
Ercc6	12,03	9,59	10,69	10,50	9,80	9,50	10,03	9,43	-0,14	6,42	0,0302	0,2129
Tbc1d20	42,09	39,74	40,79	43,99	48,34	46,24	43,88	45,56	0,14	6,41	0,0303	0,2129
Wdfy2	4,97	4,26	3,86	4,24	3,12	3,66	3,82	3,59	-0,30	3,00	0,0303	0,2129
Spag7	11,38	15,32	15,80	12,12	15,16	15,40	16,31	16,96	0,24	4,11	0,0304	0,2134
Jup	1,67	1,51	1,55	1,29	1,53	1,44	1,15	0,70	-0,31	2,77	0,0305	0,2139
Oraov1	12,53	11,03	10,67	12,31	13,00	13,53	13,35	13,86	0,20	4,63	0,0305	0,2142
Dazap1	54,40	62,14	64,32	56,31	54,04	53,99	54,97	52,06	-0,14	6,88	0,0305	0,2142
Gripap1	28,88	27,56	31,46	25,93	33,00	32,59	29,75	30,04	0,14	6,45	0,0307	0,2154
Ypel3	117,15	116,77	139,56	123,07	145,54	141,33	136,25	123,28	0,14	7,10	0,0308	0,2154
March7	50,40	43,02	44,45	45,03	43,14	40,91	40,74	41,29	-0,14	6,89	0,0308	0,2158
Aup1	85,82	91,17	88,81	80,64	99,49	89,92	92,25	99,90	0,14	7,10	0,0310	0,2163
Trim30d	18,04	15,97	16,23	17,14	14,89	16,64	14,99	14,13	-0,15	5,91	0,0310	0,2163
Ercc6l2	9,21	8,05	7,92	8,74	7,41	7,17	8,07	7,58	-0,17	5,48	0,0310	0,2166
Kif1b	13,18	10,38	10,14	13,02	11,32	10,15	10,42	10,59	-0,14	6,82	0,0311	0,2169
Alg9	6,12	6,05	3,91	5,81	4,94	4,44	4,74	4,51	-0,25	3,84	0,0311	0,2170
Med4	16,16	20,78	20,67	18,16	21,94	20,94	22,21	21,74	0,20	4,73	0,0312	0,2170
Spg11	19,30	15,57	17,10	18,28	16,46	15,54	16,35	15,45	-0,14	7,01	0,0312	0,2171
B4galnt1	263,94	275,68	283,02	267,66	310,67	306,51	304,95	284,48	0,15	9,47	0,0313	0,2174
Zfp64	9,69	8,72	9,45	9,08	10,75	9,81	11,15	10,60	0,20	4,78	0,0314	0,2180
Dnttip1	15,47	20,21	22,20	17,46	22,07	21,55	21,46	21,28	0,21	4,66	0,0314	0,2180
Mcm3	20,88	30,14	22,94	23,58	20,78	21,87	22,70	22,80	-0,15	6,07	0,0314	0,2182

Lyrm1	2,09	1,80	1,70	1,87	0,84	1,77	1,77	1,08	-0,47	1,10	0,0315	0,2184
Vps8	7,22	6,28	5,61	6,84	5,95	5,61	5,79	5,48	-0,19	4,94	0,0316	0,2187
Khnyn	46,28	48,73	50,73	50,44	53,79	54,59	51,94	56,05	0,14	7,64	0,0316	0,2187
Zbtb14	11,38	12,80	11,41	12,61	13,99	12,70	13,49	13,96	0,16	5,52	0,0316	0,2187
Tango6	4,44	3,03	3,54	3,02	2,67	3,10	2,97	3,12	-0,24	3,84	0,0316	0,2187
Dip2a	5,19	4,36	4,81	5,47	4,59	4,36	4,50	3,93	-0,19	4,89	0,0317	0,2187
Sin3b	28,68	28,86	30,69	28,09	33,02	31,64	31,23	32,12	0,14	6,98	0,0317	0,2187
D3Ertd751e	2,27	1,78	1,85	2,33	1,78	1,92	1,70	1,26	-0,31	2,75	0,0318	0,2193
Cep350	32,01	24,37	27,37	31,50	27,50	23,70	26,65	26,39	-0,15	8,51	0,0318	0,2193
Mrpl9	46,99	48,70	44,07	49,00	51,14	52,11	51,30	54,14	0,14	6,32	0,0319	0,2197
Bag1	35,91	45,41	46,83	35,40	43,98	43,88	44,93	48,74	0,16	5,86	0,0320	0,2198
C2cd3	25,65	23,02	22,75	26,54	23,88	21,09	23,56	20,39	-0,14	7,51	0,0320	0,2198
Zfp654	27,02	23,18	23,30	25,52	22,80	22,75	21,81	22,64	-0,14	6,81	0,0320	0,2198
Tmem63b	4,29	3,21	4,09	3,73	4,56	5,20	4,00	4,39	0,25	3,77	0,0320	0,2198
Tnf	5,05	5,54	3,95	4,66	6,48	5,76	5,80	5,45	0,28	3,18	0,0320	0,2198
L1cam	7,25	6,39	6,62	6,80	6,18	6,06	7,03	4,58	-0,18	5,08	0,0321	0,2200
Ubqln4	12,92	13,84	13,13	13,99	15,32	15,49	13,75	15,80	0,16	5,59	0,0321	0,2200
Tmem64	3,70	4,19	4,12	4,16	4,94	4,54	4,18	5,10	0,22	4,36	0,0322	0,2208
Znrf2	152,34	146,12	160,77	177,57	145,38	147,20	143,67	139,53	-0,15	8,63	0,0323	0,2208
Phf10	10,32	13,67	12,79	11,49	12,51	13,17	13,53	16,59	0,21	4,44	0,0326	0,2231
E2f1	2,91	3,43	2,96	2,63	2,54	2,46	2,44	2,19	-0,31	2,74	0,0327	0,2232
Mrto4	8,74	10,12	8,24	11,39	11,98	11,38	12,06	11,28	0,26	3,34	0,0328	0,2237
Snx15	7,18	9,00	8,04	6,55	9,33	9,22	8,90	9,09	0,25	3,71	0,0328	0,2237
Rfx3	10,10	7,57	7,27	8,76	7,33	7,56	8,04	7,63	-0,15	6,21	0,0328	0,2237
Phactr4	6,88	7,73	6,91	6,93	8,98	7,43	7,70	8,12	0,18	5,12	0,0329	0,2238
Pag1	32,76	27,20	30,38	33,68	29,24	27,50	28,33	27,33	-0,14	7,93	0,0330	0,2246
Mcph1	8,12	6,22	5,92	6,67	5,94	6,21	5,89	5,61	-0,19	4,87	0,0330	0,2246
Dynll2	12,31	14,47	14,28	13,66	14,39	14,91	15,13	17,40	0,18	5,18	0,0331	0,2247
Mrpl28	10,19	11,37	11,28	9,16	11,76	12,30	12,75	13,15	0,26	3,63	0,0331	0,2247
Fam83d	1,54	2,04	1,46	2,02	1,33	1,11	1,93	1,09	-0,38	1,87	0,0332	0,2256
Ccdc55	2,90	3,57	4,28	2,75	4,03	4,04	3,95	4,00	0,27	3,53	0,0333	0,2256
Thumpd1	17,19	18,54	17,34	17,18	19,21	18,99	19,36	20,98	0,16	5,65	0,0333	0,2256
Npm1	163,16	201,71	188,54	173,55	198,82	192,98	195,34	214,98	0,14	8,09	0,0335	0,2269
Rabggtb	14,13	15,44	15,31	13,29	14,43	16,04	18,03	18,50	0,21	4,54	0,0335	0,2270
Wdr78	3,24	2,00	2,44	2,91	2,08	2,18	2,39	2,11	-0,28	3,21	0,0336	0,2272
Rps19	349,23	379,98	413,16	321,17	394,13	417,30	377,72	423,94	0,14	7,92	0,0337	0,2277
Dlg4	6,66	6,63	6,40	6,24	8,08	6,97	7,51	7,30	0,20	4,55	0,0337	0,2278
Arap2	40,80	33,46	32,54	35,71	32,41	31,70	32,89	32,26	-0,14	7,97	0,0338	0,2278
Exosc6	2,70	5,88	6,49	4,73	5,81	6,42	5,68	6,23	0,31	2,88	0,0338	0,2278
Nup155	9,92	9,11	9,01	10,64	8,79	8,34	9,35	8,37	-0,15	5,88	0,0338	0,2278
Smpd2	9,95	9,36	11,87	8,66	11,87	11,38	11,48	11,58	0,23	4,11	0,0339	0,2278
Gtpbp2	54,90	52,51	55,58	54,52	61,43	60,16	56,79	60,93	0,14	7,41	0,0339	0,2278
Abcg1	27,39	22,21	24,33	25,30	29,62	28,96	26,13	24,45	0,14	7,25	0,0339	0,2278
N4bp2l1	32,82	31,70	35,38	32,34	37,02	35,97	35,64	37,56	0,15	6,05	0,0339	0,2281
Gpatch11	4,08	3,81	4,41	3,35	4,40	4,74	4,66	4,39	0,23	4,16	0,0340	0,2281
Fxr1	30,47	35,39	34,49	28,20	35,27	35,75	34,15	36,51	0,14	6,30	0,0340	0,2282
Tom1	11,54	12,82	11,47	12,00	14,34	13,87	12,78	13,51	0,19	4,92	0,0341	0,2286
Zfyve16	7,51	6,36	6,49	7,45	6,47	6,53	5,94	5,70	-0,18	5,16	0,0341	0,2286
Sclt1	2,78	2,19	1,82	2,05	1,74	1,90	1,83	1,64	-0,33	2,61	0,0341	0,2286
Adamts10	62,80	52,20	63,65	54,36	67,65	65,87	60,25	63,02	0,14	7,96	0,0343	0,2297
Sh2b1	54,35	52,56	58,73	54,38	62,41	61,10	58,27	60,40	0,14	7,63	0,0344	0,2302
Nt5dc1	20,91	21,26	19,19	22,13	18,71	19,66	19,39	17,32	-0,16	5,75	0,0345	0,2302
Camk2n1	1,01	1,15	1,20	1,15	1,44	1,55	1,58	1,16	0,35	2,25	0,0345	0,2302
Zmat1	1,47	1,09	1,08	1,08	1,03	0,83	1,10	0,68	-0,37	1,91	0,0346	0,2308
Ccdc102a	2,62	3,13	3,53	2,49	3,49	3,96	2,98	3,93	0,30	2,93	0,0346	0,2308

Adamts14	3,94	3,15	4,05	3,24	5,35	3,81	3,84	3,59	0,22	4,34	0,0347	0,2309
Ccnt2	39,26	31,71	32,56	34,42	32,89	31,70	33,49	27,47	-0,14	6,86	0,0347	0,2310
E4f1	18,88	20,45	22,71	18,40	23,32	22,20	20,02	23,79	0,16	5,77	0,0347	0,2310
Akna	214,44	229,33	233,22	214,84	255,25	245,86	241,93	242,31	0,14	10,33	0,0347	0,2310
Maf	4,73	4,55	4,49	4,09	3,77	4,21	3,83	3,38	-0,23	3,91	0,0350	0,2323
Emc9	3,65	4,87	5,87	3,05	4,49	5,95	5,70	6,02	0,38	2,02	0,0350	0,2327
Phf19	3,46	4,08	3,61	3,55	3,40	2,72	3,01	3,26	-0,25	3,67	0,0351	0,2329
Pank4	15,97	15,00	18,62	15,33	18,53	19,03	16,60	18,38	0,17	5,46	0,0352	0,2331
Sec22a	2,09	1,78	1,42	1,76	1,30	1,51	1,43	1,46	-0,32	2,69	0,0352	0,2331
Tmem184b	12,76	13,90	14,24	12,88	15,44	14,52	15,82	14,25	0,16	5,58	0,0353	0,2331
Ncln	55,79	46,96	55,71	53,53	64,63	57,89	55,32	55,08	0,14	7,32	0,0353	0,2331
Rfc4	3,34	4,55	3,27	3,79	2,16	3,31	2,99	3,30	-0,37	2,05	0,0353	0,2331
Scaf1	36,46	37,12	40,19	35,58	42,50	40,45	40,55	40,58	0,14	7,36	0,0353	0,2331
Rpgrip1	1,37	1,50	1,45	1,25	1,68	1,65	1,25	2,21	0,29	3,03	0,0354	0,2331
Agtpbp1	8,88	8,04	8,05	7,36	6,69	6,69	7,80	7,40	-0,18	5,10	0,0354	0,2331
Zfp644	17,45	15,24	15,06	16,74	14,88	14,51	14,49	14,78	-0,14	6,45	0,0354	0,2331
Sesn2	4,67	5,59	5,49	4,45	6,32	5,58	5,03	6,82	0,24	3,88	0,0354	0,2331
Eif5	65,46	63,16	61,50	67,84	72,43	70,35	66,73	74,87	0,14	8,07	0,0355	0,2339
Rpl30	669,93	697,17	627,29	620,29	733,07	699,88	708,50	745,37	0,14	8,63	0,0356	0,2341
Qsox1	16,90	17,67	16,66	16,70	18,80	18,69	18,91	18,94	0,15	5,92	0,0356	0,2342
Fancb	1,41	1,34	1,50	1,19	0,89	1,21	1,24	0,84	-0,37	1,85	0,0358	0,2351
Pstpip1	113,59	112,92	115,67	106,25	125,49	122,26	121,59	124,36	0,14	7,77	0,0358	0,2351
Trrap	45,74	34,69	38,16	45,40	40,66	34,23	38,45	35,25	-0,14	8,93	0,0359	0,2355
Rnf167	86,31	87,27	85,14	84,01	93,70	96,07	94,23	92,58	0,14	7,10	0,0360	0,2359
Glipr1	45,11	45,65	46,02	42,77	50,83	48,00	51,24	49,93	0,16	5,68	0,0360	0,2360
Rp2h	7,60	6,93	7,77	8,30	6,75	5,92	7,06	7,03	-0,19	4,76	0,0360	0,2360
Bcl2l12	9,60	11,08	12,49	10,40	13,57	12,79	13,01	12,10	0,25	3,69	0,0361	0,2361
Erf	9,10	10,16	11,34	8,85	11,16	10,83	10,32	12,02	0,18	5,20	0,0362	0,2363
Il1rl2	1,62	1,73	0,87	1,74	2,38	1,89	1,77	1,80	0,35	1,84	0,0362	0,2363
Zfp799	5,48	3,98	4,50	4,41	3,88	4,14	4,20	3,57	-0,22	4,18	0,0362	0,2363
Psmb10	61,18	74,47	74,17	60,62	72,33	72,63	71,07	81,03	0,14	6,49	0,0362	0,2363
Rilpl2	41,55	52,70	47,96	42,85	50,84	50,82	50,48	52,77	0,15	5,94	0,0363	0,2367
Trim8	43,89	51,62	55,79	47,07	52,12	55,49	53,20	57,01	0,14	7,40	0,0363	0,2367
Rev3l	19,34	14,67	15,57	17,33	15,77	14,59	15,55	15,01	-0,14	7,41	0,0364	0,2367
Idh3a	30,72	32,94	30,13	34,20	27,97	27,43	31,03	29,72	-0,14	6,20	0,0364	0,2367
Brd4	53,16	58,86	57,66	53,11	62,62	58,88	63,03	61,14	0,14	8,46	0,0364	0,2367
Tacc3	9,78	13,96	10,27	10,31	8,41	9,46	10,81	10,23	-0,19	4,78	0,0364	0,2367
Usmg5	38,89	41,25	34,11	33,36	41,13	46,69	44,74	42,07	0,24	3,80	0,0365	0,2367
Morf4l1	77,98	88,00	81,36	80,29	91,82	86,68	87,57	94,03	0,14	7,41	0,0365	0,2367
Ssbp4	46,33	57,21	65,01	46,87	58,13	61,45	57,16	59,70	0,14	6,38	0,0365	0,2367
Traip	1,98	2,38	1,58	2,20	1,34	1,40	2,05	1,72	-0,34	2,34	0,0365	0,2367
Pet117	16,44	19,63	25,85	14,47	15,50	16,12	11,84	16,59	-0,31	2,44	0,0366	0,2368
Hist1h2ba	14,06	16,59	15,76	11,62	11,09	12,86	11,35	10,56	-0,33	2,33	0,0366	0,2369
Il31ra	1,17	1,16	1,37	1,32	1,63	1,24	1,14	2,31	0,34	2,41	0,0366	0,2369
Rbl1	24,17	24,14	22,66	26,43	22,42	21,42	23,04	21,87	-0,14	6,83	0,0367	0,2369
Fam50a	14,54	16,48	17,51	12,69	16,83	16,90	18,12	18,35	0,21	4,51	0,0368	0,2376
Psat1	13,23	15,16	13,93	14,61	12,37	11,63	12,50	13,69	-0,18	4,94	0,0369	0,2378
Hyi	4,85	4,28	5,00	4,81	5,43	5,82	6,95	5,66	0,34	2,35	0,0369	0,2378
Tubb5	255,23	325,63	272,73	292,64	254,07	244,98	268,75	271,27	-0,14	9,50	0,0369	0,2380
Slc37a3	22,42	15,64	17,38	17,23	16,54	16,54	16,98	15,81	-0,14	6,14	0,0370	0,2385
Ccdc50	30,85	31,34	31,59	35,81	28,10	28,68	30,36	30,66	-0,14	7,75	0,0371	0,2386
Nabp1	56,17	56,57	61,31	51,94	51,56	53,93	54,47	45,66	-0,13	7,26	0,0371	0,2386
Cxcr4	13,47	16,43	9,28	10,33	12,19	13,28	15,62	16,04	0,19	4,61	0,0372	0,2386
Cog5	31,42	24,15	27,48	28,45	25,25	26,01	25,83	24,18	-0,14	6,32	0,0372	0,2386
Rims3	1,20	2,01	1,16	1,71	1,32	1,24	0,65	1,06	-0,55	0,45	0,0372	0,2386

Ppp1r13b	15,77	14,52	15,08	16,25	18,49	15,87	16,01	17,65	0,14	6,14	0,0372	0,2386
Ttc1	16,36	18,21	18,10	19,24	17,91	19,53	22,67	21,94	0,19	4,79	0,0372	0,2387
Pja2	7,84	6,56	7,96	7,98	6,89	6,46	6,94	6,52	-0,17	5,07	0,0373	0,2390
Tbc1d23	8,06	6,86	6,81	7,72	7,12	6,21	6,51	5,92	-0,20	4,66	0,0374	0,2396
Zc3h18	27,59	29,55	28,86	28,50	31,68	31,22	31,45	31,36	0,13	6,84	0,0376	0,2405
Rbmxl1	21,30	26,53	23,68	21,86	26,44	26,05	25,03	27,07	0,16	5,42	0,0377	0,2410
Spcs3	34,76	34,44	36,67	38,44	30,86	33,39	33,99	33,24	-0,13	6,90	0,0378	0,2413
Eif4a2	96,80	94,83	97,58	94,75	107,13	104,27	105,75	105,82	0,14	8,32	0,0378	0,2414
Ttll5	8,15	5,42	6,37	6,43	5,87	5,92	6,31	5,12	-0,18	4,91	0,0378	0,2414
Ppp1r12b	6,44	4,19	4,82	4,27	3,54	4,42	4,65	4,16	-0,23	3,84	0,0379	0,2414
Mrpl1	6,19	5,87	5,90	6,94	5,04	5,74	5,70	5,08	-0,21	4,33	0,0379	0,2414
Ifi30	12,10	16,09	11,66	8,95	9,30	11,97	9,40	10,34	-0,26	3,47	0,0379	0,2415
Ccnk	34,66	38,32	35,97	33,76	39,90	37,80	38,78	40,23	0,14	6,62	0,0380	0,2418
Acp6	6,36	5,86	6,41	5,98	8,38	6,71	6,88	7,21	0,25	3,58	0,0381	0,2419
LOC102308570	7,25	11,59	10,85	6,14	10,66	11,04	10,78	9,98	0,26	3,50	0,0382	0,2423
Cct3	38,83	38,09	37,89	38,31	41,46	42,09	39,72	45,33	0,14	6,30	0,0382	0,2423
Rgcc	4,50	5,84	6,10	4,35	5,08	6,50	7,20	7,14	0,33	2,44	0,0382	0,2424
Slc5a3	3,89	2,82	3,23	3,15	2,72	2,75	3,06	3,05	-0,18	5,07	0,0382	0,2424
Pdcl3	10,78	17,29	17,79	12,42	14,50	16,42	16,29	19,08	0,20	4,73	0,0383	0,2429
Sytl2	13,22	9,49	10,41	11,07	9,55	10,18	10,83	9,15	-0,16	5,66	0,0384	0,2432
Ccdc138	1,52	1,43	1,65	1,75	1,50	1,25	1,18	0,98	-0,36	1,82	0,0385	0,2432
Trip6	4,25	3,04	3,76	4,18	4,50	5,30	4,13	4,69	0,29	2,92	0,0385	0,2432
St7l	7,99	5,19	5,53	6,18	5,11	5,66	6,08	5,24	-0,18	5,08	0,0385	0,2433
Dedd2	31,59	30,91	34,87	32,70	35,45	38,12	34,47	35,64	0,15	5,97	0,0385	0,2433
Ubc	414,14	411,90	365,75	426,48	451,90	448,27	444,16	439,92	0,14	10,00	0,0387	0,2437
Ldlrap1	20,08	22,59	22,16	20,58	24,37	22,12	21,69	26,32	0,15	5,91	0,0387	0,2437
Fxr2	24,92	28,17	27,51	23,67	28,51	28,80	27,12	30,18	0,14	6,35	0,0387	0,2437
Aldh2	2,45	2,46	1,71	2,09	1,85	2,49	1,21	1,37	-0,36	2,14	0,0388	0,2437
Plod3	2,76	2,65	2,80	2,63	3,48	3,37	3,27	2,88	0,27	3,31	0,0388	0,2437
Erp29	33,08	37,10	36,14	33,02	37,42	39,88	37,07	41,19	0,16	5,52	0,0388	0,2437
Cysltr2	8,58	7,86	7,19	8,52	6,83	6,43	8,16	5,90	-0,24	3,76	0,0388	0,2437
Mtfr1l	22,42	21,54	23,13	22,06	23,86	24,02	24,90	26,62	0,16	5,58	0,0388	0,2437
Zfp335	29,79	28,49	31,66	27,21	34,19	31,88	30,46	31,89	0,14	7,13	0,0388	0,2437
Bax	48,73	52,11	51,47	48,86	57,04	55,25	54,02	58,24	0,16	5,54	0,0389	0,2437
Mrpl24	58,60	60,52	63,48	54,56	68,69	67,21	59,66	66,78	0,15	5,89	0,0389	0,2437
Utp20	4,83	4,78	4,24	5,53	4,51	4,10	4,46	4,26	-0,17	5,35	0,0389	0,2437
Mrps18c	20,88	25,77	23,36	20,12	24,08	25,99	29,76	26,81	0,24	3,64	0,0390	0,2437
Reep4	18,73	21,60	22,14	19,70	23,47	20,85	21,89	26,16	0,17	5,19	0,0390	0,2437
Surf1	30,69	37,28	34,36	29,89	37,55	33,49	39,31	37,67	0,17	5,37	0,0391	0,2447
Ctso	12,71	12,99	11,80	12,85	11,45	11,13	11,78	10,63	-0,17	5,37	0,0393	0,2452
Stx5a	38,79	35,43	37,88	35,89	42,45	40,29	40,39	39,49	0,14	6,36	0,0393	0,2453
Eif3i	63,84	67,92	63,10	67,43	69,60	72,05	73,49	73,79	0,14	6,26	0,0394	0,2457
Ccdc84	7,20	8,00	10,21	7,66	9,70	10,31	9,84	9,44	0,27	3,40	0,0395	0,2462
Tef	8,81	7,86	9,72	9,38	11,18	10,65	8,53	9,68	0,17	5,33	0,0396	0,2465
Cbx4	31,53	30,94	28,37	31,40	32,99	34,38	32,99	33,83	0,13	7,38	0,0396	0,2465
Ankle1	1,33	1,86	1,95	1,38	1,25	1,27	1,38	1,04	-0,37	1,63	0,0396	0,2465
Hnrnph3	11,94	13,25	14,13	11,42	13,53	14,41	14,03	15,52	0,19	4,88	0,0397	0,2470
Strn4	27,15	25,65	27,39	26,20	29,82	29,90	26,68	30,31	0,13	6,63	0,0398	0,2474
Swap70	5,69	6,76	6,56	6,88	6,80	6,69	8,63	7,33	0,19	4,81	0,0399	0,2476
Pex26	4,08	4,25	4,40	4,49	4,88	5,22	4,66	5,18	0,21	4,26	0,0399	0,2478
Zfp566	3,26	2,38	3,07	2,67	3,43	3,75	3,46	3,51	0,33	2,46	0,0400	0,2478
Timm44	18,51	21,15	20,11	17,28	22,60	21,01	20,64	22,35	0,17	5,19	0,0402	0,2490
Mnda	5,89	6,38	6,42	6,33	7,82	7,35	7,26	7,31	0,25	3,52	0,0402	0,2490
Swi5	23,05	35,54	29,55	23,75	33,33	30,77	31,15	32,98	0,20	4,54	0,0402	0,2490
Arid3b	28,65	25,98	28,34	26,79	30,57	32,00	28,98	28,75	0,13	6,77	0,0403	0,2493

Rela	39,46	41,61	38,16	39,44	44,99	42,94	42,62	43,48	0,13	6,82	0,0403	0,2493
Zfp687	15,02	13,73	13,29	14,74	16,54	15,34	14,79	15,97	0,14	6,12	0,0404	0,2493
Atg2a	35,79	33,25	32,01	34,63	38,55	37,48	35,83	37,28	0,14	7,82	0,0405	0,2499
Tsr2	3,50	2,86	2,34	2,94	3,29	3,35	3,69	3,52	0,24	3,63	0,0406	0,2502
Adrm1	46,40	49,80	44,01	44,02	50,52	48,09	49,94	54,63	0,14	6,12	0,0406	0,2502
Eif3f	228,40	246,79	258,80	232,22	260,46	261,89	255,99	285,18	0,14	8,58	0,0407	0,2505
Fam35a	7,56	7,85	7,48	7,88	7,03	6,55	7,77	5,58	-0,19	4,64	0,0407	0,2505
Dclre1c	6,79	5,51	5,15	5,74	5,16	4,74	5,57	4,76	-0,20	4,47	0,0407	0,2505
Ndufab1	7,95	10,17	9,81	8,27	10,81	12,09	9,76	11,19	0,28	3,02	0,0409	0,2513
Serp2	4,33	4,04	3,71	2,88	4,39	4,81	4,93	5,24	0,37	1,77	0,0409	0,2515
Nob1	16,14	18,81	14,99	15,54	17,50	18,63	17,95	20,43	0,18	4,86	0,0411	0,2521
Mcl1	133,70	153,53	142,74	142,78	158,64	158,45	148,18	165,30	0,14	9,04	0,0411	0,2521
Card6	28,72	29,03	29,95	29,87	32,92	32,80	31,61	31,50	0,13	7,13	0,0412	0,2524
Angptl4	1,46	2,21	1,29	1,57	2,37	2,01	1,81	2,29	0,35	1,91	0,0412	0,2524
Dpf2	35,01	34,18	31,32	33,78	36,50	35,79	37,59	37,52	0,13	6,57	0,0414	0,2535
Atxn7l2	7,78	8,02	7,70	7,96	9,26	9,14	8,50	9,04	0,19	4,67	0,0415	0,2543
Pgm2l1	14,88	13,39	14,48	15,96	13,30	12,49	15,03	12,78	-0,13	6,92	0,0416	0,2546
Arhgef2	95,69	96,89	102,87	95,98	113,03	105,93	101,97	109,82	0,14	8,83	0,0416	0,2546
Hip1r	40,62	46,80	49,83	43,85	48,29	51,08	48,52	50,79	0,14	7,70	0,0417	0,2549
Tmtc4	4,95	3,38	4,71	4,48	4,02	3,64	3,74	3,47	-0,23	3,78	0,0418	0,2550
Slc39a7	35,35	38,32	40,78	37,09	41,82	42,44	39,14	42,61	0,13	6,57	0,0418	0,2550
Wdr7	12,57	11,04	10,23	11,66	10,44	10,31	10,09	10,62	-0,14	6,27	0,0419	0,2551
Pdss2	4,19	2,87	3,15	3,68	2,43	2,87	2,71	3,21	-0,32	2,49	0,0419	0,2551
Hnrnpa3	107,53	134,85	117,25	108,08	119,95	121,88	130,15	142,77	0,14	9,33	0,0419	0,2551
Krtcap3	6,21	5,53	6,38	5,70	7,57	7,80	7,23	6,79	0,31	2,62	0,0419	0,2551
Exosc1	8,77	8,70	8,80	8,80	10,03	10,25	10,13	10,55	0,22	3,96	0,0420	0,2553
Camk4	28,37	24,69	24,00	27,17	23,86	21,84	24,67	24,48	-0,14	8,26	0,0420	0,2553
Cyb5r1	5,49	4,67	3,95	4,25	6,40	5,61	4,64	5,66	0,27	3,08	0,0420	0,2553
Scaper	8,62	7,90	6,74	7,24	6,71	6,95	6,49	7,12	-0,17	5,25	0,0421	0,2557
Bcl2	5,39	5,37	4,58	5,96	5,77	6,27	5,85	6,02	0,16	5,36	0,0424	0,2569
Phf11d	5,45	4,56	4,47	4,47	4,44	3,73	4,18	3,68	-0,24	3,56	0,0426	0,2580
Znrf1	11,33	10,80	13,40	11,45	13,99	13,15	11,18	13,29	0,14	6,10	0,0426	0,2580
Phf11c	37,97	34,52	37,29	38,02	32,42	35,39	33,98	31,68	-0,15	5,81	0,0428	0,2589
Rab31	2,23	2,11	2,07	2,54	2,09	1,91	1,83	1,51	-0,29	2,84	0,0428	0,2590
Scamp3	58,42	68,02	69,75	58,93	72,11	69,72	69,11	68,23	0,13	6,63	0,0431	0,2603
Ing4	26,98	28,34	29,48	28,75	33,31	30,94	30,66	31,30	0,15	5,60	0,0431	0,2603
Acap1	138,53	126,11	139,38	125,66	145,23	153,64	139,11	144,15	0,14	8,43	0,0431	0,2603
Mgat4a	8,01	5,94	6,69	7,46	6,41	6,17	6,73	5,95	-0,16	5,56	0,0432	0,2605
Zbtb2	20,43	18,41	20,95	19,95	22,72	21,40	22,34	21,25	0,14	6,08	0,0433	0,2611
Rtfdc1	37,10	41,59	39,78	39,37	43,27	43,18	41,40	45,18	0,13	6,47	0,0433	0,2611
Zcchc17	11,33	13,37	12,33	11,57	14,45	14,32	13,19	14,24	0,21	4,22	0,0434	0,2611
Dnajb2	1,44	1,30	1,73	1,69	2,25	1,88	1,73	1,78	0,33	2,43	0,0434	0,2611
Galt	13,31	12,15	10,36	10,44	13,75	13,60	13,85	11,70	0,19	4,64	0,0435	0,2614
Mppe1	32,58	32,99	36,19	32,59	34,41	37,78	37,60	37,86	0,14	6,15	0,0435	0,2614
Sap25	42,43	41,18	48,40	38,40	50,86	48,35	45,49	44,36	0,16	5,58	0,0435	0,2615
Prkab1	26,02	28,77	28,77	25,84	30,98	30,11	30,59	29,09	0,15	5,89	0,0436	0,2617
Zfp26	13,66	11,85	12,63	15,02	12,72	11,66	12,48	11,72	-0,13	7,18	0,0437	0,2620
Trmu	3,80	3,80	4,67	3,42	5,29	4,18	4,45	5,18	0,30	2,75	0,0437	0,2621
Fbxl12	16,50	15,17	14,90	16,21	17,34	17,32	17,40	18,55	0,17	5,16	0,0438	0,2623
Tardbp	39,05	38,82	40,04	43,58	43,18	43,09	43,64	47,47	0,14	8,30	0,0443	0,2653
Klrb1f	4,29	3,96	2,77	3,56	2,54	2,98	3,06	3,27	-0,32	2,53	0,0444	0,2655
Gprin3	44,95	36,82	37,98	38,33	37,25	35,31	37,82	34,10	-0,13	6,87	0,0444	0,2656
Slc30a4	2,63	2,92	3,21	3,28	3,56	3,30	3,42	3,62	0,21	4,16	0,0445	0,2657
Rpap1	14,25	12,53	13,57	13,23	11,87	13,02	12,80	10,88	-0,14	5,94	0,0445	0,2657
Klf16	12,32	14,40	14,58	14,42	16,81	15,54	12,89	17,09	0,16	5,30	0,0445	0,2657

Dennd1b	31,13	28,28	28,92	34,52	27,88	26,54	29,54	28,06	-0,13	7,91	0,0445	0,2657
Mepce	26,31	31,56	30,86	29,41	33,72	34,05	30,83	30,71	0,13	6,62	0,0446	0,2659
Hars	21,00	26,81	25,15	19,01	25,40	25,38	24,81	26,49	0,16	5,59	0,0446	0,2659
Ttc17	21,82	20,71	21,32	21,97	20,01	20,04	20,23	18,08	-0,13	6,56	0,0447	0,2662
Map3k11	24,97	27,53	29,74	26,32	30,21	30,47	28,31	29,70	0,13	6,76	0,0448	0,2667
Cd79b	6,20	6,42	4,89	6,26	6,86	7,02	6,33	8,75	0,26	3,02	0,0449	0,2671
Srrm1	52,98	58,37	55,88	49,02	59,69	57,98	59,83	59,51	0,13	7,73	0,0449	0,2671
Rxrb	34,71	31,18	36,96	34,19	39,77	38,33	34,26	37,52	0,13	6,56	0,0450	0,2671
Tnks	12,58	11,29	10,57	13,03	10,54	10,68	11,12	10,94	-0,14	6,19	0,0450	0,2674
Proser1	14,14	15,02	15,80	14,22	16,22	16,56	15,83	16,44	0,14	6,07	0,0452	0,2682
Trappc12	20,64	18,82	21,53	21,73	19,82	18,88	19,14	17,27	-0,14	6,06	0,0453	0,2684
Trim34a	43,13	36,60	34,27	44,02	37,00	35,60	37,59	34,40	-0,13	6,61	0,0454	0,2684
Tpd52	2,59	2,68	2,14	2,46	1,79	2,24	1,87	2,12	-0,32	2,47	0,0454	0,2684
Gnl2	12,40	13,89	10,91	12,04	13,13	14,06	14,06	14,48	0,17	4,96	0,0454	0,2684
Pdhb	43,79	46,23	42,41	41,70	45,84	46,55	48,83	50,44	0,14	6,09	0,0454	0,2684
Htra2	6,02	5,60	4,83	5,15	7,39	6,02	5,66	6,72	0,25	3,38	0,0454	0,2684
Tsnax	22,83	25,50	24,88	22,93	26,07	25,87	24,53	29,55	0,14	5,92	0,0455	0,2684
Zfp953	8,39	6,82	7,48	8,06	7,25	6,87	6,70	6,52	-0,17	5,08	0,0455	0,2686
Hmbs	9,25	8,44	7,82	7,34	6,58	6,98	8,11	6,23	-0,24	3,61	0,0455	0,2686
Snw1	38,83	48,46	44,67	42,08	45,16	47,59	47,49	50,20	0,13	6,69	0,0456	0,2690
Rnf181	43,03	42,63	47,66	42,72	52,67	47,94	44,78	48,19	0,14	6,00	0,0459	0,2703
Rfng	7,62	8,86	7,81	8,36	10,18	8,06	9,77	9,69	0,20	4,24	0,0460	0,2708
Faah	25,29	26,15	25,77	26,82	28,01	27,61	28,16	30,07	0,13	6,70	0,0460	0,2708
Dhrs11	5,16	4,10	4,33	3,97	5,87	5,92	4,22	5,40	0,29	2,82	0,0461	0,2710
Smchd1	63,17	58,03	56,10	61,16	54,08	53,96	54,99	54,11	-0,14	8,65	0,0462	0,2716
Adamts6	12,43	8,21	8,77	10,83	9,05	8,32	10,14	8,74	-0,16	5,53	0,0463	0,2716
Rabac1	39,78	35,90	41,29	41,52	44,45	45,49	42,70	44,84	0,17	5,20	0,0463	0,2716
Psmb8	158,01	203,60	207,70	156,56	194,79	203,17	189,88	207,20	0,13	7,86	0,0463	0,2718
Gpr132	60,29	54,75	60,29	63,37	65,92	65,40	62,02	67,69	0,13	7,25	0,0465	0,2726
Zfp358	1,79	2,33	2,51	2,08	2,86	2,52	2,70	2,75	0,33	2,32	0,0466	0,2728
Zfp433	5,16	3,64	4,80	4,30	3,99	3,99	3,56	3,40	-0,25	3,29	0,0467	0,2729
Tatdn2	49,53	42,95	42,71	46,68	46,68	49,07	48,47	54,75	0,13	6,98	0,0467	0,2729
H2-Q1	20,34	17,75	17,90	21,17	21,02	23,52	19,58	22,12	0,16	5,38	0,0467	0,2729
Ahi1	4,43	3,51	3,18	3,41	2,78	3,16	3,18	3,44	-0,22	4,05	0,0468	0,2732
Ms4a6d	5,89	6,08	5,79	6,37	7,69	8,30	6,52	6,46	0,26	3,21	0,0468	0,2732
Creld2	8,70	11,43	10,12	9,85	11,86	10,42	12,98	11,50	0,22	3,90	0,0468	0,2733
Nudt5	12,75	11,16	12,44	13,55	10,10	11,67	11,09	10,43	-0,21	4,21	0,0469	0,2735
Kdm4c	29,17	24,41	26,10	26,85	24,82	23,35	24,84	24,42	-0,13	6,76	0,0469	0,2735
Gsap	22,33	17,39	19,55	19,22	17,78	17,76	18,43	17,46	-0,14	6,13	0,0470	0,2737
Maf1	61,79	55,98	68,35	65,10	70,43	71,87	63,65	68,40	0,13	6,85	0,0472	0,2748
Nsl1	5,41	4,10	3,66	4,27	3,63	3,19	4,55	3,49	-0,24	3,60	0,0472	0,2748
Uba6	13,73	12,11	12,70	13,59	12,21	11,68	12,18	11,29	-0,14	5,98	0,0473	0,2749
Mthfd1	4,92	6,56	5,23	5,71	4,48	4,83	5,00	5,13	-0,21	4,13	0,0473	0,2749
Ube2v1	77,82	86,08	79,10	74,51	87,81	86,11	85,15	88,09	0,13	7,34	0,0473	0,2749
Ciz1	21,34	23,51	22,62	19,68	25,86	23,18	23,98	22,65	0,14	6,11	0,0475	0,2752
Celsr1	21,94	17,57	19,20	22,34	20,01	17,45	18,23	18,32	-0,13	7,74	0,0475	0,2752
Zfyve26	12,80	11,70	11,87	14,03	12,01	10,99	11,97	11,16	-0,13	6,82	0,0475	0,2752
Gnl1	11,98	12,73	13,27	12,26	13,37	15,55	12,57	14,75	0,16	5,20	0,0475	0,2752
Orc4	16,78	13,71	15,84	13,87	13,66	14,47	12,76	13,61	-0,14	5,85	0,0477	0,2761
Ppp1r2	13,47	12,34	12,49	13,66	11,33	12,25	11,60	11,73	-0,15	5,66	0,0478	0,2768
Grpel1	9,66	9,38	8,24	9,86	10,12	10,32	9,97	11,46	0,17	5,05	0,0479	0,2771
Gstcd	6,19	4,79	5,42	5,67	4,91	4,17	4,77	4,99	-0,23	3,75	0,0480	0,2771
Fhod1	19,40	17,47	18,92	17,97	21,95	20,81	17,10	20,98	0,13	6,26	0,0480	0,2771
Ctxn1	1,13	1,52	1,39	2,04	1,58	2,63	2,00	1,94	0,39	1,21	0,0481	0,2775
Rrad	7,81	9,46	10,09	8,13	9,72	9,95	10,35	11,15	0,22	3,92	0,0482	0,2777

Fig4	14,77	13,26	13,53	14,59	12,53	12,41	13,37	12,16	-0,16	5,45	0,0482	0,2781
Ndufaf2	1,26	1,87	2,78	1,37	2,91	2,44	1,80	2,69	0,51	0,63	0,0484	0,2787
Gadd45b	11,91	14,90	17,55	13,05	15,63	18,46	14,85	16,76	0,21	4,29	0,0484	0,2787
Atp6v1c1	31,99	28,54	27,45	30,31	27,19	27,28	26,81	26,15	-0,14	5,89	0,0486	0,2792
Hmces	10,41	13,13	12,30	10,42	12,51	13,32	12,97	14,59	0,21	4,14	0,0486	0,2792
Phactr2	2,03	1,93	1,88	2,01	1,87	1,74	1,67	1,49	-0,22	3,97	0,0486	0,2792
Zdhhc6	19,16	18,93	20,37	20,56	16,35	19,61	18,57	16,40	-0,15	5,42	0,0486	0,2793
Cst7	109,76	110,54	102,82	108,71	124,80	116,45	122,62	108,13	0,13	6,80	0,0488	0,2799
Dnajc15	193,67	188,99	200,38	183,95	181,53	168,79	178,38	173,08	-0,13	6,89	0,0488	0,2800
Bcorl1	6,39	6,37	6,70	5,97	7,52	6,47	7,03	7,30	0,16	5,37	0,0489	0,2801
Brf1	25,76	27,70	28,25	23,28	27,64	30,28	25,30	31,77	0,13	6,24	0,0489	0,2802
Kcnc1	2,90	2,24	3,06	3,02	2,37	1,98	3,26	2,13	-0,19	4,35	0,0489	0,2802
Doc2g	1,65	2,28	1,96	1,97	2,09	3,03	2,53	2,51	0,36	1,71	0,0490	0,2805
Usp24	44,65	33,39	36,17	43,09	36,86	34,16	36,40	36,00	-0,13	8,64	0,0491	0,2805
Folr4	2,57	3,18	1,88	1,91	1,68	1,81	1,80	2,15	-0,39	1,53	0,0491	0,2805
Nol10	15,31	12,64	12,48	14,47	11,60	12,84	13,49	11,32	-0,16	5,28	0,0492	0,2810
Zfp563	2,19	1,73	2,02	2,17	1,74	1,76	1,74	1,64	-0,23	3,58	0,0493	0,2810
BC068281	3,92	2,94	3,38	3,44	3,72	4,27	3,91	4,28	0,24	3,47	0,0493	0,2810
Prelid1	179,42	205,25	210,94	174,97	206,19	204,48	217,09	215,20	0,13	7,78	0,0493	0,2813
Ep400	51,06	42,19	42,61	49,41	44,58	39,48	43,64	41,23	-0,13	8,90	0,0494	0,2813
Gpr114	12,93	11,31	14,89	13,16	13,72	15,54	13,80	15,19	0,16	5,29	0,0494	0,2813
Slc25a24	15,76	16,46	16,94	16,77	14,26	15,32	15,85	14,17	-0,14	5,73	0,0495	0,2816
Drap1	47,87	55,00	48,42	50,75	58,81	53,24	53,53	58,60	0,15	5,61	0,0495	0,2816
Psmd4	44,12	58,89	57,00	50,53	57,53	61,36	55,60	56,10	0,13	6,21	0,0497	0,2816
Fmr1	26,57	28,38	25,34	27,63	23,48	25,00	25,98	24,44	-0,13	6,83	0,0497	0,2816
Pfkl	12,13	13,04	12,80	10,69	13,53	13,38	13,29	13,72	0,15	5,58	0,0497	0,2816
Rnf113a2	7,06	10,09	9,67	8,82	10,33	11,33	9,02	10,98	0,23	3,75	0,0497	0,2816
Kdelc2	3,54	2,86	2,72	3,53	2,67	2,41	2,80	2,85	-0,25	3,43	0,0498	0,2816
Spr	8,50	10,43	11,26	8,44	10,91	10,73	10,29	13,16	0,24	3,69	0,0499	0,2816
Parp9	40,96	41,80	40,25	46,03	39,07	39,21	38,32	38,28	-0,13	7,17	0,0499	0,2816
Ptbp3	139,08	127,06	136,00	147,58	127,99	120,89	127,00	125,32	-0,13	9,82	0,0499	0,2816
Elp4	3,40	3,13	2,59	3,20	2,45	2,80	3,03	2,22	-0,24	3,49	0,0499	0,2816
Ddx46	42,63	47,45	46,27	41,27	47,83	47,51	47,09	52,01	0,13	8,05	0,0500	0,2816
Mrpl39	7,43	9,70	9,15	8,06	9,81	8,61	11,36	9,81	0,21	4,11	0,0500	0,2816
Xpr1	15,73	13,42	14,92	16,07	13,75	13,25	14,35	13,72	-0,13	6,78	0,0500	0,2816

Supplementary Table 4. Expression of genes universally characteristic of stem-like T cells[33], in pmel-1 Lmo4-Thy1.1^{+} CD8^{+} T cells

Gene_ symbol	***logFC***	***Pvalue***	***FDR***
Itgb1	-0,099629041	0,144088639	0,481675381
Emb	0,062757223	0,342328654	0,694959756
Crtam	0,080576659	0,2394634	0,604743712
Cd9	0,065728856	0,460962189	0,781035592
Sell	-0,366350386	0,019189628	0,16298183
Traf1	0,154102796	0,019981309	0,166791027
Tnfrsf25	0,601340733	0,003877014	0,052784104
Ifi27l2a	-0,206192169	0,028756491	0,206388187
Fam162a	0,062187259	0,71759416	0,909888104
Ypel3	0,141755767	0,030766474	0,215388223
Shisa5	0,07196399	0,290958637	0,651797261
Pdcd4	0,161299683	0,016946492	0,149397437
Dapl1	#NV	#NV	#NV
Cd27	0,222713621	0,00079003	0,016077622
Id3	0,368043642	0,019992926	0,166791027
Ccr7	0,329488441	0,000019843	0,000769807

Lef1	0,123494498	0,056609952	0,303447416
Evl	0,147110772	0,029399197	0,208860078
Asap1	-0,021945322	0,741321284	0,919734542
Tmsb10	0,420594758	0,000000001	0,000000099
Bcl2	0,157438343	0,042356204	0,256924533
Tox	-0,129123635	0,264120258	0,628732908
Batf	0,153129254	0,082633843	0,367687359
Nsg2	0,215581536	0,012530891	0,121927303
Lamp1	0,033135503	0,60458455	0,863613483
Ctss	-0,041298354	0,531752829	0,825268378
Pou2f2	0,218381464	0,001182305	0,022321353
Eef1a1	0,114762486	0,092707471	0,388775933
Eif3f	0,139068223	0,040666024	0,250505857
Cnot6l	-0,113160897	0,09595922	0,396011519
Tnfsf8	0,21011783	0,078445443	0,359076949
Slamf6	-0,038699461	0,562890313	0,840313547
Ltb	0,250527814	0,00017152	0,004757027
Ifnar2	0,041377118	0,520405226	0,819435594
Fth1	0,435448885	0,000	0,000000005
Cox7a2l	0,083222973	0,213227834	0,575256268
Mpc1	-0,015901919	0,825833945	0,9501141
Cyb5a	#NV	#NV	#NV
Limd2	0,080747543	0,23486132	0,599285041
2310001H17Rik	#NV	#NV	#NV
Malat1	#NV	#NV	#NV
Gm8369	#NV	#NV	#NV
Rgs10	0,67284576	0,000000153	0,000011334
Ubac2	0,016021896	0,80208127	0,941351654
Sesn3	0,085137419	0,191262142	0,552723466
Map4k4	0,052013361	0,438354003	0,765132371
Inpp4b	-0,063287515	0,343438287	0,695456984
Tespa1	0,080531993	0,294381156	0,655713997
Tcf7	0,345042204	0,000000394	0,000026625
Ikzf2	-0,130907335	0,265810758	0,63030334

Supplementary Table 5. Pathways significantly upregulated in Lmo4-Thy1.1^{+} and down-regulated in Myb$^{\Delta/\Delta}$ pmel-1 CD8^{+} T cells, generated under identical experimental conditions

Common Pathways	***number_of_genes***	***Over-represented pathways(+)/ Under(-)***	***pvalue***	***fdr***
AUF1 (hnRNP D0) binds and destabilizes mRNA (R-MMU-450408)	50	+	0,00118	0,0158
Activation of NF-kappaB in B cells (R-MMU-1169091)	61	+	0,00119	0,0157
Activation of the mRNA upon binding of the cap-binding complex and eIFs, and subsequent binding to 43S (R-MMU-72662)	58	+	1,35E-14	9,53E-13
Antigen processing-Cross presentation (R-MMU-1236975)	72	+	0,000129	0,00261
Asymmetric localization of PCP proteins (R-MMU-4608870)	51	+	0,000599	0,00924
Autodegradation of the E3 ubiquitin ligase COP1 (R-MMU-349425)	48	+	0,00253	0,0299
CLEC7A (Dectin-1) signaling (R-MMU-5607764)	84	+	0,00234	0,0279
Cap-dependent Translation Initiation (R-MMU-72737)	111	+	0	0
Cellular response to chemical stress (R-MMU-9711123)	136	+	0,00295	0,0329
Cellular response to hypoxia (R-MMU-1234174)	64	+	0,00107	0,0148
Complex I biogenesis (R-MMU-6799198)	48	+	0,000249	0,0048
Cristae formation (R-MMU-8949613)	13	+	0,000528	0,00864
Cytokine Signaling in Immune system (R-MMU-1280215)	289	+	0,000966	0,0138

Dectin-1 mediated noncanonical NF-kB signaling (R-MMU-5607761)	54	+	0,000409	0,0072
Degradation of AXIN (R-MMU-4641257)	52	+	0,00263	0,0302
Degradation of DVL (R-MMU-4641258)	52	+	0,00124	0,0162
Degradation of GLI1 by the proteasome (R-MMU-5610780)	51	+	0,00218	0,0266
Degradation of beta-catenin by the destruction complex (R-MMU-195253)	72	+	0,00304	0,0332
Endosomal Sorting Complex Required For Transport (ESCRT) (R-MMU-917729)	28	+	0,00519	0,0488
Eukaryotic Translation Initiation (R-MMU-72613)	111	+	0	0
FBXL7 down-regulates AURKA during mitotic entry and in early mitosis (R-MMU-8854050)	50	+	0,00472	0,0454
Formation of ATP by chemiosmotic coupling (R-MMU-163210)	13	+	0,000528	0,00873
Formation of a pool of free 40S subunits (R-MMU-72689)	93	+	0	0
Formation of the Early Elongation Complex (R-MMU-113418)	33	+	0,00256	0,0298
Formation of the ternary complex, and subsequently, the 43S complex (R-MMU-72695)	50	+	2,04E-14	1,32E-12
GSK3B and BTRC:CUL1-mediated-degradation of NFE2L2 (R-MMU-9762114)	49	+	0,00126	0,0163
GTP hydrolysis and joining of the 60S ribosomal subunit (R-MMU-72706)	104	+	0	0
Hedgehog ligand biogenesis (R-MMU-5358346)	53	+	0,00362	0,0385
KEAP1-NFE2L2 pathway (R-MMU-9755511)	72	+	0,0038	0,0392
L13a-mediated translational silencing of Ceruloplasmin expression (R-MMU-156827)	103	+	0	0
Major pathway of rRNA processing in the nucleolus and cytosol (R-MMU-6791226)	164	+	0	0
Metabolism of RNA (R-MMU-8953854)	567	+	0	0
Metabolism of proteins (R-MMU-392499)	1142	+	0,00396	0,0396
Mitochondrial translation (R-MMU-5368287)	89	+	0,0000444	0,0009584
Mitochondrial translation elongation (R-MMU-5389840)	86	+	0,0000199	0,0005039
Mitochondrial translation termination (R-MMU-5419276)	88	+	0,0000304	0,0006924
Mitophagy (R-MMU-5205647)	27	+	0,00519	0,0486
NIK-->noncanonical NF-kB signaling (R-MMU-5676590)	54	+	0,000409	0,00728
Negative regulation of MAPK pathway (R-MMU-5675221)	37	+	0,00366	0,0387
Nonsense Mediated Decay (NMD) enhanced by the Exon Junction Complex (EJC) (R-MMU-975957)	105	+	0	0
Nonsense Mediated Decay (NMD) independent of the Exon Junction Complex (EJC) (R-MMU-975956)	85	+	0	0
Nonsense-Mediated Decay (NMD) (R-MMU-927802)	105	+	0	0
Nuclear events mediated by NFE2L2 (R-MMU-9759194)	52	+	0,00261	0,0302
Oxygen-dependent proline hydroxylation of Hypoxia-inducible Factor Alpha (R-MMU-1234176)	59	+	0,00062	0,00938
PCP/CE pathway (R-MMU-4086400)	68	+	0,000531	0,0086
PINK1-PRKN Mediated Mitophagy (R-MMU-5205685)	21	+	0,00283	0,0318
PTEN Regulation (R-MMU-6807070)	104	+	0,00147	0,0188
Processing of Capped Intron-Containing Pre-mRNA (R-MMU-72203)	263	+	7,41E-14	4,13E-12
RNA Polymerase I Promoter Clearance (R-MMU-73854)	42	+	0,00375	0,039
RNA Polymerase I Transcription (R-MMU-73864)	42	+	0,00375	0,0392
RNA Polymerase I Transcription Initiation (R-MMU-73762)	41	+	0,00387	0,0394
RNA Polymerase II Transcription Termination (R-MMU-73856)	62	+	0,000451	0,00777
Regulation of RUNX2 expression and activity (R-MMU-8939902)	49	+	0,002	0,0248
Regulation of RUNX3 expression and activity (R-MMU-8941858)	52	+	0,000652	0,00978
Respiratory electron transport (R-MMU-611105)	84	+	0,0000356	0,0008

Respiratory electron transport, ATP synthesis by chemiosmotic coupling, and heat production by uncoupling proteins. (R-MMU-163200)	100	+	6,44E-07	0,0000248
Ribosomal scanning and start codon recognition (R-MMU-72702)	57	+	5,11E-15	3,76E-13
SLBP independent Processing of Histone Pre-mRNAs (R-MMU-111367)	9	+	0,00535	0,0498
SRP-dependent cotranslational protein targeting to membrane (R-MMU-1799339)	83	+	0	0
TNFR2 non-canonical NF-kB pathway (R-MMU-5668541)	74	+	0,0000107	0,000303
The citric acid (TCA) cycle and respiratory electron transport (R-MMU-1428517)	136	+	6,58E-06	0,000205
Transcriptional regulation by RUNX3 (R-MMU-8878159)	68	+	0,000441	0,00768
Translation (R-MMU-72766)	217	+	0	0
Translation initiation complex formation (R-MMU-72649)	57	+	1,89E-14	1,27E-12
Ubiquitin Mediated Degradation of Phosphorylated Cdc25A (R-MMU-69601)	49	+	0,00509	0,0482
Ubiquitin-dependent degradation of Cyclin D (R-MMU-75815)	47	+	0,00402	0,0399
mRNA Splicing (R-MMU-72172)	197	+	0	0
mRNA Splicing - Major Pathway (R-MMU-72163)	189	+	0	0
mRNA Splicing - Minor Pathway (R-MMU-72165)	48	+	2,32E-07	9,41E-06
p53-Independent DNA Damage Response (R-MMU-69610)	49	+	0,00509	0,0485
p53-Independent G1/S DNA damage checkpoint (R-MMU-69613)	49	+	0,00509	0,0488
rRNA processing (R-MMU-72312)	164	+	0	0
rRNA processing in the nucleus and cytosol (R-MMU-8868773)	164	+	0	0
Activation of ATR in response to replication stress (R-MMU-176187)	34	-	5,44E-06	0,000176

Supplementary Table 6. Genes upregulated in response to IL-21 in CD4⁺ T cells[42] in pmel-1 Lmo4-Thy1.1⁺ CD8⁺ T cells

Gene	***logFC***
Socs3	0,57388758
Mex3a	0,47674406
Zfp36	0,45178836
Nop16	0,4062906
Socs1	0,34609463
Plk3	0,34587644
Junb	0,33900408
H2-Ke2	0,32985314
Uqcr11	0,32688502
Exosc6	0,31126749
Gadd45g	0,30674937
Ccdc102a	0,30336948
S100a11	0,30005348
Smyd2	0,29419325
Myl12b	0,28176822
Ost4	0,27287583
Ifrd2	0,26887684
Ebna1bp2	0,2687292
Thg1l	0,26679702
Cacnb3	0,26592398
Mrto4	0,2647644
Nudc	0,25848474
Rrp9	0,25794781
Timm13	0,25715116

Fbl	0,25498109
Exosc5	0,2546995
Polr2f	0,25173941
Tceb2	0,24988319
Lsm7	0,24794474
Mrpl20	0,24565613
Dynll1	0,24522543
Hook2	0,24482708
Slco4a1	0,23815396
Sac3d1	0,2342548
Hsp90ab1	0,23360302
Romo1	0,22553152
Alyref	0,22497901
Midn	0,22158675
Ydjc	0,21800747
Snrnp70	0,21859609
Ly6i	0,21583184
Mrps10	0,21525818
Slc52a3	0,21448269
Slc30a4	0,21336502
H2afj	0,21010791
Arl2	0,20824936
Abhd11	0,20602579
Cox6a1	0,20540186
Mrps28	0,20480929
Psmg4	0,20460548
Endog	0,20098845
Mrpl21	0,19762554
Alg3	0,19561589
Dcun1d5	0,19468679
Myl12a	0,19039911
Park7	0,18842009
Nle1	0,18685937
Psmc5	0,18516323
Grwd1	0,17203432
Jtb	0,17220717
Aen	0,17013357
Ndufs8	0,16973392
Txn2	0,16834113
Gpaa1	0,16843109
Nop56	0,16804822
Mapk11	0,1663671
BC056474	0,16547078
Etv6	0,16488052
Bax	0,15963881
Lgals1	0,15792578
Gtf2f1	0,15624525
Srrt	0,15383661
Rpp21	0,15108804
Lpcat4	0,15032855
Uchl3	0,14916484
Fpgs	0,14848999
Pdrg1	0,14774662
Ccdc86	0,14762826
Drap1	0,14754342

Ssbp4	0,14272361
Odc1	0,14294603
Plekho1	0,14272242
Ccdc124	0,14133262
Cct3	0,13825002
Mrpl12	0,13805077
Eid2	0,1360421
Mrps11	0,135327
Gpatch4	0,13475959
Wdr46	0,13364901
Nme1	0,13307882
Mif	0,12967915
Nop10	0,12989068
Gtf2h5	0,12917518
Fam102a	0,12752285
Map2k2	0,12597849
Prmt1	0,12569323
Kremen2	0,12374995
Tnfsf9	0,12116327
Dad1	0,1154088
Aes	0,11334058
G6pc3	0,11319544
Arl4c	0,11202509
Il21r	0,11175719
Aprt	0,11110859
Bcl3	0,11051441
Stat3	0,10971732
Cfl1	0,10836872
Hnrnpa2b1	0,10812726
Psmd13	0,10632161
Sfn	0,10367441
Nhp2	0,10315433
Pfn1	0,10290581
Pcdhgb7	0,10225879
Eef1e1	0,10204081
Pglyrp2	0,1020353
Slc7a5	0,10175249
Polr3d	0,10118928
Ipo4	0,10037364
Tmem147	0,10067812
Rab4b	0,09955251
Rangap1	0,09922073
Rrp15	0,0985096
Cltb	0,09827428
Chmp4b	0,09755232
Tomm5	0,09752501
Atp5g1	0,09526426
Pcdhgb4	0,09421115
Tbrg4	0,09405462
Jund	0,09419034
Galk1	0,09352926
Axin2	0,09329684
Rwdd1	0,0934044
Mrrf	0,09342492
Ltv1	0,09219132

Pcdhga1	0,09187349
Ctsa	0,09184966
Pcdhga5	0,09181966
Pcdhga2	0,09113105
Pcdhgb1	0,09048637
Pcdhga4	0,09086516
Pcdhgb2	0,09070781
Pcdhga3	0,09113105
Mybbp1a	0,09040127
Arpc1b	0,09008846
Pcdhga7	0,09048637
Ctsz	0,09030308
Mark4	0,08947617
Atp1a1	0,08930947
Pa2g4	0,08886721
Ncbp2	0,08939106
Pcdhga6	0,08867443
Pcdhga10	0,08771715
Uqcrq	0,08772249
S100a6	0,08656564
Mrpl52	0,086218
Psma7	0,08608373
Mif4gd	0,08579816
Trmt61a	0,08490948
Pcdhgb5	0,08507925
Ldha	0,08524023
Acot7	0,0845224
Pcdhga8	0,08332218
Susd3	0,08266634
Chst11	0,08313969
Trex1	0,08259716
Glrx5	0,08173314
Pcdhga12	0,08121842
Pcdhga9	0,08024305
Abi3	0,07983245
Pcdhga11	0,07967863
Cyc1	0,07904741
Pcbp1	0,07852303
Arid5a	0,07898513
Pcdhgb8	0,07889495
Gusb	0,07853372
Trnau1ap	0,07853239
Ksr1	0,07791953
Scamp4	0,07756411

Supplementary Table 7. Genes displaying one or more STAT3 binding motifs (GSEA C3:STAT3_02) in pmel-1 Lmo4-Thy1.1^{+} CD8^{+} T cells

Gene	***logFC***
Fosb	0,91542986
Lta	0,43499514
Ddit3	0,382826
Nr4a1	0,37994327
Socs1	0,34609463
Egr1	0,29357161

Mbd6	0,29201068
Hoxb4	0,24559873
Trip10	0,20317428
Tsc22d4	0,18085133
Taok2	0,16927436
Ubtf	0,1595372
Mnt	0,16028079
Bcl7a	0,13849796
Zc3h18	0,13472987
Sgms1	0,12241469
Ndst2	0,11169958
Zbtb17	0,11119144
Irf1	0,10983447
Egr3	0,10766615
Trib2	0,10422778
Kpnb1	0,10279702
Rpusd4	0,10247119

SELBSTSTÄNDIGKEITSERKLÄRUNG

Ich, Schelker, Roland geboren am 13.01.1982 in Petroschen, erkläre hiermit, dass ich die vorliegende Arbeit ohne unzulässige Hilfe Dritter und ohne Benutzung anderer als der angegebenen Hilfsmittel angefertigt habe.
Die aus anderen Quellen direkt oder indirekt übernommenen Daten und Konzepte sind unter Angabe der Quelle gekennzeichnet. Insbesondere habe ich nicht die entgeltliche Hilfe von Vermittlungs- bzw. Beratungsdiensten (Promotionsberater*in oder andere Personen) in Anspruch genommen.
Die Arbeit wurde bisher weder im In- noch im Ausland in gleicher oder ähnlicher Form einer anderen Prüfungsbehörde vorgelegt.

Regensburg, 18.11.2024
Ort, Datum

eigenhändige Unterschrift
des Promovenden