Supplementary Methods

Details on mouse strains and sample preparation.

CD19-Cre and IRF4$^{flox/flox}$ mice were purchased from Jackson Lab, Tcl-1 tg mice were originally kindly provided by C. Croce (Columbus, OH)[1]. Genotyping for IRF4 and CD19 Cre alleles was performed as recommended by Jackson Lab. CD19 Cre and Tcl-1 transgenes were kept heterozygous. IRF4 fl/fl mice contain a Loxp-flanked IRF4 allele with an eGFP gene inserted in opposite orientation upstream of the floxed IRF4 promotor region which was used to confirm IRF4 deletion in the B-cell lineage. The knockout efficacy was 100% in CD19+ cells as determined by GFP expression, while no genetic recombination took place in CD19- cells. All studies in mice were approved by the Austrian Federal Ministry of Education, Science and Research (BMBWF-66.012/0002-V/3b/2018). Mice were sacrificed after they showed signs of illness in line with the local animal ethics guidelines. For overall survival analysis a study endpoint of approx. 400 days was defined in advance. Mice that were still alive at this time point were sacrificed and censored depending on the CLL tumorburden. Flow cytometry was performed as stated below. Remaining cells were frozen in FCS + 10% DMSO and stored in liquid nitrogen.

Details on cell isolation of human PBMCs

Peripheral blood samples from CLL patients and healthy donors were diluted 1:1 with RPMI 1640 Complete (RPMI with 10% FCS, 5% Pen/Strep and 5% L-Glutamine) before separation of peripheral blood mononuclear cells (PBMCs). Cells were isolated by density gradient centrifugation. After washing with RPMI 1640 Complete, cells were used for CLL cell purification, viably frozen in FCS plus 10% DMSO and stored in liquid nitrogen. All studies on patient derived material were approved by the local ethics committee (415-E/1287/4-2011, 415-E/1287/8-2011, 415-E/1287/13-2016).

Details on Immune phenotyping

For immune phenotyping the antibodies outlined in Suppl. Table ST2 were used. IRF4 was measured by intracellular stainings using the Cytofix/Cytoperm Kit (BD). The percentage of positive cells or the mean fluorescence ratio (MFIR) between fluorescence intensity of the target and the isotype control was analyzed.

Details on Single Cell Mass Cytometry

Single cell mass cytometry was performed on a Helios device (CyTOF, Fluidigm). Leukemic mice were sacrificed (Tcl-1 tg IRF4 +/+ N = 3, Tcl-1 tg IRF4 ΔB/ΔB N = 3) and the spleen homogenized. 3 x 10^6 cells were stained with cisplatin (live/dead discrimination), Iridium (doublet discrimination) and rare metal conjugated antibodies in cell staining buffer (Fludigm). Staining protocols followed the recommendations from Fludigm. Analysis of CyTOF generated fcs files was performed using the online platform www.cytobank.org. After exclusion of dead cells and doublets, the T-cell compartment was extracted from whole cell populations using the following markers: CD3, CD5, CD4, CD8, TCRbeta. Clustering channels selected for the independent clustering methods viSNE and SPADE were: CD3, TCRbeta, CD5, CD4, CD8, CD62L, CD44, CD25 and CD69 (antibodies and conjugates used for definition of T-cell subsets are summarized in Suppl. Table ST2). SPADE trees show results for one representative mouse per genotype. viSNE plots show concatenated information of all 3 mice measured per genotype. For representation of results the color scheme "Spectrum" was selected: blue indicates cells with absent expression, red/green intermediate expression and organge/red high expression of the respective markers. In addition, classical flow cytometry was performed in 3 Tcl-1 tg IRF4 +/+ and 3 Tcl-1 tg IRF4 ΔB/ΔB to test antibody clones (CD223, CD160, CD244 and CD28) and validate single cell mass cytometry data.

Details on RNA isolation, Real Time PCR and IRF4 mutation analysis

Human PBMCs and murine splenocytes were purified for CD19+ cells using MACS technology (Miltenyi Biotec) or using the MagniSort T-cell enrichment kit purchased from ebioscience. Purity was assessed by flow cytometry and was 95% in all cases. RNA was isolated using the miRNeasy/RNeasy mini Kit (Qiagen). RNA concentration was measured with the Nanodrop 2000c device. For cDNA synthesis the iScript Kit (Biorad) was applied. Real Time PCR was performed using TaqMan probes (Thermo Fisher) on a Viia7 or an Abi7500 device. For normalization of Real Time PCR results 18S was for normalization. Expression ratios were calculated with the ΔCT method. The presence of IRF4 mutations was analyzed by RNASeq (N = 37) and Sanger Sequencing (N = 48) of the DNA binding domain as described by Havelange et. al.[2].

BCR analysis

BCR sequencing was performed as previously described. Briefly, B cells were sorted and DNA from PCR amplified VDJ rearrangements (for primers see[3]) was sequenced on an Illumina MySeqDx and analyzed against the repseqio.v1.4 reference library as previously described.

Co-culture Assays

2 x 10^6 murine splenocytes derived from leukemic Tcl-1 tg IRF4 proficient or deficient mice were co-cultured with 2 x 10^6 T-cells derived from the spleen of healthy C57/BL6 mice for 24h and/or 72h in RPMI Complete. For T-cell activation CD3/CD28 beads were used and a pre-incubation for 4h performed, before CLL cells were added. Supernatants were collected after 72h and ELISAs for IFNγ (ebioscience) performed as recommended. In addition, intracellular flow cytometry for IFNγ was performed following 4h monensin treatment and using the Cytofix/Cytoperm Kit (BD). Proliferation of T-cells was assessed using Cell Trace Violet (CTV, Thermo Fisher). T-cells were stained with 0.5 µM CTV for 20 min at 37°C, washed and activated with CD3/CD28 beads. After 4h activation T-cells

were added to CLL tumor cells. CTV dye dilution was assessed after 72h on a Cytoflex device (Beckman Coulter). IgM stimulation was performed using 10 µg/ml IgM F(ab)2 fragments (Jackson Immuno Research) for 72h[4,5]. CLL cells were cultured in RPMI complete and viability was assessed using Annexin V/7AAD.

MEC1 siRNA transfection

MEC1 cells were transfected with IRF4 siRNA (Qiagen) using electroporation (Amaxa, Nucleofector V) for 48h. The final concentration of siRNA was 50 nM.

RNA-Sequencing (RNA-Seq) and Affymetrix Genechip analysis

Splenocytes derived from 3 Tcl-1 tg IRF4 deficient and 4 Tcl-1 tg IRF4 proficient mice with overt leukemia were purified for CD19+ cells, RNA isolated and quality controlled using the Experion automated electrophoresis system (Biorad). RNA-Sequencing (IlluminaHiSeq v4) and gene mapping was performed by the Sequencing Service provided by Eurofins. For human cluster analysis we used the public datasets GSE39671**[6]** containing gene expression data from 130 untreated CLL patients including time to first treatment data and GSE21029[2] containing gene expression data of primary CLL samples derived from either the bone marrow, the lymph nodes or the peripheral blood.

Stratification of primary human CLL patients to IRF4 expression groups

CLL patients from our own dataset (N = 98) and the GSE39671[6] dataset (N = 130) were stratified to either IRF4^{low} or IRF4^{high} patients using ROC (Receiver Operating Characteristics) analysis and Youden Index calculation. The time to first treatment (TTFT) was used as separation parameter to define the optimal IRF4 cut-off value between the groups (cut-off value = 0.54).

Bioinformatic analysis of RNA-Seq data

Genelists were filtered by counts (exclusion of targets with ≤ 4 counts per million in more than 3 samples/group) and differential gene expression analyzed using the packages EdgeR**[7]** and DESeq2**[8]**. The intersection of differentially expressed genes obtained from both packages with an FDR < 0.05 and a log2 fold change (FC) of at least ± 1.5, was considered as significantly deregulated. GO terms of the categories biological process (BP), molecular function (MF) and cellular component (CC) were annotated and GO enrichment analysis of significantly deregulated genes performed using the packages gage**[9]** and clusterProfiler**[10]**. An adjusted p-value < 0.05 was considered as significant in GO enrichment analysis. Significant GO terms were summarized using REVIGO**[11]**. Heatmaps of differentially expressed genes were generated with the package pheatmap.

Bioinformatic analysis of Affymetrix GeneChips

CEL files from the public dataset GSE39671**[6]** were analyzed using RMA normalization, the package limma[12] and the Transcriptome Analysis Console (TAC) software (Thermo Fisher). Significantly differentially expressed genes (p-value < 0.05) between the IRF4^{low} and IRF4^{high} CLL patient group were filtered as described in the results section. CEL files from the public dataset GSE21029[2] were analyzed using RMA normalization, the package limma[12] and the Transcriptome Analysis Console (TAC) software (Thermo Fisher). All HLA genes were extracted from the dataset and correlated to IRF4 expression (also extracted from the dataset). Analysis was performed using unsupervised clustering of HLA-genes. Heatmaps were generated with the package pheatmap.

Statistics

Statistical analysis was performed using GraphPad Prism 5 and SPSS Statistics 21. All data sets were tested for normal distribution (Kolmogorov–Smirnov test). Normally distributed data was compared using the paired and unpaired *t* test and nonparametric data sets were analyzed with the Wilcoxon signed rank or Mann–Whitney test. P-Values are depicted in figures. Statistically significant results are additionally marked with asterisks.

References

1. Bichi R, Shinton SA, Martin ES, et al. Human chronic lymphocytic leukemia modeled in mouse by targeted TCL1 expression. *ProcNatlAcadSciUSA*. 2002;99(10):6955-6960.
2. Herishanu Y, Perez-Galan P, Liu D, et al. The lymph node microenvironment promotes B-cell receptor signaling, NF-kappaB activation, and tumor proliferation in chronic lymphocytic leukemia. *Blood*. 2011;117(2):563-574.
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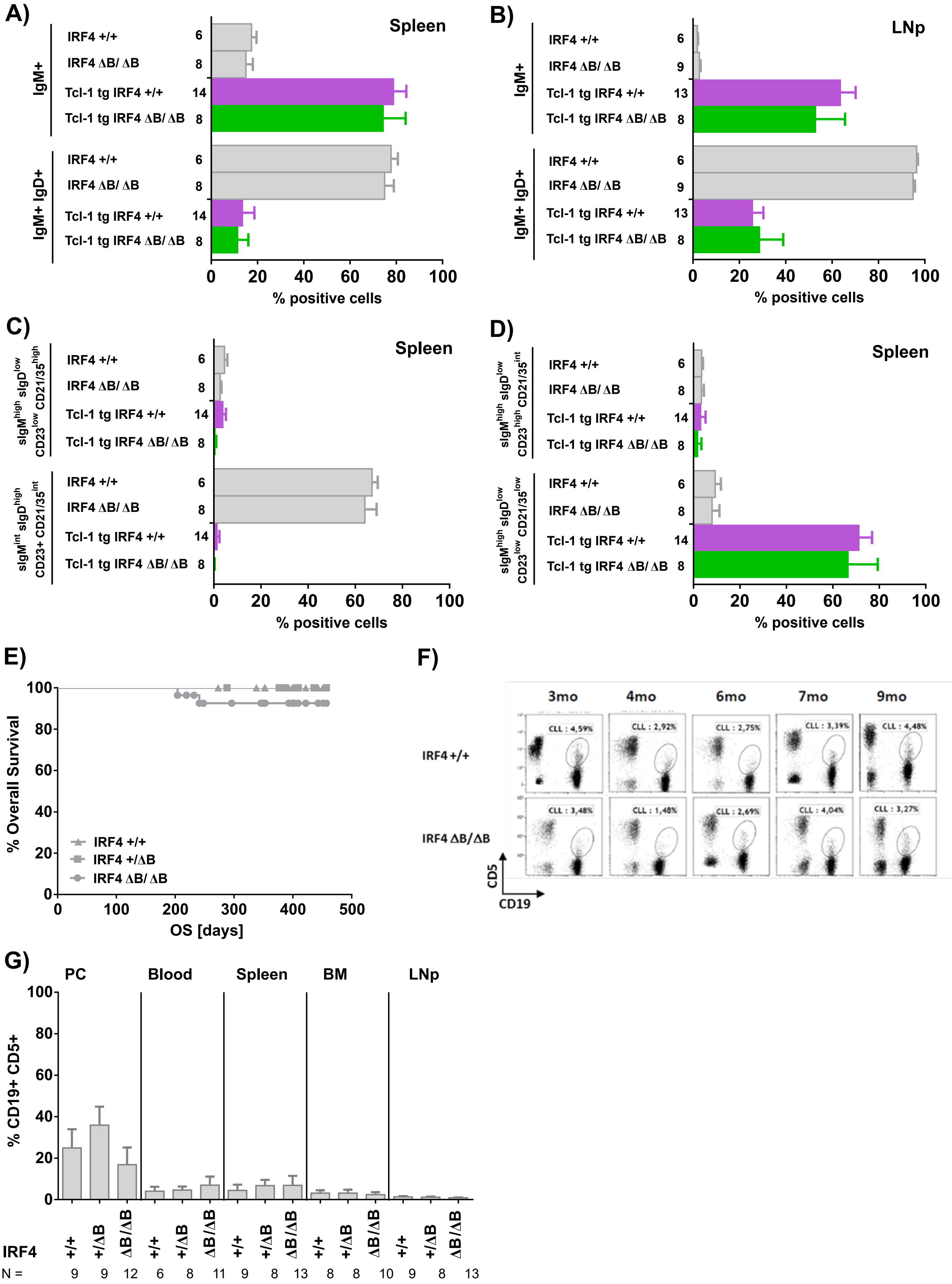
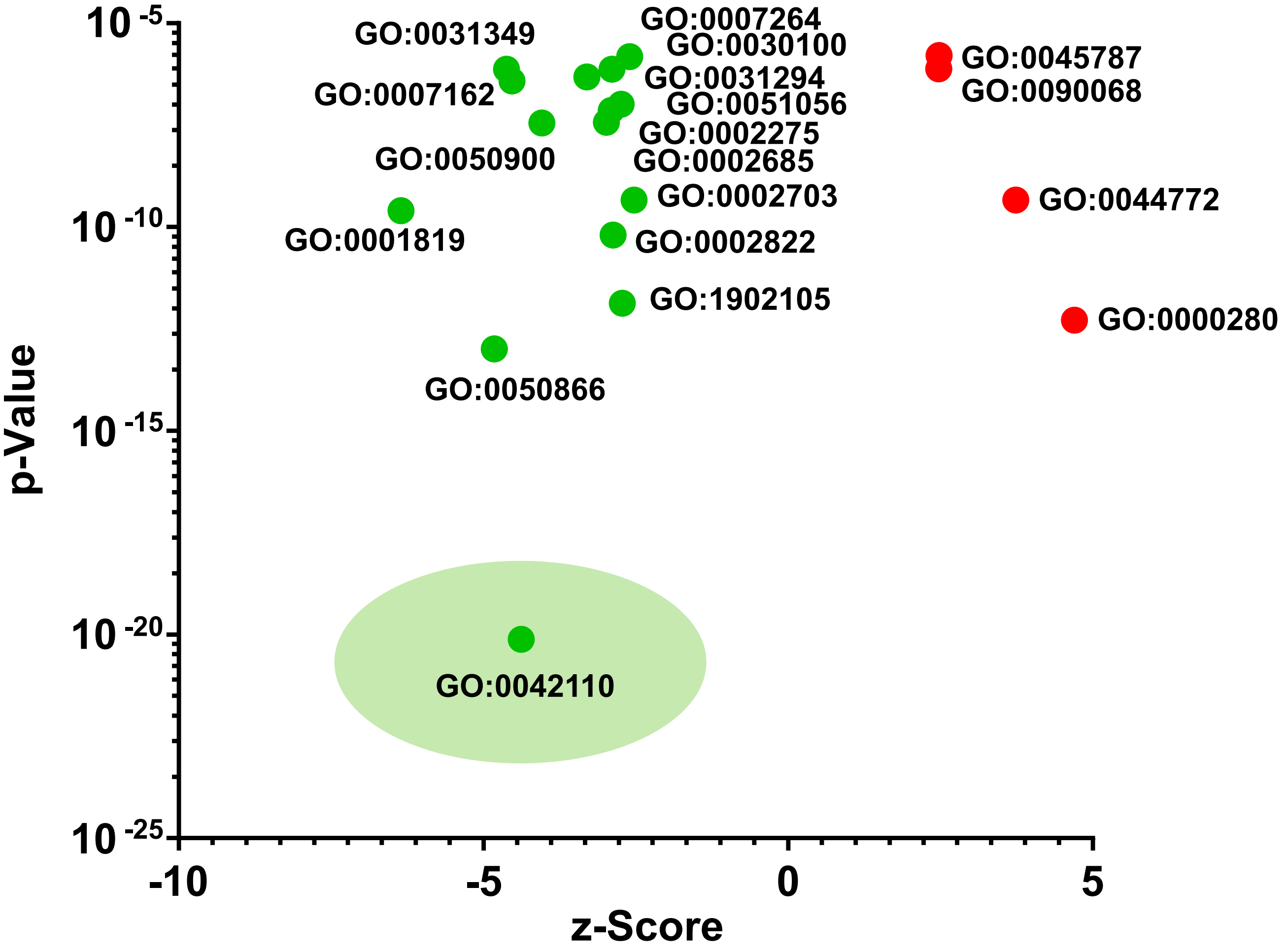
12. Ritchie ME, Phipson B, Wu D, et al. limma powers differential expression analyses for RNA-sequencing and microarray studies. *Nucleic Acids Res*. 2015;43(7):e47.

Supplementary Figures

Suppl. Figure S1)

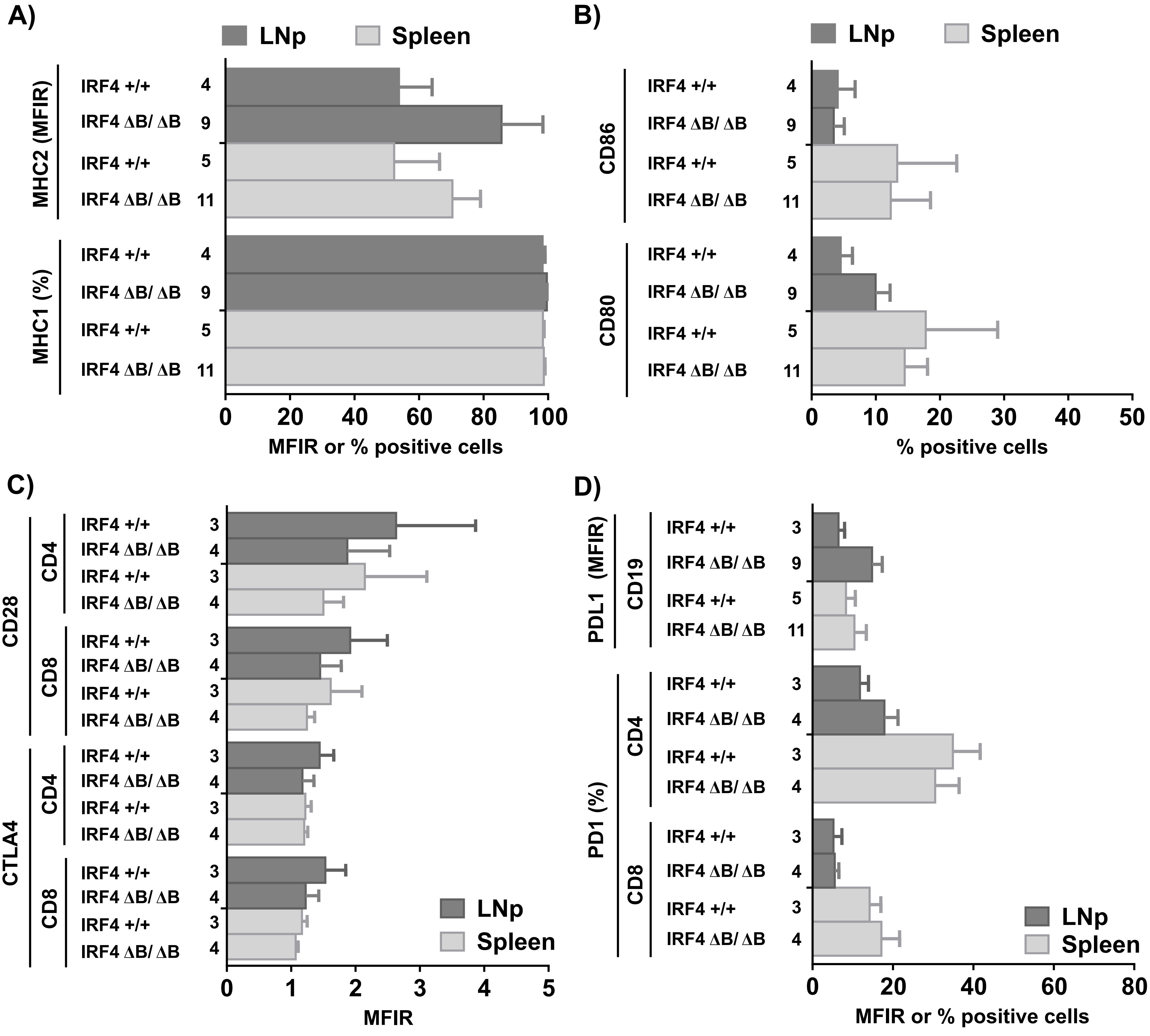


Suppl. Figure S2)

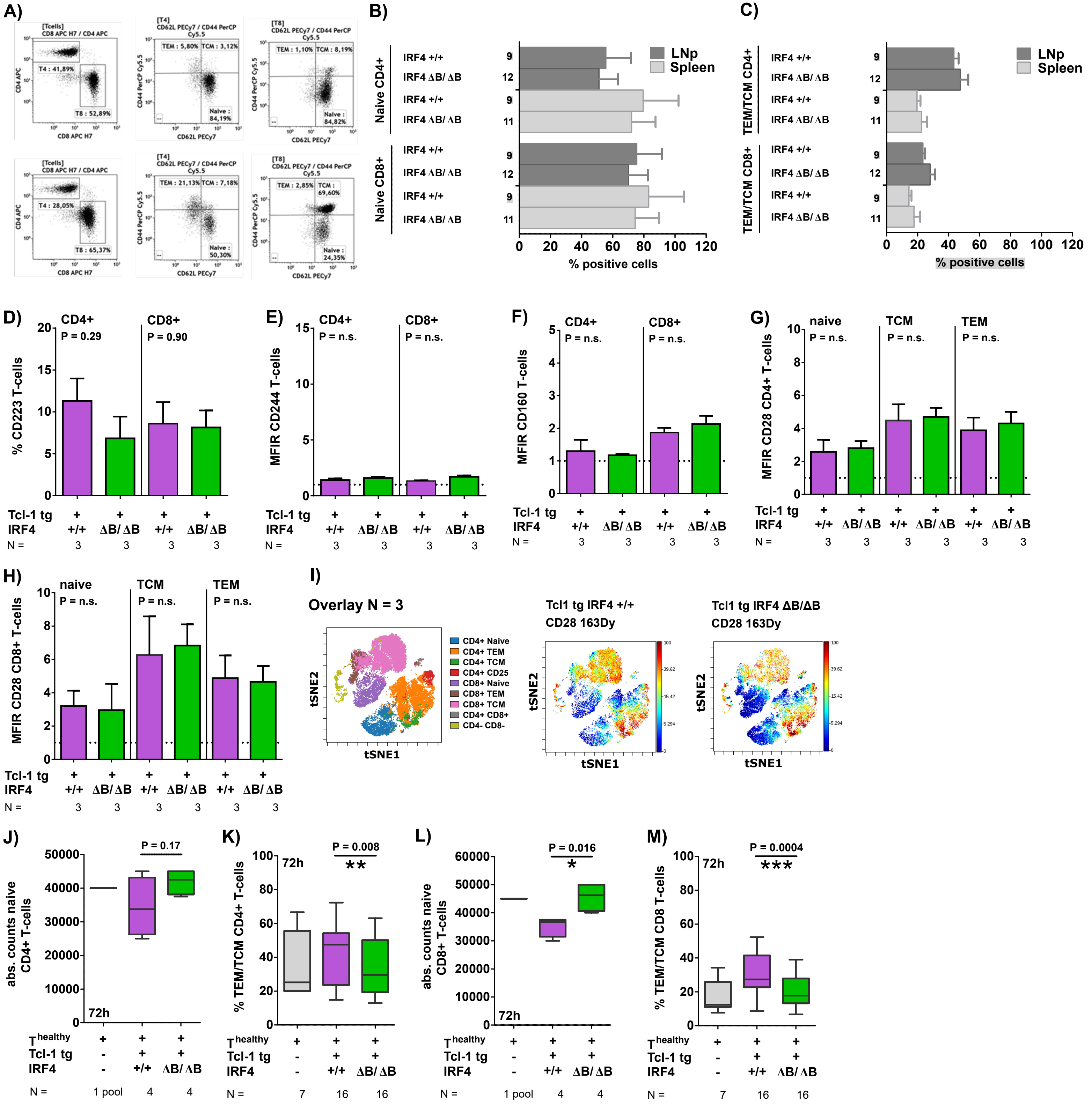


	GO term	Description	p-Value
immune system regulation	GO:0042110	T cell activation	7.6E-21
	GO:0001819	positive regulation of cytokine production	2.5E-10
	GO:0007264	small GTPase mediated signal transduction	4.8E-07
	GO:1902105	regulation of leukocyte differentiation	1.3E-12
	GO:0050900	leukocyte migration	3.5E-08
	GO:0031294	lymphocyte costimulation	7.5E-07
	GO:0050866	negative regulation of cell activation	1.0E-13
	GO:0051056	regulation of small GTPase mediated signal transduction	7.3E-08
	GO:0007162	negative regulation of cell adhesion	3.9E-07
	GO:0002703	regulation of leukocyte mediated immunity	4.6E-10
	GO:0030100	regulation of endocytosis	1.5E-06
	GO:0002822	regulation of adaptive immune response	6.4E-11
	GO:0002685	regulation of leukocyte migration	1.0E-07
	GO:0002275	myeloid cell activation involved in immune response	3.7E-08
	GO:0031349	positive regulation of defense response	7.5E-07
cell cycle	GO:0000280	nuclear division	5.2E-13
	GO:0044772	mitotic cell cycle phase transition	4.6E-10
	GO:0045787	positive regulation of cell cycle	1.6E-06
	GO:0090068	positive regulation of cell cycle process	7.6E-07

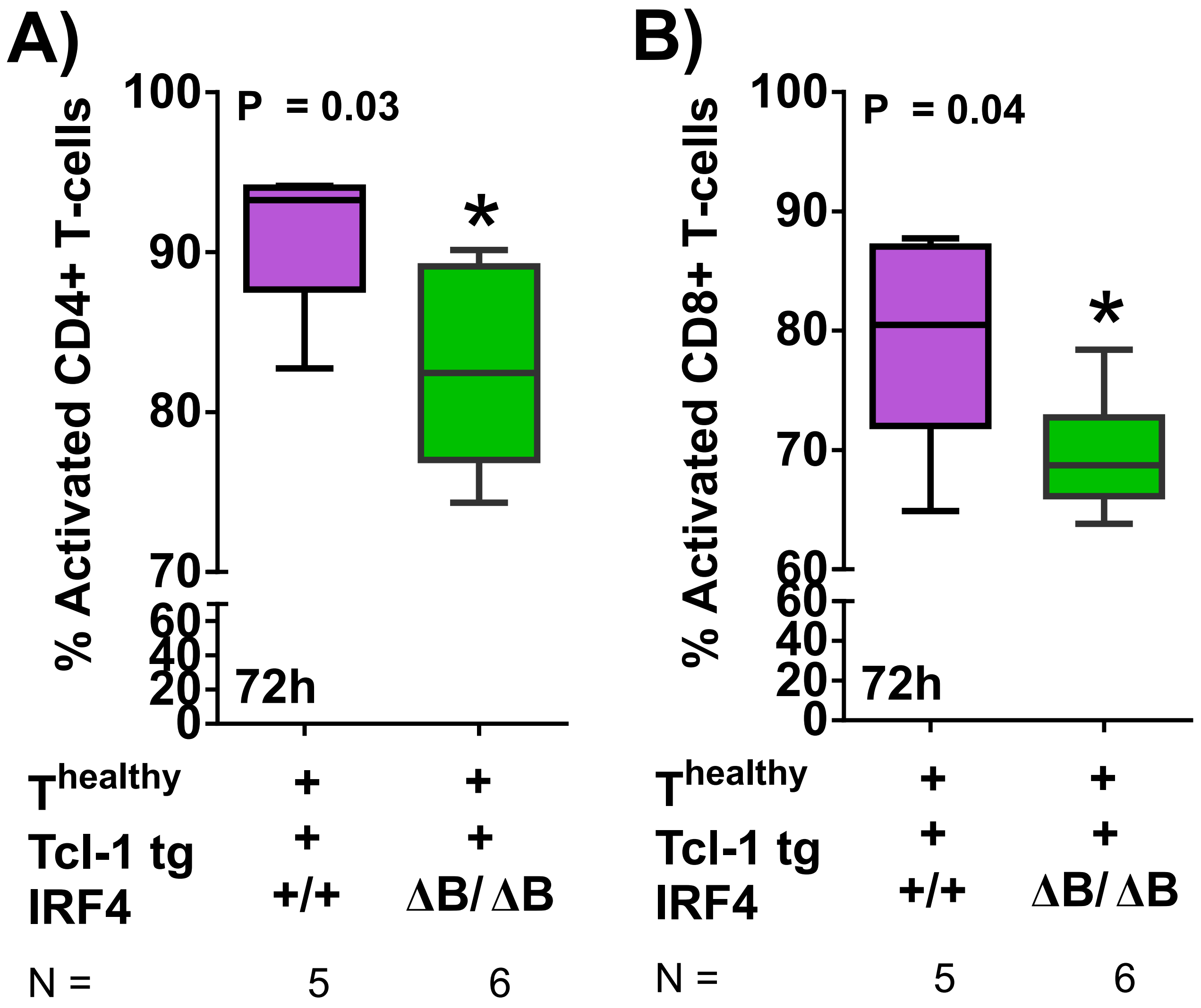
Suppl. Figure S3)



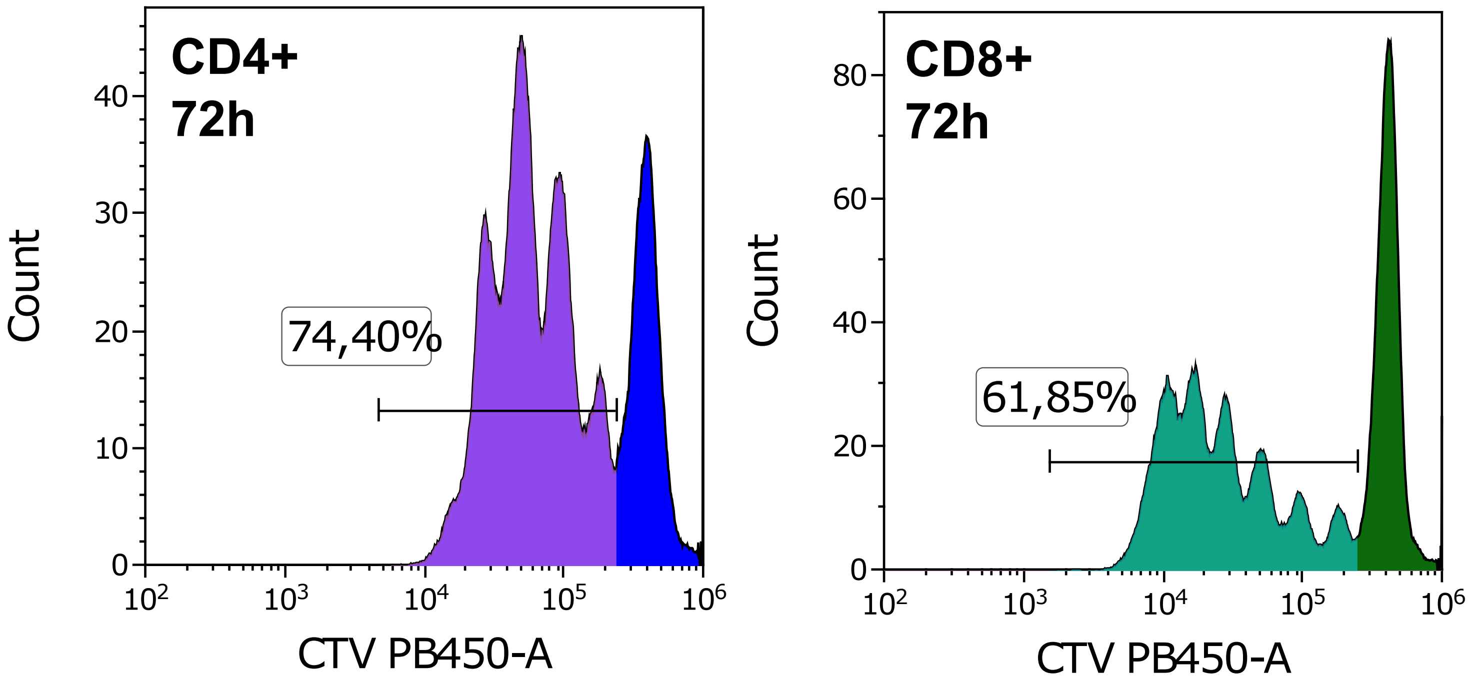
Suppl. Figure S4)



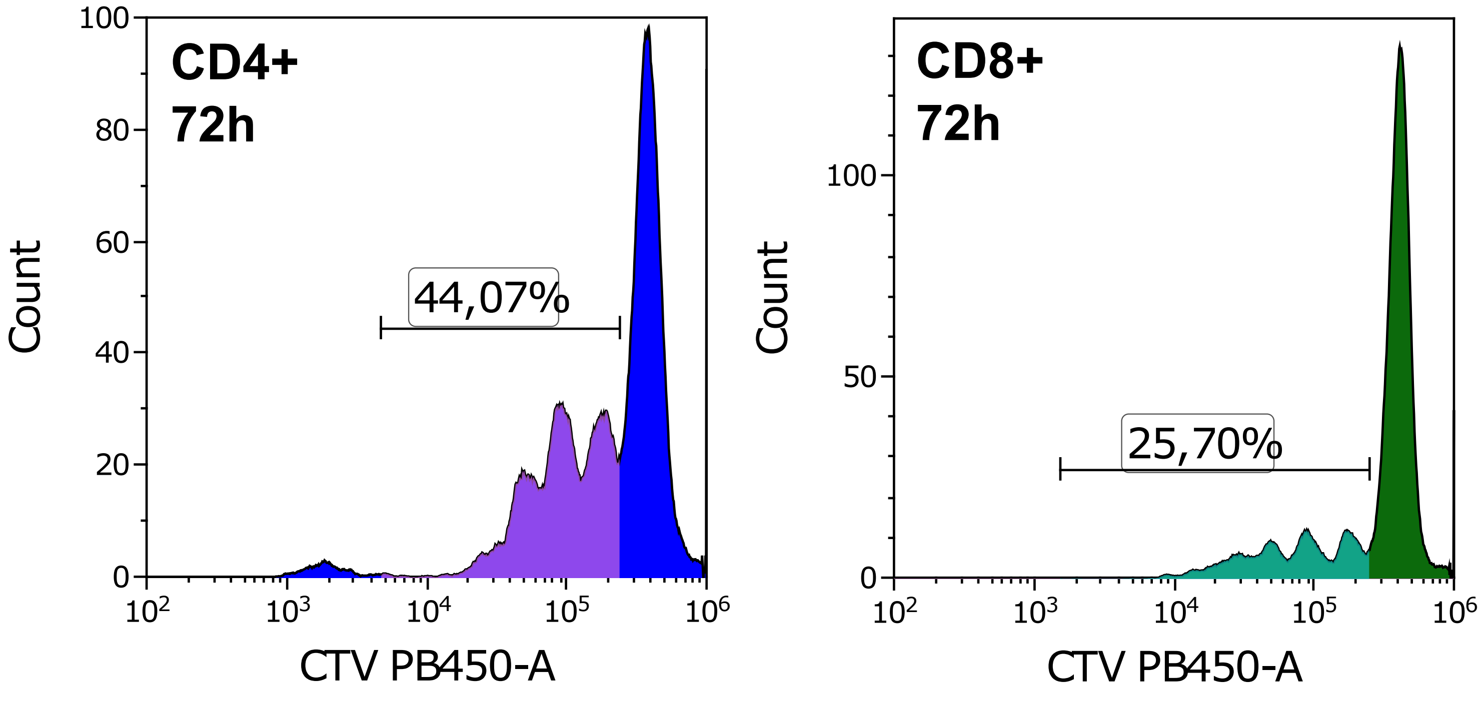
Suppl. Figure S5)



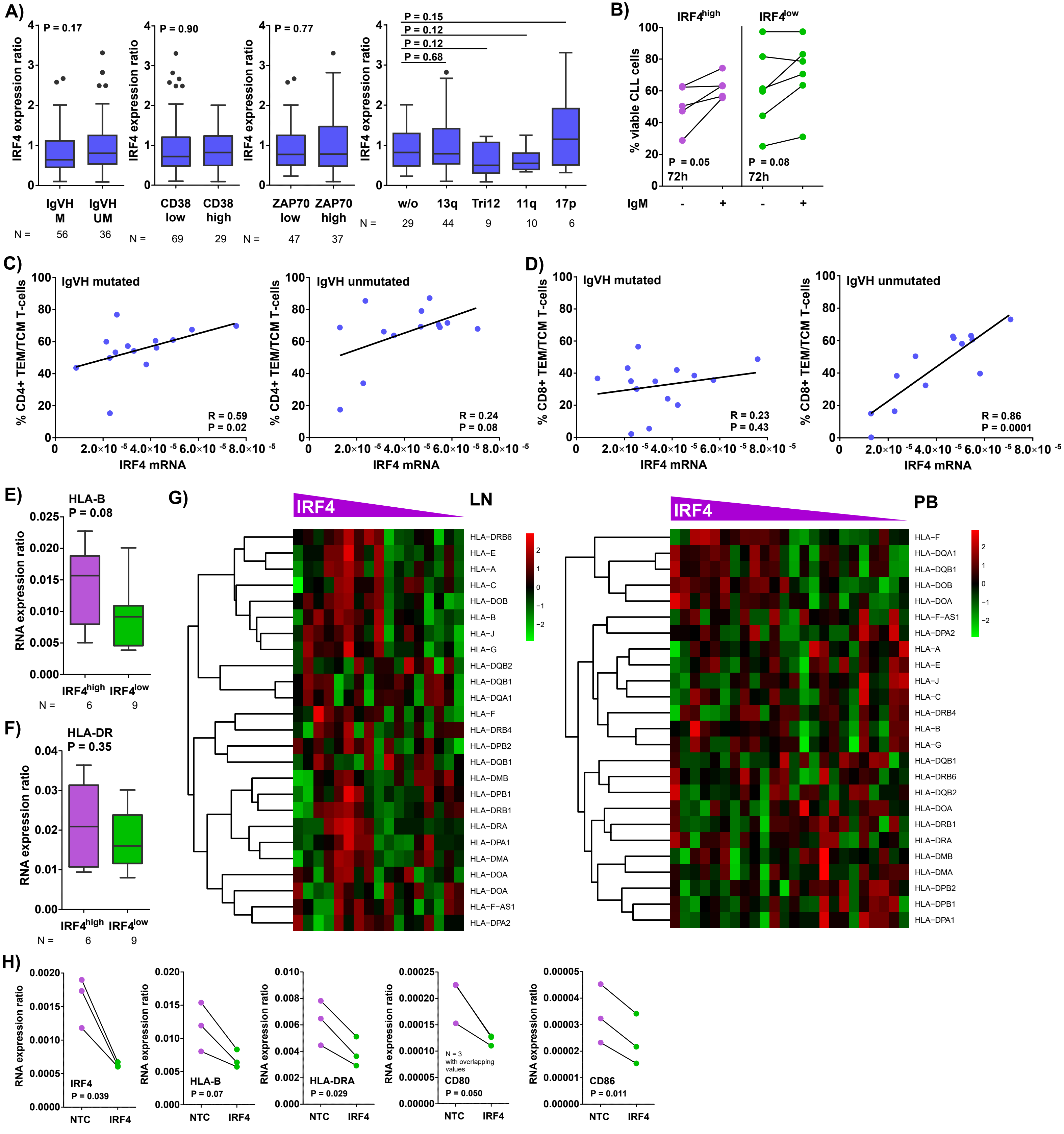
C) **Healthy T-cells + Tcl1 tg tumors**



Healthy T-cells + Tcl1 tg ΔB/ΔB tumors



Suppl. Figure S6)



Supplementary Figure Legends

Suppl. Figure S1) B-cell subsets, overall survival and CLL infiltration measured in healthy and leukemic mice representing different genotypes

(A) IgM and IgD surface expression was measured in cells derived from the spleen or **(B)** lymph nodes. **(C)** CD23, CD21 and CD35 expression in addition to IgM and IgD was used to characterize B-cells located in the marginal (MZ) or follicular (FO) zone of the spleen as well as **(D)** their distribution into T1 and T2 B-cell subsets. **(E)** Kaplan Maier analysis showing overall survival of IRF4 +/+ wildtype (WT) mice (N = 20), IRF4 +/ΔB (N = 10) and IRF4 ΔB/ΔB (N = 28) mice. The study endpoint of this analysis was 400 ± 50 days, however, some mice were sacrificed earlier due to animal ethic related reasons. **(F)** CD19+ CD5+ CLL cells were measured by flow cytometry in the peripheral blood and **(G)** in all lymphoid organs of IRF4 proficient and deficient Tcl-1 transgene negative littermates. PC = peritoneal cavity, BM = bone marrow, LNp = peripheral lymph nodes. Light grey bars represent healthy, age-matched littermates, purple = cells derived from Tcl-1 tg IRF4 +/+ leukemic mice and green = Tcl-1 tg IRF4 ΔB/ΔB leukemic mice.

Suppl. Figure S2) GO term analysis

Analysis showing GO terms significantly downregulated (green dots, negative z-score) and upregulated (red dots, positive z-score) in Tcl-1 tg IRF4 ΔB/ΔB (N = 3) mice as compared to Tcl-1 tg IRF4 +/+ mice (N = 4). GO term descriptions and p-values are indicated in the table below (this table corresponds to the table shown in Figure 2A). The GO term: 0042110 T-cell activation (highlighted in green) showed the lowest p-value in the GO term dataset and was used for further analysis.

Suppl. Figure S3) Surface expression of MHC1 and costimulatory molecules in healthy, age-matched littermate controls

(A) MHC1 and MHC2 **(B)** CD80 and CD86, **(C)** CTLA4 and CD28 **(D)** PD-1 and PD-L1 surface expression was measured using flow cytometry in healthy, age-matched IRF4 deficient and proficient littermates. The measurement was performed in samples derived from the lymph nodes (LNp, dark grey) and the spleen (light grey). MHC1, CD80, CD86 and PD-1 are depicted as percentage of CD19+ B-cells. For MHC2, CTLA4, CD28 and PD-L1 the MFIR (mean fluorescence intensity ratio) was used. An isotype control was applied to define negative cell populations. Analyzed mouse numbers are depicted on the y-axis.

Suppl. Figure S4) Naïve and antigen-experienced T-cell subsets in healthy mice and *in vitro* experiments

(A) Gating strategy for analysis of naïve (CD62L+ CD44-) and antigen-experienced effector memory (TEM, CD62L- CD44+) as well as central memory (TCM, CD62L+, CD44+) T-cells in the CD4 and CD8 T-cell compartment using classical flow cytometry. **(A)** Naïve CD4+ and CD8+ T-cells and **(B)** antigen-experienced effector and central memory (TEM/TCM) T-cells measured by flow cytometry in cells derived from the lymph nodes and spleen of healthy, age-matched IRF4 +/+ (light grey) and IRF4 ΔB/ΔB (dark grey) mice. **(D)** Expression of CD223 (Lag-3), **(E)** CD244, **(F)** CD160 and **(G)** CD28 in CD4+ and CD8+ T-cells derived from the spleen of leukemic Tcl-1 tg IRF4 +/+ and Tcl-1 tg IRF4 ΔB/ΔB mice. Measurements were performed by classical flow cytometry and **(I)** single cell mass cytometry. viSNE plots show color coded T-cell subsets and CD28 expression in the entire T-cell compartment of 3 mice (concatenated overlay). **(J)** Absolute counts of CD4+ naïve T-cells, **(K)** percentages of TEM/TCM CD4+ T-cells, **(L)** absolute counts of CD8+ naïve T-cells and **(M)** percentages of TEM/TCM CD8+ T-cells co-cultured with Tcl-1 tg IRF4 +/+ (purple) or Tcl-1 tg IRF4 ΔB/ΔB (green) tumors derived from the spleen of leukemic mice. T-cells were purified from healthy C57/BL6 mice. Pool = T-cells derived from 4 different C57/BL6 mice. Grey box plots show TEM/TCM CD4+ or CD8+ T-cells in absence of tumor cells. Cells were cultured in RPMI complete without additional stimulation. TEM = effector memory T-cells, TCM = central memory T-cells, TEM/TCM represents the total amount of both TEM and TCM T-cells. n.s. = not signficant

Suppl. Figure S5) *In vitro* activation of healthy T-cells and adoptive transfer

(A) CD4+ and **(B)** CD8+ T-cells derived from healthy C57/BL6 IRF4 +/+ mice were activated with CD3/CD28 beads and co-incubated with CLL tumor cells derived from the spleen of either Tcl-1 tg IRF +/+ or Tcl-1 tg ΔB/ΔB leukemic mice for 72h. The activation status of T-cells was measured using CD44 and CD62L antibodies by flow cytometry and **(C)** proliferation by Cell Trace Violet (CTV) dye dilution. Violet = proliferated CD4+ T-cells (each peak in CTV staining indicates one cell division) Turquoise = proliferated CD8+ T-cells

Suppl. Figure S6) IRF4 expression and relation to CLL risk factors, T-cells and MHC expression

(A) IRF4 mRNA expression was measured in purified CLL cells obtained from the peripheral blood of human CLL patients and analyzed in CLL risk groups. IgVH M = mutated B-cell receptor, UM = unmutated B-cell receptor (cut-off 98% sequence homology). CD38 low and high risk (cut-off 30%). ZAP-70 low and high risk. **B)** *In vitro* B-cell receptor stimulation using IgM crosslinking for 72h in primary patient material derived from IRF4^{low} and IRF4^{high} CLL patients. **(C)** Correlation analysis of the percentage of TEM/TCM T-cells and IRF4 expression measured by Real Time PCR in the CD4+ and **(D)** CD8+ T-cell compartment of CLL patients with either mutated or unmutated B-cell receptor

(IgVH). **(E)** IRF4 mRNA expression was correlated to HLA-B (MHC class 1) as well as **(F)** HLA-DR (MHC class 2) measured by Real Time PCR. Expression ratios were calculated according to the dCT method. For normalization 18S was used. **(G)** Heatmaps of HLA-genes extracted from Affymetrix Gene chip data derived from the public dataset GSE21029[1] are shown for lymph node (LN) and peripheral blood (PB) samples of CLL patients. IRF4 expression is shown on the x-axis using a declining expression gradient. **(H)** MEC-1 cells were transfected with IRF4 siRNA using electroporation for 48h. Real Time PCR for IRF4, HLA-B, HLA-DRA, CD80 and CD86 were performed subsequently. Expression ratios were calculated according to the dCT method. For normalization 18S was used.

References

1. Herishanu Y, Perez-Galan P, Liu D, et al. The lymph node microenvironment promotes B-cell receptor signaling, NF-kappaB activation, and tumor proliferation in chronic lymphocytic leukemia. *Blood*. 2011;117(2):563-574.

Suppl. Table ST1) Patient Characteristics

[1] Patients with more than one cytogenetic aberration are represented in both groups

[2] Patients with a del13q in presence of further cytogenetic aberrations

[3] Patients with a del13q in the absence of further cytogenetic aberrations

[4] by NGS whole exome sequening (N = 37)
and Sanger Sequencing of the DNA binding domain (N = 48)

		N	%
age	Range	42 - 93	
	Mean ± SD	76,5 ± 9,6	
sex	male	41	41.8
	female	57	58.2
CD38 risk	low	69	70.4
	high	29	29.6
	not analyzed	0	0.0
ZAP70 risk	low	47	48.0
	high	38	38.8
	borderline	6	6.1
	not analyzed	7	7.1
IgVH status	mutated	56	57.1
	unmutated	36	36.7
	not analyzed	6	6.1
Cytogenetics[1]	no aberration	29	29.6
	del13q[2]	53	54.1
	del13q only[3]	44	44.9
	Tri12	11	11.2
	del11q	11	11.2
	del17p	6	6.1
	not analyzed	3	3.1
IRF4 mutations[4]	no	85	86.7
	yes	0	0.0
	not analyzed	13	13.3
RAI stage	Rai 0 (low)	29	29.6
	Rai I-II (intermediate)	45	45.9
	Rai III-IV (high)	20	20.4
	not analyzed	4	4.1
Disease	stable	48	49.0
	progressive	46	46.9
	not analyzed	4	4.1
		98	

Suppl. Table ST2) Antibodies used for flow cytometry and single cell mass cytometry

Target	Fluorochrome	Company	Clone	Used for	Application
CD160	PE	Biolegend	7H1	mouse	flow cytometry
CD19	BV650	Biolegend	6D5	mouse	flow cytometry
CD19	PE	Biolegend	6D5	mouse	flow cytometry
CD19	APC	Biolegend	6D5	mouse	flow cytometry
CD21/35	APC	Biolegend	7E9	mouse	flow cytometry
CD23	PE	BD	B3B4	mouse	flow cytometry
CD28	APC	Biolegend	37.51	mouse	flow cytometry
CD223	Biton	Biolegend	C9B7W	mouse	flow cytometry
CD244	FITC	Biolegend	m2B4(B5)458.1	mouse	flow cytometry
CD4	APC	Biolegend	GK1.5	mouse	flow cytometry
CD4	APC Cy7	Biolegend	L3T4	mouse	flow cytometry
CD4	AF700	Biolegend	L3T4	mouse	flow cytometry
CD43	APC H7	Biolegend	1B11	mouse	flow cytometry
CD44	PerCp Cy5.5	Biolegend	IM7	mouse	flow cytometry
CD5	BV421	Biolegend	53-7.3	mouse	flow cytometry
CD5	APC eFluor 780	ebioscience	53-7.3	mouse	flow cytometry
CD62L	PC7	Biolegend	MEL-14	mouse	flow cytometry
CD8	APC eF780	ebiocience	53-6.7	mouse	flow cytometry
CD8	Alexa Fluor 700	Biolegend	53-6.7	mouse	flow cytometry
CD80	PE/Cy7	Biolegend	16-10A1	mouse	flow cytometry
CD86	APC	Biolegend	GL-1	mouse	flow cytometry
CTLA4	PE eFluor 610	ebioscience	UC10-4B9	mouse	flow cytometry
H-2	PE	Biolegend	M1/42	mouse	flow cytometry
Hamster IgG	PE/Cy7	Biolegend	HTK888	mouse	flow cytometry
Hamster IgG	PE eFluor 610	ebioscience	eBio299Arm	mouse	flow cytometry
Hamster IgG	APC	Biolegend	HTK888	mouse	flow cytometry
I-A/I-E	Alexa Fluor 700	Biolegend	M5/114.15.2	mouse	flow cytometry
IgD	AF700	Biolegend	11-26c.2a	mouse	flow cytometry
IgM	PE Cy7	BD	R6-60.2	mouse	flow cytometry
PD1	PE Cy7	Biolegend	29F.1A12	mouse	flow cytometry
PD1	BV421	Biolegend	29F.1A12	mouse	flow cytometry
PDL1	BV 421	Biolegend	10F.9G2	mouse	flow cytometry
Rat IgG2a, k	PE	Biolegend	RTK2758	mouse	flow cytometry
Rat IgG2a, k	APC	Biolegend	RTK2758	mouse	flow cytometry
Rat IgG2a, k	PE/Cy7	Biolegend	RTK2758	mouse	flow cytometry
Rat IgG2b, k	Alexa Fluor 700	Biolegend	RTK4530	mouse	flow cytometry
Rat IgG2b, k	BV 421	Biolegend	RTK4530	mouse	flow cytometry
Rat IgG1, k	Biotin	Biolegend	RTK2071	mouse	flow cytometry
Rat IgG1, k	FITC	Biolegend	MOPC-21	mouse	flow cytometry
Ter119	AF700	Biolegend	TER-119	mouse	flow cytometry
CD86	PerCp Cy5.5	Biolegend	IT2.2	human	flow cytometry
CD5	Alexa Fluor 700	Beckman coulter	BL1a	human	flow cytometry
CD45 RA	ECD	Beckman coulter	2H4LDH11LDB9	human	flow cytometry
CD4	PB	Beckman coulter	13B8.2	human	flow cytometry
CD8	PO	Invitrogen	3B5	human	flow cytometry
CD19	PE	ebioscience	SJ25C1	human	flow cytometry
Rat IgG1	eFluor 660	ebioscience	eBRG1	human	flow cytometry
Mouse IgG2b	PerCp Cy5.5	Biolegend	MPC-11	human	flow cytometry
IRF4	eFluor 660	ebioscience	3E4	human	flow cytometry

Target	Isotope	Company	Clone	Used for	Application
CD5	160Gd	Fluidigm	53-7-3	mouse	mass cytometry
CD69	143Nd	Fluidigm	H1.2F3	mouse	mass cytometry
CD4	145Nd	Fluidigm	RM4-5	mouse	mass cytometry
CD25	151Eu	Fluidigm	3C7	mouse	mass cytometry
CD3e	152Sm	Fluidigm	145-2C11	mouse	mass cytometry
PD1 (CD279)	159Tb	Fluidigm	J43	mouse	mass cytometry
CD44	162Dy	Fluidigm	IM7	mouse	mass cytometry
CD62L	164Dy	Fluidigm	MEL-14	mouse	mass cytometry
CD8a	168Er	Fluidigm	53-6.7	mouse	mass cytometry
TCRβ	169Tm	Fluidigm	H57-597	mouse	mass cytometry
CD160 PE	165Ho	Fluidigm	PE001	mouse	mass cytometry
CD223 Biotin	170Er	Fluidigm	1D4C5	mouse	mass cytometry
CD244 FITC	174Yb	Fluidigm	FIT-22	mouse	mass cytometry
CD28 APC	163Dy	Fluidigm	APC003	mouse	mass cytometry

Suppl. Table ST3) Deregulated genes (log2 FC < - 1.5 and > 1.5, FDR < 0.05)

* log2 fold-change (FC), comparison between Tcl-1 tg IRF4 +/+ (reference group) and Tcl-1 tg IRF4 dB/dB mice

Entrez ID	Gene Symbol	Description	Log2FC*	FDR
230868	*Igsf21*	immunoglobulin superfamily, member 21	-5.643	2.78E-07
70040	*2610037D02Rik*	RIKEN cDNA 2610037D02 gene	-5.553	3.24E-10
70143	*2210414B05Rik*	RIKEN cDNA 2210414B05 gene	-5.342	1.38E-10
20304	*Ccl5*	chemokine (C-C motif) ligand 5	-5.316	1.80E-06
11567	*Avil*	advillin	-5.209	5.80E-15
12161	*Bmp6*	bone morphogenetic protein 6	-5.146	1.44E-04
433024	*Gm5486*	NA	-5.136	2.12E-07
12772	*Ccr2*	chemokine (C-C motif) receptor 2	-5.080	2.11E-09
433904	*Ociad2*	OCIA domain containing 2	-5.048	1.42E-09
233529	*Kctd14*	potassium channel tetramerisation domain containing 14	-4.955	8.51E-40
244867	*Arhgap20*	Rho GTPase activating protein 20	-4.930	1.72E-12
230815	*Man1c1*	mannosidase, alpha, class 1C, member 1	-4.917	2.15E-08
50905	*Il17rb*	interleukin 17 receptor B	-4.811	7.29E-08
78252	*Nxpe2*	neurexophilin and PC-esterase domain family, member 2	-4.713	3.64E-12
71409	*Fmnl2*	formin-like 2	-4.691	6.36E-05
102638134	*LOC102638134*	NA	-4.662	4.18E-07
320997	*Cyp4f39*	cytochrome P450, family 4, subfamily f, polypeptide 39	-4.645	3.57E-08
107767	*Scamp1*	secretory carrier membrane protein 1	-4.612	5.85E-03
195359	*Trim40*	tripartite motif-containing 40	-4.596	2.09E-13
97130	*C77080*	expressed sequence C77080	-4.594	3.09E-05
103149	*Upb1*	ureidopropionase, beta	-4.587	1.06E-17
64337	*Gng13*	guanine nucleotide binding protein (G protein), gamma 13	-4.571	1.12E-18
12768	*Ccr1*	chemokine (C-C motif) receptor 1	-4.538	2.80E-06
80752	*Fam20c*	family with sequence similarity 20, member C	-4.526	1.58E-04
620078	*C130026I21Rik*	RIKEN cDNA C130026I21 gene	-4.516	2.56E-15
170834	*Oosp1*	oocyte secreted protein 1	-4.460	3.95E-05
230157	*Tmeff1*	transmembrane protein with EGF-like and two follistatin-like domains 1	-4.438	7.12E-22
102640652	*LOC102640652*	NA	-4.430	3.52E-04
102631513	*LOC102631513*	NA	-4.419	5.31E-06
16185	*Il2rb*	interleukin 2 receptor, beta chain	-4.417	4.64E-12
387285	*Hcrtr2*	hypocretin (orexin) receptor 2	-4.414	6.67E-04
234267	*Gpm6a*	glycoprotein m6a	-4.412	3.75E-03
100503790	*Gm19897*	predicted gene, 19897	-4.407	7.26E-16
102640771	*LOC102640771*	NA	-4.403	1.09E-04
72578	*2700054A10Rik*	RIKEN cDNA 2700054A10 gene	-4.400	6.77E-13
18605	*Enpp1*	ectonucleotide pyrophosphatase/phosphodiesterase 1	-4.367	6.26E-09
100382	*AW011738*	expressed sequence AW011738	-4.362	4.50E-06
14962	*Cfb*	complement factor B	-4.359	1.13E-08
12933	*Crmp1*	collapsin response mediator protein 1	-4.357	1.62E-07
225638	*Alpk2*	alpha-kinase 2	-4.322	7.31E-21
110454	*Ly6a*	lymphocyte antigen 6 complex, locus A	-4.320	3.58E-09
18703	*Pigr*	polymeric immunoglobulin receptor	-4.313	1.19E-03
102631927	*LOC102631927*	NA	-4.311	3.10E-05
105732	*Fam83h*	family with sequence similarity 83, member H	-4.306	1.31E-05
328561	*Apol10b*	apolipoprotein L 10B	-4.285	7.68E-11
407788	*BC051142*	cDNA sequence BC051142	-4.283	8.03E-07
236546	*AF067061*	cDNA sequence AF067061	-4.280	5.96E-19
13070	*Cyp11a1*	cytochrome P450, family 11, subfamily a, polypeptide 1	-4.261	2.15E-04
66857	*Plbd1*	phospholipase B domain containing 1	-4.256	2.63E-05
102638846	*LOC102638846*	NA	-4.252	1.37E-07
102640469	*LOC102640469*	NA	-4.250	9.75E-06
57781	*Cd200r1*	CD200 receptor 1	-4.241	1.02E-08
78801	*Ak7*	adenylate kinase 7	-4.235	1.44E-04
72027	*Slc39a4*	solute carrier family 39 (zinc transporter), member 4	-4.233	5.19E-28
435145	*AI848285*	expressed sequence AI848285	-4.226	3.05E-12
230810	*Slc30a2*	solute carrier family 30 (zinc transporter), member 2	-4.215	2.58E-08
23880	*Fyb*	FYN binding protein	-4.213	2.68E-03
109979	*Art3*	ADP-ribosyltransferase 3	-4.201	6.82E-05
320181	*Fndc7*	fibronectin type III domain containing 7	-4.198	4.90E-08
18599	*Padi1*	peptidyl arginine deiminase, type I	-4.197	6.76E-16
100038577	*Gm10790*	predicted gene 10790	-4.176	5.39E-12
12292	*Cacna1s*	calcium channel, voltage-dependent, L type, alpha 1S subunit	-4.167	6.37E-22
171166	*Mcoln3*	mucolipin 3	-4.159	1.09E-05
20190	*Ryr1*	ryanodine receptor 1, skeletal muscle	-4.129	8.24E-16
17105	*Lyz2*	lysozyme 2	-4.125	2.43E-06
208618	*Etl4*	enhancer trap locus 4	-4.121	3.38E-07
56226	*Espn*	espin	-4.121	1.05E-07
100043773	*Gm4637*	NA	-4.117	2.57E-06
101056250	*LOC101056250*	NA	-4.089	3.19E-10
227326	*Gpr55*	G protein-coupled receptor 55	-4.088	1.69E-13

102639511	*LOC102639511*	NA	-4.085	3.79E-11
13004	*Ncan*	neurocan	-4.081	1.12E-07
80901	*Cxcr6*	chemokine (C-X-C motif) receptor 6	-4.074	2.66E-05
109225	*Ms4a7*	membrane-spanning 4-domains, subfamily A, member 7	-4.069	3.51E-06
233424	*Tmc3*	transmembrane channel-like gene family 3	-4.069	1.13E-14
12289	*Cacna1d*	calcium channel, voltage-dependent, L type, alpha 1D subunit	-4.061	3.80E-07
99543	*Olfml3*	olfactomedin-like 3	-4.059	5.11E-05
242425	*Gabbr2*	gamma-aminobutyric acid (GABA) B receptor, 2	-4.055	8.89E-05
71653	*4930506M07Rik*	RIKEN cDNA 4930506M07 gene	-4.041	1.13E-04
76484	*Kndc1*	kinase non-catalytic C-lobe domain (KIND) containing 1	-4.038	1.68E-05
195531	*Gm13152*	predicted gene 13152	-4.028	1.62E-07
12306	*Anxa2*	annexin A2	-4.010	6.44E-05
433801	*Gm13212*	predicted gene 13212	-4.008	2.01E-12
232370	*Clstn3*	calsyntenin 3	-4.005	8.29E-04
102638555	*LOC102638555*	NA	-4.001	9.18E-09
59289	*Ackr2*	atypical chemokine receptor 2	-3.999	5.69E-08
320159	*Fam179a*	family with sequence similarity 179, member A	-3.988	9.65E-07
12263	*C2*	complement component 2 (within H-2S)	-3.978	1.01E-13
102638989	*LOC102638989*	NA	-3.974	7.58E-09
21819	*Tg*	thyroglobulin	-3.966	1.44E-08
69169	*Faim3*	Fas apoptotic inhibitory molecule 3	-3.965	9.49E-08
77209	*8030453O22Rik*	NA	-3.962	2.99E-11
328977	*Zfp532*	zinc finger protein 532	-3.957	8.44E-03
209773	*Dennd2a*	DENN/MADD domain containing 2A	-3.953	1.06E-15
329693	*Fcrl5*	Fc receptor-like 5	-3.949	3.51E-09
231470	*Fras1*	Fraser syndrome 1 homolog (human)	-3.946	2.88E-06
11658	*Alcam*	activated leukocyte cell adhesion molecule	-3.944	2.29E-07
171504	*Apobr*	apolipoprotein B receptor	-3.937	5.93E-10
22164	*Tnfsf4*	tumor necrosis factor (ligand) superfamily, member 4	-3.936	1.28E-06
21926	*Tnf*	tumor necrosis factor	-3.928	1.11E-04
243961	*Shank1*	SH3/ankyrin domain gene 1	-3.924	5.72E-04
67991	*Nacc2*	nucleus accumbens associated 2, BEN and BTB (POZ) domain containing	-3.864	2.56E-15
19876	*Robo1*	roundabout homolog 1 (Drosophila)	-3.853	1.12E-13
105278	*Cdk20*	cyclin-dependent kinase 20	-3.852	5.76E-06
67261	*2900005J15Rik*	RIKEN cDNA 2900005J15 gene	-3.849	2.69E-09
102637392	*LOC102637392*	NA	-3.848	8.11E-09
408064	*BC064078*	cDNA sequence BC064078	-3.847	6.26E-11
12524	*Cd86*	CD86 antigen	-3.841	2.29E-09
107771	*Bmyc*	brain expressed myelocytomatosis oncogene	-3.836	4.23E-04
64435	*Fcamr*	Fc receptor, IgA, IgM, high affinity	-3.834	2.03E-02
230103	*Npr2*	natriuretic peptide receptor 2	-3.833	6.58E-09
102634521	*LOC102634521*	NA	-3.829	8.90E-09
12166	*Bmpr1a*	bone morphogenetic protein receptor, type 1A	-3.819	4.80E-06
15450	*Lipc*	lipase, hepatic	-3.818	1.92E-10
57319	*Smpdl3a*	sphingomyelin phosphodiesterase, acid-like 3A	-3.815	9.57E-13
26912	*Gcat*	glycine C-acetyltransferase (2-amino-3-ketobutyrate-coenzyme A ligase)	-3.811	1.73E-06
15211	*Hexa*	hexosaminidase A	-3.811	5.93E-36
100041194	*Ahnak2*	NA	-3.799	1.12E-17
14728	*Lilrb4*	leukocyte immunoglobulin-like receptor, subfamily B, member 4	-3.798	5.22E-06
16529	*Kcnk5*	potassium channel, subfamily K, member 5	-3.794	1.76E-38
210145	*Irgc1*	immunity-related GTPase family, cinema 1	-3.793	2.21E-03
50876	*Tmod2*	tropomodulin 2	-3.786	3.16E-03
66259	*Camk2n1*	calcium/calmodulin-dependent protein kinase II inhibitor 1	-3.783	4.10E-10
17181	*Matn2*	matrilin 2	-3.781	1.70E-09
12818	*Col14a1*	collagen, type XIV, alpha 1	-3.781	2.86E-09
381524	*AI427809*	expressed sequence AI427809	-3.778	3.76E-32
380705	*Tmem102*	transmembrane protein 102	-3.774	2.35E-07
58206	*Zbtb32*	zinc finger and BTB domain containing 32	-3.769	7.24E-16
70082	*Lysmd2*	LysM, putative peptidoglycan-binding, domain containing 2	-3.768	7.60E-15
22029	*Traf1*	TNF receptor-associated factor 1	-3.767	6.51E-16
102638355	*LOC102638355*	NA	-3.766	4.25E-06
100049161	*Gm13032*	predicted gene 13032	-3.764	1.22E-09
11622	*Ahr*	aryl-hydrocarbon receptor	-3.762	2.07E-15
100434	*Slc44a1*	solute carrier family 44, member 1	-3.755	1.12E-04
67856	*Echdc3*	enoyl Coenzyme A hydratase domain containing 3	-3.751	2.15E-09
12509	*Cd59a*	CD59a antigen	-3.744	1.69E-07
14590	*Ggh*	gamma-glutamyl hydrolase	-3.721	2.29E-03
18019	*Nfatc2*	nuclear factor of activated T cells, cytoplasmic, calcineurin dependent 2	-3.712	2.69E-19
210573	*Tmem151b*	transmembrane protein 151B	-3.710	1.06E-09
231125	*Zfyve28*	zinc finger, FYVE domain containing 28	-3.705	3.56E-03
102632254	*LOC102632254*	NA	-3.694	3.18E-05
170743	*Tlr7*	toll-like receptor 7	-3.686	3.56E-21
320129	*Adrbk2*	adrenergic receptor kinase, beta 2	-3.683	3.93E-04
18726	*Lilra6*	leukocyte immunoglobulin-like receptor, subfamily A (with TM domain), member 6	-3.683	2.46E-04
16408	*Itgal*	integrin alpha L	-3.677	5.60E-16
246707	*Emilin2*	elastin microfibril interfacer 2	-3.675	9.15E-04

102632372	*LOC102632372*	NA	-3.675	3.90E-07
69987	*1700026L06Rik*	RIKEN cDNA 1700026L06 gene	-3.672	7.16E-08
80794	*Cblc*	Casitas B-lineage lymphoma c	-3.669	9.96E-13
98388	*Chst10*	carbohydrate sulfotransferase 10	-3.668	1.30E-03
23921	*Sh2b2*	SH2B adaptor protein 2	-3.642	2.64E-12
668579	*Cd9-ps*	Cd9 antigen, pseudogene	-3.636	5.65E-07
211228	*Lrrc25*	leucine rich repeat containing 25	-3.636	7.59E-19
12047	*Bcl2a1d*	B cell leukemia/lymphoma 2 related protein A1d	-3.635	6.25E-04
50498	*Ebi3*	Epstein-Barr virus induced gene 3	-3.632	3.63E-21
66815	*Ccdc109b*	coiled-coil domain containing 109B	-3.630	1.33E-08
16992	*Lta*	lymphotoxin A	-3.628	1.10E-02
213402	*Armc2*	armadillo repeat containing 2	-3.627	4.90E-08
18762	*Prkcz*	protein kinase C, zeta	-3.623	3.05E-12
107889	*Gcm2*	glial cells missing homolog 2 (Drosophila)	-3.617	1.33E-04
17259	*Mef2b*	myocyte enhancer factor 2B	-3.612	2.20E-05
100043726	*Gm4610*	NA	-3.611	2.17E-09
17068	*Ly6d*	lymphocyte antigen 6 complex, locus D	-3.609	4.00E-05
13655	*Egr3*	early growth response 3	-3.609	4.71E-05
241230	*St8sia6*	ST8 alpha-N-acetyl-neuraminide alpha-2,8-sialyltransferase 6	-3.603	5.65E-18
77531	*Anks1b*	ankyrin repeat and sterile alpha motif domain containing 1B	-3.602	8.95E-10
17969	*Ncf1*	neutrophil cytosolic factor 1	-3.601	6.78E-10
246746	*Cd300lf*	CD300 antigen like family member F	-3.601	8.36E-11
11981	*Atp9a*	ATPase, class II, type 9A	-3.599	3.14E-04
219131	*Phf11a*	PHD finger protein 11A	-3.589	2.48E-08
70789	*Kynu*	kynureninase (L-kynurenine hydrolase)	-3.587	1.20E-16
67689	*Aldh3b1*	aldehyde dehydrogenase 3 family, member B1	-3.576	1.30E-18
320046	*F730043M19Rik*	RIKEN cDNA F730043M19 gene	-3.569	1.61E-07
235431	*Coro2b*	coronin, actin binding protein, 2B	-3.566	8.26E-08
94040	*Clmn*	calmin	-3.551	6.46E-08
320782	*Tmem154*	transmembrane protein 154	-3.551	1.27E-12
69809	*1810046K07Rik*	RIKEN cDNA 1810046K07 gene	-3.546	2.14E-15
16161	*Il12rb1*	interleukin 12 receptor, beta 1	-3.540	2.64E-11
11576	*Afp*	alpha fetoprotein	-3.533	5.36E-04
277010	*Marveld1*	MARVEL (membrane-associating) domain containing 1	-3.527	1.14E-10
14085	*Fah*	fumarylacetoacetate hydrolase	-3.524	4.00E-13
15442	*Hpse*	heparanase	-3.518	1.14E-12
213439	*Gpr174*	G protein-coupled receptor 174	-3.518	2.12E-04
233765	*Plekha7*	pleckstrin homology domain containing, family A member 7	-3.515	3.28E-24
73690	*Glipr1*	GLI pathogenesis-related 1 (glioma)	-3.495	3.80E-11
11747	*Anxa5*	annexin A5	-3.488	1.02E-13
67865	*Rgs10*	regulator of G-protein signalling 10	-3.488	2.04E-04
245945	*Rbm47*	RNA binding motif protein 47	-3.474	2.73E-08
22177	*Tyrobp*	TYRO protein tyrosine kinase binding protein	-3.472	2.54E-06
207742	*Rnf43*	ring finger protein 43	-3.470	2.11E-03
12363	*Casp4*	caspase 4, apoptosis-related cysteine peptidase	-3.466	2.58E-18
16421	*Itgb7*	integrin beta 7	-3.463	5.91E-20
56193	*Plek*	pleckstrin	-3.463	6.79E-18
628693	*Gm6904*	predicted gene 6904	-3.461	4.53E-05
18733	*Pirb*	paired Ig-like receptor B	-3.452	1.14E-11
15162	*Hck*	hemopoietic cell kinase	-3.446	6.90E-06
626785	*Gm6705*	NA	-3.446	1.11E-07
219148	*Fam167a*	family with sequence similarity 167, member A	-3.442	1.06E-09
17084	*Ly86*	lymphocyte antigen 86	-3.430	8.22E-07
13058	*Cybb*	cytochrome b-245, beta polypeptide	-3.429	1.24E-13
56405	*Dusp14*	dual specificity phosphatase 14	-3.426	1.77E-03
16668	*Krt18*	keratin 18	-3.417	1.33E-03
223920	*Soat2*	sterol O-acyltransferase 2	-3.416	4.32E-02
13610	*S1pr3*	sphingosine-1-phosphate receptor 3	-3.410	1.96E-05
433637	*Gm5547*	predicted gene 5547	-3.407	2.37E-04
18566	*Pdcd1*	programmed cell death 1	-3.407	1.79E-03
11905	*Serpinc1*	serine (or cysteine) peptidase inhibitor, clade C (antithrombin), member 1	-3.404	7.07E-04
12224	*Klf5*	Kruppel-like factor 5	-3.402	7.14E-09
69608	*Sec24d*	Sec24 related gene family, member D (S. cerevisiae)	-3.398	1.66E-02
14191	*Fgr*	Gardner-Rasheed feline sarcoma viral (Fgr) oncogene homolog	-3.392	6.02E-07
102636292	*LOC102636292*	NA	-3.391	9.62E-05
102635305	*LOC102635305*	NA	-3.386	1.98E-06
625360	*BC147527*	cDNA sequence BC147527	-3.379	9.77E-07
23833	*Cd52*	CD52 antigen	-3.373	7.45E-18
78416	*Rnase6*	ribonuclease, RNase A family, 6	-3.372	3.71E-07
230757	*5730409E04Rik*	RIKEN cDNA 5730409E04Rik gene	-3.366	1.32E-08
20503	*Slc16a7*	solute carrier family 16 (monocarboxylic acid transporters), member 7	-3.364	4.92E-05
74645	*Fam46c*	family with sequence similarity 46, member C	-3.361	1.51E-02
14073	*Faah*	fatty acid amide hydrolase	-3.340	5.25E-14
79362	*Bhlhe41*	basic helix-loop-helix family, member e41	-3.330	2.33E-33
57339	*Jph1*	junctophilin 1	-3.329	1.08E-05
51875	*Tmem141*	transmembrane protein 141	-3.322	1.32E-05

14357	*Dtx1*	deltex 1 homolog (Drosophila)	-3.317	1.86E-08
231932	*Gimap7*	GTPase, IMAP family member 7	-3.315	2.13E-07
19419	*Rasgrp1*	RAS guanyl releasing protein 1	-3.314	2.37E-29
100705	*Acacb*	acetyl-Coenzyme A carboxylase beta	-3.313	3.25E-06
17937	*Nab2*	Ngfi-A binding protein 2	-3.310	2.33E-15
102639980	*LOC102639980*	NA	-3.303	6.35E-07
50723	*Icosl*	icos ligand	-3.301	1.45E-07
268481	*Krt222*	keratin 222	-3.300	1.56E-13
105827	*Amigo2*	adhesion molecule with Ig like domain 2	-3.293	9.04E-04
237759	*Col23a1*	collagen, type XXIII, alpha 1	-3.291	9.16E-07
54486	*Hpgds*	hematopoietic prostaglandin D synthase	-3.281	2.70E-02
238276	*Akap5*	A kinase (PRKA) anchor protein 5	-3.276	1.98E-03
101476	*Plekha1*	pleckstrin homology domain containing, family A (phosphoinositide binding specific)	-3.272	7.53E-30
12266	*C3*	complement component 3	-3.269	1.22E-07
56506	*Cib2*	calcium and integrin binding family member 2	-3.265	1.04E-05
18187	*Nrp2*	neuropilin 2	-3.262	1.35E-09
639910	*Gm20767*	predicted gene, 20767	-3.261	5.69E-04
56743	*Lat2*	linker for activation of T cells family, member 2	-3.260	9.46E-26
21897	*Tlr1*	toll-like receptor 1	-3.254	1.21E-11
69640	*Fam83g*	family with sequence similarity 83, member G	-3.253	2.74E-09
76954	*St5*	suppression of tumorigenicity 5	-3.250	1.05E-05
381287	*A530032D15Rik*	RIKEN cDNA A530032D15Rik gene	-3.247	4.99E-07
240427	*Setbp1*	SET binding protein 1	-3.241	1.61E-04
229488	*Fam160a1*	family with sequence similarity 160, member A1	-3.232	3.71E-07
17356	*Mllt4*	myeloid/lymphoid or mixed-lineage leukemia (trithorax homolog, Drosophila); trans	-3.224	1.01E-13
637515	*Nlrp1b*	NLR family, pyrin domain containing 1B	-3.218	6.22E-03
12522	*Cd83*	CD83 antigen	-3.216	3.51E-06
15000	*H2-DMb2*	histocompatibility 2, class II, locus Mb2	-3.216	1.21E-08
100504591	*Gm15987*	predicted gene 15987	-3.213	5.46E-13
12902	*Cr2*	complement receptor 2	-3.211	2.54E-04
110351	*Rap1gap*	Rap1 GTPase-activating protein	-3.211	2.41E-11
16192	*Il5ra*	interleukin 5 receptor, alpha	-3.211	2.49E-26
56873	*Lmbr1*	limb region 1	-3.203	5.21E-05
70377	*Derl3*	Der1-like domain family, member 3	-3.202	1.46E-02
101202	*Hepacam2*	HEPACAM family member 2	-3.202	1.42E-19
102639105	*LOC102639105*	NA	-3.201	2.35E-10
19201	*Pstpip2*	proline-serine-threonine phosphatase-interacting protein 2	-3.200	1.08E-05
11535	*Adm*	adrenomedullin	-3.200	9.15E-06
70727	*Rasgef1a*	RasGEF domain family, member 1A	-3.197	9.36E-05
331524	*Xkrx*	X Kell blood group precursor related X linked	-3.196	8.82E-12
240873	*Tnfsf18*	tumor necrosis factor (ligand) superfamily, member 18	-3.196	1.53E-06
192657	*Ell2*	elongation factor RNA polymerase II 2	-3.193	3.59E-04
244871	*Zc3h12c*	zinc finger CCCH type containing 12C	-3.192	9.47E-08
23969	*Pacsin1*	protein kinase C and casein kinase substrate in neurons 1	-3.188	1.53E-04
17075	*Epcam*	epithelial cell adhesion molecule	-3.185	4.36E-02
52323	*Klhl7*	kelch-like 7	-3.173	7.00E-11
102639299	*LOC102639299*	NA	-3.168	2.08E-03
18793	*Plaur*	plasminogen activator, urokinase receptor	-3.165	2.26E-08
68774	*Ms4a6d*	membrane-spanning 4-domains, subfamily A, member 6D	-3.164	3.90E-10
68799	*Rgmb*	repulsive guidance molecule family member B	-3.159	2.40E-09
18647	*Cdk14*	cyclin-dependent kinase 14	-3.159	1.75E-09
214359	*Tmem51*	transmembrane protein 51	-3.151	2.27E-09
12362	*Casp1*	caspase 1	-3.149	4.26E-15
18601	*Padi3*	peptidyl arginine deiminase, type III	-3.147	9.25E-07
102639068	*LOC102639068*	NA	-3.146	3.07E-08
93871	*Brwd1*	bromodomain and WD repeat domain containing 1	-3.145	8.93E-04
18186	*Nrp1*	neuropilin 1	-3.143	9.42E-04
320292	*Rasgef1b*	RasGEF domain family, member 1B	-3.143	2.29E-05
69206	*2010016I18Rik*	RIKEN cDNA 2010016I18 gene	-3.142	9.14E-08
378431	*Txlnb*	taxilin beta	-3.139	9.86E-06
18030	*Nfil3*	nuclear factor, interleukin 3, regulated	-3.138	4.07E-08
231532	*Arhgap24*	Rho GTPase activating protein 24	-3.133	6.25E-12
102632789	*LOC102632789*	NA	-3.132	4.80E-04
12527	*Cd9*	CD9 antigen	-3.131	1.41E-05
100504518	*3425401B19Rik*	RIKEN cDNA 3425401B19 gene	-3.123	1.16E-02
12043	*Bcl2*	B cell leukemia/lymphoma 2	-3.123	3.33E-11
12045	*Bcl2a1b*	B cell leukemia/lymphoma 2 related protein A1b	-3.119	2.72E-03
23936	*Lynx1*	Ly6/neurotoxin 1	-3.119	3.98E-03
217830	*9030617O03Rik*	RIKEN cDNA 9030617O03 gene	-3.110	1.28E-10
14695	*Gnb3*	guanine nucleotide binding protein (G protein), beta 3	-3.108	5.83E-05
20238	*Atxn1*	ataxin 1	-3.103	1.03E-09
52377	*Rcn3*	reticulocalbin 3, EF-hand calcium binding domain	-3.099	1.34E-05
17250	*Abcc1*	ATP-binding cassette, sub-family C (CFTR/MRP), member 1	-3.092	7.96E-11
12143	*Blk*	B lymphoid kinase	-3.090	3.42E-14
13036	*Ctsh*	cathepsin H	-3.082	1.07E-15
19418	*Rasgrf2*	RAS protein-specific guanine nucleotide-releasing factor 2	-3.082	4.58E-08

71130	*Sh2d6*	NA	-3.082	7.25E-06
18725	*Pira2*	paired-Ig-like receptor A2	-3.073	2.14E-06
16988	*Lst1*	leukocyte specific transcript 1	-3.063	5.05E-04
12298	*Cacnb4*	calcium channel, voltage-dependent, beta 4 subunit	-3.058	1.80E-04
74732	*Stx11*	syntaxin 11	-3.056	1.31E-12
12494	*Cd38*	CD38 antigen	-3.052	1.36E-05
13043	*Cttn*	cortactin	-3.051	3.93E-02
16994	*Ltb*	lymphotoxin B	-3.047	7.84E-04
17314	*Mgmt*	O-6-methylguanine-DNA methyltransferase	-3.046	2.39E-09
226101	*Myof*	myoferlin	-3.046	4.97E-03
21941	*Tnfrsf8*	tumor necrosis factor receptor superfamily, member 8	-3.042	3.67E-06
29857	*Mapk12*	mitogen-activated protein kinase 12	-3.042	1.89E-03
69288	*Rhobtb1*	Rho-related BTB domain containing 1	-3.040	1.07E-03
638068	*Gm7229*	NA	-3.040	2.56E-10
12519	*Cd80*	CD80 antigen	-3.039	2.54E-15
20720	*Serpine2*	serine (or cysteine) peptidase inhibitor, clade E, member 2	-3.035	6.48E-05
15365	*Hmga2-ps1*	high mobility group AT-hook 2, pseudogene 1	-3.033	4.49E-10
13846	*Ephb4*	Eph receptor B4	-3.030	6.66E-07
12482	*Ms4a1*	membrane-spanning 4-domains, subfamily A, member 1	-3.023	4.70E-06
56386	*B4galt6*	UDP-Gal:betaGlcNAc beta 1,4-galactosyltransferase, polypeptide 6	-3.018	4.88E-13
74761	*Mxra8*	matrix-remodelling associated 8	-3.018	1.14E-03
69387	*Dnajb13*	DnaJ (Hsp40) related, subfamily B, member 13	-3.018	2.16E-06
229595	*Adamtsl4*	ADAMTS-like 4	-3.017	1.14E-06
107607	*Nod1*	nucleotide-binding oligomerization domain containing 1	-3.017	2.00E-19
54712	*Plxnc1*	plexin C1	-3.016	2.01E-08
105245	*Txndc5*	thioredoxin domain containing 5	-3.009	1.83E-03
269713	*Clip2*	CAP-GLY domain containing linker protein 2	-3.007	9.10E-22
213989	*Tmem82*	transmembrane protein 82	-3.005	1.69E-03
208647	*Creb3l2*	cAMP responsive element binding protein 3-like 2	-3.003	2.47E-04
73656	*Ms4a6c*	membrane-spanning 4-domains, subfamily A, member 6C	-3.003	5.97E-05
245174	*Zfp937*	zinc finger protein 937	-2.993	5.82E-04
21939	*Cd40*	CD40 antigen	-2.991	1.03E-04
18636	*Cfp*	complement factor properdin	-2.986	7.21E-09
16199	*Il9r*	interleukin 9 receptor	-2.982	9.74E-03
15001	*H2-Oa*	histocompatibility 2, O region alpha locus	-2.979	5.14E-06
12798	*Cnn2*	calponin 2	-2.978	3.19E-10
14263	*Fmo5*	flavin containing monooxygenase 5	-2.976	6.51E-12
19088	*Prkar2b*	protein kinase, cAMP dependent regulatory, type II beta	-2.968	2.52E-04
14960	*H2-Aa*	histocompatibility 2, class II antigen A, alpha	-2.962	5.04E-05
12507	*Cd5*	CD5 antigen	-2.962	1.17E-09
18602	*Padi4*	peptidyl arginine deiminase, type IV	-2.961	3.74E-03
16891	*Lipg*	lipase, endothelial	-2.957	4.52E-04
668218	*Bin2*	bridging integrator 2	-2.953	2.46E-13
22409	*Wnt10a*	wingless related MMTV integration site 10a	-2.952	1.84E-02
12322	*Camk2a*	calcium/calmodulin-dependent protein kinase II alpha	-2.951	1.11E-02
18722	*Pira1*	paired-Ig-like receptor A1	-2.946	1.68E-05
12778	*Ackr3*	atypical chemokine receptor 3	-2.945	1.46E-02
227696	*Phyhd1*	phytanoyl-CoA dioxygenase domain containing 1	-2.945	6.72E-09
16149	*Cd74*	CD74 antigen (invariant polypeptide of major histocompatibility complex, class II ant	-2.944	7.78E-08
57344	*As3mt*	arsenic (+3 oxidation state) methyltransferase	-2.943	5.19E-04
74103	*Nebl*	nebulette	-2.942	6.56E-03
72823	*Pard3b*	par-3 family cell polarity regulator beta	-2.942	4.12E-07
20708	*Serpinb6b*	serine (or cysteine) peptidase inhibitor, clade B, member 6b	-2.939	7.32E-05
13830	*Stom*	stomatin	-2.939	1.93E-06
21946	*Pglyrp1*	peptidoglycan recognition protein 1	-2.938	6.00E-03
102635298	*LOC102635298*	NA	-2.932	1.17E-08
14017	*Evi2a*	ecotropic viral integration site 2a	-2.930	2.37E-12
108960	*Irak2*	interleukin-1 receptor-associated kinase 2	-2.926	2.75E-11
207521	*Dtx4*	deltex 4 homolog (Drosophila)	-2.925	1.46E-07
19024	*Ppfibp2*	PTPRF interacting protein, binding protein 2 (liprin beta 2)	-2.923	3.58E-07
16407	*Itgae*	integrin alpha E, epithelial-associated	-2.922	7.69E-07
235283	*Gramd1b*	GRAM domain containing 1B	-2.913	1.24E-10
330319	*Wipf3*	WAS/WASL interacting protein family, member 3	-2.909	1.19E-03
66995	*Zcchc18*	zinc finger, CCHC domain containing 18	-2.907	5.22E-06
434402	*Gm5617*	predicted gene 5617	-2.902	2.18E-05
23900	*Hcst*	hematopoietic cell signal transducer	-2.899	3.82E-08
72022	*Slc35f2*	solute carrier family 35, member F2	-2.897	6.76E-07
107526	*Gimap4*	GTPase, IMAP family member 4	-2.896	6.37E-06
83771	*Tas1r3*	taste receptor, type 1, member 3	-2.890	3.15E-04
11629	*Aif1*	allograft inflammatory factor 1	-2.890	1.73E-05
19009	*Pou6f1*	POU domain, class 6, transcription factor 1	-2.887	5.60E-07
27218	*Slamf1*	signaling lymphocytic activation molecule family member 1	-2.886	9.88E-04
329003	*Zfp516*	zinc finger protein 516	-2.885	3.59E-11
114128	*Laptm4b*	lysosomal-associated protein transmembrane 4B	-2.884	3.49E-05
100038909	*Gm14548*	predicted gene 14548	-2.883	2.82E-04
12265	*Ciita*	class II transactivator	-2.880	2.35E-06

268747	*Lrrc16b*	leucine rich repeat containing 16B	-2.877	5.18E-07
58205	*Pdcd1lg2*	programmed cell death 1 ligand 2	-2.876	3.58E-14
244183	*Trim30b*	tripartite motif-containing 30B	-2.870	4.49E-06
74777	*Sepn1*	selenoprotein N, 1	-2.870	2.00E-07
68732	*Lrrc16a*	leucine rich repeat containing 16A	-2.869	2.00E-07
11540	*Adora2a*	adenosine A2a receptor	-2.863	2.98E-10
13496	*Arid3a*	AT rich interactive domain 3A (BRIGHT-like)	-2.861	3.79E-11
17476	*Mpeg1*	macrophage expressed gene 1	-2.859	7.45E-18
104759	*Pld4*	phospholipase D family, member 4	-2.856	4.85E-05
72049	*Tnfrsf13c*	tumor necrosis factor receptor superfamily, member 13c	-2.855	2.76E-09
66082	*Abhd6*	abhydrolase domain containing 6	-2.854	1.82E-08
237847	*Rtn4rl1*	reticulon 4 receptor-like 1	-2.851	1.30E-05
102633658	*LOC102633658*	NA	-2.846	5.91E-03
22612	*Yes1*	Yamaguchi sarcoma viral (v-yes) oncogene homolog 1	-2.843	2.01E-05
22038	*Plscr1*	phospholipid scramblase 1	-2.842	5.74E-05
100041146	*Gm15448*	NA	-2.842	1.67E-03
13421	*Dnase1l3*	deoxyribonuclease 1-like 3	-2.840	8.74E-06
14969	*H2-Eb1*	histocompatibility 2, class II antigen E beta	-2.838	1.34E-04
102636000	*LOC102636000*	NA	-2.835	8.75E-04
212647	*Aldh4a1*	aldehyde dehydrogenase 4 family, member A1	-2.835	2.43E-08
17470	*Cd200*	CD200 antigen	-2.831	2.29E-07
76589	*Unc5cl*	unc-5 homolog C (C. elegans)-like	-2.827	5.63E-08
19261	*Sirpa*	signal-regulatory protein alpha	-2.822	1.77E-09
11603	*Agrn*	agrin	-2.821	2.83E-04
12514	*Cd68*	CD68 antigen	-2.811	2.91E-09
21961	*Tns1*	tensin 1	-2.808	1.61E-02
68870	*Ak8*	adenylate kinase 8	-2.805	2.28E-06
106347	*Ildr1*	immunoglobulin-like domain containing receptor 1	-2.802	4.41E-04
80291	*Rilpl2*	Rab interacting lysosomal protein-like 2	-2.797	3.05E-10
60613	*Kcnq4*	potassium voltage-gated channel, subfamily Q, member 4	-2.797	9.09E-04
668033	*Gm8935*	NA	-2.793	1.43E-04
56843	*Trpm5*	transient receptor potential cation channel, subfamily M, member 5	-2.790	4.91E-02
76074	*Gbp8*	guanylate-binding protein 8	-2.789	1.28E-09
210808	*Lacc1*	laccase (multicopper oxidoreductase) domain containing 1	-2.787	2.16E-04
67469	*Abhd5*	abhydrolase domain containing 5	-2.783	3.08E-10
71361	*Aifm2*	apoptosis-inducing factor, mitochondrion-associated 2	-2.782	3.56E-11
73899	*LOC73899*	NA	-2.781	8.68E-06
20678	*Sox5*	SRY (sex determining region Y)-box 5	-2.781	4.19E-06
13654	*Egr2*	early growth response 2	-2.778	4.13E-04
268451	*Rab11fip4*	RAB11 family interacting protein 4 (class II)	-2.777	5.25E-03
380712	*Tlcd2*	TLC domain containing 2	-2.772	7.92E-04
434484	*Sp140*	Sp140 nuclear body protein	-2.772	2.29E-14
20361	*Sema7a*	sema domain, immunoglobulin domain (Ig), and GPI membrane anchor, (semaphori	-2.772	1.71E-13
20741	*Sptb*	spectrin beta, erythrocytic	-2.768	1.08E-12
70550	*5730416F02Rik*	RIKEN cDNA 5730416F02 gene	-2.764	1.67E-08
14701	*Gng12*	guanine nucleotide binding protein (G protein), gamma 12	-2.760	1.07E-03
14020	*Evi5*	ecotropic viral integration site 5	-2.760	2.42E-04
14824	*Grn*	granulin	-2.752	8.61E-06
319880	*Tmcc3*	transmembrane and coiled coil domains 3	-2.749	9.57E-13
13650	*Rhbdf1*	rhomboid family 1 (Drosophila)	-2.744	2.78E-06
66898	*Baiap2l1*	BAI1-associated protein 2-like 1	-2.741	7.56E-07
50766	*Crim1*	cysteine rich transmembrane BMP regulator 1 (chordin like)	-2.737	2.69E-02
53886	*Cdkl2*	cyclin-dependent kinase-like 2 (CDC2-related kinase)	-2.736	1.83E-05
14998	*H2-DMa*	histocompatibility 2, class II, locus DMa	-2.733	7.61E-05
619308	*F830208F22Rik*	NA	-2.733	5.26E-04
11923	*Neurod4*	neurogenic differentiation 4	-2.732	1.48E-02
71720	*Osbpl3*	oxysterol binding protein-like 3	-2.731	8.67E-03
246256	*Fcgr4*	Fc receptor, IgG, low affinity IV	-2.730	6.77E-03
94089	*Trim7*	tripartite motif-containing 7	-2.728	7.56E-04
23912	*Rhof*	ras homolog gene family, member f	-2.727	2.87E-09
71706	*Slc46a3*	solute carrier family 46, member 3	-2.727	3.97E-10
16443	*Itsn1*	intersectin 1 (SH3 domain protein 1A)	-2.726	2.74E-06
67621	*Bend5*	BEN domain containing 5	-2.726	9.53E-06
74039	*Nfam1*	Nfat activating molecule with ITAM motif 1	-2.724	2.29E-07
100038347	*Fam174b*	family with sequence similarity 174, member B	-2.722	4.28E-02
677289	*Gm14492*	predicted gene 14492	-2.721	1.29E-06
100503676	*LOC100503676*	uncharacterized LOC100503676	-2.718	5.94E-07
434197	*Fam169b*	family with sequence similarity 169, member B	-2.707	1.20E-09
56460	*Pkp3*	plakophilin 3	-2.706	3.36E-06
102632117	*LOC102632117*	NA	-2.705	4.03E-03
14961	*H2-Ab1*	histocompatibility 2, class II antigen A, beta 1	-2.704	4.17E-05
98365	*Slamf9*	SLAM family member 9	-2.699	1.74E-04
17155	*Man1a*	mannosidase 1, alpha	-2.699	2.66E-08
217866	*Cdc42bpb*	CDC42 binding protein kinase beta	-2.694	6.32E-10
22724	*Zbtb7b*	zinc finger and BTB domain containing 7B	-2.688	3.87E-13
66961	*Neat1*	nuclear paraspeckle assembly transcript 1 (non-protein coding)	-2.688	1.74E-07

67475	*Ero1lb*	ERO1-like beta (S. cerevisiae)	-2.684	9.12E-10
12332	*Capg*	capping protein (actin filament), gelsolin-like	-2.682	2.54E-10
666907	*Ms4a4a*	NA	-2.680	1.42E-03
21936	*Tnfrsf18*	tumor necrosis factor receptor superfamily, member 18	-2.672	3.17E-09
18073	*Nid1*	nidogen 1	-2.669	1.04E-21
70839	*P2ry12*	purinergic receptor P2Y, G-protein coupled 12	-2.667	2.93E-03
14773	*Grk5*	G protein-coupled receptor kinase 5	-2.665	7.82E-05
75580	*Zbtb4*	zinc finger and BTB domain containing 4	-2.653	1.17E-08
106042	*Prickle1*	prickle homolog 1 (Drosophila)	-2.652	5.19E-03
217305	*Cd300ld*	CD300 molecule-like family member d	-2.643	2.91E-02
234515	*Inpp4b*	inositol polyphosphate-4-phosphatase, type II	-2.639	3.68E-10
14166	*Fgf11*	fibroblast growth factor 11	-2.635	8.03E-06
67283	*Slc25a19*	solute carrier family 25 (mitochondrial thiamine pyrophosphate carrier), member 19	-2.634	2.03E-07
66503	*1810034E14Rik*	RIKEN cDNA 1810034E14 gene	-2.633	3.85E-04
320148	*B430306N03Rik*	RIKEN cDNA B430306N03 gene	-2.633	2.56E-04
380711	*Rap1gap2*	RAP1 GTPase activating protein 2	-2.628	2.16E-06
13040	*Ctss*	cathepsin S	-2.622	1.23E-10
100038882	*Isg15*	ISG15 ubiquitin-like modifier	-2.622	9.79E-05
11816	*Apoe*	apolipoprotein E	-2.614	1.37E-03
81897	*Tlr9*	toll-like receptor 9	-2.605	4.93E-05
382118	*Zkscan7*	zinc finger with KRAB and SCAN domains 7	-2.596	2.04E-03
109270	*Prr5*	proline rich 5 (renal)	-2.590	3.08E-10
231207	*Cpeb2*	cytoplasmic polyadenylation element binding protein 2	-2.590	2.11E-04
73174	*Tbkbp1*	TBK1 binding protein 1	-2.585	2.05E-04
403202	*A430093F15Rik*	RIKEN cDNA A430093F15 gene	-2.584	3.32E-05
14744	*Gpr65*	G-protein coupled receptor 65	-2.583	5.04E-06
170829	*Tram2*	translocating chain-associating membrane protein 2	-2.581	3.12E-02
338367	*Myo1d*	myosin ID	-2.575	1.85E-12
12393	*Runx2*	runt related transcription factor 2	-2.573	3.35E-02
229499	*Fcrl1*	Fc receptor-like 1	-2.569	9.49E-05
16001	*Igf1r*	insulin-like growth factor I receptor	-2.565	2.75E-02
257632	*Nod2*	nucleotide-binding oligomerization domain containing 2	-2.564	2.23E-06
59043	*Wsb2*	WD repeat and SOCS box-containing 2	-2.562	4.05E-08
114774	*Pawr*	PRKC, apoptosis, WT1, regulator	-2.560	1.38E-04
71602	*Myo1e*	myosin IE	-2.552	1.55E-14
11906	*Zfhx3*	zinc finger homeobox 3	-2.551	8.56E-09
16153	*Il10*	interleukin 10	-2.544	5.24E-03
75985	*Rab30*	RAB30, member RAS oncogene family	-2.544	7.92E-04
235380	*Dmxl2*	Dmx-like 2	-2.538	3.89E-03
102634034	*LOC102634034*	NA	-2.536	1.71E-03
381522	*E230008N13Rik*	RIKEN cDNA E230008N13 gene	-2.534	7.05E-04
434261	*Krt8-ps*	keratin 8, pseudogene	-2.527	6.50E-03
68507	*Ppfia4*	protein tyrosine phosphatase, receptor type, f polypeptide (PTPRF), interacting prote	-2.525	1.00E-02
72318	*Cyth4*	cytohesin 4	-2.522	1.23E-09
56490	*Zbtb20*	zinc finger and BTB domain containing 20	-2.521	6.08E-12
13855	*Epn2*	epsin 2	-2.518	7.24E-08
108811	*Ccdc122*	coiled-coil domain containing 122	-2.515	4.59E-04
75914	*Exoc6b*	exocyst complex component 6B	-2.514	3.59E-11
15473	*Hrsp12*	heat-responsive protein 12	-2.512	2.53E-06
13641	*Efnb1*	ephrin B1	-2.511	4.75E-04
320225	*Catsperg1*	catsper channel auxiliary subunit gamma 1	-2.511	1.61E-02
22330	*Vcl*	vinculin	-2.506	6.82E-06
102636241	*LOC102636241*	NA	-2.506	2.85E-06
271221	*5031414D18Rik*	RIKEN cDNA 5031414D18 gene	-2.504	4.32E-06
231238	*Sel1l3*	sel-1 suppressor of lin-12-like 3 (C. elegans)	-2.504	5.01E-03
225845	*Pla2g16*	phospholipase A2, group XVI	-2.497	9.91E-08
67916	*Ppap2b*	phosphatidic acid phosphatase type 2B	-2.485	6.88E-07
216197	*Ckap4*	cytoskeleton-associated protein 4	-2.476	2.20E-04
212632	*Iffo2*	intermediate filament family orphan 2	-2.473	1.97E-02
72278	*Ccpg1*	cell cycle progression 1	-2.465	7.57E-04
22248	*Unc119*	unc-119 homolog (C. elegans)	-2.460	3.92E-09
68737	*Angel1*	angel homolog 1 (Drosophila)	-2.450	9.56E-07
18806	*Pld2*	phospholipase D2	-2.448	4.70E-06
18438	*P2rx4*	purinergic receptor P2X, ligand-gated ion channel 4	-2.446	2.80E-13
106759	*Ticam1*	toll-like receptor adaptor molecule 1	-2.446	5.35E-09
11811	*Apobec2*	apolipoprotein B mRNA editing enzyme, catalytic polypeptide 2	-2.445	7.97E-03
69202	*Ptms*	parathymosin	-2.443	1.53E-05
353310	*Zfp703*	zinc finger protein 703	-2.442	9.96E-13
100732	*Mapre3*	microtubule-associated protein, RP/EB family, member 3	-2.437	3.14E-06
68166	*Spire1*	spire homolog 1 (Drosophila)	-2.436	2.63E-04
108723	*Card11*	caspase recruitment domain family, member 11	-2.432	3.32E-06
215512	*Fam117a*	family with sequence similarity 117, member A	-2.427	3.64E-04
21858	*Timp2*	tissue inhibitor of metalloproteinase 2	-2.427	2.01E-08
208154	*Btla*	B and T lymphocyte associated	-2.419	1.73E-08
13405	*Dmd*	dystrophin, muscular dystrophy	-2.411	2.68E-02
55947	*Dclre1a*	DNA cross-link repair 1A, PSO2 homolog (S. cerevisiae)	-2.407	2.26E-09

626482	*Wsb2-ps*	WD repeat and SOCS box-containing 2, pseudogene	-2.404	4.35E-04
76737	*Creld2*	cysteine-rich with EGF-like domains 2	-2.400	2.17E-02
11975	*Atp6v0a1*	ATPase, H+ transporting, lysosomal V0 subunit A1	-2.396	3.61E-09
110168	*Gpr18*	G protein-coupled receptor 18	-2.395	7.20E-04
11676	*Aldoc*	aldolase C, fructose-bisphosphate	-2.394	9.62E-04
109361	*D730005E14Rik*	RIKEN cDNA D730005E14 gene	-2.386	9.25E-04
234353	*Psd3*	pleckstrin and Sec7 domain containing 3	-2.381	2.18E-05
16651	*Sspn*	sarcospan	-2.378	4.40E-12
69674	*Mif4gd*	MIF4G domain containing	-2.378	1.97E-11
66940	*Shisa5*	shisa homolog 5 (Xenopus laevis)	-2.377	4.43E-06
74018	*Als2*	amyotrophic lateral sclerosis 2 (juvenile)	-2.375	3.72E-10
17079	*Cd180*	CD180 antigen	-2.375	1.21E-08
16691	*Krt8*	keratin 8	-2.371	1.63E-02
17295	*Met*	met proto-oncogene	-2.370	2.86E-02
320007	*Sidt1*	SID1 transmembrane family, member 1	-2.366	3.87E-06
12051	*Bcl3*	B cell leukemia/lymphoma 3	-2.363	4.14E-04
22295	*Cdh23*	cadherin 23 (otocadherin)	-2.359	4.94E-04
20713	*Serpini1*	serine (or cysteine) peptidase inhibitor, clade I, member 1	-2.358	2.00E-09
70747	*Tspan2*	tetraspanin 2	-2.352	3.73E-02
14794	*Spsb2*	splA/ryanodine receptor domain and SOCS box containing 2	-2.346	6.26E-11
18830	*Pltp*	phospholipid transfer protein	-2.344	1.97E-02
16190	*Il4ra*	interleukin 4 receptor, alpha	-2.341	2.90E-06
12304	*Pdia4*	protein disulfide isomerase associated 4	-2.341	1.25E-06
12495	*Entpd1*	ectonucleoside triphosphate diphosphohydrolase 1	-2.329	2.04E-04
56508	*Rapgef4*	Rap guanine nucleotide exchange factor (GEF) 4	-2.329	1.25E-02
237256	*Zc3h12d*	zinc finger CCCH type containing 12D	-2.328	4.43E-09
18624	*Pepd*	peptidase D	-2.323	1.29E-08
11303	*Abca1*	ATP-binding cassette, sub-family A (ABC1), member 1	-2.321	1.33E-04
18018	*Nfatc1*	nuclear factor of activated T cells, cytoplasmic, calcineurin dependent 1	-2.321	9.75E-07
72000	*1600016N20Rik*	RIKEN cDNA 1600016N20 gene	-2.320	2.96E-04
20660	*Sorl1*	sortilin-related receptor, LDLR class A repeats-containing	-2.314	9.71E-03
12029	*Bcl6b*	B cell CLL/lymphoma 6, member B	-2.310	3.22E-05
67685	*Dyx1c1*	dyslexia susceptibility 1 candidate 1 homolog (human)	-2.305	1.78E-05
12802	*Cnr2*	cannabinoid receptor 2 (macrophage)	-2.297	5.23E-04
236451	*Phf11b*	PHD finger protein 11B	-2.294	8.07E-06
20130	*Rras*	Harvey rat sarcoma oncogene, subgroup R	-2.291	1.63E-03
102640171	*LOC102640171*	NA	-2.289	2.12E-04
194744	*Slc25a43*	solute carrier family 25, member 43	-2.288	1.11E-02
207215	*Fbxo40*	F-box protein 40	-2.287	1.34E-03
64383	*Sirt2*	sirtuin 2	-2.286	2.18E-06
11746	*Anxa4*	annexin A4	-2.283	1.29E-02
408254	*A630019I02Rik*	RIKEN cDNA A630019I02 gene	-2.277	1.01E-03
330483	*Ceacam16*	carcinoembryonic antigen-related cell adhesion molecule 16	-2.277	1.15E-04
54199	*Ccrl2*	chemokine (C-C motif) receptor-like 2	-2.276	3.58E-02
622976	*Gm6377*	predicted gene 6377	-2.276	5.03E-04
63872	*Zfp296*	zinc finger protein 296	-2.275	1.97E-13
24059	*Slco2a1*	solute carrier organic anion transporter family, member 2a1	-2.272	3.56E-02
74393	*Map10*	microtubule-associated protein 10	-2.269	7.11E-03
12290	*Cacna1e*	calcium channel, voltage-dependent, R type, alpha 1E subunit	-2.265	2.03E-07
18037	*Nfkbie*	nuclear factor of kappa light polypeptide gene enhancer in B cells inhibitor, epsilon	-2.261	6.03E-09
18792	*Plau*	plasminogen activator, urokinase	-2.260	7.11E-03
16414	*Itgb2*	integrin beta 2	-2.259	1.17E-10
16456	*F11r*	F11 receptor	-2.251	3.61E-09
238875	*Gapt*	Grb2-binding adaptor, transmembrane	-2.250	2.36E-02
67171	*Dram2*	DNA-damage regulated autophagy modulator 2	-2.249	3.87E-17
269180	*Inpp4a*	inositol polyphosphate-4-phosphatase, type I	-2.247	7.69E-07
16194	*Il6ra*	interleukin 6 receptor, alpha	-2.247	6.20E-06
16985	*Lsp1*	lymphocyte specific 1	-2.240	4.28E-06
56857	*Slc37a2*	solute carrier family 37 (glycerol-3-phosphate transporter), member 2	-2.235	2.69E-05
76088	*Dock8*	dedicator of cytokinesis 8	-2.230	2.66E-04
240168	*Rasgrp3*	RAS, guanyl releasing protein 3	-2.229	1.11E-03
69548	*2310015A10Rik*	RIKEN cDNA 2310015A10 gene	-2.228	6.66E-07
243910	*Nfkbid*	nuclear factor of kappa light polypeptide gene enhancer in B cells inhibitor, delta	-2.226	1.73E-05
20397	*Sgpl1*	sphingosine phosphate lyase 1	-2.225	1.00E-14
235493	*Fam214a*	family with sequence similarity 214, member A	-2.223	1.56E-05
21953	*Tnni2*	troponin I, skeletal, fast 2	-2.221	4.64E-03
242083	*Ppm1l*	protein phosphatase 1 (formerly 2C)-like	-2.220	7.12E-11
76062	*5830428M24Rik*	RIKEN cDNA 5830428M24 gene	-2.218	8.79E-07
218734	*3830406C13Rik*	RIKEN cDNA 3830406C13 gene	-2.217	4.91E-02
102634465	*LOC102634465*	NA	-2.215	4.52E-05
68867	*Rnf122*	ring finger protein 122	-2.212	1.89E-03
213233	*Tapbpl*	TAP binding protein-like	-2.212	1.21E-06
17087	*Ly96*	lymphocyte antigen 96	-2.206	9.16E-07
14422	*B4galnt2*	beta-1,4-N-acetyl-galactosaminyl transferase 2	-2.204	3.50E-04
74766	*Yipf2*	Yip1 domain family, member 2	-2.201	3.45E-10
233878	*Sez6l2*	seizure related 6 homolog like 2	-2.200	8.38E-05

72948	*Tppp*	tubulin polymerization promoting protein	-2.199	2.00E-03
270160	*Rab39*	RAB39, member RAS oncogene family	-2.199	8.38E-04
71520	*Grap*	GRB2-related adaptor protein	-2.198	1.18E-07
71972	*Dnmbp*	dynamin binding protein	-2.198	7.19E-06
170460	*Stard5*	StAR-related lipid transfer (START) domain containing 5	-2.196	1.32E-03
78309	*Cul9*	cullin 9	-2.195	6.65E-05
20444	*St3gal2*	ST3 beta-galactoside alpha-2,3-sialyltransferase 2	-2.191	8.91E-05
69908	*Rab3b*	RAB3B, member RAS oncogene family	-2.189	3.44E-02
269823	*Pon3*	paraoxonase 3	-2.188	6.36E-03
70873	*Cnbd2*	cyclic nucleotide binding domain containing 2	-2.185	2.39E-06
94088	*Trim6*	tripartite motif-containing 6	-2.182	1.71E-02
213391	*Rassf4*	Ras association (RalGDS/AF-6) domain family member 4	-2.180	1.11E-10
16412	*Itgb1*	integrin beta 1 (fibronectin receptor beta)	-2.175	5.06E-19
84004	*Mcam*	melanoma cell adhesion molecule	-2.173	1.28E-02
11444	*Chrnb2*	cholinergic receptor, nicotinic, beta polypeptide 2 (neuronal)	-2.171	1.98E-04
13733	*Emr1*	EGF-like module containing, mucin-like, hormone receptor-like sequence 1	-2.171	2.54E-02
73998	*Herc3*	hect domain and RLD 3	-2.167	2.55E-07
71310	*Tbc1d9*	TBC1 domain family, member 9	-2.166	2.61E-05
242248	*Bank1*	B cell scaffold protein with ankyrin repeats 1	-2.160	1.31E-04
102631889	*LOC102631889*	NA	-2.158	1.08E-03
74347	*Tldc1*	TBC/LysM associated domain containing 1	-2.151	3.22E-05
624083	*Gm15753*	NA	-2.150	2.17E-09
11992	*Auh*	AU RNA binding protein/enoyl-coenzyme A hydratase	-2.150	4.69E-14
78752	*Csgalnact2*	chondroitin sulfate N-acetylgalactosaminyltransferase 2	-2.148	9.38E-07
74769	*Pik3cb*	phosphatidylinositol 3-kinase, catalytic, beta polypeptide	-2.147	9.45E-06
14999	*H2-DMb1*	histocompatibility 2, class II, locus Mb1	-2.146	3.76E-03
207818	*Smagp*	small cell adhesion glycoprotein	-2.146	1.57E-03
71279	*Slc29a3*	solute carrier family 29 (nucleoside transporters), member 3	-2.140	1.48E-06
13660	*Ehd1*	EH-domain containing 1	-2.135	1.19E-07
237711	*Eml6*	echinoderm microtubule associated protein like 6	-2.132	7.00E-04
83408	*Gimap3*	GTPase, IMAP family member 3	-2.132	3.58E-05
71398	*5430427O19Rik*	RIKEN cDNA 5430427O19 gene	-2.131	3.26E-03
65221	*Slc15a3*	solute carrier family 15, member 3	-2.131	4.26E-09
67525	*Trim62*	tripartite motif-containing 62	-2.128	2.42E-03
72925	*March1*	membrane-associated ring finger (C3HC4) 1	-2.127	5.32E-07
243374	*Gimap8*	GTPase, IMAP family member 8	-2.125	1.67E-03
68487	*Tmem140*	transmembrane protein 140	-2.123	8.77E-03
110784	*Nr3c2*	nuclear receptor subfamily 3, group C, member 2	-2.123	4.55E-02
237360	*Adamts14*	a disintegrin-like and metallopeptidase (reprolysin type) with thrombospondin type	-2.118	1.64E-02
19881	*Rom1*	rod outer segment membrane protein 1	-2.117	2.77E-05
619313	*I730030J21Rik*	RIKEN cDNA I730030J21 gene	-2.116	2.20E-02
102632404	*LOC102632404*	NA	-2.113	8.87E-03
13034	*Ctse*	cathepsin E	-2.112	1.45E-03
85308	*Emc9*	ER membrane protein complex subunit 9	-2.111	2.32E-04
320435	*Rinl*	Ras and Rab interactor-like	-2.110	1.39E-03
53331	*Stx7*	syntaxin 7	-2.105	2.23E-13
14421	*B4galnt1*	beta-1,4-N-acetyl-galactosaminyl transferase 1	-2.102	1.08E-02
16578	*Kif9*	kinesin family member 9	-2.097	3.47E-04
20621	*Snn*	stannin	-2.095	2.04E-07
19260	*Ptpn22*	protein tyrosine phosphatase, non-receptor type 22 (lymphoid)	-2.094	1.14E-03
60533	*Cd274*	CD274 antigen	-2.094	3.34E-04
16909	*Lmo2*	LIM domain only 2	-2.093	5.09E-03
17972	*Ncf4*	neutrophil cytosolic factor 4	-2.088	1.72E-04
69106	*Stoml1*	stomatin-like 1	-2.080	1.17E-08
231668	*Vsig10*	V-set and immunoglobulin domain containing 10	-2.076	3.03E-05
56078	*Car5b*	carbonic anhydrase 5b, mitochondrial	-2.075	5.77E-03
215999	*Mcu*	mitochondrial calcium uniporter	-2.071	1.40E-11
218518	*Marveld2*	MARVEL (membrane-associating) domain containing 2	-2.067	4.39E-05
76901	*Jade2*	jade family PHD finger 2	-2.067	1.32E-09
18129	*Notch2*	notch 2	-2.066	8.80E-07
102637129	*LOC102637129*	NA	-2.066	5.47E-06
11555	*Adrb2*	adrenergic receptor, beta 2	-2.066	5.46E-07
12398	*Cbfa2t3*	core-binding factor, runt domain, alpha subunit 2, translocated to, 3 (human)	-2.066	2.85E-04
12752	*Cln3*	ceroid lipofuscinosis, neuronal 3, juvenile (Batten, Spielmeyer-Vogt disease)	-2.061	1.43E-06
78388	*Mvp*	major vault protein	-2.058	1.07E-03
66847	*Hint3*	histidine triad nucleotide binding protein 3	-2.053	1.57E-04
72828	*Ubash3b*	ubiquitin associated and SH3 domain containing, B	-2.052	1.72E-03
57278	*Bcam*	basal cell adhesion molecule	-2.051	6.67E-03
18516	*Pbx3*	pre B cell leukemia homeobox 3	-2.050	3.24E-02
22379	*Fmnl3*	formin-like 3	-2.042	9.43E-05
16432	*Itm2b*	integral membrane protein 2B	-2.042	1.62E-04
244209	*Cyp2r1*	cytochrome P450, family 2, subfamily r, polypeptide 1	-2.039	2.12E-02
81535	*Sgpp1*	sphingosine-1-phosphate phosphatase 1	-2.036	2.06E-06
73102	*Slc22a23*	solute carrier family 22, member 23	-2.036	7.06E-05
14245	*Lpin1*	lipin 1	-2.035	6.04E-05
20195	*S100a11*	S100 calcium binding protein A11 (calgizzarin)	-2.033	2.81E-04

225912	*Cyb561a3*	cytochrome b561 family, member A3	-2.033	4.99E-05
70564	*Fam213a*	family with sequence similarity 213, member A	-2.028	9.25E-04
67426	*Adck3*	aarF domain containing kinase 3	-2.023	1.25E-05
13032	*Ctsc*	cathepsin C	-2.022	4.59E-15
50877	*Neu3*	neuraminidase 3	-2.021	1.93E-02
170472	*Recql5*	RecQ protein-like 5	-2.020	3.06E-05
66824	*Pycard*	PYD and CARD domain containing	-2.020	2.04E-11
20947	*Swap70*	SWA-70 protein	-2.017	4.48E-15
72805	*Zfp839*	zinc finger protein 839	-2.014	3.12E-06
233046	*Rasgrp4*	RAS guanyl releasing protein 4	-2.013	2.31E-03
18826	*Lcp1*	lymphocyte cytosolic protein 1	-2.013	1.62E-07
21981	*Ppp1r13b*	protein phosphatase 1, regulatory (inhibitor) subunit 13B	-2.010	3.10E-03
50875	*Tmod3*	tropomodulin 3	-2.009	1.07E-08
76223	*Agbl3*	ATP/GTP binding protein-like 3	-2.007	1.47E-02
14256	*Flt3l*	FMS-like tyrosine kinase 3 ligand	-2.006	5.89E-08
230787	*Themis2*	thymocyte selection associated family member 2	-2.004	5.44E-06
18034	*Nfkb2*	nuclear factor of kappa light polypeptide gene enhancer in B cells 2, p49/p100	-2.001	7.61E-03
102639292	*LOC102639292*	NA	-2.000	3.79E-04
226861	*Hhat*	hedgehog acyltransferase	-1.996	5.29E-04
667214	*9930111J21Rik1*	RIKEN cDNA 9930111J21 gene 1	-1.992	1.33E-04
100503659	*Dos*	downstream of Stk11	-1.991	4.63E-03
321019	*Gpr183*	G protein-coupled receptor 183	-1.990	7.29E-03
240064	*Zfp799*	zinc finger protein 799	-1.988	1.37E-02
338372	*Map3k9*	mitogen-activated protein kinase kinase kinase 9	-1.988	7.96E-03
70101	*Cyp4f16*	cytochrome P450, family 4, subfamily f, polypeptide 16	-1.987	7.87E-04
15186	*Hdc*	histidine decarboxylase	-1.985	1.57E-03
240752	*Pik3c2b*	phosphoinositide-3-kinase, class 2, beta polypeptide	-1.983	6.36E-10
66251	*Arfgap3*	ADP-ribosylation factor GTPase activating protein 3	-1.983	2.63E-02
17952	*Naip6*	NLR family, apoptosis inhibitory protein 6	-1.983	1.02E-04
71755	*Dhdh*	dihydrodiol dehydrogenase (dimeric)	-1.982	3.42E-05
76438	*Rftn1*	raftlin lipid raft linker 1	-1.974	3.71E-07
16889	*Lipa*	lysosomal acid lipase A	-1.974	1.49E-07
215900	*Fam26f*	family with sequence similarity 26, member F	-1.971	2.22E-02
15468	*Prmt2*	protein arginine N-methyltransferase 2	-1.964	3.23E-02
241075	*Plekhm3*	pleckstrin homology domain containing, family M, member 3	-1.964	4.45E-06
547431	*Btnl2*	butyrophilin-like 2	-1.964	2.03E-03
223433	*Fam105a*	family with sequence similarity 105, member A	-1.957	2.25E-03
56380	*Arid3b*	AT rich interactive domain 3B (BRIGHT-like)	-1.952	9.86E-06
320119	*Rps6kc1*	ribosomal protein S6 kinase polypeptide 1	-1.946	8.52E-04
100616095	*0610007N19Rik*	RIKEN cDNA 0610007N19	-1.944	9.26E-03
76469	*Cmya5*	cardiomyopathy associated 5	-1.941	1.69E-02
17948	*Naip2*	NLR family, apoptosis inhibitory protein 2	-1.940	1.03E-03
12145	*Cxcr5*	chemokine (C-X-C motif) receptor 5	-1.935	1.74E-02
74637	*Shpk*	sedoheptulokinase	-1.934	3.81E-05
218294	*Cdc14b*	CDC14 cell division cycle 14B	-1.934	3.98E-03
66270	*Fam134b*	family with sequence similarity 134, member B	-1.932	9.25E-14
27410	*Abca3*	ATP-binding cassette, sub-family A (ABC1), member 3	-1.930	1.96E-10
18715	*Pim2*	proviral integration site 2	-1.930	3.28E-03
72691	*Calhm2*	calcium homeostasis modulator 2	-1.929	2.80E-05
228564	*Frmd5*	FERM domain containing 5	-1.928	7.97E-03
16145	*Igtp*	interferon gamma induced GTPase	-1.926	5.16E-05
69903	*Rasip1*	Ras interacting protein 1	-1.925	4.82E-02
102566	*Ano10*	anoctamin 10	-1.924	4.02E-05
16541	*Napsa*	napsin A aspartic peptidase	-1.922	3.98E-04
71275	*Noxred1*	NADP+ dependent oxidoreductase domain containing 1	-1.922	3.31E-03
69368	*Wdfy1*	WD repeat and FYVE domain containing 1	-1.918	9.12E-12
59125	*Nek7*	NIMA (never in mitosis gene a)-related expressed kinase 7	-1.917	3.48E-09
433752	*AA415398*	expressed sequence AA415398	-1.917	4.24E-04
73242	*Atat1*	alpha tubulin acetyltransferase 1	-1.911	2.32E-02
15040	*H2-T23*	histocompatibility 2, T region locus 23	-1.907	3.47E-08
100502698	*1700021K19Rik*	RIKEN cDNA 1700021K19 gene	-1.906	4.69E-03
244237	*Tnfrsf26*	tumor necrosis factor receptor superfamily, member 26	-1.906	2.72E-04
15018	*H2-Q7*	histocompatibility 2, Q region locus 7	-1.904	4.67E-02
270198	*Pfkfb4*	6-phosphofructo-2-kinase/fructose-2,6-biphosphatase 4	-1.899	1.62E-04
208884	*Zdhhc9*	zinc finger, DHHC domain containing 9	-1.897	6.03E-09
50780	*Rgs3*	regulator of G-protein signaling 3	-1.896	1.84E-02
19246	*Ptpn1*	protein tyrosine phosphatase, non-receptor type 1	-1.892	1.80E-08
233016	*Blvrb*	biliverdin reductase B (flavin reductase (NADPH))	-1.891	3.29E-03
17210	*Mcl1*	myeloid cell leukemia sequence 1	-1.888	1.13E-10
229445	*Ctso*	cathepsin O	-1.888	4.09E-10
66264	*Ccdc28b*	coiled coil domain containing 28B	-1.885	3.30E-06
622665	*Ccdc17*	coiled-coil domain containing 17	-1.885	9.53E-05
101861	*Ints4*	integrator complex subunit 4	-1.879	4.96E-10
78826	*P2ry10*	purinergic receptor P2Y, G-protein coupled 10	-1.878	1.03E-03
50917	*Galns*	galactosamine (N-acetyl)-6-sulfate sulfatase	-1.878	3.47E-10
381091	*H2-Eb2*	histocompatibility 2, class II antigen E beta2	-1.875	8.03E-03

73246	*Rassf6*	Ras association (RalGDS/AF-6) domain family member 6	-1.875	2.13E-02
101502	*Hsd3b7*	hydroxy-delta-5-steroid dehydrogenase, 3 beta- and steroid delta-isomerase 7	-1.873	2.79E-02
56715	*Rabgef1*	RAB guanine nucleotide exchange factor (GEF) 1	-1.872	6.36E-12
52065	*Mfhas1*	malignant fibrous histiocytoma amplified sequence 1	-1.871	1.59E-02
223646	*Naprt1*	nicotinate phosphoribosyltransferase domain containing 1	-1.870	1.71E-03
102693	*Phldb1*	pleckstrin homology-like domain, family B, member 1	-1.869	1.13E-02
244238	*Mrgpre*	MAS-related GPR, member E	-1.869	1.30E-05
102294	*Cyp4v3*	cytochrome P450, family 4, subfamily v, polypeptide 3	-1.864	2.13E-03
57444	*Isg20*	interferon-stimulated protein	-1.863	4.44E-02
56722	*Litaf*	LPS-induced TN factor	-1.861	3.82E-08
68279	*Mcoln2*	mucolipin 2	-1.861	1.02E-02
20439	*Siah2*	seven in absentia 2	-1.859	5.11E-07
71790	*Anxa9*	annexin A9	-1.859	2.71E-03
75767	*Rab11fip1*	RAB11 family interacting protein 1 (class I)	-1.858	4.03E-03
50935	*St6galnac6*	ST6 (alpha-N-acetyl-neuraminyl-2,3-beta-galactosyl-1,3)-N-acetylgalactosaminide alp	-1.857	2.99E-06
16409	*Itgam*	integrin alpha M	-1.856	6.16E-04
76866	*Morn1*	MORN repeat containing 1	-1.853	4.16E-02
54132	*Pdlim1*	PDZ and LIM domain 1 (elfin)	-1.852	4.02E-03
619371	*Stxbp3b*	syntaxin-binding protein 3B	-1.848	1.80E-05
243813	*Leng9*	leukocyte receptor cluster (LRC) member 9	-1.848	4.67E-04
13858	*Eps15*	epidermal growth factor receptor pathway substrate 15	-1.845	5.81E-12
227659	*Slc2a6*	solute carrier family 2 (facilitated glucose transporter), member 6	-1.845	4.88E-02
17691	*Sik1*	salt inducible kinase 1	-1.844	5.94E-03
545743	*Gm5864*	predicted gene 5864	-1.840	2.18E-03
244416	*Ppp1r3b*	protein phosphatase 1, regulatory (inhibitor) subunit 3B	-1.840	1.54E-02
19156	*Psap*	prosaposin	-1.839	5.71E-06
72123	*Ccdc71l*	coiled-coil domain containing 71 like	-1.838	9.41E-05
232430	*Crebl2*	cAMP responsive element binding protein-like 2	-1.828	5.68E-04
98952	*Fam102a*	family with sequence similarity 102, member A	-1.823	1.74E-04
14127	*Fcer1g*	Fc receptor, IgE, high affinity I, gamma polypeptide	-1.819	2.18E-03
17101	*Lyst*	lysosomal trafficking regulator	-1.816	5.18E-03
244202	*Nlrp10*	NLR family, pyrin domain containing 10	-1.815	2.10E-02
236727	*Slc9a7*	solute carrier family 9 (sodium/hydrogen exchanger), member 7	-1.814	1.26E-04
231050	*Galnt11*	UDP-N-acetyl-alpha-D-galactosamine:polypeptide N-acetylgalactosaminyltransferase	-1.812	2.15E-05
239273	*Abcc4*	ATP-binding cassette, sub-family C (CFTR/MRP), member 4	-1.809	1.00E-09
20491	*Sla*	src-like adaptor	-1.809	2.82E-05
76820	*Fam49a*	family with sequence similarity 49, member A	-1.808	1.24E-06
13057	*Cyba*	cytochrome b-245, alpha polypeptide	-1.806	1.78E-04
55984	*Camkk1*	calcium/calmodulin-dependent protein kinase kinase 1, alpha	-1.805	3.32E-03
98256	*Kmo*	kynurenine 3-monooxygenase (kynurenine 3-hydroxylase)	-1.805	4.77E-02
20430	*Cyfip1*	cytoplasmic FMR1 interacting protein 1	-1.805	1.37E-08
242362	*Manea*	mannosidase, endo-alpha	-1.804	1.05E-03
229541	*Dennd4b*	DENN/MADD domain containing 4B	-1.802	5.48E-05
19889	*Rp2h*	retinitis pigmentosa 2 homolog (human)	-1.801	1.48E-05
20737	*Spn*	sialophorin	-1.799	1.79E-05
235587	*Parp3*	poly (ADP-ribose) polymerase family, member 3	-1.798	7.92E-04
245007	*Zbtb38*	zinc finger and BTB domain containing 38	-1.798	6.00E-06
668857	*Gm9402*	NA	-1.791	2.11E-03
16599	*Klf3*	Kruppel-like factor 3 (basic)	-1.789	2.57E-02
29876	*Clic4*	chloride intracellular channel 4 (mitochondrial)	-1.787	1.38E-07
67009	*Ttc23*	tetratricopeptide repeat domain 23	-1.780	2.32E-03
19241	*Tmsb4x*	thymosin, beta 4, X chromosome	-1.780	3.25E-05
213452	*Dstyk*	dual serine/threonine and tyrosine protein kinase	-1.780	6.89E-03
13808	*Eno3*	enolase 3, beta muscle	-1.780	3.83E-03
243300	*Nyap1*	neuronal tyrosine-phosphorylated phosphoinositide 3-kinase adaptor 1	-1.779	5.46E-03
14269	*Fnbp1*	formin binding protein 1	-1.779	2.43E-08
66395	*Ahnak*	AHNAK nucleoprotein (desmoyokin)	-1.774	4.01E-03
66522	*Pgpep1*	pyroglutamyl-peptidase I	-1.771	6.38E-07
208908	*Ccdc62*	coiled-coil domain containing 62	-1.771	4.89E-02
19094	*Mapk11*	mitogen-activated protein kinase 11	-1.769	3.44E-03
20111	*Rps6ka1*	ribosomal protein S6 kinase polypeptide 1	-1.766	1.69E-04
21929	*Tnfaip3*	tumor necrosis factor, alpha-induced protein 3	-1.765	1.95E-08
110521	*Hivep1*	human immunodeficiency virus type I enhancer binding protein 1	-1.763	8.17E-09
60455	*Tmem8*	transmembrane protein 8 (five membrane-spanning domains)	-1.760	1.81E-06
15042	*H2-T24*	histocompatibility 2, T region locus 24	-1.759	3.09E-02
432466	*Gm5424*	predicted gene 5424	-1.759	2.98E-03
240754	*Lax1*	lymphocyte transmembrane adaptor 1	-1.748	1.78E-02
66253	*Aig1*	androgen-induced 1	-1.745	2.05E-03
239570	*Ttc38*	tetratricopeptide repeat domain 38	-1.744	4.26E-06
16186	*Il2rg*	interleukin 2 receptor, gamma chain	-1.741	9.85E-06
80911	*Acox3*	acyl-Coenzyme A oxidase 3, pristanoyl	-1.740	2.54E-10
15894	*Icam1*	intercellular adhesion molecule 1	-1.734	9.93E-04
27056	*Irf5*	interferon regulatory factor 5	-1.733	1.07E-03
237253	*Lrp11*	low density lipoprotein receptor-related protein 11	-1.730	4.65E-02
18611	*Pea15a*	phosphoprotein enriched in astrocytes 15A	-1.726	5.10E-05
19271	*Ptprj*	protein tyrosine phosphatase, receptor type, J	-1.725	1.48E-04

19141	*Lgmn*	legumain	-1.723	6.58E-04
103768	*Tubg2*	tubulin, gamma 2	-1.721	8.77E-03
327957	*Scimp*	SLP adaptor and CSK interacting membrane protein	-1.721	9.67E-03
223693	*Tmem184b*	transmembrane protein 184b	-1.719	3.33E-03
21353	*Tank*	TRAF family member-associated Nf-kappa B activator	-1.717	1.24E-05
216198	*Tcp11l2*	t-complex 11 (mouse) like 2	-1.717	5.00E-06
19698	*Relb*	avian reticuloendotheliosis viral (v-rel) oncogene related B	-1.715	1.41E-05
19354	*Rac2*	RAS-related C3 botulinum substrate 2	-1.709	1.79E-05
331487	*Uprt*	uracil phosphoribosyltransferase (FUR1) homolog (S. cerevisiae)	-1.709	5.65E-03
65972	*Ifi30*	interferon gamma inducible protein 30	-1.706	4.14E-02
209478	*Tbc1d12*	TBC1D12: TBC1 domain family, member 12	-1.703	1.40E-04
102639315	*LOC102639315*	NA	-1.702	4.33E-04
66302	*Rmdn1*	regulator of microtubule dynamics 1	-1.696	2.48E-05
100039940	*Gm12715*	predicted gene 12715	-1.693	1.42E-05
16597	*Klf12*	Kruppel-like factor 12	-1.692	1.75E-02
23966	*Tenm4*	teneurin transmembrane protein 4	-1.692	1.42E-03
16561	*Kif1b*	kinesin family member 1B	-1.691	5.71E-04
18987	*Pou2f2*	POU domain, class 2, transcription factor 2	-1.691	5.08E-04
18195	*Nsf*	N-ethylmaleimide sensitive fusion protein	-1.691	5.78E-08
77889	*Lbh*	limb-bud and heart	-1.690	2.41E-03
60322	*Chst7*	carbohydrate (N-acetylglucosamino) sulfotransferase 7	-1.688	1.23E-02
12983	*Csf2rb*	colony stimulating factor 2 receptor, beta, low-affinity (granulocyte-macrophage)	-1.686	2.73E-03
22209	*Ube2a*	ubiquitin-conjugating enzyme E2A	-1.685	3.19E-05
212943	*Fam46a*	family with sequence similarity 46, member A	-1.683	1.02E-02
14865	*Gstm4*	glutathione S-transferase, mu 4	-1.682	3.62E-04
19264	*Ptprc*	protein tyrosine phosphatase, receptor type, C	-1.680	8.86E-04
107321	*Lpxn*	leupaxin	-1.679	6.89E-04
215114	*Hip1*	huntingtin interacting protein 1	-1.678	2.33E-03
18583	*Pde7a*	phosphodiesterase 7A	-1.673	5.47E-07
15957	*Ifit1*	interferon-induced protein with tetratricopeptide repeats 1	-1.672	2.52E-02
64294	*Itm2c*	integral membrane protein 2C	-1.671	4.16E-04
56792	*Stap1*	signal transducing adaptor family member 1	-1.670	1.35E-03
14667	*Gm2a*	GM2 ganglioside activator protein	-1.668	1.08E-05
16504	*Kcnc3*	potassium voltage gated channel, Shaw-related subfamily, member 3	-1.667	3.34E-04
12334	*Capn2*	calpain 2	-1.666	1.04E-03
11416	*Slc33a1*	solute carrier family 33 (acetyl-CoA transporter), member 1	-1.664	3.17E-02
98752	*Fcrla*	Fc receptor-like A	-1.663	1.30E-02
67399	*Pdlim7*	PDZ and LIM domain 7	-1.662	2.02E-03
20788	*Srebf2*	sterol regulatory element binding factor 2	-1.661	2.34E-06
14705	*Bscl2*	Bernardinelli-Seip congenital lipodystrophy 2 homolog (human)	-1.660	7.71E-06
54721	*Tyk2*	tyrosine kinase 2	-1.658	4.59E-10
102032	*Smim19*	small integral membrane protein 19	-1.658	5.66E-06
17951	*Naip5*	NLR family, apoptosis inhibitory protein 5	-1.652	2.39E-03
66151	*Prr13*	proline rich 13	-1.649	1.13E-06
75870	*Tcam1*	testicular cell adhesion molecule 1	-1.648	3.58E-02
241062	*Pgap1*	post-GPI attachment to proteins 1	-1.647	2.99E-03
11593	*Aga*	aspartylglucosaminidase	-1.647	5.80E-03
213236	*Dnd1*	dead end homolog 1 (zebrafish)	-1.647	7.14E-04
19267	*Ptpre*	protein tyrosine phosphatase, receptor type, E	-1.646	2.85E-05
67731	*Fbxo32*	F-box protein 32	-1.643	1.69E-03
14385	*Slc37a4*	solute carrier family 37 (glucose-6-phosphate transporter), member 4	-1.642	1.92E-05
106672	*AI413582*	expressed sequence AI413582	-1.636	3.08E-04
212285	*Arap2*	ArfGAP with RhoGAP domain, ankyrin repeat and PH domain 2	-1.636	2.79E-03
74147	*Ehhadh*	enoyl-Coenzyme A, hydratase/3-hydroxyacyl Coenzyme A dehydrogenase	-1.636	1.01E-02
67732	*Iah1*	isoamyl acetate-hydrolyzing esterase 1 homolog (S. cerevisiae)	-1.628	8.10E-08
67759	*Plgrkt*	plasminogen receptor, C-terminal lysine transmembrane protein	-1.626	7.02E-05
76687	*Spcs3*	signal peptidase complex subunit 3 homolog (S. cerevisiae)	-1.625	6.36E-03
664850	*Gm7368*	predicted gene 7368	-1.625	3.19E-02
75747	*Sesn3*	sestrin 3	-1.620	1.68E-04
17096	*Lyn*	Yamaguchi sarcoma viral (v-yes-1) oncogene homolog	-1.619	3.78E-05
667410	*Gm8615*	predicted pseudogene 8615	-1.619	4.86E-03
22619	*Siae*	sialic acid acetylesterase	-1.619	2.67E-04
22401	*Zmat3*	zinc finger matrin type 3	-1.614	6.20E-04
231871	*Daglb*	diacylglycerol lipase, beta	-1.611	1.39E-05
268752	*Wdfy2*	WD repeat and FYVE domain containing 2	-1.610	3.58E-04
13244	*Degs1*	degenerative spermatocyte homolog 1 (Drosophila)	-1.609	1.13E-02
29813	*Zfp385a*	zinc finger protein 385A	-1.608	2.99E-04
101148	*B630005N14Rik*	RIKEN cDNA B630005N14 gene	-1.601	5.77E-04
232413	*Clec12a*	C-type lectin domain family 12, member a	-1.599	3.13E-03
226970	*Arhgef4*	Rho guanine nucleotide exchange factor (GEF) 4	-1.596	1.59E-02
68778	*Gucd1*	guanylyl cyclase domain containing 1	-1.595	7.32E-05
68043	*N6amt2*	N-6 adenine-specific DNA methyltransferase 2 (putative)	-1.594	9.43E-05
317757	*Gimap5*	GTPase, IMAP family member 5	-1.593	1.26E-03
211329	*Ncoa7*	nuclear receptor coactivator 7	-1.593	2.91E-04
54396	*Irgm2*	immunity-related GTPase family M member 2	-1.592	7.07E-03
620648	*Gm6169*	predicted gene 6169	-1.591	2.99E-05

13996	*Etohd2*	ethanol decreased 2	-1.590	1.38E-03
12481	*Cd2*	CD2 antigen	-1.589	1.03E-02
11669	*Aldh2*	aldehyde dehydrogenase 2, mitochondrial	-1.589	5.14E-07
12042	*Bcl10*	B cell leukemia/lymphoma 10	-1.587	1.30E-05
51798	*Ech1*	enoyl coenzyme A hydratase 1, peroxisomal	-1.585	1.53E-04
66885	*Acadsb*	acyl-Coenzyme A dehydrogenase, short/branched chain	-1.584	1.97E-04
14583	*Gfpt1*	glutamine fructose-6-phosphate transaminase 1	-1.583	1.43E-03
231931	*Gimap6*	GTPase, IMAP family member 6	-1.582	4.44E-05
54218	*B3galt4*	UDP-Gal:betaGlcNAc beta 1,3-galactosyltransferase, polypeptide 4	-1.581	4.36E-02
227612	*Tor4a*	torsin family 4, member A	-1.577	1.21E-04
56050	*Cyp39a1*	cytochrome P450, family 39, subfamily a, polypeptide 1	-1.576	3.39E-06
70497	*Arhgap17*	Rho GTPase activating protein 17	-1.576	3.30E-05
16728	*L1cam*	L1 cell adhesion molecule	-1.576	1.83E-02
15170	*Ptpn6*	protein tyrosine phosphatase, non-receptor type 6	-1.571	1.10E-04
12508	*Cd53*	CD53 antigen	-1.571	3.22E-05
74617	*Scpep1*	serine carboxypeptidase 1	-1.568	6.29E-03
230088	*Fam214b*	family with sequence similarity 214, member B	-1.564	7.14E-04
102636080	*LOC102636080*	NA	-1.564	4.95E-02
53357	*Pla2g6*	phospholipase A2, group VI	-1.564	6.20E-04
18029	*Nfic*	nuclear factor I/C	-1.564	2.49E-04
272382	*Spib*	Spi-B transcription factor (Spi-1/PU.1 related)	-1.564	1.01E-02
70152	*Mettl7a1*	methyltransferase like 7A1	-1.563	2.95E-04
20024	*Sub1*	SUB1 homolog (S. cerevisiae)	-1.563	1.08E-04
19296	*Pvt1*	plasmacytoma variant translocation 1	-1.563	8.63E-05
74513	*Neto2*	neuropilin (NRP) and tolloid (TLL)-like 2	-1.562	4.87E-02
244962	*Snx14*	sorting nexin 14	-1.562	2.92E-04
11513	*Adcy7*	adenylate cyclase 7	-1.561	1.75E-02
79554	*Gltpd1*	glycolipid transfer protein domain containing 1	-1.560	1.13E-03
100040826	*Gm2986*	NA	-1.558	8.54E-04
13423	*Dnase2a*	deoxyribonuclease II alpha	-1.558	1.44E-05
73139	*Cenpv*	centromere protein V	-1.556	4.05E-02
15275	*Hk1*	hexokinase 1	-1.550	8.04E-07
192976	*Fam211a*	family with sequence similarity 211, member A	-1.550	4.71E-03
67509	*Saysd1*	SAYSVFN motif domain containing 1	-1.548	9.82E-03
74182	*Gpcpd1*	glycerophosphocholine phosphodiesterase GDE1 homolog (S. cerevisiae)	-1.548	1.53E-05
56045	*Samhd1*	SAM domain and HD domain, 1	-1.545	2.41E-04
19645	*Rb1*	retinoblastoma 1	-1.544	9.22E-10
14201	*Fhl3*	four and a half LIM domains 3	-1.542	2.26E-02
58185	*Rsad2*	radical S-adenosyl methionine domain containing 2	-1.541	3.54E-02
12562	*Cdh5*	cadherin 5	-1.536	2.86E-03
100561	*Slc15a4*	solute carrier family 15, member 4	-1.535	3.95E-06
24017	*Rnf13*	ring finger protein 13	-1.535	6.46E-08
24056	*Sh3bp5*	SH3-domain binding protein 5 (BTK-associated)	-1.533	4.39E-04
70552	*Lrrc56*	leucine rich repeat containing 56	-1.532	9.67E-03
100042836	*Gm4057*	NA	-1.530	1.06E-02
102595	*Plekho2*	pleckstrin homology domain containing, family O member 2	-1.529	5.76E-06
18807	*Pld3*	phospholipase D family, member 3	-1.528	4.84E-03
26410	*Map3k8*	mitogen-activated protein kinase kinase kinase 8	-1.527	5.77E-04
107022	*Gramd3*	GRAM domain containing 3	-1.526	1.89E-03
12368	*Casp6*	caspase 6	-1.526	1.23E-02
71607	*Snx20*	sorting nexin 20	-1.526	1.89E-05
68203	*Diras2*	DIRAS family, GTP-binding RAS-like 2	-1.523	4.05E-02
75695	*Rilpl1*	Rab interacting lysosomal protein-like 1	-1.523	1.36E-02
22142	*Tuba1a*	tubulin, alpha 1A	-1.522	4.36E-02
211135	*D130040H23Rik*	RIKEN cDNA D130040H23 gene	-1.519	9.93E-03
52710	*Slc52a2*	solute carrier protein 52, member 2	-1.518	6.90E-06
243906	*Zfp14*	zinc finger protein 14	-1.518	5.79E-03
12183	*Bpgm*	2,3-bisphosphoglycerate mutase	-1.516	2.52E-02
215653	*Rassf2*	Ras association (RalGDS/AF-6) domain family member 2	-1.516	3.60E-03
27360	*Add3*	adducin 3 (gamma)	-1.515	4.88E-07
65113	*Ndfip1*	Nedd4 family interacting protein 1	-1.512	6.10E-07
57916	*Tnfrsf13b*	tumor necrosis factor receptor superfamily, member 13b	-1.511	3.25E-11
100504394	*Gm20203*	NA	-1.509	3.05E-02
268973	*Nlrc4*	NLR family, CARD domain containing 4	-1.505	9.60E-03
230073	*Ddx58*	DEAD (Asp-Glu-Ala-Asp) box polypeptide 58	-1.504	2.31E-09
110213	*Tmbim6*	transmembrane BAX inhibitor motif containing 6	-1.503	1.89E-07
630499	*H2-K2*	histocompatibility 2, K region locus 2	-1.500	1.40E-02
105000	*Dnal1*	dynein, axonemal, light chain 1	1.501	4.05E-02
224650	*Anks1*	ankyrin repeat and SAM domain containing 1	1.502	3.47E-08
21335	*Tacc3*	transforming, acidic coiled-coil containing protein 3	1.503	1.28E-04
71393	*Kctd6*	potassium channel tetramerisation domain containing 6	1.504	9.45E-04
231912	*Katnal1*	katanin p60 subunit A-like 1	1.506	4.46E-04
381318	*Nsl1*	NSL1, MIND kinetochore complex component, homolog (S. cerevisiae)	1.507	1.85E-06
67088	*Cand2*	cullin-associated and neddylation-dissociated 2 (putative)	1.509	7.36E-03
12581	*Cdkn2d*	cyclin-dependent kinase inhibitor 2D (p19, inhibits CDK4)	1.509	1.48E-06
73847	*Fam110a*	family with sequence similarity 110, member A	1.516	2.08E-03

27214	*Dbf4*	DBF4 homolog (S. cerevisiae)	1.519	1.82E-04
668063	*Gm8956*	NA	1.520	6.30E-03
30926	*Glrx3*	glutaredoxin 3	1.523	1.50E-04
214901	*Chtf18*	CTF18, chromosome transmission fidelity factor 18	1.524	4.12E-04
69716	*Trip13*	thyroid hormone receptor interactor 13	1.527	1.79E-04
237211	*Fancb*	Fanconi anemia, complementation group B	1.530	5.77E-03
72091	*Snhg7*	small nucleolar RNA host gene (non-protein coding) 7	1.530	9.22E-03
12009	*Azi1*	5-azacytidine induced gene 1	1.531	1.08E-03
54650	*Sfmbt1*	Scm-like with four mbt domains 1	1.531	1.11E-02
67849	*Cdca5*	cell division cycle associated 5	1.533	4.41E-04
22691	*Zscan2*	zinc finger and SCAN domain containing 2	1.534	1.53E-04
237877	*Atad5*	ATPase family, AAA domain containing 5	1.540	1.44E-03
72119	*Tpx2*	TPX2, microtubule-associated protein homolog (Xenopus laevis)	1.540	2.40E-03
18973	*Pole*	polymerase (DNA directed), epsilon	1.541	3.49E-05
78795	*Armc9*	armadillo repeat containing 9	1.542	4.59E-03
56207	*Uchl5*	ubiquitin carboxyl-terminal esterase L5	1.543	4.93E-09
67073	*Pi4k2b*	phosphatidylinositol 4-kinase type 2 beta	1.546	2.47E-02
20878	*Aurka*	aurora kinase A	1.546	1.54E-03
16563	*Kif2a*	kinesin family member 2A	1.552	6.36E-10
66497	*Cmss1*	cms small ribosomal subunit 1	1.555	2.48E-02
66977	*Nuf2*	NUF2, NDC80 kinetochore complex component, homolog (S. cerevisiae)	1.556	5.25E-03
20877	*Aurkb*	aurora kinase B	1.559	2.08E-04
18974	*Pole2*	polymerase (DNA directed), epsilon 2 (p59 subunit)	1.563	5.26E-07
21973	*Top2a*	topoisomerase (DNA) II alpha	1.564	5.64E-04
114663	*Impa2*	inositol (myo)-1(or 4)-monophosphatase 2	1.566	4.67E-03
233060	*Zfp382*	zinc finger protein 382	1.569	6.60E-04
13605	*Ect2*	ect2 oncogene	1.570	2.63E-03
70024	*Mcm10*	minichromosome maintenance deficient 10 (S. cerevisiae)	1.574	4.64E-04
69551	*2310022B05Rik*	RIKEN cDNA 2310022B05 gene	1.575	1.07E-04
13361	*Dhfr*	dihydrofolate reductase	1.578	1.15E-04
50720	*Sacs*	sacsin	1.582	1.15E-05
77022	*2700099C18Rik*	RIKEN cDNA 2700099C18 gene	1.584	7.08E-05
75623	*Tex30*	testis expressed 30	1.584	5.45E-05
72415	*Sgol1*	shugoshin-like 1 (S. pombe)	1.585	5.20E-03
64296	*Abhd8*	abhydrolase domain containing 8	1.587	1.93E-02
20443	*St3gal4*	ST3 beta-galactoside alpha-2,3-sialyltransferase 4	1.588	3.41E-04
22640	*Zfp1*	zinc finger protein 1	1.588	2.68E-03
21853	*Timeless*	timeless circadian clock 1	1.589	3.88E-05
18818	*Plk-ps1*	polo-like kinase, pseudogene 1	1.591	1.21E-02
56532	*Ripk3*	receptor-interacting serine-threonine kinase 3	1.592	4.05E-04
68612	*Ube2c*	ubiquitin-conjugating enzyme E2C	1.593	3.73E-03
381293	*Kif14*	kinesin family member 14	1.596	3.34E-04
12316	*Aspm*	asp (abnormal spindle)-like, microcephaly associated (Drosophila)	1.600	2.99E-04
12428	*Ccna2*	cyclin A2	1.600	5.08E-03
68521	*Fam189b*	family with sequence similarity 189, member B	1.603	4.65E-03
98682	*Mfsd6*	major facilitator superfamily domain containing 6	1.604	8.96E-03
16906	*Lmnb1*	lamin B1	1.605	8.69E-06
11640	*Akap1*	A kinase (PRKA) anchor protein 1	1.605	9.82E-03
434175	*Gm5593*	NA	1.607	4.08E-03
217216	*BC030867*	cDNA sequence BC030867	1.608	4.29E-03
71085	*Arhgap19*	Rho GTPase activating protein 19	1.609	1.35E-03
78733	*Troap*	trophinin associated protein	1.609	2.52E-03
11881	*Arsb*	arylsulfatase B	1.610	1.64E-05
68201	*Ccdc34*	coiled-coil domain containing 34	1.610	4.72E-05
71934	*Car13*	carbonic anhydrase 13	1.616	1.55E-02
17121	*Mxd3*	Max dimerization protein 3	1.617	1.58E-05
100043272	*5430417L22Rik*	RIKEN cDNA 5430417L22 gene	1.620	8.49E-03
19362	*Rad51ap1*	RAD51 associated protein 1	1.621	6.71E-05
328833	*Treml2*	triggering receptor expressed on myeloid cells-like 2	1.622	5.79E-03
214552	*Cep164*	centrosomal protein 164	1.623	2.54E-03
272551	*Gins2*	GINS complex subunit 2 (Psf2 homolog)	1.624	4.60E-05
12704	*Cit*	citron	1.625	1.02E-08
56434	*Tspan3*	tetraspanin 3	1.625	2.98E-02
434234	*2610020H08Rik*	RIKEN cDNA 2610020H08 gene	1.628	1.79E-05
217882	*Cep170b*	centrosomal protein 170B	1.629	2.04E-03
219072	*Haus4*	HAUS augmin-like complex, subunit 4	1.630	1.90E-08
319953	*Ttll1*	tubulin tyrosine ligase-like 1	1.631	4.30E-05
68549	*Sgol2*	shugoshin-like 2 (S. pombe)	1.633	2.38E-03
433604	*Gm5540*	predicted pseudogene 5540	1.634	1.95E-03
68133	*Gcsh*	glycine cleavage system protein H (aminomethyl carrier)	1.639	5.15E-08
277973	*Slc9a5*	solute carrier family 9 (sodium/hydrogen exchanger), member 5	1.639	1.28E-02
76872	*Ccdc116*	coiled-coil domain containing 116	1.640	1.06E-04
21752	*Tert*	telomerase reverse transcriptase	1.641	1.30E-02
66442	*Spc25*	SPC25, NDC80 kinetochore complex component, homolog (S. cerevisiae)	1.643	6.01E-05
216459	*Myl6b*	myosin, light polypeptide 6B	1.644	2.91E-02
269582	*Clspn*	claspin	1.644	5.41E-04

20971	*Sdc4*	syndecan 4	1.646	6.65E-07
72787	*Ndc1*	NDC1 transmembrane nucleoporin	1.648	8.25E-05
74470	*Cep72*	centrosomal protein 72	1.648	1.45E-06
110074	*Dut*	deoxyuridine triphosphatase	1.657	1.84E-08
665939	*Gm7856*	predicted gene 7856	1.662	2.63E-02
74682	*Wdr35*	WD repeat domain 35	1.662	8.60E-04
67824	*Nmral1*	NmrA-like family domain containing 1	1.663	2.53E-03
72061	*2010111I01Rik*	RIKEN cDNA 2010111I01 gene	1.664	7.15E-08
54366	*Ctnnal1*	catenin (cadherin associated protein), alpha-like 1	1.665	2.49E-03
14081	*Acsl1*	acyl-CoA synthetase long-chain family member 1	1.668	9.51E-06
140482	*Zfp358*	zinc finger protein 358	1.669	8.55E-03
66336	*Cenpp*	centromere protein P	1.671	1.82E-03
68087	*Dcakd*	dephospho-CoA kinase domain containing	1.672	2.00E-06
81896	*Ift122*	intraflagellar transport 122	1.677	2.11E-04
217340	*Rnf157*	ring finger protein 157	1.680	1.17E-02
404710	*Iqgap3*	IQ motif containing GTPase activating protein 3	1.681	4.93E-03
236266	*Alms1*	Alstrom syndrome 1	1.688	1.30E-04
67534	*Ttll4*	tubulin tyrosine ligase-like family, member 4	1.688	1.16E-08
241303	*Fam78a*	family with sequence similarity 78, member A	1.690	2.30E-02
14270	*Srgap2*	SLIT-ROBO Rho GTPase activating protein 2	1.691	3.97E-12
56218	*Patz1*	POZ (BTB) and AT hook containing zinc finger 1	1.691	8.33E-07
107995	*Cdc20*	cell division cycle 20	1.694	1.27E-02
76464	*Casc5*	cancer susceptibility candidate 5	1.694	2.19E-05
216363	*Rab3ip*	RAB3A interacting protein	1.697	6.44E-05
54392	*Ncapg*	non-SMC condensin I complex, subunit G	1.697	6.68E-04
21778	*Tex9*	testis expressed gene 9	1.697	2.50E-05
216505	*Pik3ip1*	phosphoinositide-3-kinase interacting protein 1	1.699	1.83E-03
239096	*Cdh24*	cadherin-like 24	1.701	7.06E-03
20514	*Slc1a5*	solute carrier family 1 (neutral amino acid transporter), member 5	1.701	2.93E-11
67333	*Stk35*	serine/threonine kinase 35	1.701	1.29E-06
68026	*2810417H13Rik*	RIKEN cDNA 2810417H13 gene	1.702	2.36E-03
16571	*Kif4*	kinesin family member 4	1.704	8.21E-04
380684	*Nefh*	neurofilament, heavy polypeptide	1.704	2.15E-02
74201	*Cep97*	centrosomal protein 97	1.707	1.27E-06
12236	*Bub1b*	budding uninhibited by benzimidazoles 1 homolog, beta (S. cerevisiae)	1.709	2.58E-04
246728	*Oas2*	2'-5' oligoadenylate synthetase 2	1.710	1.29E-02
67052	*Ndc80*	NDC80 homolog, kinetochore complex component (S. cerevisiae)	1.711	1.83E-06
52637	*Cisd1*	CDGSH iron sulfur domain 1	1.714	3.79E-08
13537	*Dusp2*	dual specificity phosphatase 2	1.714	1.43E-02
76843	*Dtl*	denticleless homolog (Drosophila)	1.721	2.79E-08
68763	*1110038B12Rik*	RIKEN cDNA 1110038B12 gene	1.725	7.60E-06
224273	*Crybg3*	beta-gamma crystallin domain containing 3	1.726	5.01E-03
381352	*Mamdc4*	MAM domain containing 4	1.729	1.68E-02
78376	*Sapcd1*	suppressor APC domain containing 1	1.729	1.17E-03
215387	*Ncaph*	non-SMC condensin I complex, subunit H	1.731	2.16E-04
100040018	*Gm9835*	NA	1.733	4.88E-05
14581	*Gfi1*	growth factor independent 1	1.733	2.64E-06
72655	*Snhg5*	small nucleolar RNA host gene 5	1.734	1.72E-07
233071	*Arhgap33*	Rho GTPase activating protein 33	1.741	5.94E-07
17858	*Mx2*	myxovirus (influenza virus) resistance 2	1.746	2.96E-02
20419	*Shcbp1*	Shc SH2-domain binding protein 1	1.749	7.12E-04
623474	*Rad54b*	RAD54 homolog B (S. cerevisiae)	1.756	5.60E-07
52276	*Cdca8*	cell division cycle associated 8	1.758	3.88E-05
27060	*Tcirg1*	T cell, immune regulator 1, ATPase, H+ transporting, lysosomal V0 protein A3	1.759	2.69E-13
94118	*Kifc5c-ps*	kinesin family member C5C, pseudogene	1.768	2.01E-02
233876	*Hirip3*	HIRA interacting protein 3	1.769	3.74E-09
171486	*Cd99l2*	CD99 antigen-like 2	1.773	7.57E-03
26558	*Homer3*	homer homolog 3 (Drosophila)	1.773	2.86E-07
18817	*Plk1*	polo-like kinase 1	1.777	5.18E-03
12449	*Ccnf*	cyclin F	1.779	8.90E-06
27416	*Abcc5*	ATP-binding cassette, sub-family C (CFTR/MRP), member 5	1.780	1.74E-02
67121	*Mastl*	microtubule associated serine/threonine kinase-like	1.781	6.37E-03
381067	*Zfp229*	zinc finger protein 229	1.784	3.56E-03
58887	*Repin1*	replication initiator 1	1.784	9.79E-05
56717	*Mtor*	mechanistic target of rapamycin (serine/threonine kinase)	1.785	8.33E-03
219114	*Ska3*	spindle and kinetochore associated complex subunit 3	1.785	2.12E-03
29871	*Scmh1*	sex comb on midleg homolog 1	1.786	7.32E-05
16579	*Kifap3*	kinesin-associated protein 3	1.795	6.25E-03
56017	*Slc2a8*	solute carrier family 2, (facilitated glucose transporter), member 8	1.796	1.98E-03
79456	*Recql4*	RecQ protein-like 4	1.797	1.80E-04
65964	*Zak*	sterile alpha motif and leucine zipper containing kinase AZK	1.798	3.70E-03
623331	*D16Ertd727e*	DNA segment, Chr 16, ERATO Doi 727, expressed	1.805	3.64E-08
66311	*Cenpw*	centromere protein W	1.805	3.34E-04
270906	*Prr11*	proline rich 11	1.806	6.20E-04
15331	*Hmgn2*	high mobility group nucleosomal binding domain 2	1.807	1.19E-05
73804	*Kif2c*	kinesin family member 2C	1.809	1.83E-03

218977	*Dlgap5*	discs, large (Drosophila) homolog-associated protein 5	1.810	4.12E-07
20778	*Scarb1*	scavenger receptor class B, member 1	1.815	3.60E-07
68948	*Fam216a*	family with sequence similarity 216, member A	1.816	2.02E-04
29870	*Gtse1*	G two S phase expressed protein 1	1.818	1.34E-03
235406	*Snx33*	sorting nexin 33	1.820	2.71E-09
51944	*Knstrn*	kinetochore-localized astrin/SPAG5 binding	1.821	2.78E-05
625958	*Gm12611*	predicted gene 12611	1.823	2.43E-02
229841	*Cenpe*	centromere protein E	1.824	1.74E-04
77011	*Ticrr*	TOPBP1-interacting checkpoint and replication regulator	1.825	1.64E-04
98432	*Phlpp1*	PH domain and leucine rich repeat protein phosphatase 1	1.829	1.68E-08
320799	*Zhx3*	zinc fingers and homeoboxes 3	1.832	3.66E-02
268465	*Eme1*	essential meiotic endonuclease 1 homolog 1 (S. pombe)	1.835	6.12E-07
16780	*Lamb3*	laminin, beta 3	1.836	2.32E-04
51788	*H2afz*	H2A histone family, member Z	1.837	3.52E-03
218138	*Gmds*	GDP-mannose 4, 6-dehydratase	1.838	2.99E-04
329421	*Myo3b*	myosin IIIB	1.840	3.63E-03
52033	*Pbk*	PDZ binding kinase	1.845	1.41E-03
26909	*Exo1*	exonuclease 1	1.851	6.21E-08
102640298	*LOC102640298*	NA	1.852	7.40E-04
100503380	*Snhg4*	small nucleolar RNA host gene 4 (non-protein coding)	1.856	1.58E-04
67141	*Fbxo5*	F-box protein 5	1.859	2.95E-06
70081	*2210404O09Rik*	RIKEN cDNA 2210404O09 gene	1.859	1.70E-02
381605	*Tbc1d2*	TBC1 domain family, member 2	1.863	2.49E-02
56459	*Sae1*	SUMO1 activating enzyme subunit 1	1.869	4.24E-18
12235	*Bub1*	budding uninhibited by benzimidazoles 1 homolog (S. cerevisiae)	1.881	1.72E-04
224171	*C330027C09Rik*	RIKEN cDNA C330027C09 gene	1.882	7.27E-04
218639	*Arl15*	ADP-ribosylation factor-like 15	1.885	3.26E-03
80986	*Ckap2*	cytoskeleton associated protein 2	1.887	3.51E-04
217653	*Mis18bp1*	MIS18 binding protein 1	1.891	9.32E-06
105722	*Ano6*	anoctamin 6	1.892	9.48E-05
19679	*Pitpnm2*	phosphatidylinositol transfer protein, membrane-associated 2	1.901	1.34E-03
107239	*Carns1*	carnosine synthase 1	1.902	3.12E-11
109242	*Kif24*	kinesin family member 24	1.905	5.97E-06
382864	*Colq*	collagen-like tail subunit (single strand of homotrimer) of asymmetric acetylcholines	1.908	1.10E-02
68235	*Mturn*	maturin, neural progenitor differentiation regulator homolog (Xenopus)	1.909	1.92E-04
13591	*Ebf1*	early B cell factor 1	1.911	1.24E-10
17864	*Mybl1*	myeloblastosis oncogene-like 1	1.919	1.08E-02
14676	*Gna15*	guanine nucleotide binding protein, alpha 15	1.922	4.82E-02
18140	*Uhrf1*	ubiquitin-like, containing PHD and RING finger domains, 1	1.922	1.03E-11
56615	*Mgst1*	microsomal glutathione S-transferase 1	1.924	8.24E-03
269224	*Pask*	PAS domain containing serine/threonine kinase	1.925	5.17E-10
20515	*Slc20a1*	solute carrier family 20, member 1	1.925	7.43E-08
14056	*Ezh2*	enhancer of zeste homolog 2 (Drosophila)	1.928	2.06E-04
19377	*Rai1*	retinoic acid induced 1	1.929	1.29E-10
69051	*Pycr2*	pyrroline-5-carboxylate reductase family, member 2	1.929	1.27E-04
66126	*Elof1*	elongation factor 1 homolog (ELF1, S. cerevisiae)	1.935	2.61E-05
71729	*Rgs12*	regulator of G-protein signaling 12	1.935	1.67E-03
209737	*Kif15*	kinesin family member 15	1.936	1.25E-05
629292	*Gm6960*	predicted pseudogene 6960	1.946	3.51E-05
66892	*Eif4e3*	eukaryotic translation initiation factor 4E member 3	1.949	2.76E-02
110033	*Kif22*	kinesin family member 22	1.952	3.12E-05
59033	*Slc4a8*	solute carrier family 4 (anion exchanger), member 8	1.963	7.61E-05
77744	*Bora*	bora, aurora kinase A activator	1.965	2.55E-09
16319	*Incenp*	inner centromere protein	1.965	8.34E-05
13340	*Slc29a2*	solute carrier family 29 (nucleoside transporters), member 2	1.965	5.38E-04
58521	*Eid1*	EP300 interacting inhibitor of differentiation 1	1.966	1.32E-02
66929	*Asf1b*	ASF1 anti-silencing function 1 homolog B (S. cerevisiae)	1.967	5.89E-08
192188	*Stab2*	stabilin 2	1.971	3.14E-03
16907	*Lmnb2*	lamin B2	1.982	1.52E-08
63986	*Gmfg*	glia maturation factor, gamma	1.984	1.21E-10
70458	*2610318N02Rik*	RIKEN cDNA 2610318N02 gene	1.985	3.44E-06
56448	*Cyp2d22*	cytochrome P450, family 2, subfamily d, polypeptide 22	1.985	7.19E-03
330814	*Lphn1*	latrophilin 1	1.987	3.96E-04
50887	*Hmgn5*	high-mobility group nucleosome binding domain 5	1.989	4.19E-04
73124	*Golim4*	golgi integral membrane protein 4	1.990	4.34E-03
80720	*Pbx4*	pre B cell leukemia homeobox 4	1.991	2.25E-03
12534	*Cdk1*	cyclin-dependent kinase 1	1.993	4.73E-04
58207	*Slc43a3*	solute carrier family 43, member 3	1.995	2.26E-06
107272	*Psat1*	phosphoserine aminotransferase 1	1.997	2.02E-03
11480	*Acvr2a*	activin receptor IIA	2.000	2.76E-03
11933	*Atp1b3*	ATPase, Na+/K+ transporting, beta 3 polypeptide	2.010	2.94E-12
71435	*Arhgap21*	Rho GTPase activating protein 21	2.012	1.69E-02
30928	*Zbtb18*	zinc finger and BTB domain containing 18	2.013	2.31E-09
223752	*Gramd4*	GRAM domain containing 4	2.013	1.13E-02
57913	*Lrdd*	leucine-rich and death domain containing	2.014	1.18E-06
71878	*Fam83d*	family with sequence similarity 83, member D	2.016	1.31E-03

102635638	*LOC102635638*	NA	2.017	1.21E-08
17245	*Mdm1*	transformed mouse 3T3 cell double minute 1	2.019	7.19E-06
69953	*2810025M15Rik*	RIKEN cDNA 2810025M15 gene	2.031	1.80E-03
102640974	*LOC102640974*	NA	2.033	9.75E-04
235048	*Zfp599*	zinc finger protein 599	2.035	1.32E-03
18600	*Padi2*	peptidyl arginine deiminase, type II	2.036	3.14E-03
70083	*Metrn*	meteorin, glial cell differentiation regulator	2.039	5.13E-05
66531	*Cmc2*	COX assembly mitochondrial protein 2	2.040	4.53E-04
12448	*Ccne2*	cyclin E2	2.041	9.06E-05
13178	*Dck*	deoxycytidine kinase	2.047	1.98E-12
328245	*E030007A22Rik*	NA	2.051	4.72E-02
66953	*Cdca7*	cell division cycle associated 7	2.052	1.16E-17
235534	*Acpl2*	acid phosphatase-like 2	2.054	3.56E-02
15289	*Hmgb1*	high mobility group box 1	2.058	7.65E-06
66468	*Ska1*	spindle and kinetochore associated complex subunit 1	2.058	3.34E-04
16580	*Kifc5b*	kinesin family member C5B	2.059	2.42E-04
13619	*Phc1*	polyhomeotic-like 1 (Drosophila)	2.063	4.19E-09
75939	*4930579G24Rik*	RIKEN cDNA 4930579G24 gene	2.063	4.80E-05
18950	*Pnp*	purine-nucleoside phosphorylase	2.064	1.06E-17
11799	*Birc5*	baculoviral IAP repeat-containing 5	2.065	1.43E-03
12442	*Ccnb2*	cyclin B2	2.070	1.70E-05
100039888	*Gm11223*	predicted gene 11223	2.074	6.53E-06
66098	*Chchd6*	coiled-coil-helix-coiled-coil-helix domain containing 6	2.075	1.55E-04
97165	*Hmgb2*	high mobility group box 2	2.076	8.65E-05
229694	*AI504432*	expressed sequence AI504432	2.085	3.17E-07
17427	*Mns1*	meiosis-specific nuclear structural protein 1	2.094	8.98E-07
268417	*Zkscan17*	zinc finger with KRAB and SCAN domains 17	2.096	6.37E-07
100503415	*Gm19680*	predicted gene, 19680	2.099	8.20E-05
60406	*Sap30*	sin3 associated polypeptide	2.107	1.23E-06
228421	*Kif18a*	kinesin family member 18A	2.107	5.85E-05
234396	*Ankle1*	ankyrin repeat and LEM domain containing 1	2.110	1.64E-04
217364	*Engase*	endo-beta-N-acetylglucosaminidase	2.115	6.94E-07
71804	*Mtfr2*	mitochondrial fission regulator 2	2.119	4.49E-05
14235	*Foxm1*	forkhead box M1	2.123	8.29E-06
217935	*Wdr60*	WD repeat domain 60	2.124	4.12E-05
100502766	*Kifc1*	kinesin family member C1	2.126	2.10E-03
76123	*Gpsm2*	G-protein signalling modulator 2 (AGS3-like, C. elegans)	2.127	5.24E-03
71820	*Wdr34*	WD repeat domain 34	2.127	8.07E-06
232533	*Stk38l*	serine/threonine kinase 38 like	2.131	9.65E-07
12977	*Csf1*	colony stimulating factor 1 (macrophage)	2.136	9.96E-03
16491	*Kcna3*	potassium voltage-gated channel, shaker-related subfamily, member 3	2.144	3.51E-06
78267	*Klhdc8b*	kelch domain containing 8B	2.148	3.17E-04
101565	*Ccp110*	centriolar coiled coil protein 110	2.155	2.40E-09
319996	*Casc4*	cancer susceptibility candidate 4	2.158	3.54E-06
54390	*Sit1*	suppression inducing transmembrane adaptor 1	2.158	5.57E-03
73254	*Ccdc18*	coiled-coil domain containing 18	2.160	4.09E-06
14645	*Glul*	glutamate-ammonia ligase (glutamine synthetase)	2.160	7.81E-17
71988	*Esco2*	establishment of cohesion 1 homolog 2 (S. cerevisiae)	2.166	4.69E-05
330409	*Cecr2*	cat eye syndrome chromosome region, candidate 2	2.168	4.69E-02
50492	*Thop1*	thimet oligopeptidase 1	2.168	1.88E-08
71675	*0610010F05Rik*	RIKEN cDNA 0610010F05 gene	2.181	1.02E-06
102637225	*LOC102637225*	NA	2.185	1.05E-04
233199	*Mybpc2*	myosin binding protein C, fast-type	2.186	8.59E-07
22152	*Tubb3*	tubulin, beta 3 class III	2.188	2.63E-03
26936	*Mprip*	myosin phosphatase Rho interacting protein	2.192	5.76E-24
20460	*Stil*	Scl/Tal1 interrupting locus	2.192	9.42E-05
20497	*Slc12a3*	solute carrier family 12, member 3	2.201	1.22E-05
268697	*Ccnb1*	cyclin B1	2.204	1.50E-04
18739	*Pitpnm1*	phosphatidylinositol transfer protein, membrane-associated 1	2.209	7.36E-13
76630	*Stambpl1*	STAM binding protein like 1	2.211	4.63E-14
17907	*Mylpf*	myosin light chain, phosphorylatable, fast skeletal muscle	2.231	2.19E-05
73680	*Zbtb8a*	zinc finger and BTB domain containing 8a	2.231	4.14E-12
66197	*Cks2*	CDC28 protein kinase regulatory subunit 2	2.232	6.75E-05
108961	*E2f8*	E2F transcription factor 8	2.239	1.78E-04
27401	*Skp2*	S-phase kinase-associated protein 2 (p45)	2.240	8.41E-08
259300	*Ehd2*	EH-domain containing 2	2.250	8.89E-08
17865	*Mybl2*	myeloblastosis oncogene-like 2	2.254	4.12E-07
54141	*Spag5*	sperm associated antigen 5	2.256	2.56E-07
18551	*Pcsk4*	proprotein convertase subtilisin/kexin type 4	2.256	1.69E-03
320706	*Soga1*	RIKEN cDNA 9830001H06 gene	2.261	7.15E-03
67603	*Dusp6*	dual specificity phosphatase 6	2.270	6.89E-05
81840	*Sorcs2*	sortilin-related VPS10 domain containing receptor 2	2.281	1.56E-02
12532	*Cdc25c*	cell division cycle 25C	2.289	2.44E-03
68281	*4930430F08Rik*	RIKEN cDNA 4930430F08 gene	2.311	4.35E-03
12571	*Cdk6*	cyclin-dependent kinase 6	2.311	5.39E-05
99167	*Ssx2ip*	synovial sarcoma, X breakpoint 2 interacting protein	2.313	9.80E-05

64291	*Osbpl1a*	oxysterol binding protein-like 1A	2.321	3.35E-10
68743	*Anln*	anillin, actin binding protein	2.322	1.20E-05
70997	*Spef1*	sperm flagellar 1	2.323	3.94E-07
17863	*Myb*	myeloblastosis oncogene	2.330	4.26E-08
207592	*Tbc1d16*	TBC1 domain family, member 16	2.332	1.06E-02
70218	*Kif18b*	kinesin family member 18B	2.334	2.77E-04
434189	*Gm5596*	predicted gene 5596	2.336	2.15E-04
52028	*Bbs1*	Bardet-Biedl syndrome 1 (human)	2.338	8.89E-05
16601	*Klf9*	Kruppel-like factor 9	2.341	9.46E-04
67249	*Tbc1d19*	TBC1 domain family, member 19	2.352	2.76E-02
72569	*Bbs5*	Bardet-Biedl syndrome 5 (human)	2.352	1.16E-02
547127	*Tmem181b-ps*	transmembrane protein 181B, pseudogene	2.360	1.56E-04
12695	*Inadl*	InaD-like (Drosophila)	2.365	1.23E-02
209380	*Gm4759*	predicted gene 4759	2.370	1.58E-04
12048	*Bcl2l1*	BCL2-like 1	2.373	1.57E-03
224023	*Klhl22*	kelch-like 22	2.378	1.79E-02
381101	*Dnph1*	2'-deoxynucleoside 5'-phosphate N-hydrolase 1	2.396	1.54E-02
66659	*Acp6*	acid phosphatase 6, lysophosphatidic	2.399	4.09E-10
12850	*Coq7*	demethyl-Q 7	2.409	6.19E-10
71846	*Syce2*	synaptonemal complex central element protein 2	2.412	1.66E-06
68099	*Fam92a*	family with sequence similarity 92, member A	2.429	1.78E-02
232969	*Zfp428*	zinc finger protein 428	2.431	2.25E-07
17687	*Msh5*	mutS homolog 5 (E. coli)	2.437	2.66E-10
80876	*Ifitm2*	interferon induced transmembrane protein 2	2.438	2.73E-08
70974	*Pgm2l1*	phosphoglucomutase 2-like 1	2.440	2.90E-08
232232	*Hdac11*	histone deacetylase 11	2.454	9.56E-07
22042	*Tfrc*	transferrin receptor	2.458	3.73E-05
107993	*Bfsp2*	beaded filament structural protein 2, phakinin	2.466	2.55E-04
68691	*Kansl1l*	KAT8 regulatory NSL complex subunit 1-like	2.476	9.76E-11
69928	*Apitd1*	apoptosis-inducing, TAF9-like domain 1	2.478	8.17E-09
242557	*Atg4c*	autophagy related 4C, cysteine peptidase	2.480	1.84E-02
108797	*Mex3b*	mex3 homolog B (C. elegans)	2.484	3.41E-04
108000	*Cenpf*	centromere protein F	2.490	1.49E-06
16568	*Kif3a*	kinesin family member 3A	2.496	1.19E-11
218581	*Depdc1b*	DEP domain containing 1B	2.503	9.97E-06
16859	*Lgals9*	lectin, galactose binding, soluble 9	2.506	1.60E-22
67839	*Gpsm1*	G-protein signalling modulator 1 (AGS3-like, C. elegans)	2.509	5.99E-05
110279	*Bcr*	breakpoint cluster region	2.510	4.91E-03
75687	*Fam65a*	family with sequence similarity 65, member A	2.527	1.20E-13
11865	*Arntl*	aryl hydrocarbon receptor nuclear translocator-like	2.531	2.52E-08
19735	*Rgs2*	regulator of G-protein signaling 2	2.539	8.15E-09
72155	*Cenpn*	centromere protein N	2.560	5.69E-08
16159	*Il12a*	interleukin 12a	2.563	8.48E-04
212937	*Tifab*	TRAF-interacting protein with forkhead-associated domain, family member B	2.571	7.86E-04
103743	*Tmem98*	transmembrane protein 98	2.583	2.57E-06
234258	*Neil3*	nei like 3 (E. coli)	2.585	1.68E-07
17131	*Smad7*	SMAD family member 7	2.588	4.05E-12
67775	*Rtp4*	receptor transporter protein 4	2.601	1.63E-03
72254	*1700030K09Rik*	RIKEN cDNA 1700030K09 gene	2.602	5.75E-09
19072	*Prep*	prolyl endopeptidase	2.602	3.14E-17
232560	*Caprin2*	caprin family member 2	2.609	2.16E-03
20522	*Slc23a1*	solute carrier family 23 (nucleobase transporters), member 1	2.610	4.01E-03
67946	*Spata6*	spermatogenesis associated 6	2.619	1.22E-10
381280	*Hjurp*	Holliday junction recognition protein	2.621	2.09E-11
58809	*Rnase4*	ribonuclease, RNase A family 4	2.625	6.13E-09
66972	*Slc25a23*	solute carrier family 25 (mitochondrial carrier; phosphate carrier), member 23	2.631	2.97E-03
16765	*Stmn1*	stathmin 1	2.635	3.41E-09
239743	*Klhl6*	kelch-like 6	2.664	1.99E-17
20822	*Trove2*	TROVE domain family, member 2	2.669	2.26E-06
68440	*Dusp23*	dual specificity phosphatase 23	2.671	1.43E-04
13417	*Dnah8*	dynein, axonemal, heavy chain 8	2.683	2.18E-02
77938	*Fam53b*	family with sequence similarity 53, member B	2.692	8.65E-14
100040736	*Foxd2os*	forkhead box D2, opposite strand	2.697	6.67E-09
12580	*Cdkn2c*	cyclin-dependent kinase inhibitor 2C (p18, inhibits CDK4)	2.698	6.18E-05
19663	*Rbpms*	RNA binding protein gene with multiple splicing	2.706	1.78E-02
22719	*Zfp61*	zinc finger protein 61	2.707	1.81E-06
63959	*Slc29a1*	solute carrier family 29 (nucleoside transporters), member 1	2.726	1.14E-08
12070	*Ngfrap1*	nerve growth factor receptor (TNFRSF16) associated protein 1	2.734	1.59E-05
236690	*Nyx*	nyctalopin	2.736	4.19E-02
212728	*Gm17296*	predicted gene, 17296	2.739	2.02E-20
110749	*Chaf1b*	chromatin assembly factor 1, subunit B (p60)	2.742	3.70E-17
17304	*Mfge8*	milk fat globule-EGF factor 8 protein	2.750	5.52E-11
216551	*Lgalsl*	lectin, galactoside binding-like	2.753	1.36E-05
71911	*Bdh1*	3-hydroxybutyrate dehydrogenase, type 1	2.753	8.58E-09
12984	*Csf2rb2*	colony stimulating factor 2 receptor, beta 2, low-affinity (granulocyte-macrophage)	2.753	9.37E-03
22158	*Tulp3*	tubby-like protein 3	2.765	1.25E-05

12323	*Camk2b*	calcium/calmodulin-dependent protein kinase II, beta	2.769	5.89E-05
30944	*Zfp354c*	zinc finger protein 354C	2.769	5.47E-05
70310	*Plscr3*	phospholipid scramblase 3	2.786	9.28E-16
320472	*Ppm1e*	protein phosphatase 1E (PP2C domain containing)	2.804	2.50E-04
22775	*Zik1*	zinc finger protein interacting with K protein 1	2.824	2.96E-06
72080	*Sapcd2*	suppressor APC domain containing 2	2.829	5.77E-04
20501	*Slc16a1*	solute carrier family 16 (monocarboxylic acid transporters), member 1	2.833	4.73E-15
14281	*Fos*	FBJ osteosarcoma oncogene	2.836	3.35E-02
70762	*Dclk2*	doublecortin-like kinase 2	2.837	2.25E-03
102448	*Xylb*	xylulokinase homolog (H. influenzae)	2.838	3.46E-08
58996	*Arhgap23*	Rho GTPase activating protein 23	2.847	1.31E-02
11861	*Arl4a*	ADP-ribosylation factor-like 4A	2.848	6.47E-07
108089	*Rnf144a*	ring finger protein 144A	2.863	3.29E-07
142682	*Zcchc14*	zinc finger, CCHC domain containing 14	2.865	4.21E-02
268445	*Ankrd13b*	ankyrin repeat domain 13b	2.865	2.17E-03
20849	*Stat4*	signal transducer and activator of transcription 4	2.870	8.56E-03
54367	*Zfp326*	zinc finger protein 326	2.877	2.65E-06
100042415	*Mnd1-ps*	Mnd1 retrotransposed pseudogene	2.877	1.04E-07
108075	*Ltbp4*	latent transforming growth factor beta binding protein 4	2.889	6.99E-04
67016	*Tbc1d2b*	TBC1 domain family, member 2B	2.909	2.93E-05
226525	*Rasal2*	RAS protein activator like 2	2.916	3.31E-07
171543	*Bmf*	BCL2 modifying factor	2.918	6.11E-07
619829	*Gm6104*	predicted gene 6104	2.927	6.40E-03
106628	*Trip10*	thyroid hormone receptor interactor 10	2.953	7.62E-07
17756	*Map2*	microtubule-associated protein 2	2.959	5.42E-03
23917	*Impdh1*	inosine 5'-phosphate dehydrogenase 1	2.962	2.14E-06
20322	*Sord*	sorbitol dehydrogenase	2.968	5.69E-08
18642	*Pfkm*	phosphofructokinase, muscle	2.974	3.48E-09
231510	*Agpat9*	1-acylglycerol-3-phosphate O-acyltransferase 9	2.983	1.91E-03
17761	*Map7*	microtubule-associated protein 7	2.985	2.54E-04
211586	*Tfdp2*	transcription factor Dp 2	2.991	1.77E-18
626000	*Ccnd3-ps*	cyclin D3, pseudogene	2.995	4.29E-08
209378	*Itih5*	inter-alpha (globulin) inhibitor H5	2.999	1.15E-02
18803	*Plcg1*	phospholipase C, gamma 1	3.001	3.10E-08
51793	*Ddah2*	dimethylarginine dimethylaminohydrolase 2	3.018	8.38E-09
66686	*Dcbld1*	discoidin, CUB and LCCL domain containing 1	3.019	6.89E-04
71276	*Ccdc57*	coiled-coil domain containing 57	3.019	9.30E-06
76267	*Fads1*	fatty acid desaturase 1	3.040	9.43E-03
74476	*4933439C10Rik*	RIKEN cDNA 4933439C10 gene	3.058	3.58E-25
69718	*Ipmk*	inositol polyphosphate multikinase	3.075	9.85E-17
227753	*Gsn*	gelsolin	3.079	7.15E-03
207777	*Bzrap1*	benzodiazepine receptor associated protein 1	3.098	3.97E-23
237436	*Gas2l3*	growth arrest-specific 2 like 3	3.110	5.29E-04
208084	*Pif1*	PIF1 5'-to-3' DNA helicase homolog (S. cerevisiae)	3.131	5.94E-07
73916	*Ift57*	intraflagellar transport 57	3.131	1.00E-09
52679	*E2f7*	E2F transcription factor 7	3.138	1.59E-05
433926	*Lrrc8b*	leucine rich repeat containing 8 family, member B	3.145	2.76E-02
16842	*Lef1*	lymphoid enhancer binding factor 1	3.156	4.98E-06
19280	*Ptprs*	protein tyrosine phosphatase, receptor type, S	3.162	5.48E-05
69443	*1700027J07Rik*	RIKEN cDNA 1700027J07 gene	3.166	4.36E-09
12193	*Zfp36l2*	zinc finger protein 36, C3H type-like 2	3.167	4.09E-10
22036	*Traip*	TRAF-interacting protein	3.182	1.68E-08
212712	*Satb2*	special AT-rich sequence binding protein 2	3.189	3.07E-03
246229	*Bivm*	basic, immunoglobulin-like variable motif containing	3.227	7.41E-05
72401	*Slc43a1*	solute carrier family 43, member 1	3.253	1.31E-02
12014	*Bach2*	BTB and CNC homology 2	3.258	1.89E-07
56278	*Gkap1*	G kinase anchoring protein 1	3.288	7.92E-04
19252	*Dusp1*	dual specificity phosphatase 1	3.301	4.02E-04
12445	*Ccnd3*	cyclin D3	3.307	2.82E-11
70237	*Bhlhb9*	basic helix-loop-helix domain containing, class B9	3.315	1.97E-03
11982	*Atp10a*	ATPase, class V, type 10A	3.323	8.54E-06
15500	*Hsf2*	heat shock factor 2	3.338	8.91E-05
22637	*Zap70*	zeta-chain (TCR) associated protein kinase	3.346	5.72E-04
18645	*Pfn2*	profilin 2	3.352	2.15E-02
213539	*Bag2*	BCL2-associated athanogene 2	3.355	2.16E-09
12700	*Cish*	cytokine inducible SH2-containing protein	3.364	1.21E-15
224454	*Zdhhc14*	zinc finger, DHHC domain containing 14	3.368	2.63E-02
12385	*Ctnna1*	catenin (cadherin associated protein), alpha 1	3.369	3.70E-17
102124	*Enkd1*	enkurin domain containing 1	3.379	3.85E-19
67103	*Ptgr1*	prostaglandin reductase 1	3.393	3.42E-07
70638	*Fam189a1*	family with sequence similarity 189, member A1	3.399	2.32E-02
20393	*Sgk1*	serum/glucocorticoid regulated kinase 1	3.404	3.03E-07
170799	*Rtkn2*	rhotekin 2	3.405	1.15E-02
75607	*Wnk2*	WNK lysine deficient protein kinase 2	3.411	1.46E-03
209032	*Zc3hav1l*	zinc finger CCCH-type, antiviral 1-like	3.456	6.74E-12
101320	*Dyrk4*	dual-specificity tyrosine-(Y)-phosphorylation regulated kinase 4	3.487	5.08E-03

71865	*Fbxo30*	F-box protein 30	3.535	6.03E-17
243219	*2900026A02Rik*	RIKEN cDNA 2900026A02 gene	3.537	3.65E-03
83397	*Akap12*	A kinase (PRKA) anchor protein (gravin) 12	3.548	1.69E-03
53885	*Nphp1*	nephronophthisis 1 (juvenile) homolog (human)	3.557	7.17E-05
211550	*Tifa*	TRAF-interacting protein with forkhead-associated domain	3.560	7.93E-09
22032	*Traf4*	TNF receptor associated factor 4	3.561	4.73E-10
668158	*Ccdc85c*	coiled-coil domain containing 85C	3.562	1.65E-05
232223	*Txnrd3*	thioredoxin reductase 3	3.578	8.02E-28
111173	*Erc1*	ELKS/RAB6-interacting/CAST family member 1	3.591	6.95E-10
15354	*Hmgb3*	high mobility group box 3	3.616	4.71E-06
93840	*Vangl2*	vang-like 2 (van gogh, Drosophila)	3.617	2.31E-06
320683	*Zfp629*	zinc finger protein 629	3.617	1.35E-06
20499	*Slc12a7*	solute carrier family 12, member 7	3.624	1.22E-10
14282	*Fosb*	FBJ osteosarcoma oncogene B	3.637	2.40E-03
230098	*Arhgef39*	Rho guanine nucleotide exchange factor (GEF) 39	3.675	1.67E-08
16779	*Lamb2*	laminin, beta 2	3.726	8.10E-05
108115	*Slco4a1*	solute carrier organic anion transporter family, member 4a1	3.792	1.55E-08
12416	*Cbx2*	chromobox 2	3.794	5.50E-12
104383	*Rcor2*	REST corepressor 2	3.801	3.70E-17
22041	*Trf*	transferrin	3.833	8.89E-05
216848	*Chd3*	chromodomain helicase DNA binding protein 3	3.860	1.99E-03
229055	*Zbtb10*	zinc finger and BTB domain containing 10	3.881	6.43E-04
269593	*Luzp1*	leucine zipper protein 1	3.891	2.76E-23
108899	*2700081O15Rik*	RIKEN cDNA 2700081O15 gene	3.931	1.79E-05
338349	*Cntln*	centlein, centrosomal protein	3.931	4.64E-04
327762	*Dna2*	DNA replication helicase 2 homolog (yeast)	3.952	6.70E-05
106393	*Srl*	sarcalumenin	3.960	1.75E-07
72050	*Kdelc1*	KDEL (Lys-Asp-Glu-Leu) containing 1	3.975	3.76E-05
17035	*Lxn*	latexin	3.989	8.04E-22
77619	*Prelid2*	PRELI domain containing 2	3.998	9.30E-06
21833	*Thra*	thyroid hormone receptor alpha	4.108	1.22E-05
14732	*Gpam*	glycerol-3-phosphate acyltransferase, mitochondrial	4.165	1.32E-31
242864	*Napepld*	N-acyl phosphatidylethanolamine phospholipase D	4.171	1.42E-05
77045	*Bcl7a*	B cell CLL/lymphoma 7A	4.173	1.20E-14
319164	*Hist1h2ac*	histone cluster 1, H2ac	4.184	3.85E-03
110084	*Dnah1*	dynein, axonemal, heavy chain 1	4.192	1.37E-07
68149	*Otub2*	OTU domain, ubiquitin aldehyde binding 2	4.195	2.03E-18
109135	*Plekha5*	pleckstrin homology domain containing, family A member 5	4.204	3.39E-08
69181	*Dyrk2*	dual-specificity tyrosine-(Y)-phosphorylation regulated kinase 2	4.255	8.59E-06
170737	*Znrf1*	zinc and ring finger 1	4.286	5.83E-19
70123	*2210013O21Rik*	RIKEN cDNA 2210013O21 gene	4.324	8.31E-11
260409	*Cdc42ep3*	CDC42 effector protein (Rho GTPase binding) 3	4.335	4.63E-11
109212	*Fam64a*	family with sequence similarity 64, member A	4.341	4.23E-18
103172	*Chchd10*	coiled-coil-helix-coiled-coil-helix domain containing 10	4.359	1.14E-11
20910	*Stxbp1*	syntaxin binding protein 1	4.471	1.77E-09
71685	*Galnt14*	UDP-N-acetyl-alpha-D-galactosamine:polypeptide N-acetylgalactosaminyltransferas	4.555	1.15E-28
52357	*Wwc2*	WW, C2 and coiled-coil domain containing 2	4.568	3.67E-12
104099	*Itga9*	integrin alpha 9	4.573	4.80E-06
171211	*Edaradd*	EDAR (ectodysplasin-A receptor)-associated death domain	4.607	4.83E-26
20230	*Satb1*	special AT-rich sequence binding protein 1	4.611	1.96E-08
18755	*Prkch*	protein kinase C, eta	4.624	1.65E-11
11877	*Arvcf*	armadillo repeat gene deleted in velo-cardio-facial syndrome	4.649	3.64E-26
207728	*Pde2a*	phosphodiesterase 2A, cGMP-stimulated	4.659	1.25E-05
16848	*Lfng*	LFNG O-fucosylpeptide 3-beta-N-acetylglucosaminyltransferase	4.753	3.61E-16
16880	*Lifr*	leukemia inhibitory factor receptor	4.791	1.39E-09
22092	*Rsph1*	radial spoke head 1 homolog (Chlamydomonas)	4.814	4.11E-04
269023	*Zfp608*	zinc finger protein 608	4.817	5.35E-05
328232	*Gfod1*	glucose-fructose oxidoreductase domain containing 1	4.828	2.05E-14
66725	*Lrrk2*	leucine-rich repeat kinase 2	4.858	5.69E-10
170439	*Elovl6*	ELOVL family member 6, elongation of long chain fatty acids (yeast)	4.861	2.13E-15
56520	*Nme4*	NME/NM23 nucleoside diphosphate kinase 4	4.923	5.92E-11
399603	*Fam84b*	family with sequence similarity 84, member B	4.964	8.08E-05
23797	*Akt3*	thymoma viral proto-oncogene 3	5.126	1.40E-34
54156	*Egfl6*	EGF-like-domain, multiple 6	5.144	1.74E-08
29856	*Smtn*	smoothelin	5.180	6.27E-21
68428	*Steap3*	STEAP family member 3	5.222	6.12E-12
75292	*Prkd3*	protein kinase D3	5.227	1.00E-13
268857	*Nlrc3*	NLR family, CARD domain containing 3	5.275	1.42E-25
108686	*Ccdc88a*	coiled coil domain containing 88A	5.368	3.97E-23
12890	*Cplx2*	complexin 2	5.389	1.27E-09
12035	*Bcat1*	branched chain aminotransferase 1, cytosolic	5.591	2.28E-08
12388	*Ctnnd1*	catenin (cadherin associated protein), delta 1	5.596	1.15E-34
74050	*4921525O09Rik*	RIKEN cDNA 4921525O09 gene	5.654	1.24E-06
70155	*Ogfrl1*	opioid growth factor receptor-like 1	5.711	1.50E-28
14160	*Lgr5*	leucine rich repeat containing G protein coupled receptor 5	5.719	7.51E-16
319743	*9630013D21Rik*	NA	5.794	6.03E-15

94092	*Trim16*	tripartite motif-containing 16	6.063	7.04E-31
14758	*Gpm6b*	glycoprotein m6b	6.147	4.73E-19
16197	*Il7r*	interleukin 7 receptor	6.211	1.36E-36
22364	*Vpreb3*	pre-B lymphocyte gene 3	6.285	2.15E-52
14766	*Gpr56*	G protein-coupled receptor 56	6.397	5.31E-22
52187	*Rragd*	Ras-related GTP binding D	6.399	2.62E-39
17387	*Mmp14*	matrix metallopeptidase 14 (membrane-inserted)	6.445	2.37E-35
100039964	*Gm15411*	NA	6.454	1.06E-47
140703	*Emid1*	EMI domain containing 1	6.526	2.41E-33
13482	*Dpp4*	dipeptidylpeptidase 4	6.573	9.45E-98
216233	*Socs2*	suppressor of cytokine signaling 2	6.623	1.16E-17
12349	*Car2*	carbonic anhydrase 2	6.992	1.96E-27
140765	*Tmprss3*	transmembrane protease, serine 3	7.248	1.72E-30
22362	*Vpreb1*	pre-B lymphocyte gene 1	7.588	2.65E-60
16136	*Igll1*	immunoglobulin lambda-like polypeptide 1	7.649	4.91E-50
13809	*Enpep*	glutamyl aminopeptidase	8.008	9.13E-125

Suppl. Table ST4) REVIGO analysis

* Eliminated GO terms = 1, Used for further analyis = 0

** expression (up- or downregulated) of the majority of genes associated to the selected GO term as compared to the reference (Tcl-1 tg IRF4 +/+))

Ontology	GO term	GO term neighbor	description	eliminated*	branch	direction**	z-score	adj. p-value
BP	GO:0042110		T cell activation	0	immune system process	downregulated	-4.38	7.58E-21
		GO:0030217	T cell differentiation	1				
		GO:0050671	positive regulation of lymphocyte proliferation	1				
		GO:0042113	B cell activation	1				
		GO:0050670	regulation of lymphocyte proliferation	1				
		GO:0046631	alpha-beta T cell activation	1				
		GO:0022409	positive regulation of cell-cell adhesion	1				
		GO:0032944	regulation of mononuclear cell proliferation	1				
		GO:0032946	positive regulation of mononuclear cell proliferation	1				
		GO:0022408	negative regulation of cell-cell adhesion	1				
		GO:1903039	positive regulation of leukocyte cell-cell adhesion	1				
		GO:0050870	positive regulation of T cell activation	1				
		GO:1903037	regulation of leukocyte cell-cell adhesion	1				
		GO:1903038	negative regulation of leukocyte cell-cell adhesion	1				
		GO:0050863	regulation of T cell activation	1				
		GO:0046651	lymphocyte proliferation	1				
		GO:0042100	B cell proliferation	1				
		GO:0042098	T cell proliferation	1				
		GO:0070663	regulation of leukocyte proliferation	1				
		GO:0070665	positive regulation of leukocyte proliferation	1				
BP	GO:0000280		nuclear division	0	cell cycle	upregulated	4.70	5.20E-13
		GO:0051225	spindle assembly	1				
		GO:0000070	mitotic sister chromatid segregation	1				
		GO:0007052	mitotic spindle organization	1				
		GO:0000819	sister chromatid segregation	1				
		GO:1902850	microtubule cytoskeleton organization involved in mitosis	1				
BP	GO:0001819		positive regulation of cytokine production	0	signaling	downregulated	-6.35	2.50E-10
		GO:0032649	regulation of interferon-gamma production	1				
		GO:0032760	positive regulation of tumor necrosis factor production	1				
		GO:0032675	regulation of interleukin-6 production	1				
		GO:0032680	regulation of tumor necrosis factor production	1				
		GO:1903557	positive regulation of tumor necrosis factor superfamily cy	1				
		GO:1903555	regulation of tumor necrosis factor superfamily cytokine p	1				
		GO:0050715	positive regulation of cytokine secretion	1				
		GO:0050707	regulation of cytokine secretion	1				
BP	GO:0051056		regulation of small GTPase mediated signal transduction	0	signaling	downregulated	-2.90	7.29E-08
		GO:0007265	Ras protein signal transduction	1				
BP	GO:0044772		mitotic cell cycle phase transition	0	cell cycle	upregulated	3.74	4.63E-10
BP	GO:0030100		regulation of endocytosis	0	immune system process	downregulated	-2.60	1.53E-06
BP	GO:0031349		positive regulation of defense response	0	immune system process	downregulated	-4.62	7.51E-07
BP	GO:0007264		small GTPase mediated signal transduction	0	signaling	downregulated	-3.30	4.83E-07
BP	GO:1902105		regulation of leukocyte differentiation	0	immune system process	downregulated	-2.72	1.34E-12
		GO:1902107	positive regulation of leukocyte differentiation	1				
		GO:0030098	lymphocyte differentiation	1				
		GO:0045619	regulation of lymphocyte differentiation	1				
		GO:1903708	positive regulation of hemopoiesis	1				
		GO:1903706	regulation of hemopoiesis	1				
BP	GO:0050900		leukocyte migration	0	immune system process	downregulated	-4.04	3.54E-08
BP	GO:0002822		regulation of adaptive immune response based on somati	0	immune system process	downregulated	-2.87	6.38E-11
		GO:0002456	T cell mediated immunity	1				
		GO:0002821	positive regulation of adaptive immune response	1				
		GO:0002819	regulation of adaptive immune response	1				
		GO:0002253	activation of immune response	1				
		GO:0002764	immune response-regulating signaling pathway	1				
BP	GO:0002703		regulation of leukocyte mediated immunity	0	immune system process	downregulated	-2.53	4.63E-10
		GO:0002699	positive regulation of immune effector process	1				
BP	GO:0045787		positive regulation of cell cycle	0	cell cycle	upregulated	2.48	1.63E-06
BP	GO:0002685		regulation of leukocyte migration	0	immune system process	downregulated	-2.74	1.04E-07
BP	GO:0007162		negative regulation of cell adhesion	0	immune system process	downregulated	-4.53	3.87E-07
BP	GO:0031294		lymphocyte costimulation	0	immune system process	downregulated	-2.89	7.51E-07
BP	GO:0002275		myeloid cell activation involved in immune response	0	immune system process	downregulated	-2.98	3.69E-08
		GO:0002285	lymphocyte activation involved in immune response	1				
BP	GO:0050866		negative regulation of cell activation	0	immune system process	downregulated	-4.82	1.02E-13
		GO:0051250	negative regulation of lymphocyte activation	1				
		GO:0051251	positive regulation of lymphocyte activation	1				
		GO:0002695	negative regulation of leukocyte activation	1				
		GO:0002696	positive regulation of leukocyte activation	1				
		GO:0050867	positive regulation of cell activation	1				
		GO:0050868	negative regulation of T cell activation	1				
BP	GO:0090068		positive regulation of cell cycle process	0	cell cycle	upregulated	2.47	7.58E-07
MF	GO:0004896		cytokine receptor activity	0				
MF	GO:0005096		GTPase activator activity	0				
MF	GO:0031267		small GTPase binding	0				
MF	GO:0098641		cadherin binding involved in cell-cell adhesion	0				
MF	GO:0008017		microtubule binding	0				
MF	GO:0005085		guanyl-nucleotide exchange factor activity	0				
CC	GO:0005819		spindle	0				
CC	GO:0005913		cell-cell adherens junction	0				
CC	GO:0045121		membrane raft	0				
		GO:0098857	membrane microdomain	1				
		GO:0005901	caveola	1				
		GO:0044853	plasma membrane raft	1				
CC	GO:0001726		ruffle	0				
		GO:0031256	leading edge membrane	1				
CC	GO:0000307		cyclin-dependent protein kinase holoenzyme complex	0				
CC	GO:0005769		early endosome	0				
		GO:0005770	late endosome	1				
CC	GO:0099568		cytoplasmic region	0				
CC	GO:0009897		external side of plasma membrane	0				
		GO:0009898	cytoplasmic side of plasma membrane	1				
		GO:0031234	extrinsic component of cytoplasmic side of plasma membr	1				
		GO:0098562	cytoplasmic side of membrane	1				
CC	GO:0043034		costamere	0				
CC	GO:0000776		kinetochore	0				
		GO:0000778	condensed nuclear chromosome kinetochore	1				
		GO:0000940	condensed chromosome outer kinetochore	1				
CC	GO:0042611		MHC protein complex	0				

CC	GO:0001772		immunological synapse	0
CC	GO:0019897		extrinsic component of plasma membrane	0
CC	GO:0098802		plasma membrane receptor complex	0
		GO:0008305	integrin complex	1
CC	GO:0002102		podosome	0
CC	GO:0044441		ciliary part	0
		GO:0005930	axoneme	1
		GO:0097729	9+2 motile cilium	1
		GO:0036126	sperm flagellum	1
		GO:0097014	ciliary plasm	1
CC	GO:0051233		spindle midzone	0
		GO:0000922	spindle pole	1
CC	GO:0005881		cytoplasmic microtubule	0
CC	GO:0005741		mitochondrial outer membrane	0
CC	GO:0005875		microtubule associated complex	0
CC	GO:0044450		microtubule organizing center part	0
CC	GO:1990752		microtubule end	0
CC	GO:0005814		centriole	0
CC	GO:0098687		chromosomal region	0

Suppl. Table ST5) Deregulated Genes GO term 0042110

* log2 fold-change (FC), comparison between Tcl-1 tg IRF4 +/+ (reference group) and Tcl-1 tg IRF4 dB/dB mice

Genesybmol	**Description**	**Entrez ID**	**MGI**	**Log2FC***	**pValue**	**FDR**
Adora2a	adenosine A2a receptor	11540	99402	-2.86	6.46E-12	2.98E-10
Aif1	allograft inflammatory factor 1	11629	1343098	-2.89	1.28E-06	1.73E-05
Bcl10	B cell leukemia/lymphoma 10	12042	1337994	-1.59	9.24E-07	1.30E-05
Bcl2	B cell leukemia/lymphoma 2	12043	88138	-3.12	6.03E-13	3.33E-11
Bcl2a1d	B cell leukemia/lymphoma 2 related protein A1d	12047	1278325	-3.64	8.01E-05	6.25E-04
Bcl3	B cell leukemia/lymphoma 3	12051	88140	-2.36	4.93E-05	4.14E-04
Blk	B lymphoid kinase	12143	88169	-3.09	3.66E-16	3.42E-14
Btla	B and T lymphocyte associated	208154	2658978	-2.42	5.93E-10	1.73E-08
Btnl2	butyrophilin-like 2	547431	1859549	-1.96	3.14E-04	2.03E-03
Card11	caspase recruitment domain family, member 11	108723	1916978	-2.43	1.97E-07	3.32E-06
Ccl5	chemokine (C-C motif) ligand 5	20304	98262	-5.32	9.84E-08	1.80E-06
Ccnd3	cyclin D3	12445	88315	3.31	4.98E-13	2.82E-11
Ccr2	chemokine (C-C motif) receptor 2	12772	106185	-5.08	5.63E-11	2.11E-09
Cd2	CD2 antigen	12481	88320	-1.59	2.21E-03	1.03E-02
Cd274	CD274 antigen	60533	1926446	-2.09	3.85E-05	3.34E-04
Cd5	CD5 antigen	12507	88340	-2.96	2.97E-11	1.17E-09
Cd74	CD74 antigen (invariant polypeptide of major histocompatibility complex, class II	16149	96534	-2.94	3.11E-09	7.78E-08
Cd80	CD80 antigen	12519	101775	-3.04	2.36E-17	2.54E-15
Cd83	CD83 antigen	12522	1328316	-3.22	2.10E-07	3.51E-06
Cd86	CD86 antigen	12524	101773	-3.84	6.26E-11	2.29E-09
Cdk6	cyclin-dependent kinase 6	12571	1277162	2.31	4.65E-06	5.39E-05
Dock8	dedicator of cytokinesis 8	76088	1921396	-2.23	2.98E-05	2.66E-04
Dpp4	dipeptidylpeptidase 4	13482	94919	6.57	1.70E-101	9.45E-98
Dtx1	deltex 1 homolog (Drosophila)	14357	1352744	-3.32	6.47E-10	1.86E-08
Ebi3	Epstein-Barr virus induced gene 3	50498	1354171	-3.63	1.54E-23	3.63E-21
Efnb1	ephrin B1	13641	102708	-2.51	5.82E-05	4.75E-04
Egr3	early growth response 3	13655	1306780	-3.61	3.95E-06	4.71E-05
Ephb4	Eph receptor B4	13846	104757	-3.03	3.28E-08	6.66E-07
Fcer1g	Fc receptor, IgE, high affinity I, gamma polypeptide	14127	95496	-1.82	3.43E-04	2.18E-03
Gpam	glycerol-3-phosphate acyltransferase, mitochondrial	14732	109162	4.16	2.15E-34	1.32E-31
Gpr18	G protein-coupled receptor 18	110168	107859	-2.40	9.41E-05	7.20E-04
Gpr183	G protein-coupled receptor 183	321019	2442034	-1.99	1.45E-03	7.29E-03
Gsn	gelsolin	227753	95851	3.08	1.42E-03	7.15E-03
H2-Aa	histocompatibility 2, class II antigen A, alpha	14960	95895	-2.96	4.29E-06	5.04E-05
H2-Ab1	histocompatibility 2, class II antigen A, beta 1	14961	103070	-2.70	3.45E-06	4.17E-05
H2-DMa	histocompatibility 2, class II, locus DMa	14998	95921	-2.73	6.94E-06	7.61E-05
H2-Oa	histocompatibility 2, O region alpha locus	15001	95924	-2.98	3.22E-07	5.14E-06
H2-T23	histocompatibility 2, T region locus 23	15040	95957	-1.91	1.30E-09	3.47E-08
Icam1	intercellular adhesion molecule 1	15894	96392	-1.73	1.37E-04	9.93E-04
Icosl	icos ligand	50723	1354701	-3.30	6.09E-09	1.45E-07
Il12a	interleukin 12a	16159	96539	2.56	1.14E-04	8.48E-04
Il12rb1	interleukin 12 receptor, beta 1	16161	104579	-3.54	4.62E-13	2.64E-11
Il2rg	interleukin 2 receptor, gamma chain	16186	96551	-1.74	6.71E-07	9.85E-06
Il4ra	interleukin 4 receptor, alpha	16190	105367	-2.34	1.69E-07	2.90E-06
Il7r	interleukin 7 receptor	16197	96562	6.21	1.23E-39	1.36E-36
Itgal	integrin alpha L	16408	96606	-3.68	4.44E-18	5.60E-16
Itgam	integrin alpha M	16409	96607	-1.86	7.86E-05	6.16E-04
Itgb2	integrin beta 2	16414	96611	-2.26	2.37E-12	1.17E-10
Lax1	lymphocyte transmembrane adaptor 1	240754	2443362	-1.75	4.32E-03	1.78E-02
Lcp1	lymphocyte cytosolic protein 1	18826	104808	-2.01	6.90E-09	1.62E-07
Lef1	lymphoid enhancer binding factor 1	16842	96770	3.16	3.11E-07	4.98E-06
Lfng	LFNG O-fucosylpeptide 3-beta-N-acetylglucosaminyltransferase	16848	1095413	4.75	2.83E-18	3.61E-16
Lgals9	lectin, galactose binding, soluble 9	16859	109496	2.51	5.61E-25	1.60E-22
Mtor	mechanistic target of rapamycin (serine/threonine kinase)	56717	1928394	1.79	1.69E-03	8.33E-03
Myb	myeloblastosis oncogene	17863	97249	2.33	1.62E-09	4.26E-08
Ndfip1	Nedd4 family interacting protein 1	65113	1929601	-1.51	2.95E-08	6.10E-07
Nfkbid	nuclear factor of kappa light polypeptide gene enhancer in B cells inhibitor, delta	243910	3041243	-2.23	1.28E-06	1.73E-05
Nlrc3	NLR family, CARD domain containing 3	268857	2444070	5.28	4.09E-28	1.42E-25
Patz1	POZ (BTB) and AT hook containing zinc finger 1	56218	1891832	1.69	4.20E-08	8.33E-07
Pawr	PRKC, apoptosis, WT1, regulator	114774	2149961	-2.56	1.37E-05	1.38E-04
Pdcd1lg2	programmed cell death 1 ligand 2	58205	1930125	-2.88	3.87E-16	3.58E-14
Pnp	purine-nucleoside phosphorylase	18950	97365	2.06	6.95E-20	1.06E-17
Prkcz	protein kinase C, zeta	18762	97602	-3.62	4.51E-14	3.05E-12
Ptpn22	protein tyrosine phosphatase, non-receptor type 22 (lymphoid)	19260	107170	-2.09	1.61E-04	1.14E-03
Ptpn6	protein tyrosine phosphatase, non-receptor type 6	15170	96055	-1.57	1.06E-05	1.10E-04
Ptprc	protein tyrosine phosphatase, receptor type, C	19264	97810	-1.68	1.20E-04	8.86E-04
Pycard	PYD and CARD domain containing	66824	1931465	-2.02	3.50E-13	2.04E-11
Rac2	RAS-related C3 botulinum substrate 2	19354	97846	-1.71	1.33E-06	1.79E-05
Rasgrp1	RAS guanyl releasing protein 1	19419	1314635	-3.31	4.70E-32	2.37E-29
Relb	avian reticuloendotheliosis viral (v-rel) oncogene related B	19698	103289	-1.72	1.01E-06	1.41E-05
Ripk3	receptor-interacting serine-threonine kinase 3	56532	2154952	1.59	4.80E-05	4.05E-04
Rsad2	radical S-adenosyl methionine domain containing 2	58185	1929628	-1.54	9.93E-03	3.54E-02

Runx2	runt related transcription factor 2	12393	99829	-2.57	9.27E-03	3.35E-02
Satb1	special AT-rich sequence binding protein 1	20230	105084	4.61	6.87E-10	1.96E-08
Sdc4	syndecan 4	20971	1349164	1.65	3.27E-08	6.65E-07
Sirpa	signal-regulatory protein alpha	19261	108563	-2.82	4.68E-11	1.77E-09
Sit1	suppression inducing transmembrane adaptor 1	54390	1889342	2.16	1.05E-03	5.57E-03
Slamf1	signaling lymphocytic activation molecule family member 1	27218	1351314	-2.89	1.36E-04	9.88E-04
Smad7	SMAD family member 7	17131	1100518	2.59	6.12E-14	4.05E-12
Spn	sialophorin	20737	98384	-1.80	1.32E-06	1.79E-05
Stx11	syntaxin 11	74732	1921982	-3.06	1.82E-14	1.31E-12
Tfrc	transferrin receptor	22042	98822	2.46	3.03E-06	3.73E-05
Tnfrsf13c	tumor necrosis factor receptor superfamily, member 13c	72049	1919299	-2.85	7.81E-11	2.76E-09
Tnfsf18	tumor necrosis factor (ligand) superfamily, member 18	240873	2673064	-3.20	8.33E-08	1.53E-06
Tnfsf4	tumor necrosis factor (ligand) superfamily, member 4	22164	104511	-3.94	6.82E-08	1.28E-06
Treml2	triggering receptor expressed on myeloid cells-like 2	328833	2147038	1.62	1.10E-03	5.79E-03
Zap70	zeta-chain (TCR) associated protein kinase	22637	99613	3.35	7.20E-05	5.72E-04
Zbtb32	zinc finger and BTB domain containing 32	58206	1891838	-3.77	5.94E-18	7.24E-16
Zbtb7b	zinc finger and BTB domain containing 7B	22724	102755	-2.69	4.95E-15	3.87E-13
Zc3h12d	zinc finger CCCH type containing 12D	237256	3045313	-2.33	1.32E-10	4.43E-09
Zfp36l2	zinc finger protein 36, C3H type-like 2	12193	107945	3.17	9.47E-12	4.09E-10
Zfp608	zinc finger protein 608	269023	2442338	4.82	4.61E-06	5.35E-05

Suppl. Table ST6) Mouse Human Homologs

Genesymbol Murine	**Description**	**Gensymbol Human**	**Affymetrix ID**
Adora2a	adenosine A2a receptor	*ADORA2A*	205013_s_at
Aif1	allograft inflammatory factor 1	*AIF1*	231095_x_at
Bcl10	B cell leukemia/lymphoma 10	*BCL10*	205263_at
Bcl2	B cell leukemia/lymphoma 2	*BCL2*	207004_at
Bcl2a1d	B cell leukemia/lymphoma 2 related protein A1d	*BCL2A1*	205681_at
Bcl3	B cell leukemia/lymphoma 3	*BCL3*	204907_s_at
Blk	B lymphoid kinase	*BLK*	210934_at
Btla	B and T lymphocyte associated	*BTLA*	236226_at
Btnl2	butyrophilin-like 2	*BTNL2*	221457_s_at
Card11	caspase recruitment domain family, member 11	*CARD11*	223514_at
Ccl5	chemokine (C-C motif) ligand 5	*CCL5*	204655_at
Ccnd3	cyclin D3	*CCND3*	201700_at
Ccr2	chemokine (C-C motif) receptor 2	*CCR2*	207794_at
Cd2	CD2 antigen	*CD2*	205831_at
Cd274	CD274 antigen	*CD274*	223834_at
Cd5	CD5 antigen	*CD5*	230489_at
Cd74	CD74 antigen (invariant polypeptide of major histocompatibility complex, class I	*CD74*	1567627_at
Cd80	CD80 antigen	*CD80*	1554519_at
Cd83	CD83 antigen	*CD83*	204440_at
Cd86	CD86 antigen	*CD86*	210895_s_at
Cdk6	cyclin-dependent kinase 6	*CDK6*	235287_at
Dock8	dedicator of cytokinesis 8	*DOCK8*	225502_at
Dpp4	dipeptidylpeptidase 4	*DPP4*	203717_at
Dtx1	deltex 1 homolog (Drosophila)	*DTX1*	227336_at
Ebi3	Epstein-Barr virus induced gene 3	*EBI3*	219424_at
Efnb1	ephrin B1	*EFNB1*	202711_at
Egr3	early growth response 3	*EGR3*	206115_at
Ephb4	Eph receptor B4	*EPHB4*	216680_s_at
Fcer1g	Fc receptor, IgE, high affinity I, gamma polypeptide	*FCER1G*	204232_at
Gpam	glycerol-3-phosphate acyltransferase, mitochondrial	*GPAM*	225424_at
Gpr18	G protein-coupled receptor 18	*GPR18*	210279_at
Gpr183	G protein-coupled receptor 183	*GPR183*	205419_at
Gsn	gelsolin	*GSN*	214040_s_at
H2-Aa	histocompatibility 2, class II antigen A, alpha	*HLA-DQA1*	203290_at
H2-Ab1	histocompatibility 2, class II antigen A, beta 1	*HLA-DQB1*	210747_at
H2-DMa	histocompatibility 2, class II, locus DMa	*HLA-DMA*	217478_s_at
H2-Oa	histocompatibility 2, O region alpha locus	*HLA-DOA*	216946_at
H2-T23	histocompatibility 2, T region locus 23	*HLA-E*	200905_x_at
Icam1	intercellular adhesion molecule 1	*ICAM1*	215485_s_at
Icosl	icos ligand	*ICOSLG*	211198_s_at
Il12a	interleukin 12a	*IL12A*	207160_at
Il12rb1	interleukin 12 receptor, beta 1	*IL12RB1*	1552584_at
Il2rg	interleukin 2 receptor, gamma chain	*IL2RG*	204116_at
Il4ra	interleukin 4 receptor, alpha	*IL4R*	203233_at
Il7r	interleukin 7 receptor	*IL7R*	205798_at
Itgal	integrin alpha L	*ITGAL*	213475_s_at
Itgam	integrin alpha M	*ITGAM*	205786_s_at
Itgb2	integrin beta 2	*ITGB2*	236988_x_at
Lax1	lymphocyte transmembrane adaptor 1	*LAX1*	207734_at
Lcp1	lymphocyte cytosolic protein 1	*LCP1*	208885_at
Lef1	lymphoid enhancer binding factor 1	*LEF1*	221557_s_at
Lfng	LFNG O-fucosylpeptide 3-beta-N-acetylglucosaminyltransferase	*LFNG*	215270_at
Lgals9	lectin, galactose binding, soluble 9	*LGALS9*	203236_s_at
Mtor	mechanistic target of rapamycin (serine/threonine kinase)	*MTOR*	215381_at
Myb	myeloblastosis oncogene	*MYB*	204798_at
n.a.	n.a.	*CIITA*	210925_at
n.a.	n.a.	*HLA-DRB4*	209728_at

Ndfip1	Nedd4 family interacting protein 1	*NDFIP1*	217800_s_at
Nfkbid	nuclear factor of kappa light polypeptide gene enhancer in B cells inhibitor, delt	*NFKBID*	241889_at
Nlrc3	NLR family, CARD domain containing 3	*NLRC3*	236295_s_at
Patz1	POZ (BTB) and AT hook containing zinc finger 1	*PATZ1*	211392_s_at
Pawr	PRKC, apoptosis, WT1, regulator	*PAWR*	214237_x_at
Pdcd1lg2	programmed cell death 1 ligand 2	*PDCD1LG2*	224399_at
Pnp	purine-nucleoside phosphorylase	*PNP*	201695_s_at
Prkcz	protein kinase C, zeta	*PRKCZ*	1569748_at
Ptpn22	protein tyrosine phosphatase, non-receptor type 22 (lymphoid)	*PTPN22*	236539_at
Ptpn6	protein tyrosine phosphatase, non-receptor type 6	*PTPN6*	206687_s_at
Ptprc	protein tyrosine phosphatase, receptor type, C	*PTPRC*	1569830_at
Pycard	PYD and CARD domain containing	*PYCARD*	221666_s_at
Rac2	RAS-related C3 botulinum substrate 2	*RAC2*	207419_s_at
Rasgrp1	RAS guanyl releasing protein 1	*RASGRP1*	205590_at
Relb	avian reticuloendotheliosis viral (v-rel) oncogene related B	*RELB*	205205_at
Ripk3	receptor-interacting serine-threonine kinase 3	*RIPK3*	228139_at
Rsad2	radical S-adenosyl methionine domain containing 2	*RSAD2*	242625_at
Runx2	runt related transcription factor 2	*RUNX2*	221283_at
Satb1	special AT-rich sequence binding protein 1	*SATB1*	241365_at
Sdc4	syndecan 4	*SDC4*	202071_at
Sirpa	signal-regulatory protein alpha	*SIRPA*	217024_x_at
Sit1	suppression inducing transmembrane adaptor 1	*SIT1*	205484_at
Slamf1	signaling lymphocytic activation molecule family member 1	*SLAMF1*	239427_at
Smad7	SMAD family member 7	*SMAD7*	204790_at
Spn	sialophorin	*SPN*	216980_s_at
Stx11	syntaxin 11	*STX11*	210190_at
Tfrc	transferrin receptor	*TFRC*	240686_x_at
Tnfrsf13c	tumor necrosis factor receptor superfamily, member 13c	*TNFRSF13C*	1552892_at
Tnfsf18	tumor necrosis factor (ligand) superfamily, member 18	*TNFSF18*	221371_at
Tnfsf4	tumor necrosis factor (ligand) superfamily, member 4	*TNFSF4*	207426_s_at
Treml2	triggering receptor expressed on myeloid cells-like 2	*TREML2*	219748_at
Zap70	zeta-chain (TCR) associated protein kinase	*ZAP70*	1555613_a_at
Zbtb32	zinc finger and BTB domain containing 32	*ZBTB32*	220118_at
Zbtb7b	zinc finger and BTB domain containing 7B	*ZBTB7B*	205853_at
Zc3h12d	zinc finger CCCH type containing 12D	*ZC3H12D*	1559263_s_at
Zfp36l2	zinc finger protein 36, C3H type-like 2	*ZFP36L2*	227681_at
Zfp608	zinc finger protein 608	*n.a.*	n.a.