Impact of *MLL5* expression on decitabine efficacy and DNA methylation in acute myeloid leukemia

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Supplementary Data

Supplementary Methods

Cytogenetic and molecular analysis

Cytogenetic analysis was performed centrally by G- and R-banding analysis. Mononuclear cells from patients' bone marrow or peripheral blood samples were enriched by Ficoll density gradient centrifugation and genomic DNA was extracted using the All Prep DNA/RNA Kit (Qiagen, Hilden, Germany). Mutation analyses were performed for *DNMT3A*,[1] *NPM1*[2] and *FLT3*[3] as previously reported.

Quantification of *MLL5*, *HOXA9*, and *Cebpa* transcript levels

Mononuclear cells from diagnostic bone marrow or blood specimens were enriched by Ficoll density gradient centrifugation. Total RNA was isolated using the All Prep DNA/RNA Kit (Qiagen, Hilden, Germany) according to the manufacturer's recommendations. Random hexamer priming and M-MLV reverse transcriptase (Life Technologies, Darmstadt, Germany) were used to generate cDNA. *MLL5* expression levels were quantified in mononuclear cells from bone marrow (n=50, median blast percentage 48%) or peripheral blood (n=7, median blast percentage 54%) using the *MLL5* TaqMan Gene Expression Assay (Applied Biosystems, Assay ID: Hs00218773_m1) and the *ABL* FusionQuant Standard Kit as an endogenous control (Ipsogen, Marseille, France) as previously reported.[4] *HOXA9* quantification was performed in 35 out of 57 samples using HOXA9 TaqMan Gene Expression Assay (Applied Biosystems, Assay ID: Hs00266821_m1) and the same *ABL* quantification kit as an endogenous control. Total RNAs

and cDNAs from KG1a, HL60 and 293T cell lines were similarly prepared. Real-time reverse-transcriptase-polymerase chain reaction (RT-PCR) was carried out on a StepOne Plus real-time PCR system (Life Technologies). All reactions were quantified in duplicate. The data were analyzed using the StepOne Plus Software v2.0 (Life Technologies). To obtain a standard curve for *MLL5,* quantitative PCR reactions were carried out with 5-fold dilutions covering the expected detection range with a reference cDNA (KG1a cell line).

To quantify the transcript level of *Cebpa*, total RNA was isolated and cDNA was prepared from corresponding mouse cell lines as described above. *Cebpa* mRNA expression levels were quantified using QuantiTect SYBR Green PCR Kits (Qiagen) with specific primer set targeting Cebpa and *Hprt* mRNA expression was measured as endogenous control. Real-time RT-PCR was carried out and analysed on a StepOne Plus real-time PCR system and its software. All reactions were quantified in duplicate. Primer sequences are listed below (F, forward; R, reverse). *Cebpa*: F, 5'-CAAGAACAGCAACGAGTACCG-3'; R, 5'-GTCACTGGTCAACTCCAGCAC-3'; *Hprt*: F, 5'-GATTAGCGATGATGAACCAGGTT-3'; R, 5'- CCTCCCATCTCCTTCATGACA-3';

Immunoblotting

Western blot was performed as previously described.[5] In brief, 10^7 cells were collected for KG1a, HL60 and 293T cells and lysed with lysis buffer (50 mM Tris-HCl, pH 7.4, 150 mM NaCl, 1% NP-40, 0.5% Sodium deoxycolate, 0.1% SDS, 100 mM NaF; 10 mM EDTA; 1 mM PMSF; 1 mM Na_2VO_4) supplemented with protease inhibitor cocktail (Roche, Mannheim, Germany), separated by sodium dodecyl sulfate-polyacrylamide gel electrophoresis (SDS-PAGE), transferred to PVDF membrane (Whatman GmbH, Dassel, Germany), and immunoblotted with polyclonal rabbit anti-MLL5 antibody (Acris Antibodies, Herford, Germany) and monoclonal mouse anti-ß-actin (AC-15) (Sigma-Aldrich, Hannover, Germany) in 5% BSA overnight at 4°C. Secondary horseradish peroxidase-conjugated antibodies used were donkey anti-rabbit IgG (Santa Cruz Biotechnology, Heidelberg, Germany) and goat anti-mouse IgG (Beckman Coulter, Fullerton, CA, USA). Chemoluminescence was used for visualization using the ECL Western blotting detection reagents (Amersham Biosciences-GE Healthcare, Buckinghamshire, UK) according to the manufacturer's instructions.

Retroviral infection of murine bone marrow cells

Wildtype and transgenic mice with homozygous loss of Mll5 in 129S6/SvEv genetic background have been described previously.[6] Primary mouse bone marrow cells were harvested from stock mice at 6-8 weeks of age and stimulated for 48 hours in Dulbecco's modified Eagle's medium (DMEM) supplemented with 15% fetal bovine serum (Stemcell Technologies, Vancouver, Canada), 10 ng/mL of human interleukin-6 (hIL-6), 6 ng/mL of murine interleukin-3 (mIL-3), and 20 ng/mL of murine stem cell factor (mSCF; all from Peprotech, Hamburg, Germany). Generation of HOXA9- or HOXA9/MEIS1-transduced cells was performed as described.[7] Briefly, MSCV-HOXA9-PGKneomycin and MSCV-MEIS1-IRESYFP vectors were used for generating recombinant ecotropic retrovirus-producing GP+E86 cells. Pre-stimulated cells were co-cultured with irradiated GP+E86 cells for 48 hours in the presence of 5 μg/mL protamine sulfate (Sigma-Aldrich) and later were selected by geneticin (Gibco, Darmstadt, Germany), or were sorted for yellow fluorescent protein (YFP) expression by fluorescence-activated cell sorting (FACS).

Fluorescence-activated cell sorting (FACS) analysis, cell cycle analysis, and apoptosis measurement

Cells were harvested after 3 days of decitabine treatment at the indicated concentrations, and were stained using the following antibodies for differentiation analysis: Phycoerythrin- (PE) labeled Gr-1-PE (clone-RB6-8CS) from BD Biosciences (Heidelberg, Germany) and Allophycocyanin- (APC) labeled CD11b-APC (clone-M 1/70) from eBiosciences (Frankfurt, Germany). For cell cycle analysis, cells were first fixed with 2.5 volumes of ethanol for 15 minutes on ice, then were treated with 50 μg/mL propidium iodide (PI; BD Biosciences) for staining along with 0.1 mg/mL RNase A and 0.05% Triton X-100 (all from Sigma-Aldrich) for 40 minutes incubation at 37°C, afterwards the samples were resuspended in phosphate buffered saline (PBS; PAA Laboratories, Cölbe, Germany) for flow cytometry measurement. For apoptosis analysis, cells were stained with Annexin V-FITC and PI according to the manufacturer’s protocol (BD Biosciences), and measured by FACS. Data acquisition was

performed on a BD FACSCalibur flow cytometer (Becton Dickinson, Heidelberg, Germany). All FACS analyses were performed with FlowJo 7.2.5 software (Tree Star, Ashland, USA).

Colony forming cell (CFC) assay

Cells were treated with decitabine *in vitro* as described above. Then, 1,000 viable cells were plated in duplicate in methylcellulose medium (Methocult M3234; Stemcell Technologies) supplemented with 10 ng/mL murine IL3, 10 ng/mL human IL6, 50 ng/mL SCF, and 3 U/mL erythropoetin (EPO; Peprotech). Plates were incubated at 37 °C for 10 days, and colonies were evaluated microscopically by standard criteria (minimum of 30 cells per colony). Morphology was captured using an Olympus CKX41 (Olympus, Tokyo, Japan) microscope equipped with a Camedia C-5060 wide zoom digital compact camera and a 40x/0.75 numerical aperture objective.

Methylated DNA immunoprecipitation combined with microarray (MeDIP-chip) or real-time PCR (MeDIP-PCR)

MeDIP was performed with genomic DNA from cells untreated or treated with 20nM decitabine for three days using the MagMeDIP kit (Diagenode, Liège, Belgium), following the manufacturer's instructions. For each cell type, three independent treatment and immunoprecipitation were prepared, and MeDIP-enriched DNA was amplified with the GenomePlex Complete Whole Genome Amplification (WGA) Kit (Sigma-Aldrich). DNA from three immunoprecipitations (IP) and was pooled for subsequent microarray analysis. Labeling, hybridization and scanning was performed in the department for genome analytics at the Helmholtz Center for Infection Research in Braunschweig, Germany. The enriched DNA and corresponding input genomic DNA was labeled with Cy3 and Cy5, respectively. Afterwards, Cy3 and Cy5-labeled DNAs were hybridized on Agilent custom mouse promoter microarrays (consisting of 560,769 probes covering all the annotated promoters, assembly build mm9) according to the Agilent Methylation Assay Protocol G4170-90012 (Agilent Technologies, Waldbronn, Germany). Signal intensity scanning and data analysis followed the instructions of the manufacturer. The methylation value of individual probes was defined by the $\log_2$ transformed ratio of Cy3 to Cy5 signal intensity ($\log_2$ ratio). The relative methylation status was

defined by different cut-offs for $\log_2$ ratio values. The primary data are available at Gene Expression Omnibus (GEO) with accession number GSE52199.

MeDIP-PCR was performed to validate selected targets showing differential methylation detected by MeDIP-chip. Three MeDIP-enriched DNA samples were used as template for RT-PCR to quantify the enrichment ratio of methylated targets in comparison to input DNA. RT-PCR was done using SYBR Green (Qiagen) on a StepOnePlus Real-Time PCR system (Applied Biosystems). Methylated DNA enrichment was determined with the $2^{-\Delta\Delta CT}$ method, and the input DNA was used to normalize the results. Primer sequences are listed below (F, forward; R, reverse). *Rpl37*: F, 5'-TAGTTCCTGTGGGTCCGAAG-3'; R, 5'-CATCACTCACCCACTTCCA-3'; *Stx6*: F, 5'-ATGATTGGTAGTGGCGAAGG-3'; R, 5'-GGTCCAGCAGTCGGTCAG-3'; *Surf1*: F, 5'-TCACAGCAGCCATCTTTGAG-3'; R, 5'-ACATCAGAGGGTGGTTCGTC-3'; *Cebpa*: F, 5'-CCTTCAACGACGAGTTCCTG-3'; R, 5'-TCCCGGGTAGTCAAAGTCAC-3'; *Lrrc45*: F, 5'-TGGGTACCTGTGTCTTGGTG-3'; R, 5'-GCACTCCACATCTGCCACTA-3'.

Bisulfite sequencing

Bisulfite sequencing was performed as previously described.[5] Briefly, genomic DNA was extracted using the Allprep DNA RNA kit (Qiagen) and 1 µg was bisulfite converted with the EZ DNA MethylationTM kit (Zymo Research, Freiburg, Germany). 50-100 ng bisulfite-converted DNA was amplified by touchdown PCR with specific primer sets using HotStarTaq DNA Polymerase (Qiagen) with cycling conditions as follows: 95°C for 15 minutes, then 10 cycles of 95°C for 30 seconds, 65°C for 30 seconds which was decreased by 1°C after each cycle, and 72°C for 30seconds, then 25 cycles of 95°C for 30 seconds, 55°C for 30 seconds, and 72°C for 30 seconds, followed by an extension step at 72°C for 10 minutes. Fresh PCR products were purified using the QIAquick gel extraction kit (Qiagen) and cloned into the pCR2.1-TOPO vector (Invitrogen, Darmstadt, Germany), and transformed into TOP10 chemically competent E.Coli cells (Invitrogen). Plasmid DNA was isolated using the QIAprep Spin Miniprep Kit (Qiagen) and sequenced using the M13 reverse primer by Sanger sequencing. 12-15 independent clones were sequenced per bisulfite treated sample. Primers used for amplication of bisulfite-treated DNA are listed below (F, forward; R, reverse).

Rpl37: F, 5'- GTTATATGATTGTTTTGGGATTTTA-3';
R, 5'-ATCCTCATCTCTAACAAACCTACTC-3';
Stx6: F, 5'-TTGTTTTTTTTAGGTAGTAGAAGAT-3';
R, 5'-AAAAAAATCCTCCATAAACATAAC-3';
Surf1: F, 5'-TTGAGTAGGATTTTTTTTGAATTTT-3';
R, 5'- CAAAAATAACTACTATAATAACTTTAACTA-3';
Lrrc45: F, 5'-TGGGAGATGTAGTTTTTATTTTTTT-3';
R, 5'-CTAATCTAACCCTATAACCCCCAAC-3';
Cebpa: F, 5'- GAGAATTTTAATTTTTTTATGGAGT-3';
R, 5'-TACAAAAACTCCAACCTACC-3'.

Gene ontology (GO) analysis

GO clustering analysis on the selected gene sets was performed with DAVID bioinformatics resource (http://david.abcc.ncifcrf.gov/).[8] The Functional Annotation Clustering module was used to generate a list of enriched gene ontology (GO) clusters, based on the enrichment score and calculated *P* value of each cluster.

Correlation of DNA methylation and gene expression levels in AML patients according to *MLL5* expression

Fifty four patients with core-binding-factor AML and 153 patients with cytogenetically normal AML out of a cohort of 344 AML patients, along with 8 CD34+ normal bone marrow samples, all with publicly available data sets of DNA methylation profiles (GEO accession number: GSE18700) and gene expression profiles (GEO accession number: GSE6891) were selected for the analysis. Details about their clinical profiles, assay description and data processing were previously described.[9-11] *MLL5* expression levels are represented by probe sets 223189_x_at and 223190_s_at from Affymetrix HG-U133 plus 2 GeneChips. Patients with *MLL5* expression in the upper and lower third were defined as high and low *MLL5* expressing patients for this analysis, respectively. DNA methylation profiles were generated by HpaII tiny fragment enrichment by ligation-mediated PCR (HELP) assay.[10,12,13] The methylation value of each probe from individual patients was defined by $\log_2$ transformation of the ratio of HpaII fragments

compared to MspI fragments (log_2 HpaII/MspI), usually a negative value. Differentially methylated probe sets between patients and CD34+ normal bone marrows were analyzed using R and Bioconductor using the LIMMA package.[14,15] Probe sets with an absolute difference in methylation above 2 and with *P*-value less than 0.01 corrected by Benjamini-Hochberg (BH) multiple t-testing were counted as differentially methylated probe sets. For supervised hierarchical clustering, the 50 most differentially methylated probe sets were selected.

Statistical analysis

All statistical analyses were performed with the GraphPad Prism 5 Software (Statcon, Witzenhausen, Germany) or the software package SPSS Version 17.0 (SPSS, Chicago, IL). The Kaplan-Meier method was used to estimate patients' overall survival, and the log-rank test was used to compare differences between survival curves. Pairwise comparisons were performed by Student's t-test or Kolmogorov-Smirnov test for continuous variables and by the chi-squared test for categorical variables. For multivariate analysis, a Cox proportional hazards model was constructed for adjusting for potential confounding covariates.[16] Variables considered for model inclusion were age, gender, type of AML (secondary after MDS or de novo), white blood cell count (above or below median), cytogenetic risk according to MRC criteria (high vs. intermediate),[17] mutation status of *NPM1*, *FLT3*, and *DNMT3A*, and expression levels of *MLL5*. Variables with $P \leq 0.2$ in univariate analysis for OS were included in the model. The two-tailed level of significance was set at *P* less than 0.05.

Supplementary Tables and Figures

Supplementary Table S1. Comparison of pretreatment characteristics of decitabine-treated patients according to *MLL5* expression levels

Characteristic	High *MLL5* (n = 29)	Low *MLL5* (n = 28)	*P*
Age, years			.95
median	70.6	70.7	
range	61 - 84	63 - 83	

Sex			.51
male - no. (%)	20 (69.0)	17 (60.7)	
female - no. (%)	9 (31.0)	11 (39.3)	
Peripheral blood blasts			.93
median	64	43	
range	32 - 92	30 - 74	
samples - no. (%)	3 (10.3)	4 (14.3)	
Bone marrow blasts			.67
median	48	48	
range	30 - 95	30 - 100	
samples - no. (%)	26 (89.7)	24 (85.7)	
Type of AML			.54
de novo - no. (%)	17 (58.6)	17 (60.7)	
post MDS - no. (%)	12 (41.4)	11 (39.3)	
ATRA treatment			.55
no ATRA - no. (%)	13 (44.8)	10 (35.7)	
with ATRA - no. (%)	9 (31.0)	11 (39.3)	
missing data - no. (%)	7 (24.1)	7 (25.0)	
WBC count			.9
median - ($x10^9$/l)	4.2	5.05	
range - ($x10^9$/l)	0.8 - 202	0.8 - 419	
Hemoglobin			.63
median - g/L	9.6	9.7	
range - g/L	5.7 - 113	7.6 - 109	
Platelet count			.86
median - ($x10^9$/l)	46	78	
range - ($x10^9$/l)	11 - 474	6 - 253	
LDH			.41
median - (U/l)	219	266	

range - (U/l)	92 - 1010	139 - 1056	
missing - no. (%)	1 (3.4)	0 (0)	
ECOG performance status			.33
0 - no. (%)	10 (34.5)	5 (17.9)	
1 - no. (%)	14 (48.3)	19 (67.8)	
2 - no. (%)	4 (13.8)	4 (14.3)	
3 - no. (%)	1 (3.4)	0 (0)	
Cytogenetic risk*			.1
favorable - no. (%)	0 (0)	0 (0)	
intermediate - no. (%)	19 (65.5)	15 (53.6)	
high - no. (%)	5 (17.2)	11 (39.3)	
missing - no. (%)	5 (17.2)	2 (7.1)	
NPM1			.67
mutated - no. (%)	3 (10.3)	2 (7.1)	
missing - no. (%)	1 (3.4)	1 (3.6)	
FLT3-ITD - no. (%)	2 (6.9)	1 (3.6)	.57
missing - no. (%)	1 (3.4)	1 (3.6)	
DNMT3A			.16
mutated - no. (%)	1 (3.4)	4 (14.3)	
missing - no. (%)	1 (3.4)	0 (0)	
Best response			.37
CR - no. (%)	4 (13.8)	3 (10.7)	
PR - no. (%)	4 (13.8)	5 (17.9)	
ALE - no. (%)	10 (34.5)	5 (17.9)	
SD - no. (%)	5 (17.2)	8 (28.6)	
PD - no. (%)	4 (13.8)	1 (3.6)	
ED - no. (%)	1 (3.4)	4 (14.3)	
missing data - no. (%)	1 (3.4)	2 (7.1)	

P indicates *P* value from two-sided Chi-squared tests for categorical variables and from two-sided Kolmogorov-Smirnov tests for continuous variables; ATRA, all-trans retinoic

acid; WBC, white blood cell count; LDH, lactate dehydrogenase; ECOG, performance status of the Eastern Cooperative Oncology Group; CR, complete response; PR, partial response; ALE, antileukemic effect, defined as a greater than 25% reduction of bone marrow blasts relative to the initial blast percentage but not enough to fulfill the criteria for a partial remission; SD, stable disease; PD, progressive disease; ED, early death.

*Cytogenetic risk was defined according to MRC criteria.[17]

Supplementary Table S2. Comparison of pretreatment characteristics of patients treated with 3 or more decitabine courses with high or low *MLL5* expression levels.

Characteristic	High *MLL5* (n = 18)	Low *MLL5* (n = 15)	*P*
Age, years			.55
median	70.9	70.6	
range	65 - 79	63 - 83	
Sex			.94
male - no. (%)	13 (72.2)	11 (73.3)	
female - no. (%)	5 (27.8)	4 (26.7)	
Peripheral blood blasts			
value	64	48	
samples - no. (%)	1 (5.6)	1 (6.7)	
Bone marrow blasts			.36
median	45	49	
range	31 - 90	30 - 100	
samples - no. (%)	17 (94.4)	14 (93.3)	
Type of AML			.52
de novo - no. (%)	10 (55.6)	10 (66.7)	
post MDS - no. (%)	8 (44.4)	5 (33.3)	
ATRA treatment			.06
no ATRA - no. (%)	9 (50.0)	3 (20.0)	

with ATRA - no. (%)	5 (27.8)	9 (60.0)	
missing data - no. (%)	4 (22.2)	3 (20.0)	
WBC count			.45
median - ($x10^9$/l)	3.4	3.4	
range - ($x10^9$/l)	0.8 - 92	0.8 - 419	
Hemoglobin			.44
median - g/L	9.55	10.7	
range - g/L	5.7 - 109	7.6 - 109	
Platelet count			.77
median - ($x10^9$/l)	65.5	84	
range - ($x10^9$/l)	13 - 474	6 - 253	
LDH			.43
median - (U/l)	216	258	
range - (U/l)	131 - 542	174 - 1056	
missing - no. (%)	1 (5.6)	0 (0)	
ECOG performance status			.11
0 - no. (%)	7 (38.9)	2 (13.3)	
1 - no. (%)	8 (44.4)	12 (80.0)	
2 - no. (%)	3 (16.7)	1 (6.7)	
Cytogenetic risk*			.23
favorable - no. (%)	0 (0)	0 (0)	
intermediate - no. (%)	12 (66.7)	7 (46.7)	
high - no. (%)	4 (22.2)	6 (40)	
missing - no. (%)	2 (11.1)	2 (13.3)	
NPM1			.84
mutated - no. (%)	2 (11.1)	2 (13.3)	
missing - no. (%)	1 (5.6)	1 (6.7)	
FLT3-ITD - no. (%)	2 (11.1)	1 (6.7)	.67
missing - no. (%)	1 (5.6)	1 (6.7)	

DNMT3A			.27
mutated - no. (%)	0 (0)	1 (6.7)	
missing - no. (%)	0 (0)	0 (0)	
Best response			.29
CR - no. (%)	4 (22.2)	3 (20.0)	
PR - no. (%)	3 (16.7)	5 (33.3)	
ALE - no. (%)	7 (38.9)	2 (13.3)	
SD - no. (%)	3 (16.7)	3 (20.0)	
PD - no. (%)	1 (5.6)	0 (0)	
missing data - no. (%)	0 (0)	2 (13.3)	

Abbreviations and symbols are explained in Supplementary Table S1.

*Cytogenetic risk was defined according to MRC criteria.[17]

Supplementary Table S3. Univariate and multivariate analysis for OS in patients receiving 3 or more cycles of decitabine.

	OS Univariate analysis			**OS Multivariate analysis**		
	HR	95% CI	P	HR	95% CI	P
***MLL5* high vs. low**	0.35	0.14-0.82	.016	0.37	0.14-0.98	.046
Cytogenetic risk high vs. intermediate	2.67	0.88-8.11	.082	2.4	0.78-7.41	.13

NOTE. Hazard ratios greater than 1 indicate an increased risk of an event for the first category listed. **Abbreviations:** OS, overall survival; HR, hazard ratio; CI, confidence interval; ECOG, performance status of the Eastern Cooperative Oncology Group.

Supplementary Table S4. List of genes with 2 or more promoters differentially responsive to decitabine-induced DNA demethylation between Mll5 wildtype and knockout cells revealed by MeDIP-chip. See attached excel table.

(A) List of 2478 genes that were differentially demethylated upon DAC treatment in Mll5 wildtype cells.

Gene Name	Refseq ID	Gene Description
A3GALT2	NM_001080438.1	Alpha 1,3-galactosyltransferase 2 (isoglobotriaosylceramide
AA409316		
AA960436		
AACS	NM_023928	Acetoacetyl-CoA synthetase
AADACL1	NM_020792	Arylacetamide deacetylase-like 1
AAK1	NM_014911.3	AP2 associated kinase 1
Aard		
AATK	NM_001080395.1	Apoptosis-associated tyrosine kinase
AB124611		
Abca14		
ABCA5	NM_018672	ATP-binding cassette, sub-family A (ABC1), member 5
ABCC10	NM_033450	ATP-binding cassette, sub-family C (CFTR/MRP), member 10
ABCC5	NM_001023587	ATP-binding cassette, sub-family C (CFTR/MRP), member 5
ABCF3	NM_018358	ATP-binding cassette, sub-family F (GCN20), member 3
ABCG1	NM_004915	ATP-binding cassette, sub-family G (WHITE), member 1
ABCG4	NM_022169	ATP-binding cassette, sub-family G (WHITE), member 4
ABHD1	NM_032604	Abhydrolase domain containing 1
ABHD11		Abhydrolase domain containing 11
ABHD13	NM_032859	Abhydrolase domain containing 13
ABHD14A	NM_015407	Abhydrolase domain containing 14A
ABHD6		Abhydrolase domain containing 6
ABI3	NM_016428	ABI gene family, member 3
ABL1	NM_005157	V-abl Abelson murine leukemia viral oncogene homolog 1
Abpz		
ABRA	NM_139166	Actin-binding Rho activating protein
ABTB2	NM_032184.1	Ankyrin repeat and BTB (POZ) domain containing 2
ACADL	NM_001608	Acyl-Coenzyme A dehydrogenase, long chain
ACADVL	NM_000018	Acyl-Coenzyme A dehydrogenase, very long chain
ACBD4	NM_024722.1	Acyl-Coenzyme A binding domain containing 4
ACBD5	NM_001042473.1	Acyl-Coenzyme A binding domain containing 5
ACCN1	NM_001094.4	Amiloride-sensitive cation channel 1, neuronal (degenerin)
ACCN2	NM_020039	Amiloride-sensitive cation channel 2, neuronal
ACCN3	NM_002719	Amiloride-sensitive cation channel 3
ACD	NM_001082486.1	Adrenocortical dysplasia homolog (mouse)
ACE	NM_001765	Angiotensin I converting enzyme (peptidyl-dipeptidase A) 1
ACOT12	NM_130767	Acyl-CoA thioesterase 12
ACOT7	NM_007274	Acyl-CoA thioesterase 7
ACP1	NM_033450	Acid phosphatase 1, soluble
ACSBG1	NM_015162	Acyl-CoA synthetase bubblegum family member 1
ACSBG2	NM_030924	Acyl-CoA synthetase bubblegum family member 2
ACSL6	NM_001009185	Acyl-CoA synthetase long-chain family member 6
ACTB		Actin, beta
ACTN3	NM_001104.1	Actinin, alpha 3
ACY3	NM_080658	Aspartoacylase (aminocyclase) 3

ADAM11	NM_002390	ADAM metallopeptidase domain 11
ADAM22	NM_004194.2	ADAM metallopeptidase domain 22
ADAMTS10	NM_030957	ADAM metallopeptidase with thrombospondin type 1 motif, 10
ADAMTS13	NM_139025	ADAM metallopeptidase with thrombospondin type 1 motif, 13
ADAMTS15	NM_139055	ADAM metallopeptidase with thrombospondin type 1 motif, 15
ADAMTS4	NM_005099	ADAM metallopeptidase with thrombospondin type 1 motif, 4
ADAMTS8	NM_007037.4	ADAM metallopeptidase with thrombospondin type 1 motif, 8
ADAMTS9	NM_182920	ADAM metallopeptidase with thrombospondin type 1 motif, 9
ADAMTSL4	NM_019032	ADAMTS-like 4
ADAR	NM_001025107	Adenosine deaminase, RNA-specific
Adat3		
ADC		Arginine decarboxylase
ADCY7	NM_001114	Adenylate cyclase 7
ADCYAP1R1	NM_001118	Adenylate cyclase activating polypeptide 1 (pituitary) receptor type
ADH7	NM_000673	Alcohol dehydrogenase 7 (class IV), mu or sigma polypeptide
ADO	NM_032804	2-aminoethanethiol (cysteamine) dioxygenase
ADORA1	NM_000674	Adenosine A1 receptor
ADORA3	NM_000677	Adenosine A3 receptor
ADPRH	NM_001125	ADP-ribosylarginine hydrolase
ADPRHL1	NM_138430	ADP-ribosylhydrolase like 1
ADRA2C	NM_000683.3	Adrenergic, alpha-2C-, receptor
ADRB3	NM_000025	Adrenergic, beta-3-, receptor
ADRBK1	NM_001619	Adrenergic, beta, receptor kinase 1
ADSSL1		Adenylosuccinate synthase like 1
AF251705		
AFF1	NM_005935	AF4/FMR2 family, member 1
AGPAT1		1-acylglycerol-3-phosphate O-acyltransferase 1
AGPAT2	NM_001012727	1-acylglycerol-3-phosphate O-acyltransferase 2
AGPAT3	NM_001037553	1-acylglycerol-3-phosphate O-acyltransferase 3
AGPAT7	NM_153613	1-acylglycerol-3-phosphate O-acyltransferase 7
AGPS	NM_003659	Alkylglycerone phosphate synthase
AGRP	NM_001138	Agouti related protein homolog (mouse)
AHDC1	NM_001029882	AT hook, DNA binding motif, containing 1
AHR	NM_001621	Aryl hydrocarbon receptor
AI132487		
AI593442		
AI595406		
AI836003		
AICDA	NM_020661.1	Activation-induced cytidine deaminase
AIP	NM_003977	Aryl hydrocarbon receptor interacting protein
AJAP1	NM_001042478.1	Adherens junction associated protein 1
AK122525		
AK2	NM_001625	Adenylate kinase 2
AKAP8	NM_005858	A kinase (PRKA) anchor protein 8
AKAP8L	NM_014371.2	A kinase (PRKA) anchor protein 8-like
AKAP9	NM_005751	A kinase (PRKA) anchor protein (yotiao) 9
Akp3		
Akr7a5		
ALAS1	NM_000688	Aminolevulinate, delta-, synthase 1

ALDH2	NM_000690	Aldehyde dehydrogenase 2 family (mitochondrial)
ALDH3B1	NM_000694.2	Aldehyde dehydrogenase 3 family, member B1
ALDH4A1	NM_003748	Aldehyde dehydrogenase 4 family, member A1
ALDH6A1	NM_005589	Aldehyde dehydrogenase 6 family, member A1
ALDH7A1	NM_001182	Aldehyde dehydrogenase 7 family, member A1
ALDOA	NM_001033049.1	Aldolase A, fructose-bisphosphate
ALDOC	NM_005165	Aldolase C, fructose-bisphosphate
ALG12	NM_024105	Asparagine-linked glycosylation 12 homolog (S. cerevisiae, alpha-1,6-mannosyltransferase)
ALG8	NM_001007027.2	Asparagine-linked glycosylation 8 homolog (S. cerevisiae, alpha-1,3-glucosyltransferase)
ALKBH2	NM_001001655	AlkB, alkylation repair homolog 2 (E. coli)
ALOX12	NM_000697	Arachidonate 12-lipoxygenase
ALOX15	NM_001140	Arachidonate 15-lipoxygenase
ALOXE3	NM_021628	Arachidonate lipoxygenase 3
ALS2CL		ALS2 C-terminal like
ALS2CR13	NM_173511	Amyotrophic lateral sclerosis 2 (juvenile) chromosome region,
ALS2CR4	NM_001044385.1	Amyotrophic lateral sclerosis 2 (juvenile) chromosome region,
AMBP	NM_001124	Alpha-1-microglobulin/bikunin precursor
AMDHD2	NM_015944	Amidohydrolase domain containing 2
AMH	NM_000479	Anti-Mullerian hormone
AMHR2	NM_020547	Anti-Mullerian hormone receptor, type II
AMMECR1	NM_001025580	Alport syndrome, mental retardation, midface hypoplasia and elliptocytosis chromosomal region, gene 1
AMOT	NM_133265	Angiomotin
ANGEL1	NM_015305	Angel homolog 1 (Drosophila)
ANK3	NM_001149	Ankyrin 3, node of Ranvier (ankyrin G)
ANKRD13D	NM_207354	Ankyrin repeat domain 13 family, member D
Ankrd39		
ANKS3	NM_133450	Ankyrin repeat and sterile alpha motif domain containing 3
ANP32B	NM_006401	Acidic (leucine-rich) nuclear phosphoprotein 32 family, member B
ANXA5	NM_001154	Annexin A5
ANXA6	NM_001155.3	Annexin A6
AOF2	NM_015013	Amine oxidase (flavin containing) domain 2
AP2A2	NM_012305.2	Adaptor-related protein complex 2, alpha 2 subunit
AP3B2	NM_004644.3	Adaptor-related protein complex 3, beta 2 subunit
AP4M1		Adaptor-related protein complex 4, mu 1 subunit
APBA1	NM_001136	Amyloid beta (A4) precursor protein-binding, family A, member 1
APITD1	NM_001302	Apoptosis-inducing, TAF9-like domain 1
APOE		Apolipoprotein E
APOH	NM_000042	Apolipoprotein H (beta-2-glycoprotein I)
AQP1	NM_198098	Aquaporin 1 (Colton blood group)
Aqp12		
AQP3	NM_004925	Aquaporin 3 (Gill blood group)
AQP5	NM_001625	Aquaporin 5
ARF1	NM_001024226	ADP-ribosylation factor 1
ARF3	NM_001659	ADP-ribosylation factor 3
ARF5	NM_001662	ADP-ribosylation factor 5
ARFGAP1	NM_018209	ADP-ribosylation factor GTPase activating protein 1

ARHGAP17	NM_001006634	Rho GTPase activating protein 17
Arhgap4		
ARHGDIA	NM_004309	Rho GDP dissociation inhibitor (GDI) alpha
ARHGDIB	NM_001175	Rho GDP dissociation inhibitor (GDI) beta
ARHGEF10L	NM_001011722	Rho guanine nucleotide exchange factor (GEF) 10-like
Arl5c		
ARL6	NM_032146	ADP-ribosylation factor-like 6
ARL6IP1	NM_015161	ADP-ribosylation factor-like 6 interacting protein 1
ARL6IP2	NM_022374	ADP-ribosylation factor-like 6 interacting protein 2
ARL6IP6	NM_152522	ADP-ribosylation-like factor 6 interacting protein 6
ARL8B	NM_018184	ADP-ribosylation factor-like 8B
ARNT	NM_001668	Aryl hydrocarbon receptor nuclear translocator
Arpp21		
ARRDC5	NM_001080523.1	Arrestin domain containing 5
ART3	NM_001179	ADP-ribosyltransferase 3
ASAH1	NM_004304	N-acylsphingosine amidohydrolase (acid ceramidase) 1
ASCL1	NM_004316	Achaete-scute complex homolog 1 (Drosophila)
ASCL2	NM_001139	Achaete-scute complex homolog 2 (Drosophila)
ASPH	NM_004318	Aspartate beta-hydroxylase
ASPSCR1	NM_024083	Alveolar soft part sarcoma chromosome region, candidate 1
ATCAY	NM_033064.3	Ataxia, cerebellar, Cayman type (caytaxin)
ATF2	NM_001880	Activating transcription factor 2
ATG12	NM_004707	ATG12 autophagy related 12 homolog (S. cerevisiae)
ATG2A	NM_015104	ATG2 autophagy related 2 homolog A (S. cerevisiae)
ATG9B	NM_000603	ATG9 autophagy related 9 homolog B (S. cerevisiae)
ATN1	NM_001007026	Atrophin 1
ATP12A	NM_001676	ATPase, H+/K+ transporting, nongastric, alpha polypeptide
ATP1A3	NM_152296	ATPase, Na+/K+ transporting, alpha 3 polypeptide
ATP4A	NM_000704	ATPase, H+/K+ exchanging, alpha polypeptide
ATP4B	NM_000705	ATPase, H+/K+ exchanging, beta polypeptide
ATP5E	NM_001001977	ATP synthase, H+ transporting, mitochondrial F1 complex, epsilon
ATP5F1	NM_001688	ATP synthase, H+ transporting, mitochondrial F0 complex,
ATP5G3	NM_001002258	ATP synthase, H+ transporting, mitochondrial F0 complex,
ATP5H	NM_001003785	ATP synthase, H+ transporting, mitochondrial F0 complex,
ATP5J		ATP synthase, H+ transporting, mitochondrial F0 complex,
ATP5J2		ATP synthase, H+ transporting, mitochondrial F0 complex,
ATP5S	NM_001003803	ATP synthase, H+ transporting, mitochondrial F0 complex,
Atp5sl		
ATP6AP2	NM_005765	ATPase, H+ transporting, lysosomal accessory protein 2
ATP6V0A4	NM_020632	ATPase, H+ transporting, lysosomal V0 subunit a4
ATP6V0B	NM_001039457.1	ATPase, H+ transporting, lysosomal 21kDa, V0 subunit b
ATP6V0D1	NM_004691	ATPase, H+ transporting, lysosomal 38kDa, V0 subunit d1
ATPBD1B	NM_018066	ATP binding domain 1 family, member B
ATPBD1C	NM_016301	ATP binding domain 1 family, member C
ATXN2L	NM_007245	Ataxin 2-like
AU022751		
AU042651		
AUP1	NM_181575.3	Ancient ubiquitous protein 1
AW549877		

AW555464		
AXIN1		Axin 1
AXIN2	NM_004655	Axin 2 (conductin, axil)
B230208H17Rik		
B230209C24Rik		
B230396O12Rik		
B3GAT1	NM_018644	Beta-1,3-glucuronyltransferase 1 (glucuronosyltransferase P)
B3GNT4	NM_030765	UDP-GlcNAc:betaGal beta-1,3-N-acetylglucosaminyltransferase 4
B4GALT7	NM_000348.3	Xylosylprotein beta 1,4-galactosyltransferase, polypeptide 7
B930041F14Rik		
BACE1	NM_012104	Beta-site APP-cleaving enzyme 1
BAD		BCL2-antagonist of cell death
BAG1	NM_007347	BCL2-associated athanogene
BAHD1	NM_014952	Bromo adjacent homology domain containing 1
BAIAP2		BAI1-associated protein 2
BAIAP2L2	NM_025045.4	BAI1-associated protein 2-like 2
BAK1	NM_001188	BCL2-antagonist/killer 1
BAMBI	NM_012342	BMP and activin membrane-bound inhibitor homolog (Xenopus
BANF1	NM_003860	Barrier to autointegration factor 1
BARX2	NM_003658	BARX homeobox 2
Bat1a		
BAT2	NM_080686	HLA-B associated transcript 2
BATF	NM_006399	Basic leucine zipper transcription factor, ATF-like
BAZ2A	NM_013449.3	Bromodomain adjacent to zinc finger domain, 2A
BC004728		
BC006662		
BC017158		
BC021381		
BC021614		
BC022623		
BC022651		
BC024997		
BC025546		
BC026590		
BC029214		
BC030183		
BC037034		
BC043098		
BC052040		
BC052484		
BC055111		
BC055324		
BC056923		
BC057893		
BC060632		
BC061039		
BC065085		
BC066135		
BC068157		

BC107230		
BCAN	NM_021948	Brevican
BCAS2	NM_005872	Breast carcinoma amplified sequence 2
BCKDHA	NM_000709	Branched chain keto acid dehydrogenase E1, alpha polypeptide
BCKDK	NM_005881	Branched chain ketoacid dehydrogenase kinase
BCL10	NM_003921	B-cell CLL/lymphoma 10
BCL2L13	NM_015367	BCL2-like 13 (apoptosis facilitator)
BCL7B	NM_001707	B-cell CLL/lymphoma 7B
BDKRB1	NM_000710	Bradykinin receptor B1
BDP1	NM_018429.2	B double prime 1, subunit of RNA polymerase III transcription
BET1L	NM_001098787.1	Blocked early in transport 1 homolog (S. cerevisiae)-like
BFSP1	NM_001195	Beaded filament structural protein 1, filensin
BHLHB8	NM_177455	Basic helix-loop-helix domain containing, class B, 8
BICD2	NM_001003800	Bicaudal D homolog 2 (Drosophila)
BIRC6	NM_016252	Baculoviral IAP repeat-containing 6 (apollon)
BIVM	NM_017693	Basic, immunoglobulin-like variable motif containing
BLOC1S1	NM_001487	Biogenesis of lysosome-related organelles complex-1, subunit 1
BMP1	NM_001655	Bone morphogenetic protein 1
BMP15	NM_000306	Bone morphogenetic protein 15
BMP6	NM_001718	Bone morphogenetic protein 6
BMP8B	NM_001661	Bone morphogenetic protein 8b (osteogenic protein 2)
BNIPL	NM_138278	BCL2/adenovirus E1B 19kD interacting protein like
BOC	NM_033254	Boc homolog (mouse)
BOK	NM_032515	BCL2-related ovarian killer
BOLA3	NM_001035505	BolA homolog 3 (E. coli)
BOLL	NM_033030	Bol, boule-like (Drosophila)
BRD2		Bromodomain containing 2
BRD7	NM_013263	Bromodomain containing 7
BST2	NM_004335	Bone marrow stromal cell antigen 2
BTBD14A	NM_144653	BTB (POZ) domain containing 14A
BTBD3	NM_014962	BTB (POZ) domain containing 3
BTBD9	NM_001099272.1	BTB (POZ) domain containing 9
BTG4		B-cell translocation gene 4
BUB1B	NM_001211	BUB1 budding uninhibited by benzimidazoles 1 homolog beta
BXDC5	NM_025065	Brix domain containing 5
BYSL	NM_004053	Bystin-like
C130034I18Rik		
C1GALT1C1	NM_001011551	C1GALT1-specific chaperone 1
C1QB		Complement component 1, q subcomponent, B chain
C1qdc2		
C1QL3	NM_001010908	Complement component 1, q subcomponent-like 3
C1QTNF5	NM_015645	C1q and tumor necrosis factor related protein 5
C1RL	NM_016546	Complement component 1, r subcomponent-like
C230081A13Rik		
C230094A16Rik		
C230096C10Rik		
C2CD3	NM_015531	C2 calcium-dependent domain containing 3
C330005M16Rik		
C430004E15Rik		

C630004H02Rik		
C630035N08Rik		
C77080		
C79127		
C920005C14Rik		
CABIN1	NM_012295	Calcineurin binding protein 1
CABLES2	NM_031215	Cdk5 and Abl enzyme substrate 2
CABP4	NM_145200	Calcium binding protein 4
CACNA1B	NM_000718.1	Calcium channel, voltage-dependent, N type, alpha 1B subunit
CACNA1D	NM_000720	Calcium channel, voltage-dependent, L type, alpha 1D subunit
CACNA1E	NM_000721.2	Calcium channel, voltage-dependent, R type, alpha 1E subunit
CACNA1F	NM_005183	Calcium channel, voltage-dependent, L type, alpha 1F subunit
CACNA1H	NM_001005407.1	Calcium channel, voltage-dependent, T type, alpha 1H subunit
CACNA2D4	NM_172364.4	Calcium channel, voltage-dependent, alpha 2/delta subunit 4
CACNB1	NM_000723.3	Calcium channel, voltage-dependent, beta 1 subunit
CACNB3	NM_000725	Calcium channel, voltage-dependent, beta 3 subunit
CACNG1	NM_000727	Calcium channel, voltage-dependent, gamma subunit 1
CADM1	NM_014333	Cell adhesion molecule 1
CADPS	NM_003716.2	Ca2+-dependent secretion activator
CADPS2	NM_001009571.2	Ca2+-dependent activator protein for secretion 2
CALB2	NM_001740	Calbindin 2, 29kDa (calretinin)
CALD1	NM_000702	Caldesmon 1
CALM3	NM_012069	Calmodulin 3 (phosphorylase kinase, delta)
Caly		
CAMK2B	NM_001220	Calcium/calmodulin-dependent protein kinase (CaM kinase) II
CAMKK2	NM_006549	Calcium/calmodulin-dependent protein kinase kinase 2, beta
CAMTA2	NM_015099	Calmodulin binding transcription activator 2
CANX	NM_001024649	Calnexin
CAP1	NM_006367.2	CAP, adenylate cyclase-associated protein 1 (yeast)
CAPN1	NM_001001937	Calpain 1, (mu/I) large subunit
CAPN5	NM_004055	Calpain 5
CAPN7	NM_001098844.1	Calpain 7
CAPZB	NM_004930.2	Capping protein (actin filament) muscle Z-line, beta
Car8		
CARD11	NM_032415	Caspase recruitment domain family, member 11
CARM1	NM_199141	Coactivator-associated arginine methyltransferase 1
CARS	NM_001001973	Cysteinyl-tRNA synthetase
Caskin1		
CASQ1	NM_001231	Calsequestrin 1 (fast-twitch, skeletal muscle)
CBR3	NM_001236	Carbonyl reductase 3
CBS	NM_000071	Cystathionine-beta-synthase
CBX4	NM_002560	Chromobox homolog 4 (Pc class homolog, Drosophila)
CBX5	NM_012117	Chromobox homolog 5 (HP1 alpha homolog, Drosophila)
CBX7	NM_175709	Chromobox homolog 7
CCDC104	NM_080667	Coiled-coil domain containing 104
CCDC109B	NM_017918	Coiled-coil domain containing 109B
CCDC12	NM_144716	Coiled-coil domain containing 12
CCDC123		Coiled-coil domain containing 123
CCDC124	NM_138442	Coiled-coil domain containing 124

CCDC126	NM_138771	Coiled-coil domain containing 126
CCDC21	NM_022778	Coiled-coil domain containing 21
CCDC51	NM_024661	Coiled-coil domain containing 51
CCDC72		Coiled-coil domain containing 72
CCDC79		Coiled-coil domain containing 79
CCDC85A	NM_001080433.1	Coiled-coil domain containing 85A
CCDC94	NM_018074	Coiled-coil domain containing 94
CCL22	NM_002990	Chemokine (C-C motif) ligand 22
CCND3	NM_000707	Cyclin D3
CCNG1	NM_004060	Cyclin G1
CCNH	NM_001239	Cyclin H
CCNL1		Cyclin L1
CCR10	NM_016602	Chemokine (C-C motif) receptor 10
CCR7	NM_001838	Chemokine (C-C motif) receptor 7
CCR8	NM_005201	Chemokine (C-C motif) receptor 8
CCT5	NM_012073	Chaperonin containing TCP1, subunit 5 (epsilon)
CCT8	NM_006585	Chaperonin containing TCP1, subunit 8 (theta)
CD248	NM_020404	CD248 molecule, endosialin
CD27	NM_001242	CD27 molecule
CD2AP	NM_012120	CD2-associated protein
CD33	NM_001082618.1	CD33 molecule
CD5	NM_018644	CD5 molecule
CD63		CD63 molecule
CD68	NM_001040059.1	CD68 molecule
CD79A	NM_001783	CD79a molecule, immunoglobulin-associated alpha
CD8A	NM_001005417	CD8a molecule
CDC27	NM_001256	Cell division cycle 27 homolog (S. cerevisiae)
CDC34	NM_004359	Cell division cycle 34 homolog (S. cerevisiae)
CDC42BPB	NM_006035	CDC42 binding protein kinase beta (DMPK-like)
CDC42EP3	NM_001039	CDC42 effector protein (Rho GTPase binding) 3
CDC42EP4	NM_012121	CDC42 effector protein (Rho GTPase binding) 4
CDC42SE1	NM_001038707	CDC42 small effector 1
CDC73	NM_024529	Cell division cycle 73, Paf1/RNA polymerase II complex component, homolog (S. cerevisiae)
CDCA2	NM_152562	Cell division cycle associated 2
CDCA5	NM_080668	Cell division cycle associated 5
CDCP2	NM_201546	CUB domain containing protein 2
CDH1	NM_004360	Cadherin 1, type 1, E-cadherin (epithelial)
CDH13	NM_001257.3	Cadherin 13, H-cadherin (heart)
CDH15	NM_004933	Cadherin 15, M-cadherin (myotubule)
CDH22	NM_021248	Cadherin-like 22
CDH5	NM_001795	Cadherin 5, type 2, VE-cadherin (vascular epithelium)
CDH6	NM_020993	Cadherin 6, type 2, K-cadherin (fetal kidney)
CDH8	NM_001796	Cadherin 8, type 2
CDK5RAP1	NM_016082.3	CDK5 regulatory subunit associated protein 1
CDKN1A	NM_000389	Cyclin-dependent kinase inhibitor 1A (p21, Cip1)
CDKN1B	NM_004064	Cyclin-dependent kinase inhibitor 1B (p27, Kip1)
CDS2	NM_003818	CDP-diacylglycerol synthase (phosphatidate cytidylyltransferase)
CDX1	NM_001804	Caudal type homeobox 1

CEBPE	NM_001805	CCAAT/enhancer binding protein (C/EBP), epsilon
CEL	NM_001807.3	Carboxyl ester lipase (bile salt-stimulated lipase)
CELSR2	NM_000740	Cadherin, EGF LAG seven-pass G-type receptor 2 (flamingo
CEND1	NM_016564	Cell cycle exit and neuronal differentiation 1
CENPE	NM_000712	Centromere protein E, 312kDa
CENTA1	NM_003615	Centaurin, alpha 1
CENTA2	NM_018404	Centaurin, alpha 2
CENTB1	NM_014716	Centaurin, beta 1
CENTG2	NM_001037131	Centaurin, gamma 2
CEP250	NM_001035518	Centrosomal protein 250kDa
CETN2	NM_004344	Centrin, EF-hand protein, 2
CFLAR		CASP8 and FADD-like apoptosis regulator
CHAF1A	NM_005483	Chromatin assembly factor 1, subunit A (p150)
CHCHD4	NM_001098502.1	Coiled-coil-helix-coiled-coil-helix domain containing 4
CHCHD6		Coiled-coil-helix-coiled-coil-helix domain containing 6
CHCHD7	NM_001011667.1	Coiled-coil-helix-coiled-coil-helix domain containing 7
CHIC1	NM_001039840	Cysteine-rich hydrophobic domain 1
Chkb		
CHMP4C	NM_152284	Chromatin modifying protein 4C
CHRD	NM_003741	Chordin
CHRNA4	NM_000744	Cholinergic receptor, nicotinic, alpha 4
CHRNG	NM_005199	Cholinergic receptor, nicotinic, gamma
CHST1	NM_003654	Carbohydrate (keratan sulfate Gal-6) sulfotransferase 1
CHST2	NM_004267	Carbohydrate (N-acetylglucosamine-6-O) sulfotransferase 2
CHTF18	NM_022092.1	CTF18, chromosome transmission fidelity factor 18 homolog (S.
CIB1	NM_014363	Calcium and integrin binding 1 (calmyrin)
CIC	NM_015125	Capicua homolog (Drosophila)
CIDEA		Cell death-inducing DFFA-like effector a
CIDEC	NM_022094	Cell death-inducing DFFA-like effector c
CISD1	NM_018464	CDGSH iron sulfur domain 1
CISD2	NM_001008388	CDGSH iron sulfur domain 2
CIT	NM_007174	Citron (rho-interacting, serine/threonine kinase 21)
CKB		Creatine kinase, brain
Ckmt1		
CLDN1	NM_021101	Claudin 1
CLDN10	NM_006984	Claudin 10
CLDN11		Claudin 11 (oligodendrocyte transmembrane protein)
CLDN19	NM_148960	Claudin 19
CLDN6	NM_021195	Claudin 6
CLDN9		Claudin 9
CLEC11A	NM_002975	C-type lectin domain family 11, member A
CLEC14A	NM_175060	C-type lectin domain family 14, member A
CLEC4F	NM_173535	C-type lectin domain family 4, member F
CLK3		CDC-like kinase 3
CLN3	NM_000086	Ceroid-lipofuscinosis, neuronal 3, juvenile (Batten, Spielmeyer-
CLPP		ClpP caseinolytic peptidase, ATP-dependent, proteolytic subunit
CLPTM1	NM_001294	Cleft lip and palate associated transmembrane protein 1
CLSTN2	NM_022131	Calsyntenin 2

CMAH		Cytidine monophosphate-N-acetylneuraminic acid hydroxylase (CMP-N-acetylneuraminate monooxygenase)
CNBP	NM_001033081	CCHC-type zinc finger, nucleic acid binding protein
CNKSR1	NM_001083592.1	Connector enhancer of kinase suppressor of Ras 1
CNN1	NM_001299	Calponin 1, basic, smooth muscle
CNNM2	NM_017649.3	Cyclin M2
CNR2	NM_001841	Cannabinoid receptor 2 (macrophage)
CNTN1	NM_001843	Contactin 1
CNTROB	NM_001037144	Centrobin, centrosomal BRCA2 interacting protein
COASY	NM_001042529.1	Coenzyme A synthase
Cobra1		
COCH	NM_004086	Coagulation factor C homolog, cochlin (Limulus polyphemus)
COG4	NM_015386	Component of oligomeric golgi complex 4
COL11A2	NM_080679	Collagen, type XI, alpha 2
COL16A1	NM_001856.3	Collagen, type XVI, alpha 1
COL23A1	NM_173465.2	Collagen, type XXIII, alpha 1
COL7A1	NM_000094	Collagen, type VII, alpha 1 (epidermolysis bullosa, dystrophic, dominant and recessive)
COL9A2	NM_001852	Collagen, type IX, alpha 2
COMMD4	NM_017828	COMM domain containing 4
COMMD7	NM_001099339.1	COMM domain containing 7
COPB2	NM_001033556.1	Coatomer protein complex, subunit beta 2 (beta prime)
COPG	NM_016128	Coatomer protein complex, subunit gamma
COPS4		COP9 constitutive photomorphogenic homolog subunit 4
COPS8	NM_005073	COP9 constitutive photomorphogenic homolog subunit 8
COPZ2	NM_016429.2	Coatomer protein complex, subunit zeta 2
COQ3		Coenzyme Q3 homolog, methyltransferase (S. cerevisiae)
CORIN		Corin, serine peptidase
Corl2		
CORO6	NM_032854	Coronin 6
COX19	NM_001031617	COX19 cytochrome c oxidase assembly homolog (S. cerevisiae)
COX4I1	NM_001861	Cytochrome c oxidase subunit IV isoform 1
COX4NB	NM_006067	COX4 neighbor
COX7B	NM_001866	Cytochrome c oxidase subunit VIIb
Cox8b		
CPEB1	NM_001079533.1	Cytoplasmic polyadenylation element binding protein 1
CPLX1	NM_006651.3	Complexin 1
CPNE8	NM_153634	Copine VIII
CPSF3	NM_016207	Cleavage and polyadenylation specific factor 3, 73kDa
CPSF4L		Cleavage and polyadenylation specific factor 4-like
CPT1C	NM_152359	Carnitine palmitoyltransferase 1C
CREB5	NM_001011666.1	CAMP responsive element binding protein 5
CRHR2	NM_001005407.1	Corticotropin releasing hormone receptor 2
CRTC1	NM_001098482.1	CREB regulated transcription coactivator 1
CRTC2	NM_181715	CREB regulated transcription coactivator 2
CRY1		Cryptochrome 1 (photolyase-like)
CRYBA2	NM_005209	Crystallin, beta A2
CRYM	NM_001014444.1	Crystallin, mu
CRYZL1	NM_145858	Crystallin, zeta (quinone reductase)-like 1

CSE1L	NM_001316	CSE1 chromosome segregation 1-like (yeast)
CSMD1	NM_033225.3	CUB and Sushi multiple domains 1
CSNK1G3	NM_001031812	Casein kinase 1, gamma 3
CSNK2B	NM_001320	Casein kinase 2, beta polypeptide
CSPG4	NM_001897	Chondroitin sulfate proteoglycan 4
CSPG5	NM_006574	Chondroitin sulfate proteoglycan 5 (neuroglycan C)
CSTF3	NM_001748	Cleavage stimulation factor, 3' pre-RNA, subunit 3, 77kDa
CTDP1	NM_004715	CTD (carboxy-terminal domain, RNA polymerase II, polypeptide A) phosphatase, subunit 1
CTNNAL1	NM_003798	Catenin (cadherin-associated protein), alpha-like 1
CTNNBL1	NM_030877	Catenin, beta like 1
CTRL		Chymotrypsin-like
CTSB	NM_001908	Cathepsin B
CTSD	NM_001909	Cathepsin D
CTSF	NM_003793	Cathepsin F
CTSG		Cathepsin G
CTSZ	NM_001336	Cathepsin Z
CTTN	NM_004921	Cortactin
CUGBP2	NM_001025076.2	CUG triplet repeat, RNA binding protein 2
CUL5	NM_003478	Cullin 5
CUTA	NM_001014433	CutA divalent cation tolerance homolog (E. coli)
CX3CL1	NM_002996	Chemokine (C-X3-C motif) ligand 1
CXADR	NM_001338	Coxsackie virus and adenovirus receptor
CXCL12	NM_000609.4	Chemokine (C-X-C motif) ligand 12 (stromal cell-derived factor 1)
CXCR4	NM_001008540	Chemokine (C-X-C motif) receptor 4
CXCR7	NM_020311	Chemokine (C-X-C motif) receptor 7
CYB5R2	NM_016229	Cytochrome b5 reductase 2
CYBA		Cytochrome b-245, alpha polypeptide
CYP1B1	NM_000104	Cytochrome P450, family 1, subfamily B, polypeptide 1
Cyp21a1		
Cyp2c70		
Cyp2d12		
CYP2S1	NM_030622	Cytochrome P450, family 2, subfamily S, polypeptide 1
CYP39A1	NM_016593	Cytochrome P450, family 39, subfamily A, polypeptide 1
Cyp4f18		
Cyp51		
D030011O10Rik		
D10Jhu81e		
D11Wsu47e		
D17H6S56E-3		
D18Ertd653e		
D19Bwg1357e		
D230039L06Rik		
D2Wsu81e		
D330022A01Rik		
D330027H18Rik		
D430015B01Rik		
D430041B17Rik		
D630003M21Rik		

D6Wsu116e		
D8Ertd82e		
D9Ertd280e		
DAB2IP	NM_032552	DAB2 interacting protein
DALRD3	NM_001009996	DALR anticodon binding domain containing 3
DAPK2	NM_014326	Death-associated protein kinase 2
DCLRE1B	NM_022836	DNA cross-link repair 1B (PSO2 homolog, S. cerevisiae)
DCUN1D3	NM_173475	DCN1, defective in cullin neddylation 1, domain containing 3 (S.
DDB1	NM_001923	Damage-specific DNA binding protein 1, 127kDa
DDN	NM_015086	Dendrin
DDX21	NM_000938	DEAD (Asp-Glu-Ala-Asp) box polypeptide 21
DDX39	NM_005804	DEAD (Asp-Glu-Ala-Asp) box polypeptide 39
DDX41	NM_016222	DEAD (Asp-Glu-Ala-Asp) box polypeptide 41
DDX51	NM_175066.3	DEAD (Asp-Glu-Ala-Asp) box polypeptide 51
Defb36		
Defb37		
Defb39		
DEPDC5	NM_001007188.1	DEP domain containing 5
DERL3	NM_001002862	Der1-like domain family, member 3
DEXI	NM_014015	Dexamethasone-induced transcript
DGAT1	NM_012079	Diacylglycerol O-acyltransferase homolog 1 (mouse)
DGCR2		DiGeorge syndrome critical region gene 2
DGCR8	NM_022720	DiGeorge syndrome critical region gene 8
DGUOK	NM_080916	Deoxyguanosine kinase
DHDDS	NM_024887	Dehydrodolichyl diphosphate synthase
DHFR	NM_001077181.1	Dihydrofolate reductase
DHODH	NM_001361.3	Dihydroorotate dehydrogenase
DHRS3	NM_004753	Dehydrogenase/reductase (SDR family) member 3
DHRS4		Dehydrogenase/reductase (SDR family) member 4
DHRS7B	NM_015510	Dehydrogenase/reductase (SDR family) member 7B
DHX35	NM_021931	DEAH (Asp-Glu-Ala-His) box polypeptide 35
DHX37	NM_032656	DEAH (Asp-Glu-Ala-His) box polypeptide 37
DHX38	NM_014003	DEAH (Asp-Glu-Ala-His) box polypeptide 38
DKC1	NM_001039802	Dyskeratosis congenita 1, dyskerin
DLGAP2	NM_003711	Discs, large (Drosophila) homolog-associated protein 2
DLX3	NM_005220	Distal-less homeobox 3
DLX4	NM_138281	Distal-less homeobox 4
DMRT3	NM_021240	Doublesex and mab-3 related transcription factor 3
DMRTA1	NM_022160	DMRT-like family A1
DNAJC10	NM_018981	DnaJ (Hsp40) homolog, subfamily C, member 10
DNASE1L1	NM_004935.2	Deoxyribonuclease I-like 1
DNMT3B	NM_006892	DNA (cytosine-5-)-methyltransferase 3 beta
DNPEP	NM_012100.2	Aspartyl aminopeptidase
DOC2A		Double C2-like domains, alpha
Doc2g		
DOCK2	NM_004946	Dedicator of cytokinesis 2
DOCK3	NM_001801	Dedicator of cytokinesis 3
DOCK6	NM_020812.1	Dedicator of cytokinesis 6
DOK1	NM_001381	Docking protein 1, 62kDa (downstream of tyrosine kinase 1)

DOK2	NM_003974	Docking protein 2, 56kDa
DPAGT1	NM_001382	Dolichyl-phosphate (UDP-N-acetylglucosamine) N-acetylglucosaminephosphotransferase 1 (GlcNAc-1-P
DPEP3	NM_022357	Dipeptidase 3
DPH1	NM_001383.3	DPH1 homolog (S. cerevisiae)
DPH3	NM_001047434.1	DPH3, KTI11 homolog (S. cerevisiae)
DPH4	NM_181706	DPH4, JJJ3 homolog (S. cerevisiae)
DPP3	NM_005700	Dipeptidyl-peptidase 3
DPYSL4	NM_006426	Dihydropyrimidinase-like 4
DQX1	NM_133637	DEAQ box polypeptide 1 (RNA-dependent ATPase)
Drctnnb1a		
DRG2	NM_006890	Developmentally regulated GTP binding protein 2
DSCAML1	NM_020693	Down syndrome cell adhesion molecule like 1
DTNBP1	NM_032122	Dystrobrevin binding protein 1
DTX2	NM_020892	Deltex homolog 2 (Drosophila)
DTX4	NM_015177.1	Deltex 4 homolog (Drosophila)
DTYMK		Deoxythymidylate kinase (thymidylate kinase)
DUOXA1	NM_144565	Dual oxidase maturation factor 1
DUOXA2	NM_207581	Dual oxidase maturation factor 2
DUS3L	NM_020175	Dihydrouridine synthase 3-like (S. cerevisiae)
DUSP13	NM_001007271.1	Dual specificity phosphatase 13
DUSP18	NM_152511	Dual specificity phosphatase 18
DUSP26	NM_024025	Dual specificity phosphatase 26 (putative)
DUSP9	NM_001395	Dual specificity phosphatase 9
DYNLRB1	NM_014183	Dynein, light chain, roadblock-type 1
DYNLT1	NM_006519	Dynein, light chain, Tctex-type 1
DYRK2	NM_003583	Dual-specificity tyrosine-(Y)-phosphorylation regulated kinase 2
E030049G20Rik		
E130303B06Rik		
E130308A19Rik		
E130309D14Rik		
E2F1	NM_005225	E2F transcription factor 1
E330009J07Rik		
EAF1	NM_033083	ELL associated factor 1
EAF2		ELL associated factor 2
EAPP	NM_018453.3	E2F-associated phosphoprotein
EBF2	NM_022659.2	Early B-cell factor 2
EBNA1BP2	NM_006824	EBNA1 binding protein 2
Ebp		
EBPL	NM_032565	Emopamil binding protein-like
ECHDC2	NM_018281	Enoyl Coenzyme A hydratase domain containing 2
EDC4	NM_014329	Enhancer of mRNA decapping 4
EDG6	NM_003775	Endothelial differentiation, lysophosphatidic acid G-protein-
EDG8	NM_030760	Endothelial differentiation, sphingolipid G-protein-coupled
EDN3	NM_000114	Endothelin 3
EEF1A1	NM_001270	Eukaryotic translation elongation factor 1 alpha 1
EEF1D	NM_001960	Eukaryotic translation elongation factor 1 delta (guanine nucleotide exchange protein)
EEF1E1	NM_004280	Eukaryotic translation elongation factor 1 epsilon 1

EEF2	NM_005198	Eukaryotic translation elongation factor 2
EEFSEC	NM_021937	Eukaryotic elongation factor, selenocysteine-tRNA-specific
EFEMP1	NM_001039348	EGF-containing fibulin-like extracellular matrix protein 1
EFHA1	NM_152726	EF-hand domain family, member A1
EFHD2	NM_024329	EF-hand domain family, member D2
EFNA2	NM_001405	Ephrin-A2
EFNA3	NM_004952	Ephrin-A3
EFNA4	NM_005227	Ephrin-A4
EFNA5	NM_001962	Ephrin-A5
EFTUD2	NM_004247	Elongation factor Tu GTP binding domain containing 2
EG114600		
EG381438		
EGFL6	NM_015507	EGF-like-domain, multiple 6
EGFL7	NM_016215	EGF-like-domain, multiple 7
EGFR	NM_000742	Epidermal growth factor receptor (erythroblastic leukemia viral (v-erb-b) oncogene homolog, avian)
EGLN2	NM_053046	Egl nine homolog 2 (C. elegans)
EGR1	NM_001964	Early growth response 1
EHD1	NM_006795	EH-domain containing 1
EIF2B2	NM_014239	Eukaryotic translation initiation factor 2B, subunit 2 beta, 39kDa
EIF2B4	NM_001034116	Eukaryotic translation initiation factor 2B, subunit 4 delta, 67kDa
EIF2S2	NM_003908	Eukaryotic translation initiation factor 2, subunit 2 beta, 38kDa
EIF3D	NM_003753	Eukaryotic translation initiation factor 3, subunit D
EIF3H	NM_018898	Eukaryotic translation initiation factor 3, subunit H
EIF3I	NM_003757	Eukaryotic translation initiation factor 3, subunit I
EIF4E1B		Eukaryotic translation initiation factor 4E family member 1B
EIF4EBP1	NM_004095	Eukaryotic translation initiation factor 4E binding protein 1
ELA2A	NM_033440	Elastase 2A
ELF1		E74-like factor 1 (ets domain transcription factor)
ELF3	NM_004433	E74-like factor 3 (ets domain transcription factor, epithelial-
ELFN2	NM_052906	Extracellular leucine-rich repeat and fibronectin type III containing
ELK1	NM_005229	ELK1, member of ETS oncogene family
ELL	NM_006532	Elongation factor RNA polymerase II
ELOVL4	NM_022726	Elongation of very long chain fatty acids (FEN1/Elo2, SUR4/Elo3,
EMD	NM_000117	Emerin (Emery-Dreifuss muscular dystrophy)
EMILIN1	NM_007046	Elastin microfibril interfacer 1
EML4	NM_019063	Echinoderm microtubule associated protein like 4
EMP3	NM_001828	Epithelial membrane protein 3
EMX2	NM_012128.3	Empty spiracles homeobox 2
EN2	NM_001427	Engrailed homeobox 2
ENAH	NM_001008493	Enabled homolog (Drosophila)
ENC1	NM_003999	Ectodermal-neural cortex (with BTB-like domain)
ENO1		Enolase 1, (alpha)
ENPP5	NM_021572	Ectonucleotide pyrophosphatase/phosphodiesterase 5 (putative
EPHA10	NM_001099439.1	EPH receptor A10
EPHA2	NM_004431	EPH receptor A2
EPHA3	NM_005233	EPH receptor A3
EPN3	NM_017957	Epsin 3
EPOR	NM_000121	Erythropoietin receptor

EPS8L2	NM_022772	EPS8-like 2
EPX	NM_000502	Eosinophil peroxidase
ERAS	NM_003908	ES cell expressed Ras
ERBB3	NM_001982	V-erb-b2 erythroblastic leukemia viral oncogene homolog 3
ERBB4	NM_001042599.1	V-erb-a erythroblastic leukemia viral oncogene homolog 4 (avian)
ERCC2	NM_004071	Excision repair cross-complementing rodent repair deficiency, complementation group 2 (xeroderma pigmentosum D)
ERCC6L	NM_001009954	Excision repair cross-complementing rodent repair deficiency, complementation group 6-like
ERLIN1	NM_001100626.1	ER lipid raft associated 1
ERN1	NM_001433.3	Endoplasmic reticulum to nucleus signaling 1
ERP29	NM_001034025.1	Endoplasmic reticulum protein 29
ESPN	NM_031475	Espin
ETV5	NM_004454	Ets variant gene 5 (ets-related molecule)
ETV6	NM_001987	Ets variant gene 6 (TEL oncogene)
EVPL	NM_001988	Envoplakin
EVX1	NM_001989	Even-skipped homeobox 1
EVX2	NM_001080458	Even-skipped homeobox 2
EXOSC4	NM_019037	Exosome component 4
EXPH5	NM_015065	Exophilin 5
EZH1	NM_001991	Enhancer of zeste homolog 1 (Drosophila)
F2	NM_000506	Coagulation factor II (thrombin)
F3	NM_001993	Coagulation factor III (thromboplastin, tissue factor)
F7	NM_000131	Coagulation factor VII (serum prothrombin conversion accelerator)
F8a		
FAAH	NM_001441	Fatty acid amide hydrolase
FABP1		Fatty acid binding protein 1, liver
FABP3	NM_001842	Fatty acid binding protein 3, muscle and heart (mammary-derived
FADS3		Fatty acid desaturase 3
FADS6	NM_178128.3	Fatty acid desaturase domain family, member 6
FAIM2	NM_012306	Fas apoptotic inhibitory molecule 2
FANCA	NM_014361.2	Fanconi anemia, complementation group A
FANCI	NM_018193	Fanconi anemia, complementation group I
FANK1	NM_145235	Fibronectin type III and ankyrin repeat domains 1
Fat1		
FBXL10	NM_001005366.1	F-box and leucine-rich repeat protein 10
FBXL15	NM_024326	F-box and leucine-rich repeat protein 15
FBXL19	NM_001099784.1	F-box and leucine-rich repeat protein 19
Fbxl8		
FBXO15	NM_152676	F-box protein 15
FBXO17	NM_024907	F-box protein 17
FBXO21	NM_015002.2	F-box protein 21
FBXO22	NM_012170.2	F-box protein 22
FBXO3	NM_012175	F-box protein 3
FBXO43	NM_001029860.2	F-box protein 43
FBXO7		F-box protein 7
FBXO8	NM_012180	F-box protein 8
FBXO9	NM_012347.4	F-box protein 9
FBXW4		F-box and WD repeat domain containing 4

FBXW9	NM_032301	F-box and WD repeat domain containing 9
FCGRT	NM_004107	Fc fragment of IgG, receptor, transporter, alpha
FCHSD1	NM_033449.1	FCH and double SH3 domains 1
FDXR	NM_004110	Ferredoxin reductase
FECH	NM_001008490	Ferrochelatase (protoporphyria)
FFAR2	NM_001361.3	Free fatty acid receptor 2
FFAR3	NM_021044	Free fatty acid receptor 3
FGF18	NM_003862	Fibroblast growth factor 18
FGF4	NM_002007	Fibroblast growth factor 4 (heparin secretory transforming protein 1, Kaposi sarcoma oncogene)
FGF5	NM_004464	Fibroblast growth factor 5
FGFR3	NM_000142	Fibroblast growth factor receptor 3 (achondroplasia, thanatophoric
FGFRL1		Fibroblast growth factor receptor-like 1
FHOD1	NM_013241	Formin homology 2 domain containing 1
FIBCD1	NM_032843	Fibrinogen C domain containing 1
FIGLA	NM_001004311.2	Folliculogenesis specific basic helix-loop-helix
FKBP1B		FK506 binding protein 1B, 12.6 kDa
FKBP2	NM_004470	FK506 binding protein 2, 13kDa
FKBP3	NM_002013	FK506 binding protein 3, 25kDa
FKBP5	NM_004117	FK506 binding protein 5
FKBP8	NM_012181	FK506 binding protein 8, 38kDa
FKBPL	NM_022110	FK506 binding protein like
FLOT1	NM_005803	Flotillin 1
FLOT2	NM_006032	Flotillin 2
FMNL3	NM_175736.4	Formin-like 3
FMR1	NM_002024	Fragile X mental retardation 1
FNBP1	NM_015033.2	Formin binding protein 1
FNBP4	NM_015308.1	Formin binding protein 4
FNDC5	NM_153756	Fibronectin type III domain containing 5
FNIP1	NM_001008738	Folliculin interacting protein 1
FOXA3	NM_004497	Forkhead box A3
FOXC1	NM_001453	Forkhead box C1
FOXD2	NM_004474	Forkhead box D2
FOXF2	NM_001452	Forkhead box F2
FOXG1	NM_005249	Forkhead box G1
FOXH1	NM_003923	Forkhead box H1
FOXL1	NM_001872	Forkhead box L1
FOXO4	NM_005938.2	Forkhead box O4
FOXQ1	NM_033260	Forkhead box Q1
FOXRED2	NM_001102371.1	FAD-dependent oxidoreductase domain containing 2
FREM2	NM_207361	FRAS1 related extracellular matrix protein 2
FRG1		FSHD region gene 1
FRMD5	NM_032892	FERM domain containing 5
FRMD8	NM_031904	FERM domain containing 8
FRYL	NM_015030.1	FRY-like
FSTL1	NM_007085	Follistatin-like 1
FTH1	NM_002032.2	Ferritin, heavy polypeptide 1
FUBP1		Far upstream element (FUSE) binding protein 1
FUBP3	NM_003934.1	Far upstream element (FUSE) binding protein 3

FUT11	NM_173540	Fucosyltransferase 11 (alpha (1,3) fucosyltransferase)
FYB	NM_001465.3	FYN binding protein (FYB-120/130)
FZD6	NM_001005566	Frizzled homolog 6 (Drosophila)
FZD8	NM_031866	Frizzled homolog 8 (Drosophila)
G6pdx		
GAB1	NM_002039	GRB2-associated binding protein 1
GABRQ	NM_018558	Gamma-aminobutyric acid (GABA) receptor, theta
GADD45A	NM_001924	Growth arrest and DNA-damage-inducible, alpha
GADD45B	NM_015675	Growth arrest and DNA-damage-inducible, beta
GAL3ST3	NM_033036	Galactose-3-O-sulfotransferase 3
GALE	NM_000403	UDP-galactose-4-epimerase
GALK1	NM_000154	Galactokinase 1
GALNT10	NM_017540.3	UDP-N-acetyl-alpha-D-galactosamine:polypeptide N-acetylgalactosaminyltransferase 10 (GalNAc-T10)
GALNT2	NM_000781	UDP-N-acetyl-alpha-D-galactosamine:polypeptide N-acetylgalactosaminyltransferase 2 (GalNAc-T2)
GALR2	NM_005391	Galanin receptor 2
GAPDH	NM_002046	Glyceraldehyde-3-phosphate dehydrogenase
GAPDHS	NM_014364	Glyceraldehyde-3-phosphate dehydrogenase, spermatogenic
GARNL4	NM_001100398.1	GTPase activating Rap/RanGAP domain-like 4
GBA	NM_000157	Glucosidase, beta; acid (includes glucosylceramidase)
GBX2	NM_017460	Gastrulation brain homeobox 2
GCK	NM_000162	Glucokinase (hexokinase 4, maturity onset diabetes of the young
GCN5L2	NM_021078	GCN5 general control of amino-acid synthesis 5-like 2 (yeast)
GDAP1L1	NM_024034	Ganglioside-induced differentiation-associated protein 1-like 1
GDF15		Growth differentiation factor 15
GDF7	NM_182828	Growth differentiation factor 7
GEN1	NM_182625	Gen homolog 1, endonuclease (Drosophila)
GFAP	NM_002055	Glial fibrillary acidic protein
GFPT2	NM_005110.2	Glutamine-fructose-6-phosphate transaminase 2
GFRA4	NM_022139	GDNF family receptor alpha 4
GGN	NM_152657	Gametogenetin
GGT6	NM_153338	Gamma-glutamyltransferase 6 homolog (rat)
GIF	NM_005142	Gastric intrinsic factor (vitamin B synthesis)
GIMAP1	NM_130759	GTPase, IMAP family member 1
GINS2	NM_016095	GINS complex subunit 2 (Psf2 homolog)
GINS4	NM_032336	GINS complex subunit 4 (Sld5 homolog)
GIPC1	NM_005716	GIPC PDZ domain containing family, member 1
GJA1	NM_001352	Gap junction protein, alpha 1, 43kDa
GJA4	NM_002060	Gap junction protein, alpha 4, 37kDa
GJB2	NM_004004	Gap junction protein, beta 2, 26kDa
GLP2R	NM_004246	Glucagon-like peptide 2 receptor
Glt28d2		
Gm1568		
Gm166		
Gm1673		
Gm1964		
GMNN	NM_015895	Geminin, DNA replication inhibitor
GMPPB	NM_013334	GDP-mannose pyrophosphorylase B

GMPS	NM_003875.2	Guanine monphosphate synthetase
GNA14	NM_002825	Guanine nucleotide binding protein (G protein), alpha 14
GNAL	NM_002071	Guanine nucleotide binding protein (G protein), alpha activating activity polypeptide, olfactory type
GNAS	NM_000516	GNAS complex locus
GNB1L	NM_053004	Guanine nucleotide binding protein (G protein), beta polypeptide 1-
GNB2L1	NM_006098	Guanine nucleotide binding protein (G protein), beta polypeptide 2-
GNB3	NM_002075	Guanine nucleotide binding protein (G protein), beta polypeptide 3
GNG13	NM_016541	Guanine nucleotide binding protein (G protein), gamma 13
GNG7	NM_052847	Guanine nucleotide binding protein (G protein), gamma 7
GNMT	NM_018960	Glycine N-methyltransferase
GOLGA4	NM_002078	Golgi autoantigen, golgin subfamily a, 4
GOLIM4	NM_014498	Golgi integral membrane protein 4
GORASP1	NM_031899	Golgi reassembly stacking protein 1, 65kDa
GPATCH1	NM_018025	G patch domain containing 1
GPBP1L1	NM_021639	GC-rich promoter binding protein 1-like 1
GPC1	NM_002081	Glypican 1
GPD1	NM_005276	Glycerol-3-phosphate dehydrogenase 1 (soluble)
Gpihbp1		
GPR137	NM_020155	G protein-coupled receptor 137
GPR150	NM_199243	G protein-coupled receptor 150
GPR152	NM_206997	G protein-coupled receptor 152
GPR162	NM_014262.3	G protein-coupled receptor 162
GPR175	NM_016372	G protein-coupled receptor 175
GPR180	NM_180989	G protein-coupled receptor 180
GPR20	NM_005293	G protein-coupled receptor 20
GPR26	NM_153442	G protein-coupled receptor 26
GPR35	NM_005301	G protein-coupled receptor 35
GPR44	NM_004598	G protein-coupled receptor 44
GPR61	NM_031936	G protein-coupled receptor 61
GPR88	NM_022049	G protein-coupled receptor 88
GPRC5A	NM_003979	G protein-coupled receptor, family C, group 5, member A
GPRC5C	NM_018653.3	G protein-coupled receptor, family C, group 5, member C
GPRIN3	NM_198281	GPRIN family member 3
GPX1	NM_001079812.1	Glutathione peroxidase 1
GPX6	NM_182701.1	Glutathione peroxidase 6 (olfactory)
GRIA2	NM_000826	Glutamate receptor, ionotropic, AMPA 2
GRID2	NM_001510	Glutamate receptor, ionotropic, delta 2
GRID2IP		Glutamate receptor, ionotropic, delta 2 (Grid2) interacting protein
GRIK4	NM_014619	Glutamate receptor, ionotropic, kainate 4
GRIK5	NM_002088	Glutamate receptor, ionotropic, kainate 5
GRIN1	NM_020730.1	Glutamate receptor, ionotropic, N-methyl D-aspartate 1
GRIN2A	NM_001365.2	Glutamate receptor, ionotropic, N-methyl D-aspartate 2A
GRIN2B	NM_000834	Glutamate receptor, ionotropic, N-methyl D-aspartate 2B
GRIN2C	NM_000835	Glutamate receptor, ionotropic, N-methyl D-aspartate 2C
GRIPAP1	NM_020137	GRIP1 associated protein 1
GRK1	NM_000588	G protein-coupled receptor kinase 1
GRM1	NM_000838	Glutamate receptor, metabotropic 1
GRM4	NM_001038493	Glutamate receptor, metabotropic 4

GRM7	NM_000844.2	Glutamate receptor, metabotropic 7
GRP	NM_001012512.1	Gastrin-releasing peptide
GRPEL2	NM_152407	GrpE-like 2, mitochondrial (E. coli)
GRWD1	NM_031485	Glutamate-rich WD repeat containing 1
Gsdma2		
GSTCD	NM_001031720.2	Glutathione S-transferase, C-terminal domain containing
GSTM4	NM_000850	Glutathione S-transferase M4
GSTO2		Glutathione S-transferase omega 2
GSTT2	NM_001080843	Glutathione S-transferase theta 2
GTF2E1	NM_001375	General transcription factor IIE, polypeptide 1, alpha 56kDa
GTF2F1	NM_002096	General transcription factor IIF, polypeptide 1, 74kDa
GTF2H5	NM_207118	General transcription factor IIH, polypeptide 5
GTF3C4	NM_005972	General transcription factor IIIC, polypeptide 4, 90kDa
GTPBP8	NM_014170	GTP-binding protein 8 (putative)
Gtrgeo22		
GUCA2A	NM_033553	Guanylate cyclase activator 2A (guanylin)
GUCY2E		Guanylate cyclase 2E
GULP1	NM_016315	GULP, engulfment adaptor PTB domain containing 1
H1FNT	NM_181788	H1 histone family, member N, testis-specific
H2-Eb2		
HACL1	NM_012260	2-hydroxyacyl-CoA lyase 1
HAGH	NM_001040427	Hydroxyacylglutathione hydrolase
HARS	NM_002109	Histidyl-tRNA synthetase
Hba-x		
HCFC1R1	NM_001002017	Host cell factor C1 regulator 1 (XPO1 dependent)
HCK	NM_002110	Hemopoietic cell kinase
HCRTR1	NM_012145	Hypocretin (orexin) receptor 1
HDAC1	NM_004964	Histone deacetylase 1
HDC	NM_002112	Histidine decarboxylase
HDGF	NM_004494	Hepatoma-derived growth factor (high-mobility group protein 1-
Hdgfrp2		
HEATR3	NM_182922	HEAT repeat containing 3
HEG1	NM_020733.1	HEG homolog 1 (zebrafish)
HERPUD1	NM_001010989.1	Homocysteine-inducible, endoplasmic reticulum stress-inducible, ubiquitin-like domain member 1
HES1	NM_005524	Hairy and enhancer of split 1, (Drosophila)
HES2	NM_019089	Hairy and enhancer of split 2 (Drosophila)
HES5	NM_001010926.2	Hairy and enhancer of split 5 (Drosophila)
HEXA		Hexosaminidase A (alpha polypeptide)
HEY1	NM_001040708.1	Hairy/enhancer-of-split related with YRPW motif 1
HEY2	NM_012259	Hairy/enhancer-of-split related with YRPW motif 2
HGS	NM_004712	Hepatocyte growth factor-regulated tyrosine kinase substrate
Hhipl1		
HIBCH		3-hydroxyisobutyryl-Coenzyme A hydrolase
HIGD1B	NM_016438	HIG1 domain family, member 1B
HIP1	NM_005338	Huntingtin interacting protein 1
HIRIP3	NM_003609	HIRA interacting protein 3
HISPPD1	NM_015216	Histidine acid phosphatase domain containing 1
HMBOX1	NM_024567	Homeobox containing 1

HMG20A	NM_018200	High-mobility group 20A
Hmgb2l1		
HMGN1	NM_004965	High-mobility group nucleosome binding domain 1
HN1L	NM_144570	Hematological and neurological expressed 1-like
HNRPH1	NM_005520	Heterogeneous nuclear ribonucleoprotein H1 (H)
HNRPLL	NM_138394	Heterogeneous nuclear ribonucleoprotein L-like
HOOK1	NM_015888	Hook homolog 1 (Drosophila)
HOXA6	NM_024014	Homeobox A6
HOXB3	NM_002146	Homeobox B3
HOXB4	NM_024015	Homeobox B4
HOXD13	NM_000523	Homeobox D13
HOXD9	NM_014213	Homeobox D9
HPD	NM_002150	4-hydroxyphenylpyruvate dioxygenase
HRASLS	NM_020386	HRAS-like suppressor
HRBL	NM_006076	HIV-1 Rev binding protein-like
HS3ST3B1	NM_006041	Heparan sulfate (glucosamine) 3-O-sulfotransferase 3B1
HSD17B1	NM_000413	Hydroxysteroid (17-beta) dehydrogenase 1
HSD17B4	NM_000414	Hydroxysteroid (17-beta) dehydrogenase 4
HSD3B1	NM_000862	Hydroxy-delta-5-steroid dehydrogenase, 3 beta- and steroid delta-
HSD3B7	NM_025193	Hydroxy-delta-5-steroid dehydrogenase, 3 beta- and steroid delta-
HSDL2	NM_032303.3	Hydroxysteroid dehydrogenase like 2
HSF1	NM_005526	Heat shock transcription factor 1
HSF4	NM_001969	Heat shock transcription factor 4
HSP90AB1	NM_007355	Heat shock protein 90kDa alpha (cytosolic), class B member 1
HSP90B1		Heat shock protein 90kDa beta (Grp94), member 1
HTATIP	NM_006388	HIV-1 Tat interacting protein, 60kDa
HTF9C	NM_022727	HpaII tiny fragments locus 9C
HTR1B	NM_000863	5-hydroxytryptamine (serotonin) receptor 1B
HTRA3	NM_053044	HtrA serine peptidase 3
HTRA4	NM_153692	HtrA serine peptidase 4
HYAL1	NM_001429	Hyaluronoglucosaminidase 1
HYAL2	NM_003773	Hyaluronoglucosaminidase 2
HYI	NM_031207	Hydroxypyruvate isomerase homolog (E. coli)
IARS	NM_002161	Isoleucyl-tRNA synthetase
ICAM1	NM_000201	Intercellular adhesion molecule 1 (CD54), human rhinovirus
Icosl		
IDUA	NM_000203	Iduronidase, alpha-L-
IER5	NM_016545	Immediate early response 5
IFI30	NM_003952.2	Interferon, gamma-inducible protein 30
IFRD2	NM_006764.3	Interferon-related developmental regulator 2
IFT140	NM_014714	Intraflagellar transport 140 homolog (Chlamydomonas)
IGF1R	NM_000875	Insulin-like growth factor 1 receptor
IGF2	NM_000126	Insulin-like growth factor 2 (somatomedin A)
IGF2BP1	NM_006546	Insulin-like growth factor 2 mRNA binding protein 1
IGFBP1	NM_000596	Insulin-like growth factor binding protein 1
IGSF3	NM_001007237	Immunoglobulin superfamily, member 3
IKBKAP	NM_003640	Inhibitor of kappa light polypeptide gene enhancer in B-cells, kinase complex-associated protein
IKBKE	NM_014002	Inhibitor of kappa light polypeptide gene enhancer in B-cells,

IKZF5	NM_022466.5	IKAROS family zinc finger 5 (Pegasus)
IL11	NM_000641	Interleukin 11
IL15RA		Interleukin 15 receptor, alpha
IL17RC	NM_032732	Interleukin 17 receptor C
IL17RE	NM_153480	Interleukin 17 receptor E
IL1RAP	NM_000134	Interleukin 1 receptor accessory protein
IL3RA	NM_002183	Interleukin 3 receptor, alpha (low affinity)
Il4i1		
Il6ra		
ILF2		Interleukin enhancer binding factor 2, 45kDa
ILF3	NM_004516	Interleukin enhancer binding factor 3, 90kDa
IMMT	NM_002635	Inner membrane protein, mitochondrial (mitofilin)
IMPA1	NM_002002	Inositol(myo)-1(or 4)-monophosphatase 1
IMPA2	NM_014214	Inositol(myo)-1(or 4)-monophosphatase 2
INA	NM_032727	Internexin neuronal intermediate filament protein, alpha
ING4	NM_016162	Inhibitor of growth family, member 4
INPP5E	NM_019892	Inositol polyphosphate-5-phosphatase, 72 kDa
INSIG2		Insulin induced gene 2
INSM1	NM_002196	Insulinoma-associated 1
INTS1		Integrator complex subunit 1
INTS3	NM_023015	Integrator complex subunit 3
IQSEC2	NM_015075	IQ motif and Sec7 domain 2
IRAK1	NM_001025242	Interleukin-1 receptor-associated kinase 1
IRF3	NM_001571	Interferon regulatory factor 3
IRF6	NM_006147	Interferon regulatory factor 6
IRF7	NM_000800	Interferon regulatory factor 7
IRF8	NM_004443	Interferon regulatory factor 8
Irs3		
ISG20L2	NM_030980	Interferon stimulated exonuclease gene 20kDa-like 2
Itga1		
ITGB3BP	NM_014288	Integrin beta 3 binding protein (beta3-endonexin)
ITGB7	NM_000889	Integrin, beta 7
ITGB8	NM_002214	Integrin, beta 8
ITPKB	NM_002221	Inositol 1,4,5-trisphosphate 3-kinase B
IZUMO1	NM_182575	Izumo sperm-egg fusion 1
JARID1C	NM_004187	Jumonji, AT rich interactive domain 1C
JMJD1A	NM_018433	Jumonji domain containing 1A
JMJD1B	NM_016604	Jumonji domain containing 1B
JMJD2B	NM_015015	Jumonji domain containing 2B
JMJD4	NM_023007	Jumonji domain containing 4
JMJD5	NM_024773	Jumonji domain containing 5
JPH1	NM_020647	Junctophilin 1
JUNB	NM_002229	Jun B proto-oncogene
JUP		Junction plakoglobin
KARS	NM_005548	Lysyl-tRNA synthetase
KATNB1	NM_005886	Katanin p80 (WD repeat containing) subunit B 1
KAZALD1	NM_030929	Kazal-type serine peptidase inhibitor domain 1
KCNA3	NM_002232	Potassium voltage-gated channel, shaker-related subfamily,
KCNC1	NM_004976	Potassium voltage-gated channel, Shaw-related subfamily,

KCNE1	NM_000219	Potassium voltage-gated channel, Isk-related family, member 1
KCNG1		Potassium voltage-gated channel, subfamily G, member 1
KCNH4	NM_012285	Potassium voltage-gated channel, subfamily H (eag-related),
KCNH5	NM_139318	Potassium voltage-gated channel, subfamily H (eag-related),
KCNIP1	NM_001034837	Kv channel interacting protein 1
KCNIP2	NM_014591	Kv channel interacting protein 2
KCNJ10	NM_002241	Potassium inwardly-rectifying channel, subfamily J, member 10
KCNJ12	NM_021012	Potassium inwardly-rectifying channel, subfamily J, member 12
KCNJ14	NM_001460	Potassium inwardly-rectifying channel, subfamily J, member 14
KCNK12	NM_022055	Potassium channel, subfamily K, member 12
KCNK5	NM_003740	Potassium channel, subfamily K, member 5
KCNMB1	NM_004137	Potassium large conductance calcium-activated channel, subfamily M, beta member 1
KCNN1	NM_002248.3	Potassium intermediate/small conductance calcium-activated channel, subfamily N, member 1
KCNN2	NM_021614	Potassium intermediate/small conductance calcium-activated channel, subfamily N, member 2
KCNQ1	NM_000218	Potassium voltage-gated channel, KQT-like subfamily, member 1
KCNQ2	NM_004518	Potassium voltage-gated channel, KQT-like subfamily, member 2
KCNQ4	NM_004700	Potassium voltage-gated channel, KQT-like subfamily, member 4
KCNS1	NM_002251	Potassium voltage-gated channel, delayed-rectifier, subfamily S,
KCNS2	NM_020697	Potassium voltage-gated channel, delayed-rectifier, subfamily S,
KCTD10	NM_031954	Potassium channel tetramerisation domain containing 10
KCTD11	NM_001002914	Potassium channel tetramerisation domain containing 11
KCTD2	NM_015353	Potassium channel tetramerisation domain containing 2
KCTD21	NM_001029859	Potassium channel tetramerisation domain containing 21
KCTD7	NM_014504	Potassium channel tetramerisation domain containing 7
KEAP1	NM_012289	Kelch-like ECH-associated protein 1
KEL	NM_000420	Kell blood group, metallo-endopeptidase
KIF15	NM_020242	Kinesin family member 15
KIF2B	NM_032559	Kinesin family member 2B
KIFC1	NM_002263	Kinesin family member C1
KISS1R	NM_032551	KISS1 receptor
KIT	NM_000222	V-kit Hardy-Zuckerman 4 feline sarcoma viral oncogene homolog
KLB	NM_175737	Klotho beta
KLC1		Kinesin light chain 1
KLF10	NM_001032282.1	Kruppel-like factor 10
KLF3	NM_016531	Kruppel-like factor 3 (basic)
KLF4	NM_000944	Kruppel-like factor 4 (gut)
KLHDC5	NM_020782	Kelch domain containing 5
KLHL31	NM_001003760	Kelch-like 31 (Drosophila)
KLK14	NM_022046	Kallikrein-related peptidase 14
Klra22		
KLRG1	NM_005810	Killer cell lectin-like receptor subfamily G, member 1
KNDC1	NM_152643	Kinase non-catalytic C-lobe domain (KIND) containing 1
KPNA6	NM_012316	Karyopherin alpha 6 (importin alpha 7)
KRAS	NM_004985	V-Ki-ras2 Kirsten rat sarcoma viral oncogene homolog
KREMEN2	NM_024507	Kringle containing transmembrane protein 2
KRI1	NM_023008	KRI1 homolog (S. cerevisiae)

KRT12	NM_000223	Keratin 12 (Meesmann corneal dystrophy)
KRT13	NM_002274	Keratin 13
Krt42		
KRT71	NM_033448	Keratin 71
KRT85	NM_002283	Keratin 85
KRTAP13-1	NM_181599	Keratin associated protein 13-1
KSR2	NM_173598.3	Kinase suppressor of ras 2
l7Rn6		
LAG3	NM_002286	Lymphocyte-activation gene 3
LAMC2	NM_005562	Laminin, gamma 2
LAMC3	NM_006059	Laminin, gamma 3
Lao1		
LAPTM4A		Lysosomal-associated protein transmembrane 4 alpha
LARS2	NM_015340	Leucyl-tRNA synthetase 2, mitochondrial
LASS6	NM_203463	LAG1 homolog, ceramide synthase 6
LBX2	NM_001009812	Ladybird homeobox 2
LCN2	NM_005564	Lipocalin 2 (oncogene 24p3)
Lcn5		
LDB3	NM_001080114.1	LIM domain binding 3
LDLR	NM_000527	Low density lipoprotein receptor (familial hypercholesterolemia)
LDOC1		Leucine zipper, down-regulated in cancer 1
LEMD2	NM_181336	LEM domain containing 2
LENG9	NM_198988	Leukocyte receptor cluster (LRC) member 9
LEP	NM_000230	Leptin (obesity homolog, mouse)
LEPR	NM_014286	Leptin receptor
LETM2	NM_144652	Leucine zipper-EF-hand containing transmembrane protein 2
LGALS1	NM_002305	Lectin, galactoside-binding, soluble, 1 (galectin 1)
LGR5	NM_012388	Leucine-rich repeat-containing G protein-coupled receptor 5
LGR6	NM_001017403	Leucine-rich repeat-containing G protein-coupled receptor 6
LHB		Luteinizing hormone beta polypeptide
LHFP	NM_005780	Lipoma HMGIC fusion partner
LHX1	NM_005568	LIM homeobox 1
LHX2	NM_004789	LIM homeobox 2
LHX9	NM_001014434	LIM homeobox 9
LIF	NM_002309	Leukemia inhibitory factor (cholinergic differentiation factor)
LIG1	NM_012190	Ligase I, DNA, ATP-dependent
LIM2	NM_030657	Lens intrinsic membrane protein 2, 19kDa
LIME1	NM_017806	Lck interacting transmembrane adaptor 1
LIN28	NM_024674	Lin-28 homolog (C. elegans)
LIN7B	NM_022165	Lin-7 homolog B (C. elegans)
LIN9	NM_173083	Lin-9 homolog (C. elegans)
LINGO2	NM_152570	Leucine rich repeat and Ig domain containing 2
LINGO4	NM_001004432	Leucine rich repeat and Ig domain containing 4
LLGL1	NM_004140	Lethal giant larvae homolog 1 (Drosophila)
LMAN1	NM_005570	Lectin, mannose-binding, 1
LMAN1L		Lectin, mannose-binding, 1 like
LMAN2L	NM_030805	Lectin, mannose-binding 2-like
LMBR1L	NM_018113	Limb region 1 homolog (mouse)-like
LMF2	NM_033200	Lipase maturation factor 2

LMNA	NM_005572	Lamin A/C
LOC100041265		
LOC547349		
LPHN3	NM_015236.3	Latrophilin 3
LRBA	NM_000056	LPS-responsive vesicle trafficking, beach and anchor containing
LRCH1	NM_015116	Leucine-rich repeats and calponin homology (CH) domain
LRCH2	NM_020871.3	Leucine-rich repeats and calponin homology (CH) domain
LRDD	NM_145886	Leucine-rich repeats and death domain containing
LRFN1	NM_020862.1	Leucine rich repeat and fibronectin type III domain containing 1
LRFN2	NM_020737	Leucine rich repeat and fibronectin type III domain containing 2
LRFN3	NM_024509	Leucine rich repeat and fibronectin type III domain containing 3
LRP1	NM_002332	Low density lipoprotein-related protein 1 (alpha-2-macroglobulin
LRP3	NM_002333	Low density lipoprotein receptor-related protein 3
LRP4	NM_002334	Low density lipoprotein receptor-related protein 4
LRP8	NM_001018054	Low density lipoprotein receptor-related protein 8, apolipoprotein e
LRRC10	NM_201550	Leucine rich repeat containing 10
Lrrc14		
LRRC15	NM_130830	Leucine rich repeat containing 15
Lrrc16a		
LRRC24	NM_001024678	Leucine rich repeat containing 24
LRRC26	NM_001013653	Leucine rich repeat containing 26
LRRC45	NM_144999	Leucine rich repeat containing 45
LSG1	NM_018385	Large subunit GTPase 1 homolog (S. cerevisiae)
LSM12	NM_152344	LSM12 homolog (S. cerevisiae)
LSM7		LSM7 homolog, U6 small nuclear RNA associated (S. cerevisiae)
LSP1	NM_001013253	Lymphocyte-specific protein 1
LSS	NM_001001438	Lanosterol synthase (2,3-oxidosqualene-lanosterol cyclase)
LTA	NM_000595	Lymphotoxin alpha (TNF superfamily, member 1)
LTB4R2	NM_019839	Leukotriene B4 receptor 2
LTBP1		Latent transforming growth factor beta binding protein 1
LTBP4	NM_001042544.1	Latent transforming growth factor beta binding protein 4
LY6E	NM_002346	Lymphocyte antigen 6 complex, locus E
LY6G6C	NM_025261	Lymphocyte antigen 6 complex, locus G6C
LY6G6D	NM_001003693	Lymphocyte antigen 6 complex, locus G6D
LYNX1	NM_023946	Ly6/neurotoxin 1
LYPD2	NM_205545	LY6/PLAUR domain containing 2
LYPD4	NM_173506	LY6/PLAUR domain containing 4
LZTR1	NM_006767	Leucine-zipper-like transcription regulator 1
LZTS1	NM_021020	Leucine zipper, putative tumor suppressor 1
M6PRBP1	NM_005817	Mannose-6-phosphate receptor binding protein 1
MADCAM1	NM_130760	Mucosal vascular addressin cell adhesion molecule 1
MAFF	NM_012323	V-maf musculoaponeurotic fibrosarcoma oncogene homolog F
MAG	NM_002361	Malignancy-associated gene
MAGED1	NM_001005332	Melanoma antigen family D, 1
MAGI1	NM_001033057	Membrane associated guanylate kinase, WW and PDZ domain
MAK10	NM_024635	MAK10 homolog, amino-acid N-acetyltransferase subunit, (S.
Man1a		
MAN1B1	NM_012445	Mannosidase, alpha, class 1B, member 1
MAN2B1	NM_000528	Mannosidase, alpha, class 2B, member 1

MAP3K12	NM_006301	Mitogen-activated protein kinase kinase kinase 12
MAP3K9		Mitogen-activated protein kinase kinase kinase 9
MAPK13	NM_002754	Mitogen-activated protein kinase 13
MAPK15	NM_139021	Mitogen-activated protein kinase 15
Mapk1ip1		
MAPK3	NM_001040056.1	Mitogen-activated protein kinase 3
MAPK8IP1	NM_005456	Mitogen-activated protein kinase 8 interacting protein 1
MAPKBP1		Mitogen activated protein kinase binding protein 1
Mare		
MAST2	NM_015112.2	Microtubule associated serine/threonine kinase 2
MATN1	NM_002379	Matrilin 1, cartilage matrix protein
MATN3	NM_002381.4	Matrilin 3
MBD3	NM_003926	Methyl-CpG binding domain protein 3
MBD4	NM_003925	Methyl-CpG binding domain protein 4
MBIP		MAP3K12 binding inhibitory protein 1
MBOAT2	NM_138799	Membrane bound O-acyltransferase domain containing 2
MBOAT5	NM_005768	Membrane bound O-acyltransferase domain containing 5
MBP	NM_001025081	Myelin basic protein
MCAM	NM_006500	Melanoma cell adhesion molecule
MCFD2	NM_139279	Multiple coagulation factor deficiency 2
MCHR1	NM_005297	Melanin-concentrating hormone receptor 1
MCM2	NM_032638	Minichromosome maintenance complex component 2
MCM4	NM_005914	Minichromosome maintenance complex component 4
MCTP2	NM_018349	Multiple C2 domains, transmembrane 2
Mdc1		
MDFI	NM_005586	MyoD family inhibitor
MDH1		Malate dehydrogenase 1, NAD (soluble)
MDH1B	NM_001039845	Malate dehydrogenase 1B, NAD (soluble)
MDH2	NM_002054.2	Malate dehydrogenase 2, NAD (mitochondrial)
MDM1	NM_017440	Mdm4, transformed 3T3 cell double minute 1, p53 binding protein
MDS1	NM_004991.1	Myelodysplasia syndrome 1
MECP2	NM_004992	Methyl CpG binding protein 2 (Rett syndrome)
MED10	NM_032286	Mediator complex subunit 10
MED12	NM_005120.2	Mediator complex subunit 12
MED15	NM_001003891	Mediator complex subunit 15
MED16	NM_005481	Mediator complex subunit 16
MED25	NM_030973	Mediator complex subunit 25
MED8	NM_001001653	Mediator complex subunit 8
MEGF11	NM_032445	Multiple EGF-like-domains 11
MEOX1	NM_001040002.1	Mesenchyme homeobox 1
MEOX2	NM_005924	Mesenchyme homeobox 2
MESDC1	NM_022566	Mesoderm development candidate 1
METAP1	NM_015143.1	Methionyl aminopeptidase 1
METRNL	NM_001004431	Meteorin, glial cell differentiation regulator-like
METT11D1	NM_001029991.1	Methyltransferase 11 domain containing 1
MFAP4	NM_002404	Microfibrillar-associated protein 4
MFGE8	NM_005928	Milk fat globule-EGF factor 8 protein
MFSD7	NM_032219	Major facilitator superfamily domain containing 7
MFSD9	NM_032718	Major facilitator superfamily domain containing 9

MGAT3	NM_003878	Mannosyl (beta-1,4-)-glycoprotein beta-1,4-N-
MGAT4B	NM_014275	Mannosyl (alpha-1,3-)-glycoprotein beta-1,4-N-acetylglucosaminyltransferase, isozyme B
MGRN1	NM_015246.1	Mahogunin, ring finger 1
MICAL1	NM_022765	Microtubule associated monoxygenase, calponin and LIM domain
MICAL2	NM_014632	Microtubule associated monoxygenase, calponin and LIM domain
MIF4GD		MIF4G domain containing
MIS12	NM_024039	MIS12, MIND kinetochore complex component, homolog (yeast)
MKNK2	NM_017572	MAP kinase interacting serine/threonine kinase 2
MLL3	NM_021230	Myeloid/lymphoid or mixed-lineage leukemia 3
MLPH	NM_001042467.1	Melanophilin
MLXIP	NM_014938.3	MLX interacting protein
MLXIPL	NM_032951	MLX interacting protein-like
MMAA	NM_172250	Methylmalonic aciduria (cobalamin deficiency) cblA type
MMAB	NM_052845	Methylmalonic aciduria (cobalamin deficiency) cblB type
MMD	NM_012329	Monocyte to macrophage differentiation-associated
MMEL1	NM_033467	Membrane metallo-endopeptidase-like 1
MMP17	NM_000171	Matrix metallopeptidase 17 (membrane-inserted)
MMP2	NM_000170	Matrix metallopeptidase 2 (gelatinase A, 72kDa gelatinase, 72kDa type IV collagenase)
Mmp23		
MMRN2	NM_024756	Multimerin 2
MMS19	NM_022362	MMS19 nucleotide excision repair homolog (S. cerevisiae)
MOAP1	NM_022151	Modulator of apoptosis 1
MOBKL1A	NM_173468	MOB1, Mps One Binder kinase activator-like 1A (yeast)
MORF4L2	NM_012286	Mortality factor 4 like 2
MOSPD3	NM_001040097	Motile sperm domain containing 3
MPPED1	NM_000050	Metallophosphoesterase domain containing 1
MPST	NM_001013436	Mercaptopyruvate sulfurtransferase
MPV17	NM_002437	MpV17 mitochondrial inner membrane protein
MRE11A	NM_005590	MRE11 meiotic recombination 11 homolog A (S. cerevisiae)
MRGPRF	NM_001098515.1	MAS-related GPR, member F
MRPL11	NM_016050	Mitochondrial ribosomal protein L11
MRPL27	NM_016504	Mitochondrial ribosomal protein L27
MRPL32		Mitochondrial ribosomal protein L32
MRPL36	NM_032479	Mitochondrial ribosomal protein L36
MRPL4	NM_015956	Mitochondrial ribosomal protein L4
MRPL48	NM_016055.4	Mitochondrial ribosomal protein L48
MRPL49	NM_004927	Mitochondrial ribosomal protein L49
MRPL52	NM_178336.1	Mitochondrial ribosomal protein L52
MRPL54	NM_172251	Mitochondrial ribosomal protein L54
MRPS35	NM_021821	Mitochondrial ribosomal protein S35
MRPS36	NM_033281	Mitochondrial ribosomal protein S36
MRRF	NM_138777	Mitochondrial ribosome recycling factor
MRVI1		Murine retrovirus integration site 1 homolog
MS4A1	NM_021950	Membrane-spanning 4-domains, subfamily A, member 1
Ms4a15		
MSC	NM_005098.3	Musculin (activated B-cell factor-1)
MSH5	NM_000173.4	MutS homolog 5 (E. coli)

MSI1	NM_002442	Musashi homolog 1 (Drosophila)
Msx3		
MT4	NM_032935.2	Metallothionein 4
MTA1	NM_007221	Metastasis associated 1
MTCH2	NM_014342	Mitochondrial carrier homolog 2 (C. elegans)
MTF1	NM_005955	Metal-regulatory transcription factor 1
MTF2	NM_007358	Metal response element binding transcription factor 2
MTG1	NM_138384	Mitochondrial GTPase 1 homolog (S. cerevisiae)
MTHFD1	NM_005285	Methylenetetrahydrofolate dehydrogenase (NADP+ dependent) 1, methenyltetrahydrofolate cyclohydrolase, formyltetrahydrofolate
MTIF3	NM_152912	Mitochondrial translational initiation factor 3
MTMR10	NM_017762.2	Myotubularin related protein 10
MTMR12	NM_001040446	Myotubularin related protein 12
MTMR14	NM_001077525.1	Myotubularin related protein 14
MTMR4	NM_004687	Myotubularin related protein 4
MTMR9	NM_015458	Myotubularin related protein 9
MTR	NM_000254	5-methyltetrahydrofolate-homocysteine methyltransferase
MTX1	NM_021956	Metaxin 1
MUC1	NM_001018016	Mucin 1, cell surface associated
MUC6	NM_005961.2	Mucin 6, oligomeric mucus/gel-forming
MUS81	NM_025128	MUS81 endonuclease homolog (S. cerevisiae)
MUSTN1		Musculoskeletal, embryonic nuclear protein 1
MVD	NM_002461	Mevalonate (diphospho) decarboxylase
MVP	NM_005115	Major vault protein
MX2		Myxovirus (influenza virus) resistance 2 (mouse)
MXD4		MAX dimerization protein 4
MXRA8		Matrix-remodelling associated 8
MYBL2	NM_002466	V-myb myeloblastosis viral oncogene homolog (avian)-like 2
MYBPC3	NM_000256.3	Myosin binding protein C, cardiac
MYBPHL	NM_001005290	Myosin binding protein H-like
MYC	NM_005314	V-myc myelocytomatosis viral oncogene homolog (avian)
MYCBPAP	NM_032133	MYCBP associated protein
MYCT1	NM_025107	Myc target 1
Myd116		
MYD88	NM_002468	Myeloid differentiation primary response gene (88)
Myg1		
Myh1		
Myh6		
MYH7	NM_000257	Myosin, heavy chain 7, cardiac muscle, beta
MYL3	NM_000258	Myosin, light chain 3, alkali; ventricular, skeletal, slow
MYL6B	NM_002475	Myosin, light chain 6B, alkali, smooth muscle and non-muscle
MYLIP	NM_013262	Myosin regulatory light chain interacting protein
MYO10	NM_012334.2	Myosin X
MYO18A	NM_078471.3	Myosin XVIIIA
MYO1G	NM_033054	Myosin IG
MYO3B	NM_001083615.1	Myosin IIIB
MYO9B	NM_004145.2	Myosin IXB
Nae1		
NAGLU	NM_004286	N-acetylglucosaminidase, alpha- (Sanfilippo disease IIIB)

NANOS2	NM_001029861	Nanos homolog 2 (Drosophila)
NAP1L4	NM_005969.3	Nucleosome assembly protein 1-like 4
NAPSA	NM_004851	Napsin A aspartic peptidase
NARF	NM_001038618.2	Nuclear prelamin A recognition factor
NASP	NM_002482	Nuclear autoantigenic sperm protein (histone-binding)
NAT14	NM_020378	N-acetyltransferase 14
NAV1	NM_020443	Neuron navigator 1
NAV2	NM_145117	Neuron navigator 2
NBR1		Neighbor of BRCA1 gene 1
NCAN	NM_004386	Neurocan
NCDN	NM_001014839	Neurochondrin
NCF1	NM_000265	Neutrophil cytosolic factor 1, (chronic granulomatous disease,
NDUFA5	NM_005000	NADH dehydrogenase (ubiquinone) 1 alpha subcomplex, 5,
NDUFB10	NM_004548	NADH dehydrogenase (ubiquinone) 1 beta subcomplex, 10,
NDUFB11		NADH dehydrogenase (ubiquinone) 1 beta subcomplex, 11,
NDUFB5	NM_002492	NADH dehydrogenase (ubiquinone) 1 beta subcomplex, 5, 16kDa
NDUFC2	NM_004549	NADH dehydrogenase (ubiquinone) 1, subcomplex unknown, 2,
NDUFS1	NM_005006	NADH dehydrogenase (ubiquinone) Fe-S protein 1, 75kDa (NADH· coenzyme Q reductase)
NDUFS6	NM_004553	NADH dehydrogenase (ubiquinone) Fe-S protein 6, 13kDa (NADH· coenzyme Q reductase)
NDUFV2	NM_021074	NADH dehydrogenase (ubiquinone) flavoprotein 2, 24kDa
Necab2		
NEK3	NM_002498.2	NIMA (never in mitosis gene a)-related kinase 3
NELL1	NM_006157	NEL-like 1 (chicken)
NENF	NM_013349	Neuron derived neurotrophic factor
NES	NM_006617	Nestin
NEU4	NM_080741	Sialidase 4
NEURL2	NM_080749	Neuralized homolog 2 (Drosophila)
NEUROD2	NM_006160	Neurogenic differentiation 2
NEUROG1	NM_006161	Neurogenin 1
NFATC1	NM_006162	Nuclear factor of activated T-cells, cytoplasmic, calcineurin-
NFATC2	NM_012340	Nuclear factor of activated T-cells, cytoplasmic, calcineurin-
NFE2L1	NM_003204	Nuclear factor (erythroid-derived 2)-like 1
NFIA		Nuclear factor I/A
NFIC	NM_005597	Nuclear factor I/C (CCAAT-binding transcription factor)
NFKBIA	NM_020529	Nuclear factor of kappa light polypeptide gene enhancer in B-cells
NFKBIL2	NM_013432	Nuclear factor of kappa light polypeptide gene enhancer in B-cells
NFYC	NM_014223	Nuclear transcription factor Y, gamma
NGB	NM_021257	Neuroglobin
Ngf		
NGFR	NM_002507	Nerve growth factor receptor (TNFR superfamily, member 16)
NHLH1	NM_005598	Nescient helix loop helix 1
NHS	NM_198270	Nance-Horan syndrome (congenital cataracts and dental
NHSL1		NHS-like 1
Niban		
NIPSNAP1	NM_003634	Nipsnap homolog 1 (C. elegans)
NIT2		Nitrilase family, member 2
Nkx1-2		

NKX2-1	NM_001079668.1	NK2 homeobox 1
NKX2-5	NM_004055	NK2 transcription factor related, locus 5 (Drosophila)
NKX2-6		NK2 transcription factor related, locus 6 (Drosophila)
NLGN2	NM_020795	Neuroligin 2
NLGN3	NM_018977	Neuroligin 3
NLRX1	NM_024618	NLR family member X1
NMB	NM_021077	Neuromedin B
NME4	NM_005009	Non-metastatic cells 4, protein expressed in
NMT1	NM_021079	N-myristoyltransferase 1
NNT	NM_014431	Nicotinamide nucleotide transhydrogenase
NOC3L	NM_022451	Nucleolar complex associated 3 homolog (S. cerevisiae)
NOD1	NM_006092	Nucleotide-binding oligomerization domain containing 1
NOL1	NM_001033714.1	Nucleolar protein 1, 120kDa
NOL3	NM_003946.3	Nucleolar protein 3 (apoptosis repressor with CARD domain)
NOLA1	NM_018983	Nucleolar protein family A, member 1 (H/ACA small nucleolar
NOS3		Nitric oxide synthase 3 (endothelial cell)
NOTCH1	NM_017617.3	Notch homolog 1, translocation-associated (Drosophila)
NOTCH4	NM_002112	Notch homolog 4 (Drosophila)
NOTUM	NM_178493	Notum pectinacetylesterase homolog (Drosophila)
NPAS1	NM_002517	Neuronal PAS domain protein 1
NPC2	NM_007029.2	Niemann-Pick disease, type C2
Npcd		
NPDC1	NM_015392	Neural proliferation, differentiation and control, 1
NPEPL1		Aminopeptidase-like 1
NPHP3	NM_173490	Nephronophthisis 3 (adolescent)
NPHS1	NM_004667	Nephrosis 1, congenital, Finnish type (nephrin)
NPM2	NM_182795	Nucleophosmin/nucleoplasmin, 2
NPR3	NM_000908.2	Natriuretic peptide receptor C/guanylate cyclase C (atrionatriuretic peptide receptor C)
NPTXR	NM_014292	Neuronal pentraxin receptor
NR1H2	NM_007121.4	Nuclear receptor subfamily 1, group H, member 2
NR2E3		Nuclear receptor subfamily 2, group E, member 3
NR5A1	NM_004959	Nuclear receptor subfamily 5, group A, member 1
Nradd		
NRD1	NM_001101662.1	Nardilysin (N-arginine dibasic convertase)
NRIP1	NM_003489	Nuclear receptor interacting protein 1
NRXN2	NM_015080	Neurexin 2
NSF	NM_006178.2	N-ethylmaleimide-sensitive factor
NSMCE1	NM_145080.3	Non-SMC element 1 homolog (S. cerevisiae)
NT5E	NM_002526	5'-nucleotidase, ecto (CD73)
NTHL1	NM_002528	Nth endonuclease III-like 1 (E. coli)
NTN1	NM_004822	Netrin 1
NTNG1	NM_014917	Netrin G1
NTNG2	NM_032536	Netrin G2
NTRK1	NM_001007792	Neurotrophic tyrosine kinase, receptor, type 1
NTRK2	NM_001007097	Neurotrophic tyrosine kinase, receptor, type 2
NTRK3	NM_001007156	Neurotrophic tyrosine kinase, receptor, type 3
NUAK1	NM_014840	NUAK family, SNF1-like kinase, 1
NUBP1	NM_002484	Nucleotide binding protein 1 (MinD homolog, E. coli)

NUCB2	NM_005013.2	Nucleobindin 2
NUDCD1	NM_032869	NudC domain containing 1
NUDT22	NM_032344	Nudix (nucleoside diphosphate linked moiety X)-type motif 22
NUDT6	NM_007083.3	Nudix (nucleoside diphosphate linked moiety X)-type motif 6
NUDT8	NM_181843	Nudix (nucleoside diphosphate linked moiety X)-type motif 8
NUP160	NM_015231	Nucleoporin 160kDa
NUS1	NM_138459	Nuclear undecaprenyl pyrophosphate synthase 1 homolog (S.
NXPH4	NM_007224	Neurexophilin 4
Oas1c		
Oasl1		
OBSL1		Obscurin-like 1
OCM		Oncomodulin
ODZ2	NM_001080428.2	Odz, odd Oz/ten-m homolog 2 (Drosophila)
ODZ3		Odz, odd Oz/ten-m homolog 3 (Drosophila)
OGFR	NM_014228	Opioid growth factor receptor
OLFM1	NM_006334	Olfactomedin 1
Olfr1350		
Olfr284		
Olfr371		
Olfr521		
Olfr536		
Olfr632		
Olfr780		
Olfr790		
OLIG2	NM_005806	Oligodendrocyte lineage transcription factor 2
OMA1	NM_145243	OMA1 homolog, zinc metallopeptidase (S. cerevisiae)
ONECUT1	NM_004498	One cut homeobox 1
OPN4	NM_001030015	Opsin 4 (melanopsin)
OPRS1	NM_005866	Opioid receptor, sigma 1
ORAI1	NM_032790.2	ORAI calcium release-activated calcium modulator 1
ORF19		
ORF34		
ORF61		
ORMDL2	NM_014182	ORM1-like 2 (S. cerevisiae)
OSBP	NM_002556	Oxysterol binding protein
OSBP2	NM_030758.3	Oxysterol binding protein 2
OSBPL9	NM_024586.3	Oxysterol binding protein-like 9
OSTM1	NM_014028	Osteopetrosis associated transmembrane protein 1
OTP	NM_032109	Orthopedia homeobox
OTUB2	NM_023112	OTU domain, ubiquitin aldehyde binding 2
OTUD7A	NM_130901	OTU domain containing 7A
Pabpnl1		
PACRG	NM_001080378.1	PARK2 co-regulated
PADI3	NM_016233	Peptidyl arginine deiminase, type III
PAK1IP1	NM_017906	PAK1 interacting protein 1
PANX2	NM_052839	Pannexin 2
PAPD1	NM_018109	PAP associated domain containing 1
PAPLN	NM_173462	Papilin, proteoglycan-like sulfated glycoprotein
PARD3	NM_019619	Par-3 partitioning defective 3 homolog (C. elegans)

PARD6B	NM_032521	Par-6 partitioning defective 6 homolog beta (C. elegans)
PARK2	NM_004562	Parkinson disease (autosomal recessive, juvenile) 2, parkin
PARP3	NM_001003931.1	Poly (ADP-ribose) polymerase family, member 3
PARS2	NM_001037533.1	Prolyl-tRNA synthetase 2, mitochondrial (putative)
PATZ1	NM_014323	POZ (BTB) and AT hook containing zinc finger 1
PAX8	NM_003466.3	Paired box 8
Pbp2		
PBX2	NM_002586	Pre-B-cell leukemia homeobox 2
PCDH1	NM_002587.3	Protocadherin 1
PCDH17	NM_001040429	Protocadherin 17
PCDH7	NM_002589	Protocadherin 7
Pcdha1		
PCDHB18	NR_001281.1	Protocadherin beta 18 pseudogene
PCGF1	NM_032673	Polycomb group ring finger 1
PCID2	NM_018386	PCI domain containing 2
PCNT	NM_002147	Pericentrin (kendrin)
PCNXL2	NM_014801.3	Pecanex-like 2 (Drosophila)
PCOLCE	NM_002593	Procollagen C-endopeptidase enhancer
PCP2	NM_174895	Purkinje cell protein 2
PCSK1N		Proprotein convertase subtilisin/kexin type 1 inhibitor
PCTK3	NM_022658	PCTAIRE protein kinase 3
PCTP	NM_001102402.1	Phosphatidylcholine transfer protein
PCYOX1L	NM_024028	Prenylcysteine oxidase 1 like
PDCD4	NM_014456	Programmed cell death 4 (neoplastic transformation inhibitor)
PDCD6IP	NM_013374	Programmed cell death 6 interacting protein
PDE3B		Phosphodiesterase 3B, cGMP-inhibited
PDE4D	NM_002143	Phosphodiesterase 4D, cAMP-specific (phosphodiesterase E3 dunce homolog, Drosophila)
PDGFB	NM_002608	Platelet-derived growth factor beta polypeptide (simian sarcoma viral (v-sis) oncogene homolog)
PDK1	NM_000195	Pyruvate dehydrogenase kinase, isozyme 1
PDK2	NM_002611	Pyruvate dehydrogenase kinase, isozyme 2
PDRG1		P53 and DNA damage regulated 1
PDXDC1	NM_015027	Pyridoxal-dependent decarboxylase domain containing 1
PDZD11	NM_016484	PDZ domain containing 11
PDZD4	NM_032512	PDZ domain containing 4
PDZK1	NM_002614	PDZ domain containing 1
Pea15a		
Peg12		
PEMT	NM_007169	Phosphatidylethanolamine N-methyltransferase
PER1	NM_001536.3	Period homolog 1 (Drosophila)
PER2	NM_003894	Period homolog 2 (Drosophila)
PEX1	NM_000466	Peroxisome biogenesis factor 1
PEX7	NM_000288	Peroxisomal biogenesis factor 7
PFKFB2	NM_001018053	6-phosphofructo-2-kinase/fructose-2,6-biphosphatase 2
PFKFB3	NM_004566	6-phosphofructo-2-kinase/fructose-2,6-biphosphatase 3
PFN4	NM_199346	Profilin family, member 4
PGAM2	NM_000290	Phosphoglycerate mutase 2 (muscle)
PGCP	NM_016134	Plasma glutamate carboxypeptidase

PGLYRP1	NM_005091	Peptidoglycan recognition protein 1
PGM5	NM_002155	Phosphoglucomutase 5
PHCA	NM_018367	Phytoceramidase, alkaline
PHF8	NM_015107	PHD finger protein 8
PHPT1	NM_014172	Phosphohistidine phosphatase 1
PI4KA	NM_002650.2	Phosphatidylinositol 4-kinase, catalytic, alpha
PIAS3	NM_001093779.1	Protein inhibitor of activated STAT, 3
PIGA	NM_002641	Phosphatidylinositol glycan anchor biosynthesis, class A (paroxysmal nocturnal hemoglobinuria)
PIGM	NM_145167	Phosphatidylinositol glycan anchor biosynthesis, class M
PIGV	NM_017837	Phosphatidylinositol glycan anchor biosynthesis, class V
PIK3AP1	NM_152309	Phosphoinositide-3-kinase adaptor protein 1
PIK3IP1	NM_052880	Phosphoinositide-3-kinase interacting protein 1
PIK3R1	NM_181504	Phosphoinositide-3-kinase, regulatory subunit 1 (p85 alpha)
PIM2	NM_006875	Pim-2 oncogene
PIP5K1A	NM_003557	Phosphatidylinositol-4-phosphate 5-kinase, type I, alpha
PIR	NM_001018109	Pirin (iron-binding nuclear protein)
PITPNM2	NM_020845	Phosphatidylinositol transfer protein, membrane-associated 2
PITX2	NM_000325	Paired-like homeodomain 2
PJA1	NM_001032396	Praja 1
PKD1L2	NM_001076780.1	Polycystic kidney disease 1-like 2
PKNOX2	NM_022062.2	PBX/knotted 1 homeobox 2
PKP4	NM_001005476	Plakophilin 4
PLA2G2C		Phospholipase A2, group IIC
PLA2G2E	NM_014589	Phospholipase A2, group IIE
PLA2G7	NM_024409	Phospholipase A2, group VII (platelet-activating factor
PLAGL2	NM_002657	Pleiomorphic adenoma gene-like 2
PLCB1	NM_015192	Phospholipase C, beta 1 (phosphoinositide-specific)
PLCD3	NM_133373.3	Phospholipase C, delta 3
PLCG2	NM_002661.2	Phospholipase C, gamma 2 (phosphatidylinositol-specific)
PLCXD3	NM_001005473	Phosphatidylinositol-specific phospholipase C, X domain
PLEC1	NM_000445.2	Plectin 1, intermediate filament binding protein 500kDa
PLEKHA5	NM_019012	Pleckstrin homology domain containing, family A member 5
PLEKHH2	NM_172069	Pleckstrin homology domain containing, family H (with MyTH4
PLEKHJ1		Pleckstrin homology domain containing, family J member 1
PLIN	NM_002666	Perilipin
PLK1	NM_005030	Polo-like kinase 1 (Drosophila)
PLK3		Polo-like kinase 3 (Drosophila)
PLTP	NM_006227	Phospholipid transfer protein
PLXDC2	NM_032812	Plexin domain containing 2
PLXNB1	NM_002673	Plexin B1
PLXNB3	NM_005393	Plexin B3
PMAIP1	NM_021127	Phorbol-12-myristate-13-acetate-induced protein 1
PMPCA	NM_015160	Peptidase (mitochondrial processing) alpha
PMS1	NM_000534	PMS1 postmeiotic segregation increased 1 (S. cerevisiae)
PMVK	NM_006556	Phosphomevalonate kinase
PNLIPRP2	NM_005396.4	Pancreatic lipase-related protein 2
PNMA2	NM_007257	Paraneoplastic antigen MA2
PNPLA5	NM_138814	Patatin-like phospholipase domain containing 5

PNPLA6	NM_006702	Patatin-like phospholipase domain containing 6
PNPLA7	NM_001098537.1	Patatin-like phospholipase domain containing 7
PNPLA8	NM_015723	Patatin-like phospholipase domain containing 8
PODN	NM_153703	Podocan
PODNL1	NM_024825	Podocan-like 1
POFUT2	NM_015227	Protein O-fucosyltransferase 2
POLK		Polymerase (DNA directed) kappa
POLR2C	NM_000629	Polymerase (RNA) II (DNA directed) polypeptide C, 33kDa
POLR2E	NM_002176	Polymerase (RNA) II (DNA directed) polypeptide E, 25kDa
POLR2H	NM_006232	Polymerase (RNA) II (DNA directed) polypeptide H
POLR2I	NM_006233	Polymerase (RNA) II (DNA directed) polypeptide I, 14.5kDa
POLR3A	NM_007055	Polymerase (RNA) III (DNA directed) polypeptide A, 155kDa
POLS	NM_006999	Polymerase (DNA directed) sigma
POMT2	NM_013382	Protein-O-mannosyltransferase 2
POU4F3	NM_002700	POU class 4 homeobox 3
PPAP2C		Phosphatidic acid phosphatase type 2C
PPAPDC2	NM_203453	Phosphatidic acid phosphatase type 2 domain containing 2
PPARD	NM_000876	Peroxisome proliferator-activated receptor delta
PPFIBP1	NM_003622	PTPRF interacting protein, binding protein 1 (liprin beta 1)
PPIE	NM_006112	Peptidylprolyl isomerase E (cyclophilin E)
PPL	NM_002705	Periplakin
PPM1J	NM_005167	Protein phosphatase 1J (PP2C domain containing)
PPM1M	NM_144641	Protein phosphatase 1M (PP2C domain containing)
PPOX	NM_000309	Protoporphyrinogen oxidase
PPP1R16B	NM_015568	Protein phosphatase 1, regulatory (inhibitor) subunit 16B
PPP1R1B		Protein phosphatase 1, regulatory (inhibitor) subunit 1B (dopamine and cAMP regulated phosphoprotein, DARPP-32)
PPP2R5B	NM_006244	Protein phosphatase 2, regulatory subunit B', beta isoform
PPTC7	NM_139283	PTC7 protein phosphatase homolog (S. cerevisiae)
PQLC2	NM_001040125	PQ loop repeat containing 2
PQLC3	NM_152391	PQ loop repeat containing 3
PRDM5	NM_018699	PR domain containing 5
PRDM6		PR domain containing 6
PRDX1	NM_002574	Peroxiredoxin 1
PRELP	NM_002725	Proline/arginine-rich end leucine-rich repeat protein
PREP	NM_002726	Prolyl endopeptidase
PRICKLE1	NM_153026	Prickle homolog 1 (Drosophila)
PRKACA	NM_002730	Protein kinase, cAMP-dependent, catalytic, alpha
PRKAG2	NM_001040633.1	Protein kinase, AMP-activated, gamma 2 non-catalytic subunit
PRKCB1	NM_002738	Protein kinase C, beta 1
Prkcbp1		
PRKCD	NM_006254	Protein kinase C, delta
PRKCE	NM_005400	Protein kinase C, epsilon
PRKCZ	NM_001033581.1	Protein kinase C, zeta
PRKD2	NM_001079880.1	Protein kinase D2
PRMT3	NM_005788	Protein arginine methyltransferase 3
PRMT8	NM_019854	Protein arginine methyltransferase 8
PROCR	NM_006404	Protein C receptor, endothelial (EPCR)
PRODH	NM_016335	Proline dehydrogenase (oxidase) 1

PRODH2	NM_004646	Proline dehydrogenase (oxidase) 2
PROKR1	NM_138964	Prokineticin receptor 1
PROSC	NM_003114	Proline synthetase co-transcribed homolog (bacterial)
PRPF8	NM_006445	PRP8 pre-mRNA processing factor 8 homolog (S. cerevisiae)
PRPH2	NM_000322	Peripherin 2 (retinal degeneration, slow)
PRR13	NM_001005354	Proline rich 13
PRR7	NM_030567	Proline rich 7 (synaptic)
PRRC1	NM_130809	Proline-rich coiled-coil 1
PRRX1	NM_006902	Paired related homeobox 1
Prrxl1		
PRSS16	NM_005865	Protease, serine, 16 (thymus)
PRSS21	NM_006799	Protease, serine, 21 (testisin)
PRSS22	NM_022119	Protease, serine, 22
PRTG	NM_173814.3	Protogenin homolog (Gallus gallus)
PRTN3	NM_002777	Proteinase 3 (serine proteinase, neutrophil, Wegener
PSCD4	NM_013385	Pleckstrin homology, Sec7 and coiled-coil domains 4
PSENEN	NM_172341	Presenilin enhancer 2 homolog (C. elegans)
PSMA6	NM_002791	Proteasome (prosome, macropain) subunit, alpha type, 6
PSMC2	NM_002803	Proteasome (prosome, macropain) 26S subunit, ATPase, 2
PSMC6		Proteasome (prosome, macropain) 26S subunit, ATPase, 6
PSMD10	NM_002814	Proteasome (prosome, macropain) 26S subunit, non-ATPase, 10
PSMD7		Proteasome (prosome, macropain) 26S subunit, non-ATPase, 7
PSME1	NM_006263	Proteasome (prosome, macropain) activator subunit 1 (PA28
PSRC1	NM_001005290	Proline/serine-rich coiled-coil 1
PTCH2	NM_003738	Patched homolog 2 (Drosophila)
PTCHD2	NM_020780.1	Patched domain containing 2
PTDSS1	NM_014754	Phosphatidylserine synthase 1
PTGDS		Prostaglandin D2 synthase 21kDa (brain)
PTK7	NM_002821	PTK7 protein tyrosine kinase 7
PTMA		Prothymosin, alpha (gene sequence 28)
PTPLAD1	NM_016395.2	Protein tyrosine phosphatase-like A domain containing 1
PTPN2	NM_002828	Protein tyrosine phosphatase, non-receptor type 2
PTPN9	NM_002833	Protein tyrosine phosphatase, non-receptor type 9
PTPRCAP		Protein tyrosine phosphatase, receptor type, C-associated protein
PTPRD	NM_001040712.1	Protein tyrosine phosphatase, receptor type, D
PTPRE	NM_006504	Protein tyrosine phosphatase, receptor type, E
PTPRU	NM_005704	Protein tyrosine phosphatase, receptor type, U
PTRF	NM_012232	Polymerase I and transcript release factor
PUF60	NM_014281.3	Poly-U binding splicing factor 60KDa
PURB	NM_033224	Purine-rich element binding protein B
PUS1	NM_001002019	Pseudouridylate synthase 1
PVRL4	NM_030916	Poliovirus receptor-related 4
PWP1	NM_007062	PWP1 homolog (S. cerevisiae)
PYCR1	NM_006907	Pyrroline-5-carboxylate reductase 1
PYCRL	NM_023078	Pyrroline-5-carboxylate reductase-like
PYGL	NM_002863	Phosphorylase, glycogen; liver (Hers disease, glycogen storage
QPCTL	NM_017659	Glutaminyl-peptide cyclotransferase-like
QPRT	NM_014298	Quinolinate phosphoribosyltransferase (nicotinate-nucleotide pyrophosphorylase (carboxylating))

QRFP	NM_198180	Pyroglutamylated RFamide peptide
QRICH1	NM_017730	Glutamine-rich 1
QRICH2	NM_032134	Glutamine rich 2
QSOX1	NM_001004128	Quiescin Q6 sulfhydryl oxidase 1
Rab1		
RAB10	NM_016131	RAB10, member RAS oncogene family
RAB12	NM_001025300.2	RAB12, member RAS oncogene family
RAB25		RAB25, member RAS oncogene family
RAB28	NM_001017979	RAB28, member RAS oncogene family
RAB2A		RAB2A, member RAS oncogene family
RAB36	NM_004914	RAB36, member RAS oncogene family
RAB3B		RAB3B, member RAS oncogene family
RAB3D	NM_004283	RAB3D, member RAS oncogene family
RAB3IL1	NM_013401	RAB3A interacting protein (rabin3)-like 1
RAB4A	NM_004578	RAB4A, member RAS oncogene family
RAB5A	NM_004162	RAB5A, member RAS oncogene family
RAB5B	NM_002868	RAB5B, member RAS oncogene family
RAB8B	NM_016530	RAB8B, member RAS oncogene family
Rab9		
RAB9B	NM_016370	RAB9B, member RAS oncogene family
RAC2		Ras-related C3 botulinum toxin substrate 2 (rho family, small GTP binding protein Rac2)
RAC3		Ras-related C3 botulinum toxin substrate 3 (rho family, small GTP binding protein Rac3)
Rad9		
RAF1	NM_002880	V-raf-1 murine leukemia viral oncogene homolog 1
RALGPS1	NM_014369	Ral GEF with PH domain and SH3 binding motif 1
RALY	NM_007367	RNA binding protein, autoantigenic (hnRNP-associated with lethal yellow homolog (mouse))
RANBP1	NM_002882	RAN binding protein 1
RANBP3	NM_003624.1	RAN binding protein 3
RAP1A	NM_001010935	RAP1A, member of RAS oncogene family
RAP1GAP	NM_002885	RAP1 GTPase activating protein
RAP2A	NM_021033	RAP2A, member of RAS oncogene family
RAPGEF3	NM_001098531.1	Rap guanine nucleotide exchange factor (GEF) 3
RASA1		RAS p21 protein activator (GTPase activating protein) 1
RASL10A	NM_001007279.1	RAS-like, family 10, member A
RASSF1	NM_007182.4	Ras association (RalGDS/AF-6) domain family 1
RASSF7	NM_003475	Ras association (RalGDS/AF-6) domain family 7
RBBP6	NM_006910	Retinoblastoma binding protein 6
RBCK1	NM_002988	RanBP-type and C3HC4-type zinc finger containing 1
RBM11	NM_144770.2	RNA binding motif protein 11
RBM28	NM_018077	RNA binding motif protein 28
RBM34	NM_015014.1	RNA binding motif protein 34
Rbm5		
RBM8A	NM_005105	RNA binding motif protein 8A
RBPJL	NM_003143	Recombination signal binding protein for immunoglobulin kappa J
RBPMS2	NM_194272	RNA binding protein with multiple splicing 2
RCE1	NM_001032279.1	RCE1 homolog, prenyl protein peptidase (S. cerevisiae)

RCSD1	NM_052862	RCSD domain containing 1
RDH13	NM_138412.2	Retinol dehydrogenase 13 (all-trans/9-cis)
RDH14	NM_001002006	Retinol dehydrogenase 14 (all-trans/9-cis/11-cis)
RDHE2	NM_138969	Epidermal retinal dehydrogenase 2
RDX	NM_002906	Radixin
REEP1	NM_022912	Receptor accessory protein 1
REEP4	NM_025232	Receptor accessory protein 4
REEP6	NM_138393	Receptor accessory protein 6
RELA		V-rel reticuloendotheliosis viral oncogene homolog A, nuclear factor of kappa light polypeptide gene enhancer in B-cells 3, p65
RELT	NM_032871	RELT tumor necrosis factor receptor
REM1	NM_014012	RAS (RAD and GEM)-like GTP-binding 1
REST	NM_002189	RE1-silencing transcription factor
RET	NM_020630.4	Ret proto-oncogene
REXO1	NM_020695	REX1, RNA exonuclease 1 homolog (S. cerevisiae)
RFNG		RFNG O-fucosylpeptide 3-beta-N-acetylglucosaminyltransferase
RFX4	NM_002920	Regulatory factor X, 4 (influences HLA class II expression)
RFXANK	NM_003721	Regulatory factor X-associated ankyrin-containing protein
RG9MTD2	NM_152292	RNA (guanine-9-) methyltransferase domain containing 2
RGP1	NM_001080496.1	RGP1 retrograde golgi transport homolog (S. cerevisiae)
RGS14	NM_006480.4	Regulator of G-protein signaling 14
RGS20	NM_003702	Regulator of G-protein signaling 20
RGS3	NM_017790	Regulator of G-protein signaling 3
RHBDL1	NM_003961	Rhomboid, veinlet-like 1 (Drosophila)
RHEB	NM_000878	Ras homolog enriched in brain
RHOC	NM_001042678.1	Ras homolog gene family, member C
Rhox6		
RIMBP3		RIMS binding protein 3
RIOK1	NM_031480	RIO kinase 1 (yeast)
RNASEH2A	NM_001033503	Ribonuclease H2, subunit A
RNF144B	NM_182757	Ring finger 144B
RNF167	NM_001040125	Ring finger protein 167
RNF170	NM_030954	Ring finger protein 170
RNF20	NM_019592	Ring finger protein 20
RNF31	NM_017999.4	Ring finger protein 31
RNF38	NM_022781	Ring finger protein 38
Rnft1		
Rnft2		
RNUXA	NM_032177	RNA U, small nuclear RNA export adaptor (phosphorylation
ROD1	NM_005156	ROD1 regulator of differentiation 1 (S. pombe)
RORC	NM_001001523	RAR-related orphan receptor C
RPL14		Ribosomal protein L14
RPL18	NM_002205	Ribosomal protein L18
RPL21	NM_000982	Ribosomal protein L21
RPL22L1	NM_001099645.1	Ribosomal protein L22-like 1
RPL23A	NM_000984	Ribosomal protein L23a
RPL3	NM_001572	Ribosomal protein L3
RPL31	NM_000993	Ribosomal protein L31
RPL35	NM_007209	Ribosomal protein L35

RPL8	NM_000973	Ribosomal protein L8
RPP14	NM_001098783.2	Ribonuclease P/MRP 14kDa subunit
RPS15	NM_001018	Ribosomal protein S15
RPS19		Ribosomal protein S19
RPS27L	NM_015920.3	Ribosomal protein S27-like
RPS3A	NM_001006	Ribosomal protein S3A
RPS5	NM_001009	Ribosomal protein S5
RPS6KA4	NM_002648	Ribosomal protein S6 kinase, 90kDa, polypeptide 4
RPS6KA5	NM_004755	Ribosomal protein S6 kinase, 90kDa, polypeptide 5
RPS6KB1	NM_003161	Ribosomal protein S6 kinase, 70kDa, polypeptide 1
RPS6KL1	NM_031464	Ribosomal protein S6 kinase-like 1
RPS8	NM_001012	Ribosomal protein S8
RPSA	NM_001012321	Ribosomal protein SA
RPUSD2	NM_152260	RNA pseudouridylate synthase domain containing 2
RREB1	NM_001003698	Ras responsive element binding protein 1
RRP1	NM_002569	Ribosomal RNA processing 1 homolog (S. cerevisiae)
RRP9	NM_004704	RRP9, small subunit (SSU) processome component, homolog
RSHL1	NM_030785	Radial spokehead-like 1
RSPO2	NM_178565	R-spondin 2 homolog (Xenopus laevis)
RSPRY1	NM_133368	Ring finger and SPRY domain containing 1
RTN2	NM_005619	Reticulon 2
RTN3	NM_006054	Reticulon 3
RTN4	NM_007008.2	Reticulon 4
RTN4IP1	NM_032730	Reticulon 4 interacting protein 1
RTN4RL1	NM_178568.2	Reticulon 4 receptor-like 1
RTP2	NM_001004312	Receptor (chemosensory) transporter protein 2
RUNX1	NM_001001890.1	Runt-related transcription factor 1 (acute myeloid leukemia 1;
RUNX2	NM_001015051.2	Runt-related transcription factor 2
RUVBL2	NM_006666.1	RuvB-like 2 (E. coli)
RWDD2A	NM_033411	RWD domain containing 2A
RWDD3	NM_015485.4	RWD domain containing 3
SAFB2	NM_014649	Scaffold attachment factor B2
SALL4	NM_020436	Sal-like 4 (Drosophila)
SAPS2	NM_014678	SAPS domain family, member 2
SARS	NM_006513	Seryl-tRNA synthetase
SARS2	NM_017827	Seryl-tRNA synthetase 2, mitochondrial
SBSN	NM_198538	Suprabasin
SCAMP5	NM_138967.2	Secretory carrier membrane protein 5
SCAND1	NM_016558	SCAN domain containing 1
SCAP	NM_012235	SREBF chaperone
SCARF2	NM_153334	Scavenger receptor class F, member 2
SCFD1	NM_016106	Sec1 family domain containing 1
SCHIP1	NM_014575	Schwannomin interacting protein 1
SCML4	NM_198081	Sex comb on midleg-like 4 (Drosophila)
SCN8A	NM_014191.2	Sodium channel, voltage gated, type VIII, alpha subunit
SCRN1	NM_014766	Secernin 1
SDC1	NM_001006946	Syndecan 1
SDCCAG3	NM_000337.4	Serologically defined colon cancer antigen 3
SDHD		Succinate dehydrogenase complex, subunit D, integral membrane

SDPR	NM_004657	Serum deprivation response (phosphatidylserine binding protein)
SEC13		SEC13 homolog (S. cerevisiae)
SEC61G		Sec61 gamma subunit
SEC63	NM_015915	SEC63 homolog (S. cerevisiae)
Sectm1a		
SEMA3B	NM_001005914.1	Sema domain, immunoglobulin domain (Ig), short basic domain, secreted, (semaphorin) 3B
SEMA3G	NM_020163	Sema domain, immunoglobulin domain (Ig), short basic domain, secreted, (semaphorin) 3G
SEMA4C	NM_017789	Sema domain, immunoglobulin domain (Ig), transmembrane domain (TM) and short cytoplasmic domain, (semaphorin) 4C
SEMA5B	NM_001031702	Sema domain, seven thrombospondin repeats (type 1 and type 1-like), transmembrane domain (TM) and short cytoplasmic domain,
SEMA6A	NM_020796.3	Sema domain, transmembrane domain (TM), and cytoplasmic domain, (semaphorin) 6A
SEPHS2	NM_012248.2	Selenophosphate synthetase 2
Sepn1		
SERF2	NM_001018108	Small EDRK-rich factor 2
SERHL		Serine hydrolase-like
SERINC3	NM_006811	Serine incorporator 3
SERINC4	NM_001033517	Serine incorporator 4
SERPINA10	NM_001100607.1	Serpin peptidase inhibitor, clade A (alpha-1 antiproteinase,
SERPINA11	NM_001080451	Serpin peptidase inhibitor, clade A (alpha-1 antiproteinase,
Serpina3m		
Serpinb9c		
SERPINC1	NM_000488	Serpin peptidase inhibitor, clade C (antithrombin), member 1
SERPINE1	NM_000602	Serpin peptidase inhibitor, clade E (nexin, plasminogen activator inhibitor type 1), member 1
SETD4	NM_001007259.1	SET domain containing 4
SETD6	NM_024860	SET domain containing 6
SETX	NM_183239	Senataxin
SEZ6L	NM_021115	Seizure related 6 homolog (mouse)-like
SEZ6L2	NM_012410	Seizure related 6 homolog (mouse)-like 2
SF3B2	NM_006842	Splicing factor 3b, subunit 2, 145kDa
SF4		Splicing factor 4
Sfpi1		
SFRP2	NM_003013	Secreted frizzled-related protein 2
SFRS10	NM_004593	Splicing factor, arginine/serine-rich 10 (transformer 2 homolog,
SFRS11	NM_004768	Splicing factor, arginine/serine-rich 11
SFRS12IP1	NM_173829	SFRS12-interacting protein 1
SFT2D2	NM_199344	SFT2 domain containing 2
SFXN2	NM_178858	Sideroflexin 2
SFXN5	NM_144579	Sideroflexin 5
Sgk1		
SH2B1	NM_017704	SH2B adaptor protein 1
SH2D5		SH2 domain containing 5
SH3BP1	NM_018957	SH3-domain binding protein 1
SH3GL2	NM_003026	SH3-domain GRB2-like 2
SH3PXD2A	NM_014631	SH3 and PX domains 2A

Sharpin		
SHFM1	NM_006304	Split hand/foot malformation (ectrodactyly) type 1
Shisa2		
Shisa5		
SHKBP1	NM_138392	SH3KBP1 binding protein 1
SHROOM3	NM_020859	Shroom family member 3
SHROOM4	NM_020717	Shroom family member 4
SIDT2	NM_001040455	SID1 transmembrane family, member 2
SIGIRR	NM_021805	Single immunoglobulin and toll-interleukin 1 receptor (TIR)
Siglece		
SIL1	NM_001037633	SIL1 homolog, endoplasmic reticulum chaperone (S. cerevisiae)
SIN3B	NM_015260	SIN3 homolog B, transcription regulator (yeast)
SIRT3	NM_001017524.1	Sirtuin (silent mating type information regulation 2 homolog) 3 (S.
SIRT7	NM_016538	Sirtuin (silent mating type information regulation 2 homolog) 7 (S.
SIT1		Signaling threshold regulating transmembrane adaptor 1
SIX1	NM_005982	SIX homeobox 1
SIX2	NM_003966	SIX homeobox 2
SIX3	NM_005413	SIX homeobox 3
SLC10A3	NM_019848	Solute carrier family 10 (sodium/bile acid cotransporter family),
SLC10A7	NM_001029998	Solute carrier family 10 (sodium/bile acid cotransporter family),
SLC12A9	NM_020246	Solute carrier family 12 (potassium/chloride transporters),
SLC15A4	NM_145648	Solute carrier family 15, member 4
SLC16A13	NM_201566	Solute carrier family 16, member 13 (monocarboxylic acid
SLC17A6	NM_020346	Solute carrier family 17 (sodium-dependent inorganic phosphate cotransporter), member 6
SLC17A7	NM_020309	Solute carrier family 17 (sodium-dependent inorganic phosphate cotransporter), member 7
SLC18A1	NM_003053	Solute carrier family 18 (vesicular monoamine), member 1
SLC20A2	NM_006749	Solute carrier family 20 (phosphate transporter), member 2
SLC22A16	NM_033125	Solute carrier family 22 (organic cation transporter), member 16
SLC23A3	NM_144712.2	Solute carrier family 23 (nucleobase transporters), member 3
SLC25A17	NM_021976	Solute carrier family 25 (mitochondrial carrier; peroxisomal membrane protein, 34kDa), member 17
SLC25A19	NM_021734	Solute carrier family 25 (mitochondrial thiamine pyrophosphate
SLC25A20	NM_000387	Solute carrier family 25 (carnitine/acylcarnitine translocase),
SLC25A33	NM_032315	Solute carrier family 25, member 33
SLC25A4	NM_001151	Solute carrier family 25 (mitochondrial carrier; adenine nucleotide translocator), member 4
SLC25A40	NM_018843	Solute carrier family 25, member 40
SLC25A5	NM_001152	Solute carrier family 25 (mitochondrial carrier; adenine nucleotide translocator), member 5
SLC27A2	NM_004213	Solute carrier family 27 (fatty acid transporter), member 2
SLC27A3		Solute carrier family 27 (fatty acid transporter), member 3
SLC29A1	NM_001078174.1	Solute carrier family 29 (nucleoside transporters), member 1
SLC2A4	NM_004139	Solute carrier family 2 (facilitated glucose transporter), member 4
SLC2A9	NM_001001290	Solute carrier family 2 (facilitated glucose transporter), member 9
SLC30A10	NM_018713	Solute carrier family 30, member 10
SLC30A9	NM_006345	Solute carrier family 30 (zinc transporter), member 9
SLC34A3		Solute carrier family 34 (sodium phosphate), member 3

SLC35A5	NM_017945	Solute carrier family 35, member A5
SLC35B1	NM_005827	Solute carrier family 35, member B1
SLC35C2	NM_015945	Solute carrier family 35, member C2
SLC35E4	NM_001001479	Solute carrier family 35, member E4
SLC35F3	NM_173508	Solute carrier family 35, member F3
Slc38a10		
SLC38A4	NM_018018	Solute carrier family 38, member 4
SLC39A1	NM_014437	Solute carrier family 39 (zinc transporter), member 1
SLC39A4	NM_017767.2	Solute carrier family 39 (zinc transporter), member 4
SLC39A5	NM_173596	Solute carrier family 39 (metal ion transporter), member 5
SLC44A4	NM_025257	Solute carrier family 44, member 4
SLC4A2	NM_003040	Solute carrier family 4, anion exchanger, member 2 (erythrocyte membrane protein band 3-like 1)
SLC4A7	NM_003615	Solute carrier family 4, sodium bicarbonate cotransporter,
SLC5A10	NM_001042450.1	Solute carrier family 5 (sodium/glucose cotransporter), member
SLC6A11	NM_014229	Solute carrier family 6 (neurotransmitter transporter, GABA),
SLC6A17	NM_001010898	Solute carrier family 6, member 17
SLC7A4	NM_004173	Solute carrier family 7 (cationic amino acid transporter, y+
SLC7A7		Solute carrier family 7 (cationic amino acid transporter, y+
SLC8A3	NM_033262	Solute carrier family 8 (sodium-calcium exchanger), member 3
SLC9A3R2		Solute carrier family 9 (sodium/hydrogen exchanger), member 3
SLC9A5	NM_000230	Solute carrier family 9 (sodium/hydrogen exchanger), member 5
SLCO2A1	NM_005630	Solute carrier organic anion transporter family, member 2A1
SLCO5A1		Solute carrier organic anion transporter family, member 5A1
SLITRK4	NM_173078	SLIT and NTRK-like family, member 4
SLU7	NM_006425	SLU7 splicing factor homolog (S. cerevisiae)
SLURP1	NM_020427	Secreted LY6/PLAUR domain containing 1
SMAD4	NM_005359	SMAD family member 4
SMARCA5	NM_001001958	SWI/SNF related, matrix associated, actin dependent regulator of chromatin, subfamily a, member 5
SMC1A	NM_006306	Structural maintenance of chromosomes 1A
SMCR7	NM_139162	Smith-Magenis syndrome chromosome region, candidate 7
SNAPC2	NM_003083	Small nuclear RNA activating complex, polypeptide 2, 45kDa
SNCB	NM_001001502	Synuclein, beta
SNF1LK	NM_173354	SNF1-like kinase
SNRP70		Small nuclear ribonucleoprotein 70kDa polypeptide (RNP antigen)
SNRPB2	NM_003092	Small nuclear ribonucleoprotein polypeptide B''
SNRPD2		Small nuclear ribonucleoprotein D2 polypeptide 16.5kDa
SNRPE	NM_003094	Small nuclear ribonucleoprotein polypeptide E
SNTB1	NM_002315.1	Syntrophin, beta 1 (dystrophin-associated protein A1, 59kDa,
SNX11	NM_013323	Sorting nexin 11
Snx18		
SNX22	NM_024798	Sorting nexin 22
SNX26	NM_052948	Sorting nexin 26
Snx33		
SOCS1	NM_003745	Suppressor of cytokine signaling 1
SOD1	NM_000454	Superoxide dismutase 1, soluble (amyotrophic lateral sclerosis 1
SOD2	NM_000636	Superoxide dismutase 2, mitochondrial
SORCS1	NM_001013031	Sortilin-related VPS10 domain containing receptor 1

SORCS2	NM_020777.1	Sortilin-related VPS10 domain containing receptor 2
SORT1	NM_002245	Sortilin 1
SOX1	NM_005986	SRY (sex determining region Y)-box 1
SOX15	NM_006942	SRY (sex determining region Y)-box 15
SOX2	NM_003106	SRY (sex determining region Y)-box 2
SOX21	NM_007084	SRY (sex determining region Y)-box 21
SOX8	NM_014587	SRY (sex determining region Y)-box 8
Sp9		
SPAG1	NM_003114	Sperm associated antigen 1
SPATA1	NM_001081472.1	Spermatogenesis associated 1
SPATA21		Spermatogenesis associated 21
SPCS2	NM_014752.1	Signal peptidase complex subunit 2 homolog (S. cerevisiae)
SPIB	NM_003121	Spi-B transcription factor (Spi-1/PU.1 related)
SPINT1	NM_181642	Serine peptidase inhibitor, Kunitz type 1
SPN	NM_001030288	Sialophorin (leukosialin, CD43)
Spnb1		
SPRR2F	NM_001014450	Small proline-rich protein 2F
SPTY2D1	NM_194285	SPT2, Suppressor of Ty, domain containing 1 (S. cerevisiae)
SRD5A1	NM_001047	Steroid-5-alpha-reductase, alpha polypeptide 1 (3-oxo-5 alpha-steroid delta 4-dehydrogenase alpha 1)
SRD5A2	NM_000348.3	Steroid-5-alpha-reductase, alpha polypeptide 2 (3-oxo-5 alpha-steroid delta 4-dehydrogenase alpha 2)
SRI	NM_003130	Sorcin
SRP68	NM_001033667	Signal recognition particle 68kDa
SRPK3	NM_014370	SFRS protein kinase 3
SRRM2	NM_016333	Serine/arginine repetitive matrix 2
SSH3	NM_017857	Slingshot homolog 3 (Drosophila)
SSR4	NM_006280	Signal sequence receptor, delta (translocon-associated protein
SSSCA1		Sjogren syndrome/scleroderma autoantigen 1
SSTR1	NM_001049	Somatostatin receptor 1
SSTR3	NM_001051	Somatostatin receptor 3
ST3GAL1	NM_003033	ST3 beta-galactoside alpha-2,3-sialyltransferase 1
ST6GALNAC6	NM_013443	ST6 (alpha-N-acetyl-neuraminyl-2,3-beta-galactosyl-1,3)-N-acetylgalactosaminide alpha-2,6-sialyltransferase 6
ST7L	NM_017744	Suppression of tumorigenicity 7 like
ST8SIA2	NM_006011	ST8 alpha-N-acetyl-neuraminide alpha-2,8-sialyltransferase 2
STAB2	NM_017564	Stabilin 2
STARD4		StAR-related lipid transfer (START) domain containing 4
STAT2	NM_005904	Signal transducer and activator of transcription 2, 113kDa
STBD1	NM_006875	Starch binding domain 1
STEAP1		Six transmembrane epithelial antigen of the prostate 1
STEAP3	NM_001008410	STEAP family member 3
STK36	NM_015690	Serine/threonine kinase 36, fused homolog (Drosophila)
STMN2		Stathmin-like 2
STOML2		Stomatin (EPB72)-like 2
STRA13		Stimulated by retinoic acid 13 homolog (mouse)
STRBP	NM_018387	Spermatid perinuclear RNA binding protein
STX1A	NM_004603	Syntaxin 1A (brain)
STX3	NM_002364	Syntaxin 3

SUCLG2	NM_016205	Succinate-CoA ligase, GDP-forming, beta subunit
SULT2B1	NM_004605	Sulfotransferase family, cytosolic, 2B, member 1
SULT4A1	NM_014351	Sulfotransferase family 4A, member 1
SUMO2		SMT3 suppressor of mif two 3 homolog 2 (S. cerevisiae)
SUPT4H1	NM_006715	Suppressor of Ty 4 homolog 1 (S. cerevisiae)
SURF2	NM_002373.5	Surfeit 2
SURF4	NM_005909	Surfeit 4
SUSD2	NM_019601	Sushi domain containing 2
SUV39H1	NM_003173	Suppressor of variegation 3-9 homolog 1 (Drosophila)
SUV39H2	NM_024670	Suppressor of variegation 3-9 homolog 2 (Drosophila)
SVEP1	NM_153366.3	Sushi, von Willebrand factor type A, EGF and pentraxin domain
SYN1	NM_003954.2	Synapsin I
SYN2	NM_133625.3	Synapsin II
Sync		
SYNE1	NM_001099267.1	Spectrin repeat containing, nuclear envelope 1
SYPL2	NM_001040709.1	Synaptophysin-like 2
SYT3	NM_032298	Synaptotagmin III
SYT5	NM_033141	Synaptotagmin V
SYTL1		Synaptotagmin-like 1
SYVN1	NM_032431	Synovial apoptosis inhibitor 1, synoviolin
TACC2	NM_006997	Transforming, acidic coiled-coil containing protein 2
TACSTD1	NM_002354	Tumor-associated calcium signal transducer 1
TADA1L	NM_053053	Transcriptional adaptor 1 (HFI1 homolog, yeast)-like
TAF11	NM_005456	TAF11 RNA polymerase II, TATA box binding protein (TBP)-associated factor, 28kDa
TAF12	NM_005644	TAF12 RNA polymerase II, TATA box binding protein (TBP)-associated factor, 20kDa
TAF7L	NM_024885	TAF7-like RNA polymerase II, TATA box binding protein (TBP)-associated factor, 50kDa
TAGLN	NM_001001522	Transgelin
TALDO1	NM_004635	Transaldolase 1
TAP2	NM_000544.3	Transporter 2, ATP-binding cassette, sub-family B (MDR/TAP)
TARS2	NM_025150	Threonyl-tRNA synthetase 2, mitochondrial (putative)
TAZ		Tafazzin (cardiomyopathy, dilated 3A (X-linked); endocardial fibroelastosis 2; Barth syndrome)
TBC1D10A	NM_031937	TBC1 domain family, member 10A
TBC1D10B	NM_015527	TBC1 domain family, member 10B
TBC1D23	NM_018309	TBC1 domain family, member 23
TBCC	NM_003192	Tubulin folding cofactor C
TBKBP1	NM_014298	TBK1 binding protein 1
TBL3	NM_006453	Transducin (beta)-like 3
TBP	NM_002380.3	TATA box binding protein
TBRG4	NM_004749	Transforming growth factor beta regulator 4
TBX1	NM_002377	T-box 1
TBX4	NM_018488	T-box 4
TBX5	NM_000192	T-box 5
TBXA2R	NM_001060.4	Thromboxane A2 receptor
TCAP	NM_003673	Titin-cap (telethonin)
TCERG1L	NM_174937	Transcription elongation regulator 1-like

TCF21	NM_003206	Transcription factor 21
TCF7L2	NM_030756	Transcription factor 7-like 2 (T-cell specific, HMG-box)
Tcfap2c		
Tcfap2e		
Tcfcp2l1		
Tcfe3		
TCN2	NM_000355	Transcobalamin II; macrocytic anemia
TCTE1	NM_182539	T-complex-associated-testis-expressed 1
TEAD3	NM_003214.3	TEA domain family member 3
TEF		Thyrotrophic embryonic factor
TELO2	NM_016111	TEL2, telomere maintenance 2, homolog (S. cerevisiae)
TENC1		Tensin like C1 domain containing phosphatase (tensin 2)
Tesp1		
Tet2		
TEX12	NM_031275	Testis expressed 12
TEX2	NM_018469	Testis expressed 2
TFPT	NM_013342	TCF3 (E2A) fusion partner (in childhood Leukemia)
TGFB1	NM_000660	Transforming growth factor, beta 1
TGFB1I1		Transforming growth factor beta 1 induced transcript 1
TGFBR2	NM_001024847	Transforming growth factor, beta receptor II (70/80kDa)
TGIF2	NM_021809	TGFB-induced factor homeobox 2
TGM3	NM_003245	Transglutaminase 3 (E polypeptide, protein-glutamine-gamma-
THAP11	NM_020457	THAP domain containing 11
THAP3	NM_138350	THAP domain containing, apoptosis associated protein 3
THAP4	NM_015963	THAP domain containing 4
THOC6	NM_024339	THO complex 6 homolog (Drosophila)
THOP1	NM_004528	Thimet oligopeptidase 1
THPO	NM_000460	Thrombopoietin (myeloproliferative leukemia virus oncogene ligand, megakaryocyte growth and development factor)
THSD4	NM_024817.2	Thrombospondin, type I, domain containing 4
THUMPD3	NM_015453	THUMP domain containing 3
THY1	NM_006288	Thy-1 cell surface antigen
TIAM1	NM_003253	T-cell lymphoma invasion and metastasis 1
TICAM1	NM_182919	Toll-like receptor adaptor molecule 1
TIMM13	NM_012458	Translocase of inner mitochondrial membrane 13 homolog (yeast)
TIMM17A	NM_006335	Translocase of inner mitochondrial membrane 17 homolog A
TIMM44	NM_006351	Translocase of inner mitochondrial membrane 44 homolog (yeast)
TINF2	NM_001099274.1	TERF1 (TRF1)-interacting nuclear factor 2
TK1	NM_003258	Thymidine kinase 1, soluble
TK2	NM_004614	Thymidine kinase 2, mitochondrial
TKT	NM_001064	Transketolase (Wernicke-Korsakoff syndrome)
TLCD1	NM_138463	TLC domain containing 1
Tlr12		
TLR9	NM_007284	Toll-like receptor 9
TLX1	NM_005521	T-cell leukemia homeobox 1
TLX3	NM_021025	T-cell leukemia homeobox 3
TM4SF5	NM_003963	Transmembrane 4 L six family member 5
TM7SF2	NM_018848	Transmembrane 7 superfamily member 2
TM9SF2	NM_004800	Transmembrane 9 superfamily member 2

TM9SF3	NM_020123	Transmembrane 9 superfamily member 3
TMC7	NM_024847	Transmembrane channel-like 7
TMC8	NM_152468	Transmembrane channel-like 8
TMCC2	NM_014858	Transmembrane and coiled-coil domain family 2
TMCO4	NM_181719	Transmembrane and coiled-coil domains 4
TMCO6	NM_018502	Transmembrane and coiled-coil domains 6
TMED1	NM_006858	Transmembrane emp24 protein transport domain containing 1
TMED4		Transmembrane emp24 protein transport domain containing 4
TMEM1	NM_013255	Transmembrane protein 1
TMEM106C	NM_024056	Transmembrane protein 106C
TMEM107	NM_032354	Transmembrane protein 107
TMEM11	NM_152914.2	Transmembrane protein 11
TMEM115	NM_007024	Transmembrane protein 115
Tmem120b		
TMEM121	NM_025268	Transmembrane protein 121
TMEM127	NM_017849	Transmembrane protein 127
TMEM132A	NM_017870	Transmembrane protein 132A
TMEM145	NM_173633	Transmembrane protein 145
TMEM157	NM_198507	Transmembrane protein 157
TMEM159	NM_020422	Transmembrane protein 159
TMEM161A		Transmembrane protein 161A
TMEM161B	NM_153354	Transmembrane protein 161B
TMEM163	NM_030923	Transmembrane protein 163
TMEM166	NM_032181	Transmembrane protein 166
TMEM16K	NM_018075	Transmembrane protein 16K
TMEM174	NM_153217	Transmembrane protein 174
TMEM176A	NM_018487	Transmembrane protein 176A
TMEM184A	NM_001097620.1	Transmembrane protein 184A
TMEM186	NM_015421	Transmembrane protein 186
Tmem201		
Tmem205		
TMEM32	NM_173470	Transmembrane protein 32
TMEM47	NM_031442	Transmembrane protein 47
TMEM54	NM_033504	Transmembrane protein 54
TMEM59	NM_004872	Transmembrane protein 59
TMEM60	NM_032936	Transmembrane protein 60
TMEM63A		Transmembrane protein 63A
TMEM63B	NM_018426	Transmembrane protein 63B
TMEM70	NM_001040613.1	Transmembrane protein 70
TMEM81	NM_203376	Transmembrane protein 81
TMEM82	NM_001013641	Transmembrane protein 82
TMEM86A	NM_153347	Transmembrane protein 86A
TMEM86B		Transmembrane protein 86B
TMEM9B	NM_020644	TMEM9 domain family, member B
TMOD1	NM_003275	Tropomodulin 1
TMPRSS13	NM_001077263.1	Transmembrane protease, serine 13
TMPRSS4	NM_001083947.1	Transmembrane protease, serine 4
TMUB1	NM_031434	Transmembrane and ubiquitin-like domain containing 1
TNFAIP3	NM_001040108	Tumor necrosis factor, alpha-induced protein 3

TNFAIP8L2	NM_024575	Tumor necrosis factor, alpha-induced protein 8-like 2
TNFRSF13C	NM_052945	Tumor necrosis factor receptor superfamily, member 13C
TNFRSF18	NM_001083	Tumor necrosis factor receptor superfamily, member 18
TNFRSF8	NM_001243	Tumor necrosis factor receptor superfamily, member 8
TNFSF14	NM_001083314.1	Tumor necrosis factor (ligand) superfamily, member 14
TNXB	NM_019105.5	Tenascin XB
TOM1L2	NM_001033551	Target of myb1-like 2 (chicken)
TOMM34	NM_006809	Translocase of outer mitochondrial membrane 34
TOMM40		Translocase of outer mitochondrial membrane 40 homolog (yeast)
TOMM40L	NM_032174	Translocase of outer mitochondrial membrane 40 homolog (yeast)·
TOPBP1	NM_004174	Topoisomerase (DNA) II binding protein 1
TPM2	NM_003289	Tropomyosin 2 (beta)
Tprgl		
TPSAB1	NM_003294	Tryptase alpha/beta 1
TPST2	NM_001008566	Tyrosylprotein sulfotransferase 2
TPT1	NM_003295	Tumor protein, translationally-controlled 1
TRA2A	NM_013293	Transformer-2 alpha
TRAF2	NM_021138	TNF receptor-associated factor 2
TRAF3IP3	NM_025228	TRAF3 interacting protein 3
TRAM2	NM_012288	Translocation associated membrane protein 2
TRAPPC3	NM_014408	Trafficking protein particle complex 3
TRAPPC5	NM_001042461.1	Trafficking protein particle complex 5
TREM1	NM_018643	Triggering receptor expressed on myeloid cells 1
TREX1	NM_016381.3	Three prime repair exonuclease 1
TRIB1	NM_025195	Tribbles homolog 1 (Drosophila)
TRIM25	NM_005082	Tripartite motif-containing 25
TRIM31	NM_007028	Tripartite motif-containing 31
TRIM37	NM_001005207.1	Tripartite motif-containing 37
TRIM50	NM_178125	Tripartite motif-containing 50
TRIM54	NM_032546	Tripartite motif-containing 54
TRIOBP	NM_001039141.1	TRIO and F-actin binding protein
TRIP12	NM_001042388.1	Thyroid hormone receptor interactor 12
TRIP4	NM_016213	Thyroid hormone receptor interactor 4
TRIP6	NM_003302	Thyroid hormone receptor interactor 6
TRIT1	NM_017646	TRNA isopentenyltransferase 1
Trp53		
Trp53bp1		
Trp53i13		
TRPM1	NM_002420	Transient receptor potential cation channel, subfamily M, member
TRPV3	NM_145068	Transient receptor potential cation channel, subfamily V, member
TRSPAP1	NM_017846	TRNA selenocysteine associated protein 1
TSHZ1	NM_005786	Teashirt zinc finger homeobox 1
TSPAN11	NM_001080509	Tetraspanin 11
TSPAN4	NM_004993	Tetraspanin 4
TSPAN7	NM_004897	Tetraspanin 7
TSPAN9		Tetraspanin 9
TSPYL1	NM_003309	TSPY-like 1
TSR1	NM_018128	TSR1, 20S rRNA accumulation, homolog (S. cerevisiae)
TSTA3		Tissue specific transplantation antigen P35B

TTC13	NM_024525	Tetratricopeptide repeat domain 13
TTC15	NM_016030	Tetratricopeptide repeat domain 15
TTC16	NM_144965	Tetratricopeptide repeat domain 16
TTC22		Tetratricopeptide repeat domain 22
TTC24		Tetratricopeptide repeat domain 24
Ttc7		
TTLL12	NM_015140	Tubulin tyrosine ligase-like family, member 12
Ttll3		
TTYH1		Tweety homolog 1 (Drosophila)
TTYH3	NM_025250	Tweety homolog 3 (Drosophila)
TUBA1A		Tubulin, alpha 1a
TUBGCP2	NM_006659	Tubulin, gamma complex associated protein 2
TULP1	NM_003322	Tubby like protein 1
TULP3	NM_003324	Tubby like protein 3
TXNDC12	NM_015913	Thioredoxin domain containing 12 (endoplasmic reticulum)
TXNL4A	NM_000578	Thioredoxin-like 4A
TXNRD3		Thioredoxin reductase 3
TYW3	NM_138467	TRNA-yW synthesizing protein 3 homolog (S. cerevisiae)
U2AF1L4	NM_001040425.1	U2 small nuclear RNA auxiliary factor 1-like 4
UACA	NM_001008224	Uveal autoantigen with coiled-coil domains and ankyrin repeats
UAP1	NM_003115	UDP-N-acteylglucosamine pyrophosphorylase 1
UBA52	NM_001033930	Ubiquitin A-52 residue ribosomal protein fusion product 1
UBAP2	NM_018449	Ubiquitin associated protein 2
Ube1l		
UBE2I	NM_003345	Ubiquitin-conjugating enzyme E2I (UBC9 homolog, yeast)
UBE2J2	NM_058167	Ubiquitin-conjugating enzyme E2, J2 (UBC6 homolog, yeast)
Ube2k		
UBE2L3	NM_003347	Ubiquitin-conjugating enzyme E2L 3
UBE2M	NM_005084	Ubiquitin-conjugating enzyme E2M (UBC12 homolog, yeast)
UBE2S	NM_014501	Ubiquitin-conjugating enzyme E2S
UBL4B	NM_203412	Ubiquitin-like 4B
UBOX5	NM_014948	U-box domain containing 5
UBQLN3	NM_017481	Ubiquilin 3
UBXD3	NM_152376	UBX domain containing 3
UCHL5IP	NM_017518	UCHL5 interacting protein
Ufsp2		
UGDH	NM_003359	UDP-glucose dehydrogenase
Ugt1a10		
UHRF1BP1	NM_017754.3	UHRF1 (ICBP90) binding protein 1
ULK1	NM_003565	Unc-51-like kinase 1 (C. elegans)
UNC119B	NM_001080533	Unc-119 homolog B (C. elegans)
UNC13A	NM_001080421.1	Unc-13 homolog A (C. elegans)
UNC13D	NM_199242	Unc-13 homolog D (C. elegans)
UPK2	NM_006760	Uroplakin 2
UPK3A	NM_006953	Uroplakin 3A
UQCR	NM_006830	Ubiquinol-cytochrome c reductase, 6.4kDa subunit
UROD	NM_000374	Uroporphyrinogen decarboxylase
UROS	NM_000375	Uroporphyrinogen III synthase (congenital erythropoietic
USP10	NM_005153.2	Ubiquitin specific peptidase 10

USP22	NM_015276.1	Ubiquitin specific peptidase 22
USP3	NM_006537	Ubiquitin specific peptidase 3
USP38	NM_032557	Ubiquitin specific peptidase 38
USP49	NM_018561	Ubiquitin specific peptidase 49
USP5	NM_001098536.1	Ubiquitin specific peptidase 5 (isopeptidase T)
USP7		Ubiquitin specific peptidase 7 (herpes virus-associated)
USP8	NM_017514	Ubiquitin specific peptidase 8
USPL1	NM_005800	Ubiquitin specific peptidase like 1
UTP14A	NM_006649	UTP14, U3 small nucleolar ribonucleoprotein, homolog A (yeast)
V1rf2		
VAMP5	NM_003769	Vesicle-associated membrane protein 5 (myobrevin)
VASH2	NM_024749	Vasohibin 2
VAX1	NM_199131	Ventral anterior homeobox 1
VCPIP1	NM_025054	Valosin containing protein (p97)/p47 complex interacting protein 1
VDAC2	NM_003375	Voltage-dependent anion channel 2
VDR	NM_000376	Vitamin D (1,25- dihydroxyvitamin D3) receptor
VEPH1	NM_024621	Ventricular zone expressed PH domain homolog 1 (zebrafish)
VGLL4	NM_014667	Vestigial like 4 (Drosophila)
VIPR1	NM_004624	Vasoactive intestinal peptide receptor 1
VLDLR	NM_001018056	Very low density lipoprotein receptor
VPS13A	NM_001018037.1	Vacuolar protein sorting 13 homolog A (S. cerevisiae)
VPS33B	NM_024766	Vacuolar protein sorting 33 homolog B (yeast)
VPS36		Vacuolar protein sorting 36 homolog (S. cerevisiae)
VPS52	NM_002250	Vacuolar protein sorting 52 homolog (S. cerevisiae)
VPS72	NM_004526	Vacuolar protein sorting 72 homolog (S. cerevisiae)
VSIG2	NM_014312	V-set and immunoglobulin domain containing 2
VSTM2B		V-set and transmembrane domain containing 2B
VSX1	NM_014588	Visual system homeobox 1
VWA1	NM_022834	Von Willebrand factor A domain containing 1
VWC2	NM_198570	Von Willebrand factor C domain containing 2
WARS	NM_004184	Tryptophanyl-tRNA synthetase
WBP1		WW domain binding protein 1
WBP2	NM_012478	WW domain binding protein 2
WBSCR17	NM_022479	Williams-Beuren syndrome chromosome region 17
WDFY2	NM_052950	WD repeat and FYVE domain containing 2
WDR1	NM_002907	WD repeat domain 1
WDR13	NM_017883	WD repeat domain 13
WDR22	NM_003861	WD repeat domain 22
WDR27	NM_182552.3	WD repeat domain 27
WDR36	NM_139281	WD repeat domain 36
WDR40B	NM_178470	WD repeat domain 40B
WDR55	NM_017706	WD repeat domain 55
WDR5B	NM_019069	WD repeat domain 5B
WDR67	NM_145647	WD repeat domain 67
WDR74		WD repeat domain 74
WDR75	NM_032168	WD repeat domain 75
WDR78	NM_024763	WD repeat domain 78
WDR79	NM_018081	WD repeat domain 79
WDR85		WD repeat domain 85

WDR91	NM_014149	WD repeat domain 91
WDSOF1	NM_015420	WD repeats and SOF1 domain containing
WDSUB1	NM_152528	WD repeat, sterile alpha motif and U-box domain containing 1
WFDC1	NM_021197	WAP four-disulfide core domain 1
WFDC8	NM_130896	WAP four-disulfide core domain 8
WFIKKN1	NM_053284	WAP, follistatin/kazal, immunoglobulin, kunitz and netrin domain
WISP1	NM_003882	WNT1 inducible signaling pathway protein 1
WNK1	NM_018979	WNK lysine deficient protein kinase 1
WNT1	NM_005430	Wingless-type MMTV integration site family, member 1
WNT2B	NM_004185	Wingless-type MMTV integration site family, member 2B
WNT3A	NM_033131	Wingless-type MMTV integration site family, member 3A
WNT5B	NM_030775	Wingless-type MMTV integration site family, member 5B
WNT9A	NM_003395	Wingless-type MMTV integration site family, member 9A
WRN	NM_000553	Werner syndrome
WRNIP1	NM_020135	Werner helicase interacting protein 1
WSB1	NM_015626	WD repeat and SOCS box-containing 1
WSCD1	NM_015253	WSC domain containing 1
WWC2	NM_024949	WW and C2 domain containing 2
WWOX	NM_016373.1	WW domain containing oxidoreductase
WWP2	NM_001008539	WW domain containing E3 ubiquitin protein ligase 2
XKR7	NM_001011718	XK, Kell blood group complex subunit-related family, member 7
XPO7		Exportin 7
XRCC5		X-ray repair complementing defective repair in Chinese hamster
XRCC6	NM_001469	X-ray repair complementing defective repair in Chinese hamster
YARS	NM_003680	Tyrosyl-tRNA synthetase
YARS2	NM_001040436	Tyrosyl-tRNA synthetase 2, mitochondrial
YIF1B	NM_001039671.1	Yip1 interacting factor homolog B (S. cerevisiae)
YWHAB		Tyrosine 3-monooxygenase/tryptophan 5-monooxygenase activation protein, beta polypeptide
YWHAQ	NM_006826	Tyrosine 3-monooxygenase/tryptophan 5-monooxygenase activation protein, theta polypeptide
YWHAZ	NM_001008541	Tyrosine 3-monooxygenase/tryptophan 5-monooxygenase activation protein, zeta polypeptide
ZBP1		Z-DNA binding protein 1
ZBTB1	NM_014950	Zinc finger and BTB domain containing 1
ZBTB45	NM_032792	Zinc finger and BTB domain containing 45
ZC3H12B	NM_001010888.2	Zinc finger CCCH-type containing 12B
ZC3H13	NM_052944	Zinc finger CCCH-type containing 13
ZCCHC5	NM_152694	Zinc finger, CCHC domain containing 5
ZCCHC7	NM_032226	Zinc finger, CCHC domain containing 7
ZCWPW1	NM_017984.3	Zinc finger, CW type with PWWP domain 1
ZDHHC12	NM_032799	Zinc finger, DHHC-type containing 12
ZDHHC14	NM_024630	Zinc finger, DHHC-type containing 14
ZDHHC15	NM_144969	Zinc finger, DHHC-type containing 15
ZDHHC16	NM_032327	Zinc finger, DHHC-type containing 16
ZDHHC18	NM_032283	Zinc finger, DHHC-type containing 18
ZDHHC3		Zinc finger, DHHC-type containing 3
ZDHHC4	NM_018106	Zinc finger, DHHC-type containing 4
ZDHHC7	NM_017740	Zinc finger, DHHC-type containing 7

ZER1	NM_006336	Zer-1 homolog (C. elegans)
ZFAND1		Zinc finger, AN1-type domain 1
ZFAND2B		Zinc finger, AN1-type domain 2B
Zfp12		
ZFP161	NM_003409	Zinc finger protein 161 homolog (mouse)
Zfp169		
Zfp202		
Zfp238		
Zfp251		
Zfp286		
Zfp294		
Zfp318		
Zfp322a		
Zfp346		
ZFP36L2	NM_006887	Zinc finger protein 36, C3H type-like 2
Zfp39		
Zfp395		
Zfp46		
Zfp467		
Zfp512		
Zfp513		
Zfp523		
Zfp526		
Zfp536		
Zfp541		
Zfp575		
Zfp58		
Zfp598		
Zfp612		
Zfp629		
Zfp650		
Zfp653		
Zfp68		
Zfp689		
Zfp69		
Zfp704		
Zfp830		
ZFPL1	NM_032348	Zinc finger protein-like 1
ZGPAT	NM_001083113.1	Zinc finger, CCCH-type with G patch domain
ZIC5	NM_033132	Zic family member 5 (odd-paired homolog, Drosophila)
ZMAT4	NM_024645	Zinc finger, matrin type 4
ZMIZ2	NM_031449.3	Zinc finger, MIZ-type containing 2
ZMYND15	NM_032265	Zinc finger, MYND-type containing 15
ZNHIT1	NM_006349	Zinc finger, HIT type 1
ZNHIT2	NM_014205	Zinc finger, HIT type 2
ZSCAN20	NM_145238.3	Zinc finger and SCAN domain containing 20
ZSCAN21	NM_145914	Zinc finger and SCAN domain containing 21
ZSWIM3	NM_080752	Zinc finger, SWIM-type containing 3
ZW10	NM_004724	ZW10, kinetochore associated, homolog (Drosophila)

0610007P22Rik
0610011F06Rik
0610012D14Rik
0610037P05Rik
1110007A13Rik
1110007C09Rik
1110007L15Rik
1110012M11Rik
1110013L07Rik
1110014J01Rik
1110020G09Rik
1110034B05Rik
1110049B09Rik
1110059E24Rik
1190005I06Rik
1190017O12Rik
1200009I06Rik
1200011I18Rik
1300002K09Rik
1300010M03Rik
1500001M20Rik
1500003O03Rik
1500003O22Rik
1500041N16Rik
1700001J03Rik
1700001P01Rik
1700007K09Rik
1700012H17Rik
1700021F05Rik
1700021K02Rik
1700029H14Rik
1700037C18Rik
1700037H04Rik
1700040I03Rik
1700113I22Rik
1700120B06Rik
1810029B16Rik
1810031K17Rik
1810035L17Rik
1810036I24Rik
2010209O12Rik
2010311D03Rik
2010321M09Rik
2210010N04Rik
2310001A20Rik
2310003H01Rik
2310003L22Rik
2310016C08Rik
2310028H24Rik

2310035C23Rik
2310046O06Rik
2310057J16Rik
2310067B10Rik
2310076L09Rik
2410004L22Rik
2410014A08Rik
2410015N17Rik
2410018C20Rik
2410022L05Rik
2410127E18Rik
2410129H14Rik
2410131K14Rik
2510006D16Rik
2510039O18Rik
2600010E01Rik
2610019A05Rik
2610024E20Rik
2610101N10Rik
2610528J11Rik
2610528K11Rik
2700038C09Rik
2700049P18Rik
2810002N01Rik
2810408M09Rik
2810428I15Rik
2810432D09Rik
2810485I05Rik
2900006K08Rik
2900010J23Rik
2900026A02Rik
2900042B11Rik
2900073G15Rik
3110037I16Rik
3110043J09Rik
3110048E14Rik
3321401G04Rik
4632412N22Rik
4632417K18Rik
4632419K20Rik
4833422F24Rik
4833424O15Rik
4921515J06Rik
4921517L17Rik
4922505E12Rik
4930401F20Rik
4930403C10Rik
4930404N11Rik
4930427A07Rik

4930558O21Rik
4930579J09Rik
4931414P19Rik
4931433A01Rik
4932441K18Rik
4933403F05Rik
4933424B01Rik
4933426M11Rik
4933428G20Rik
4933439F18Rik
5133400G04Rik
5330417C22Rik
5430407P10Rik
5430416O09Rik
5730403M16Rik
5730410E15Rik
5730419I09Rik
5730437N04Rik
5730449L18Rik
5830415F09Rik
5830482F20Rik
6330407J23Rik
6330408A02Rik
6330569M22Rik
6430548M08Rik
8430427H17Rik
9030224M15Rik
9030409G11Rik
9030607L17Rik
9130011E15Rik
9130017N09Rik
9130227C08Rik
9130404D14Rik
9330182L06Rik
9530008L14Rik
9530068E07Rik
9630033F20Rik
9930012K11Rik
A230106M15Rik
A630042L21Rik
A830007P12Rik
A830018L16Rik
A930008G19Rik
A930025D01Rik
A930037G23Rik

(B) List of 277 genes that were differentially demethylated upon DAC treatment in Mll5 null cells.

Gene Name	Refseq ID	Gene Description
ABCC8	NM_000352	ATP-binding cassette, sub-family C (CFTR/MRP), member 8
ABR	NM_001092	Active BCR-related gene
ACAD10	NM_025247	Acyl-Coenzyme A dehydrogenase family, member 10
ACADSB	NM_001609	Acyl-Coenzyme A dehydrogenase, short/branched chain
ACTR1A	NM_005736	ARP1 actin-related protein 1 homolog A, centractin alpha (yeast)
ADAM12	NM_003474	ADAM metallopeptidase domain 12 (meltrin alpha)
ADCY1	NM_021116	Adenylate cyclase 1 (brain)
ADIPOR1		Adiponectin receptor 1
ADRA2B		Adrenergic, alpha-2B-, receptor
AGTPBP1	NM_015239	ATP/GTP binding protein 1
AKAP1	NM_003488	A kinase (PRKA) anchor protein 1
AMPD2	NM_004037	Adenosine monophosphate deaminase 2 (isoform L)
AMPH	NM_001635	Amphiphysin
ANKRD56	NM_001029870	Ankyrin repeat domain 56
Ard1		
ARHGAP10	NM_024605	Rho GTPase activating protein 10
ARHGEF1	NM_004706	Rho guanine nucleotide exchange factor (GEF) 1
ARHGEF10	NM_014629	Rho guanine nucleotide exchange factor (GEF) 10
ARHGEF6	NM_004840	Rac/Cdc42 guanine nucleotide exchange factor (GEF) 6
ARHGEF7	NM_003899	Rho guanine nucleotide exchange factor (GEF) 7
ARMC9	NM_025139	Armadillo repeat containing 9
ATOX1	NM_001008221	ATX1 antioxidant protein 1 homolog (yeast)
ATPBD3	NM_145232	ATP binding domain 3
AU040829		
AUH	NM_009590	AU RNA binding protein/enoyl-Coenzyme A hydratase
AZI2		5-azacytidine induced 2
BARX1	NM_021570	BARX homeobox 1
BC049715		
BCORL1	NM_021946	BCL6 co-repressor-like 1
BHLHB9	NM_030639	Basic helix-loop-helix domain containing, class B, 9
BMP3	NM_001201	Bone morphogenetic protein 3 (osteogenic)
CAB39	NM_016289	Calcium binding protein 39
CAMK2A	NM_015981.2	Calcium/calmodulin-dependent protein kinase (CaM kinase) II alpha
CBLL1	NM_024814	Cas-Br-M (murine) ecotropic retroviral transforming sequence-like 1
CBLN4	NM_080617	Cerebellin 4 precursor
CCDC97	NM_052848	Coiled-coil domain containing 97
CDC14B	NM_001077181.1	CDC14 cell division cycle 14 homolog B (S. cerevisiae)
CDC2L5	NM_003718	Cell division cycle 2-like 5 (cholinesterase-related cell division controller)
CDK5		Cyclin-dependent kinase 5
CDKN1C		Cyclin-dependent kinase inhibitor 1C (p57, Kip2)
CENTG1	NM_014770	Centaurin, gamma 1
CHAF1B	NM_005441	Chromatin assembly factor 1, subunit B (p60)

CHMP2A	NM_014453	Chromatin modifying protein 2A
CHMP5	NM_016410	Chromatin modifying protein 5
CHST10	NM_002771	Carbohydrate sulfotransferase 10
CHST11	NM_018413	Carbohydrate (chondroitin 4) sulfotransferase 11
CLK4	NM_020666	CDC-like kinase 4
CNNM1	NM_020348	Cyclin M1
COL14A1	NM_021110	Collagen, type XIV, alpha 1 (undulin)
COL4A3	NM_000091.3	Collagen, type IV, alpha 3 (Goodpasture antigen)
COL4A3BP	NM_005713	Collagen, type IV, alpha 3 (Goodpasture antigen) binding protein
COX18	NM_173827	COX18 cytochrome c oxidase assembly homolog (S. cerevisiae)
CREBZF		CREB/ATF bZIP transcription factor
CROT	NM_021151	Carnitine O-octanoyltransferase
CSNK1D	NM_001893	Casein kinase 1, delta
CSNK1G1	NM_022048	Casein kinase 1, gamma 1
CYB5R1	NM_016243	Cytochrome b5 reductase 1
DCUN1D2	NM_001014283	DCN1, defective in cullin neddylation 1, domain containing 2 (S. cerevisiae)
DDIT4	NM_019058	DNA-damage-inducible transcript 4
DDX3X	NM_001356.3	DEAD (Asp-Glu-Ala-Asp) box polypeptide 3, X-linked
DDX5	NM_004396	DEAD (Asp-Glu-Ala-Asp) box polypeptide 5
DHX15	NM_001358	DEAH (Asp-Glu-Ala-His) box polypeptide 15
DHX57	NM_198963	DEAH (Asp-Glu-Ala-Asp/His) box polypeptide 57
DMPK	NM_001081560.1	Dystrophia myotonica-protein kinase
DNAJC17	NM_018163	DnaJ (Hsp40) homolog, subfamily C, member 17
DPP6	NM_001039350.1	Dipeptidyl-peptidase 6
DRG1	NM_004147	Developmentally regulated GTP binding protein 1
DSCR3	NM_000980	Down syndrome critical region gene 3
DSTN	NM_001011546.1	Destrin (actin depolymerizing factor)
DYNLL2	NM_080677	Dynein, light chain, LC8-type 2
DYRK1B	NM_004714	Dual-specificity tyrosine-(Y)-phosphorylation regulated kinase 1B
ECE2	NM_001037324	Endothelin converting enzyme 2
EHMT2	NM_007163	Euchromatic histone-lysine N-methyltransferase 2
EIF2AK3	NM_004836	Eukaryotic translation initiation factor 2-alpha kinase 3
ENTPD5	NM_001249	Ectonucleoside triphosphate diphosphohydrolase 5
EPHA8	NM_001305	EPH receptor A8
EPHB3	NM_004443	EPH receptor B3
ERLIN2	NM_004175	ER lipid raft associated 2
EXOSC5	NM_020158	Exosome component 5
EYA3	NM_001990	Eyes absent homolog 3 (Drosophila)
Fh1		
FHL2		Four and a half LIM domains 2
FOXC2	NM_005251	Forkhead box C2 (MFH-1, mesenchyme forkhead 1)
FOXL2	NM_023067	Forkhead box L2
FOXN2	NM_031889	Forkhead box N2
FUSIP1	NM_006625	FUS interacting protein (serine/arginine-rich) 1
FXYD2	NM_001680	FXYD domain containing ion transport regulator 2

GABRE	NM_004961	Gamma-aminobutyric acid (GABA) A receptor, epsilon
Gas2		
GCHFR	NM_005258	GTP cyclohydrolase I feedback regulator
GFOD2	NM_030819	Glucose-fructose oxidoreductase domain containing 2
GGPS1	NM_001037277	Geranylgeranyl diphosphate synthase 1
GGT1	NM_001032364.1	Gamma-glutamyltransferase 1
Glb1l2		
GLDC	NM_001014796	Glycine dehydrogenase (decarboxylating)
GLS2		Glutaminase 2 (liver, mitochondrial)
GMCL1	NM_178439	Germ cell-less homolog 1 (Drosophila)
GOT1	NM_002079	Glutamic-oxaloacetic transaminase 1, soluble (aspartate aminotransferase 1)
GPC6	NM_005708	Glypican 6
GRAMD1A	NM_020895.2	GRAM domain containing 1A
Grinl1a		
GSTA2	NM_000846	Glutathione S-transferase A2
H1FX	NM_006026	H1 histone family, member X
HAND1	NM_004821	Heart and neural crest derivatives expressed 1
HDAC2	NM_003584	Histone deacetylase 2
HES7	NM_032580.2	Hairy and enhancer of split 7 (Drosophila)
HIC1	NM_001098202.1	Hypermethylated in cancer 1
HK2	NM_000189	Hexokinase 2
HMG20B	NM_006339.2	High-mobility group 20B
HMGA1	NM_002131	High mobility group AT-hook 1
HNRPUL1	NM_007040	Heterogeneous nuclear ribonucleoprotein U-like 1
HOXC10	NM_017409	Homeobox C10
Hoxc5		
HOXD1	NM_001408	Homeobox D1
HRB	NM_004504	HIV-1 Rev binding protein
HRK	NM_003806	Harakiri, BCL2 interacting protein (contains only BH3 domain)
ICT1	NM_001545	Immature colon carcinoma transcript 1
IL1B	NM_000576	Interleukin 1, beta
ILK	NM_001014794	Integrin-linked kinase
ISCA1	NM_030940	Iron-sulfur cluster assembly 1 homolog (S. cerevisiae)
ISL1	NM_002202.2	ISL LIM homeobox 1
ISYNA1	NM_016368	Myo-inositol 1-phosphate synthase A1
ITGA7	NM_020637	Integrin, alpha 7
ITGAL	NM_002209	Integrin, alpha L (antigen CD11A (p180), lymphocyte function-associated antigen 1; alpha polypeptide)
KCNC4	NM_001039574.1	Potassium voltage-gated channel, Shaw-related subfamily, member 4
KCNH6	NM_030779	Potassium voltage-gated channel, subfamily H (eag-related), member 6
KLHDC1	NM_172193	Kelch domain containing 1
LMTK2	NM_014916	Lemur tyrosine kinase 2
LMX1B	NM_004960	LIM homeobox transcription factor 1, beta
Lnp		

LPP	NM_005578	LIM domain containing preferred translocation partner in lipoma
LRRC48		Leucine rich repeat containing 48
LRRCC1	NM_001077501.1	Leucine rich repeat and coiled-coil domain containing 1
LYPD1	NM_001077427.2	LY6/PLAUR domain containing 1
LYSMD3	NM_198273.1	LysM, putative peptidoglycan-binding, domain containing 3
MAPK8IP3	NM_032834.3	Mitogen-activated protein kinase 8 interacting protein 3
MARCKSL1		MARCKS-like 1
MDGA1	NM_153487.3	MAM domain containing glycosylphosphatidylinositol anchor 1
MED31		Mediator complex subunit 31
METRN	NM_024042	Meteorin, glial cell differentiation regulator
MFAP3	NM_005927	Microfibrillar-associated protein 3
MIB1	NM_020774	Mindbomb homolog 1 (Drosophila)
MID1	NM_000381	Midline 1 (Opitz/BBB syndrome)
MIDN	NM_177401	Midnolin
MLLT3	NM_004529	Myeloid/lymphoid or mixed-lineage leukemia (trithorax homolog, Drosophila); translocated to, 3
MOBKL2B		MOB1, Mps One Binder kinase activator-like 2B (yeast)
MRP63	NM_024026	Mitochondrial ribosomal protein 63
MRPL9	NM_031420	Mitochondrial ribosomal protein L9
MTHFD2	NM_001040409.1	Methylenetetrahydrofolate dehydrogenase (NADP+ dependent) 2, methenyltetrahydrofolate cyclohydrolase
MYO1B	NM_012223	Myosin IB
MYO1C	NM_001080779.1	Myosin IC
Naif1		
NDUFB9	NM_005005	NADH dehydrogenase (ubiquinone) 1 beta subcomplex, 9, 22kDa
NDUFV1	NM_007103	NADH dehydrogenase (ubiquinone) flavoprotein 1, 51kDa
NET1	NM_001047160.1	Neuroepithelial cell transforming gene 1
NKD1	NM_033119	Naked cuticle homolog 1 (Drosophila)
NKX2-4		NK2 homeobox 4
NLGN1	NM_014932	Neuroligin 1
NOSIP		Nitric oxide synthase interacting protein
NRCAM	NM_001037132.1	Neuronal cell adhesion molecule
NT5C2		5'-nucleotidase, cytosolic II
NUDT3		Nudix (nucleoside diphosphate linked moiety X)-type motif 3
NXF1		Nuclear RNA export factor 1
ODF2	NM_002540	Outer dense fiber of sperm tails 2
OLIG1	NM_138983.1	Oligodendrocyte transcription factor 1
OTOR	NM_020157	Otoraplin
OTUD7B	NM_020205.2	OTU domain containing 7B
PAH	NM_000277	Phenylalanine hydroxylase
PAM	NM_000919.2	Peptidylglycine alpha-amidating monooxygenase
PAQR5	NM_017705	Progestin and adipoQ receptor family member V
PAQR6	NM_024897	Progestin and adipoQ receptor family member VI
Pcdhga1		
PDE4A	NM_006202	Phosphodiesterase 4A, cAMP-specific (phosphodiesterase E2 dunce homolog, Drosophila)

PDE9A	NM_001001567	Phosphodiesterase 9A
PGPEP1	NM_017712	Pyroglutamyl-peptidase I
PHF5A	NM_032758	PHD finger protein 5A
PKP1	NM_000299	Plakophilin 1 (ectodermal dysplasia/skin fragility syndrome)
POLD2	NM_006230	Polymerase (DNA directed), delta 2, regulatory subunit 50kDa
POLN	NM_024511	Polymerase (DNA directed) nu
PPIL6	NM_173672	Peptidylprolyl isomerase (cyclophilin)-like 6
PPP1CC	NM_002710	Protein phosphatase 1, catalytic subunit, gamma isoform
PRKACB	NM_002731	Protein kinase, cAMP-dependent, catalytic, beta
PRPS2	NM_001039091.1	Phosphoribosyl pyrophosphate synthetase 2
PRR11	NM_018304	Proline rich 11
PRX	NM_020956	Periaxin
PSMA2		Proteasome (prosome, macropain) subunit, alpha type, 2
PSMD5	NM_005047	Proteasome (prosome, macropain) 26S subunit, non-ATPase, 5
PSMD8	NM_002812	Proteasome (prosome, macropain) 26S subunit, non-ATPase, 8
PTPN13	NM_080683.1	Protein tyrosine phosphatase, non-receptor type 13 (APO-1/CD95 (Fas)-associated phosphatase)
PXMP2		Peroxisomal membrane protein 2, 22kDa
RABL3	NM_173825	RAB, member of RAS oncogene family-like 3
RAN	NM_006325	RAN, member RAS oncogene family
RASGRP2	NM_001098670.1	RAS guanyl releasing protein 2 (calcium and DAG-regulated)
RBM6		RNA binding motif protein 6
Rbmxrt		
RFX1	NM_002918	Regulatory factor X, 1 (influences HLA class II expression)
RIN1	NM_004292	Ras and Rab interactor 1
ROPN1L		Ropporin 1-like
RPL10A		Ribosomal protein L10a
RPL18A		Ribosomal protein L18a
RPLP2	NM_001004	Ribosomal protein, large, P2
RPS14		Ribosomal protein S14
RPS24	NM_003636	Ribosomal protein S24
RRAS2	NM_001102386.1	Related RAS viral (r-ras) oncogene homolog 2
RUSC2	NM_006390	RUN and SH3 domain containing 2
SCAMP3	NM_005698	Secretory carrier membrane protein 3
SCML2	NM_006089	Sex comb on midleg-like 2 (Drosophila)
SCN1B	NM_001037	Sodium channel, voltage-gated, type I, beta
SEC24B	NM_001042734.1	SEC24 related gene family, member B (S. cerevisiae)
SERINC2	NM_178865	Serine incorporator 2
SIN3A	NM_015477	SIN3 homolog A, transcription regulator (yeast)
SLAIN2	NM_020846.1	SLAIN motif family, member 2
SLC22A20		Solute carrier family 22, member 20
SLC24A2	NM_020344	Solute carrier family 24 (sodium/potassium/calcium exchanger), member 2
SLC25A11	NM_003562	Solute carrier family 25 (mitochondrial carrier; oxoglutarate carrier), member 11

Slc38a8		
SLC39A10	NM_020342	Solute carrier family 39 (zinc transporter), member 10
SLC9A2	NM_003048	Solute carrier family 9 (sodium/hydrogen exchanger), member 2
SLITRK1	NM_052910	SLIT and NTRK-like family, member 1
SMAD6	NM_005585	SMAD family member 6
SMC1B	NM_148674.3	Structural maintenance of chromosomes 1B
SORBS1		Sorbin and SH3 domain containing 1
SOX17	NM_022454	SRY (sex determining region Y)-box 17
SOX6	NM_017508.1	SRY (sex determining region Y)-box 6
SPEG		SPEG complex locus
SPERT	NM_152719	Spermatid associated
SPG3A	NM_015915	Spastic paraplegia 3A (autosomal dominant)
SPINT2	NM_021102	Serine peptidase inhibitor, Kunitz type, 2
SPRED2	NM_181784	Sprouty-related, EVH1 domain containing 2
SREBF1		Sterol regulatory element binding transcription factor 1
STK19	NM_004197	Serine/threonine kinase 19
STK32C	NM_173575	Serine/threonine kinase 32C
SUFU	NM_016169	Suppressor of fused homolog (Drosophila)
SUV420H1	NM_016028.4	Suppressor of variegation 4-20 homolog 1 (Drosophila)
TCEA3	NM_003196.1	Transcription elongation factor A (SII), 3
TGM1	NM_000359	Transglutaminase 1 (K polypeptide epidermal type I, protein-glutamine-gamma-glutamyltransferase)
THOC7		THO complex 7 homolog (Drosophila)
TIGD5	NM_032862	Tigger transposable element derived 5
TMEM123	NM_052932.2	Transmembrane protein 123
TMEM171	NM_173490	Transmembrane protein 171
TMEM192	NM_001100389.1	Transmembrane protein 192
TMOD3	NM_014547	Tropomodulin 3 (ubiquitous)
TNKS	NM_003747	Tankyrase, TRF1-interacting ankyrin-related ADP-ribose polymerase
TNRC6A	NM_014494	Trinucleotide repeat containing 6A
TOM1		Target of myb1 (chicken)
TRAF1	NM_005658	TNF receptor-associated factor 1
TRAF4	NM_004295	TNF receptor-associated factor 4
TRIM27	NM_001039659.1	Tripartite motif-containing 27
TRIM28	NM_005762	Tripartite motif-containing 28
TRIM3	NM_004166	Tripartite motif-containing 3
TRPC5	NM_012471	Transient receptor potential cation channel, subfamily C, member 5
TRPC6	NM_004621	Transient receptor potential cation channel, subfamily C, member 6
TRPM4	NM_017636	Transient receptor potential cation channel, subfamily M, member 4
TSC1	NM_000368	Tuberous sclerosis 1
TSC22D4	NM_030935	TSC22 domain family, member 4
TUBG1	NM_001070	Tubulin, gamma 1
TUSC3	NM_006765	Tumor suppressor candidate 3
TXN2	NM_012473	Thioredoxin 2

UBXD4	NM_181713	UBX domain containing 4
UBXD8	NM_014613	UBX domain containing 8
UCKL1		Uridine-cytidine kinase 1-like 1
UPK3B	NM_030570	Uroplakin 3B
USO1	NM_006192	USO1 homolog, vesicle docking protein (yeast)
USP37	NM_020935	Ubiquitin specific peptidase 37
UTX		Ubiquitously transcribed tetratricopeptide repeat, X chromosome
VSTM2L	NM_080607	V-set and transmembrane domain containing 2 like
WDR32	NM_024345	WD repeat domain 32
Wfdc6b		
XDH	NM_000379	Xanthine dehydrogenase
YPEL1	NM_013313	Yippee-like 1 (Drosophila)
Zfp114		
Zfp397		
Zfp444		
Zfp509		
ZIC3	NM_003413	Zic family member 3 heterotaxy 1 (odd-paired homolog, Drosophila)
ZNRF4	NM_181710.3	Zinc and ring finger 4
ZYX	NM_001010972	Zyxin

(C) List of 343 genes that were demethylated upon DAC treatment in both Mll5 wildtype and null cells.

Gene Name	Refseq ID	Gene Description
ABCD1	NM_000033	ATP-binding cassette, sub-family D (ALD), member 1
ABHD8	NM_024527	Abhydrolase domain containing 8
ABLIM2		Actin binding LIM protein family, member 2
ABR	NM_001092	Active BCR-related gene
ACHE	NM_000665	Acetylcholinesterase (Yt blood group)
ACIN1	NM_014977	Apoptotic chromatin condensation inducer 1
ACOX3	NM_001101667.1	Acyl-Coenzyme A oxidase 3, pristanoyl
ACSF3	NM_174917	Acyl-CoA synthetase family member 3
ADAMTS5	NM_007038	ADAM metallopeptidase with thrombospondin type 1 motif, 5 (aggrecanase-2)
ADCY5	NM_183357	Adenylate cyclase 5
AFF3	NM_001025108	AF4/FMR2 family, member 3
AIFM3	NM_001018060	Apoptosis-inducing factor, mitochondrion-associated, 3
AIG1	NM_016108	Androgen-induced 1
ANKRD9	NM_152326	Ankyrin repeat domain 9
ANTXR2	NM_058172.3	Anthrax toxin receptor 2
APC2	NM_005883	Adenomatosis polyposis coli 2
ARFIP2	NM_032571	ADP-ribosylation factor interacting protein 2 (arfaptin 2)
ARID3C	NM_001017363	AT rich interactive domain 3C (BRIGHT-like)
ARPC1B	NM_005720	Actin related protein 2/3 complex, subunit 1B, 41kDa
ARVCF		Armadillo repeat gene deletes in velocardiofacial syndrome
ASCC3L1	NM_014014	Activating signal cointegrator 1 complex subunit 3-like 1
ATP13A1	NM_020410	ATPase type 13A1
ATP6AP1	NM_001183	ATPase, H+ transporting, lysosomal accessory protein 1
AUTS2	NM_015570	Autism susceptibility candidate 2
AW125753		
BACH2	NM_021813	BTB and CNC homology 1, basic leucine zipper transcription factor 2
BAI2	NM_001703	Brain-specific angiogenesis inhibitor 2
BARHL1	NM_020064	BarH-like homeobox 1
BAX	NM_004324	BCL2-associated X protein
BBC3	NM_014417	BCL2 binding component 3
BC038286		
BCAM	NM_001013257.1	Basal cell adhesion molecule (Lutheran blood group)
BCL11B		B-cell CLL/lymphoma 11B (zinc finger protein)
BCL2L1	NM_001642	BCL2-like 1
BCL2L11	NM_006538.3	BCL2-like 11 (apoptosis facilitator)
BIK	NM_001651	BCL2-interacting killer (apoptosis-inducing)
BRAP	NM_006768	BRCA1 associated protein
BSG	NM_004723	Basigin (Ok blood group)
BSN	NM_000293	Bassoon (presynaptic cytomatrix protein)
C230093N12Rik		
CAMTA1	NM_015215	Calmodulin binding transcription activator 1
Car4		
CARD9	NM_052813	Caspase recruitment domain family, member 9
CASZ1	NM_001079843.1	Castor zinc finger 1

CBLN3	NM_001039771	Cerebellin 3 precursor
CCDC108	NM_152389	Coiled-coil domain containing 108
CCDC58	NM_001017928	Coiled-coil domain containing 58
CCR9	NM_006641	Chemokine (C-C motif) receptor 9
CD244	NM_016382	CD244 molecule, natural killer cell receptor 2B4
CD300A	NM_007261	CD300a molecule
CD81	NM_004356	CD81 molecule
CDC14A	NM_003672	CDC14 cell division cycle 14 homolog A (S. cerevisiae)
CDC42	NM_005178	Cell division cycle 42 (GTP binding protein, 25kDa)
CDK5R2	NM_003936	Cyclin-dependent kinase 5, regulatory subunit 2 (p39)
CEBPA		CCAAT/enhancer binding protein (C/EBP), alpha
CHAT	NM_005104	Choline acetyltransferase
CHCHD2	NM_016139	Coiled-coil-helix-coiled-coil-helix domain containing 2
CHRM4	NM_006806	Cholinergic receptor, muscarinic 4
CITED4	NM_133467	Cbp/p300-interacting transactivator, with Glu/Asp-rich carboxy-terminal domain, 4
CLSTN1	NM_001009566	Calsyntenin 1
COL4A2	NM_001846.2	Collagen, type IV, alpha 2
CORO7	NM_016069	Coronin 7
CTBP2	NM_006135	C-terminal binding protein 2
CTDSP1	NM_021198	CTD (carboxy-terminal domain, RNA polymerase II, polypeptide A) small phosphatase 1
CTDSP2	NM_005730.3	CTD (carboxy-terminal domain, RNA polymerase II, polypeptide A) small phosphatase 2
CYC1		Cytochrome c-1
D11Bwg0517e		
D15Wsu169e		
D930015E06Rik		
DAGLA	NM_006133	Diacylglycerol lipase, alpha
DCST1	NM_152494	DC-STAMP domain containing 1
DENND2C	NM_198459	DENN/MADD domain containing 2C
DMN	NM_015286.5	Desmuslin
DNAJC11	NM_018198	DnaJ (Hsp40) homolog, subfamily C, member 11
DNAJC7		DnaJ (Hsp40) homolog, subfamily C, member 7
Dnase2a		
DNM1	NM_001005336.1	Dynamin 1
DOCK1	NM_001380.3	Dedicator of cytokinesis 1
Dos		
DPF3	NM_012074.3	D4, zinc and double PHD fingers, family 3
DULLARD		Dullard homolog (Xenopus laevis)
DUSP4	NM_001394	Dual specificity phosphatase 4
DVL2	NM_004422	Dishevelled, dsh homolog 2 (Drosophila)
E2F2	NM_004091	E2F transcription factor 2
EFCAB4A	NM_173584.3	EF-hand calcium binding domain 4A
EFS	NM_005864	Embryonal Fyn-associated substrate
EIF1AD	NM_032325	Eukaryotic translation initiation factor 1A domain containing
EIF2C3	NM_024852	Eukaryotic translation initiation factor 2C, 3
EIF4G1	NM_004953.3	Eukaryotic translation initiation factor 4 gamma, 1
EPS15	NM_001981	Epidermal growth factor receptor pathway substrate 15

EXOSC1	NM_016046	Exosome component 1
FBL	NM_001436	Fibrillarin
FGF14	NM_004115	Fibroblast growth factor 14
FKRP	NM_001039885	Fukutin related protein
FNBP1L	NM_001024948.1	Formin binding protein 1-like
FOXD1	NM_001869	Forkhead box D1
FOXN3	NM_001085471.1	Forkhead box N3
FOXO6		Forkhead box protein O6
FUT8	NM_001910	Fucosyltransferase 8 (alpha (1,6) fucosyltransferase)
FZD1	NM_003505	Frizzled homolog 1 (Drosophila)
GATA2		GATA binding protein 2
GDNF	NM_000514	Glial cell derived neurotrophic factor
GFI1	NM_005263	Growth factor independent 1 transcription repressor
GGNBP1		Gametogenetin binding protein 1
Gm505		
Gm996		
GNPAT	NM_014236	Glyceronephosphate O-acyltransferase
GPAA1	NM_003801.3	Glycosylphosphatidylinositol anchor attachment protein 1 homolog (yeast)
GPR153	NM_207370	G protein-coupled receptor 153
GPR172B		G protein-coupled receptor 172B
GPR6	NM_005284	G protein-coupled receptor 6
GPSM1	NM_015597	G-protein signaling modulator 1 (AGS3-like, C. elegans)
GRID1	NM_014420	Glutamate receptor, ionotropic, delta 1
GSC		Goosecoid homeobox
Gse1		
GTF2F2	NM_004411	General transcription factor IIF, polypeptide 2, 30kDa
GTF3C5	NM_012087	General transcription factor IIIC, polypeptide 5, 63kDa
HDAC10	NM_032019	Histone deacetylase 10
HDAC5	NM_001015053	Histone deacetylase 5
HIVEP3	NM_024503	Human immunodeficiency virus type I enhancer binding protein 3
HLX	NM_021958	H2.0-like homeobox
HMCN2		Hemicentin 2
HNRPK	NM_002140	Heterogeneous nuclear ribonucleoprotein K
HOXD3	NM_006898	Homeobox D3
HPS1	NM_000195	Hermansky-Pudlak syndrome 1
HPS6	NM_024747	Hermansky-Pudlak syndrome 6
HSPB6	NM_144617	Heat shock protein, alpha-crystallin-related, B6
IDH3A	NM_005530	Isocitrate dehydrogenase 3 (NAD+) alpha
IGFBP5	NM_000599	Insulin-like growth factor binding protein 5
IGSF9		Immunoglobulin superfamily, member 9
ILVBL	NM_006844	IlvB (bacterial acetolactate synthase)-like
ING1	NM_005537	Inhibitor of growth family, member 1
INPP4A	NM_002004	Inositol polyphosphate-4-phosphatase, type I, 107kDa
IPO13	NM_014652	Importin 13
IRS1	NM_004112	Insulin receptor substrate 1
IRX4	NM_016358	Iroquois homeobox 4
ITFG2	NM_018463	Integrin alpha FG-GAP repeat containing 2
JAK3	NM_000215	Janus kinase 3 (a protein tyrosine kinase, leukocyte)

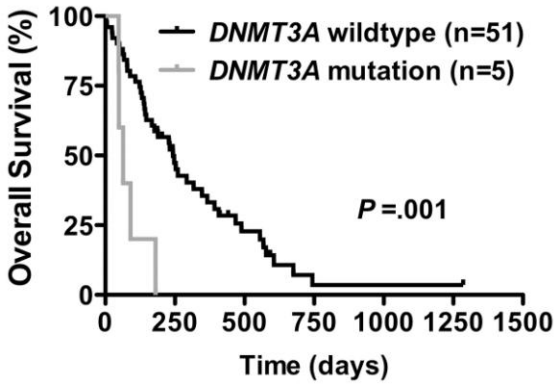
JARID2	NM_002014	Jumonji, AT rich interactive domain 2
Kank1		
Kank2		
KCNB1	NM_004975	Potassium voltage-gated channel, Shab-related subfamily, member 1
KCNK3	NM_002246	Potassium channel, subfamily K, member 3
KCNMA1	NM_001014797.1	Potassium large conductance calcium-activated channel, subfamily M, alpha member 1
KLC2	NM_022822	Kinesin light chain 2
KLF1	NM_006563	Kruppel-like factor 1 (erythroid)
KLHDC8B	NM_173546	Kelch domain containing 8B
Lamb1-1		
LBXCOR1	NM_001031807	LBXCOR1 homolog (mouse)
LEPREL2		Leprecan-like 2
LINGO1	NM_032808.5	Leucine rich repeat and Ig domain containing 1
LMNB2	NM_032737	Lamin B2
LRRC27	NM_030626	Leucine rich repeat containing 27
LRRC47	NM_020710	Leucine rich repeat containing 47
LRRC4B	NM_001080457.1	Leucine rich repeat containing 4B
LRRC50	NM_178452	Leucine rich repeat containing 50
LSM3	NM_014463	LSM3 homolog, U6 small nuclear RNA associated (S. cerevisiae)
LSR	NM_015925	Lipolysis stimulated lipoprotein receptor
LUC7L2	NM_016019.2	LUC7-like 2 (S. cerevisiae)
MACROD1	NM_014067	MACRO domain containing 1
MAP2K3	NM_002756	Mitogen-activated protein kinase kinase 3
MAP3K11	NM_002419	Mitogen-activated protein kinase kinase kinase 11
MAP3K14	NM_000298	Mitogen-activated protein kinase kinase kinase 14
MAPT	NM_022041	Microtubule-associated protein tau
MATK	NM_002378	Megakaryocyte-associated tyrosine kinase
MBD6	NM_052897	Methyl-CpG binding domain protein 6
MCM9	NM_153255	Minichromosome maintenance complex component 9
MCOLN1	NM_020533	Mucolipin 1
MDGA2	NM_182830.2	MAM domain containing glycosylphosphatidylinositol anchor 2
MED26	NM_004831	Mediator complex subunit 26
MEPCE	NM_019606	Methylphosphate capping enzyme
MLLT10		Myeloid/lymphoid or mixed-lineage leukemia (trithorax homolog, Drosophila); translocated to, 10
MMACHC	NM_017711	Methylmalonic aciduria (cobalamin deficiency) cblC type, with homocystinuria
MNT	NM_020310	MAX binding protein
MOBKL2A	NM_130807	MOB1, Mps One Binder kinase activator-like 2A (yeast)
MTHFD1L		Methylenetetrahydrofolate dehydrogenase (NADP+ dependent) 1-like
MTMR2	NM_016156	Myotubularin related protein 2
MXI1	NM_001008541	MAX interactor 1
MYRIP	NM_015460	Myosin VIIA and Rab interacting protein
MYST2	NM_007067	MYST histone acetyltransferase 2
NAPA	NM_003827	N-ethylmaleimide-sensitive factor attachment protein, alpha
NAPRT1	NM_145201	Nicotinate phosphoribosyltransferase domain containing 1

NAT8L	NM_178557	N-acetyltransferase 8-like
NCLN	NM_020170	Nicalin homolog (zebrafish)
NDST2	NM_003635	N-deacetylase/N-sulfotransferase (heparan glucosaminyl) 2
NF2	NM_021018	Neurofibromin 2 (bilateral acoustic neuroma)
NHEJ1	NM_024782	Nonhomologous end-joining factor 1
NISCH	NM_007184	Nischarin
NKX6-2	NM_177400	NK6 homeobox 2
NOL14	NM_003703	Nucleolar protein 14
NR1D1	NM_021724	Nuclear receptor subfamily 1, group D, member 1
NR2E1	NM_003269	Nuclear receptor subfamily 2, group E, member 1
NSMAF	NM_003580	Neutral sphingomyelinase (N-SMase) activation associated factor
NUBP2	NM_012225	Nucleotide binding protein 2 (MinD homolog, E. coli)
NUP62	NM_012346	Nucleoporin 62kDa
OCLN	NM_002538	Occludin
ONECUT2	NM_004852.2	One cut homeobox 2
ONECUT3	NM_001080488.1	One cut homeobox 3
OTOP2	NM_178160	Otopetrin 2
PANK3	NM_024594	Pantothenate kinase 3
PCDH8	NM_002590	Protocadherin 8
PCF11	NM_015885.2	PCF11, cleavage and polyadenylation factor subunit, homolog (S. cerevisiae)
PCNXL3		Pecanex-like 3 (Drosophila)
PCSK4	NM_017573	Proprotein convertase subtilisin/kexin type 4
Pcx		
PDE2A	NM_002599	Phosphodiesterase 2A, cGMP-stimulated
PEX16	NM_004813	Peroxisomal biogenesis factor 16
PHB2	NM_007273.3	Prohibitin 2
PHF23	NM_024297.2	PHD finger protein 23
PLEKHA1	NM_001001974	Pleckstrin homology domain containing, family A (phosphoinositide binding specific) member 1
PLOD1	NM_000302	Procollagen-lysine 1, 2-oxoglutarate 5-dioxygenase 1
PMP22	NM_000304	Peripheral myelin protein 22
PNPLA2	NM_020376	Patatin-like phospholipase domain containing 2
PODXL2	NM_015720	Podocalyxin-like 2
POLD1	NM_002175	Polymerase (DNA directed), delta 1, catalytic subunit 125kDa
PORCN	NM_022825	Porcupine homolog (Drosophila)
PPP1R13L	NM_006663	Protein phosphatase 1, regulatory (inhibitor) subunit 13 like
PPP1R16A	NM_032902	Protein phosphatase 1, regulatory (inhibitor) subunit 16A
PPP2R1A	NM_014225	Protein phosphatase 2 (formerly 2A), regulatory subunit A , alpha isoform
PRKAG1		Protein kinase, AMP-activated, gamma 1 non-catalytic subunit
PRKG1	NM_001098512.1	Protein kinase, cGMP-dependent, type I
PRMT1	NM_001536.3	Protein arginine methyltransferase 1
ProSAPiP1	NM_014731	ProSAPiP1 protein
PRR3	NM_001077497.1	Proline rich 3
PRSS36	NM_173502	Protease, serine, 36
PSAP	NM_001042465.1	Prosaposin (variant Gaucher disease and variant metachromatic leukodystrophy)
PSCD1	NM_004762.2	Pleckstrin homology, Sec7 and coiled-coil domains 1(cytohesin 1)

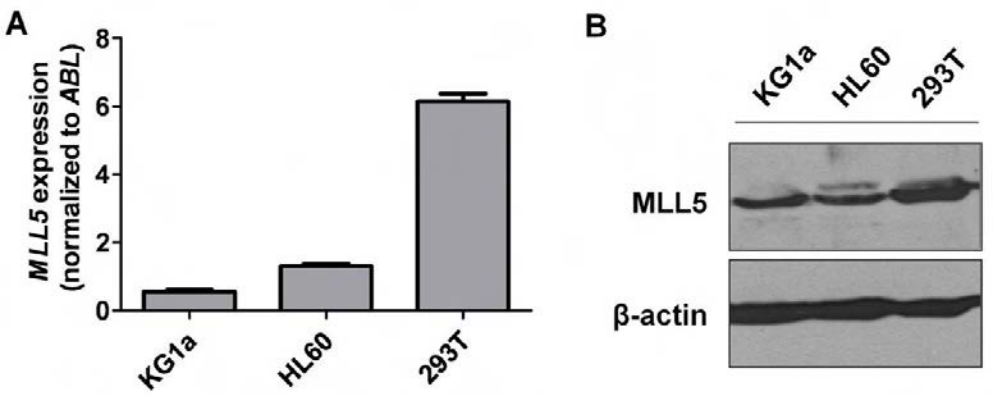
Psmb11		
PTHR1		Parathyroid hormone receptor 1
PTPN6	NM_002831.4	Protein tyrosine phosphatase, non-receptor type 6
PTPN7	NM_002832	Protein tyrosine phosphatase, non-receptor type 7
PTPRS		Protein tyrosine phosphatase, receptor type, S
R3HDM1	NM_015361	R3H domain containing 1
RAB11B	NM_003712	RAB11B, member RAS oncogene family
RAB5C	NM_004583	RAB5C, member RAS oncogene family
RAD23B	NM_002874	RAD23 homolog B (S. cerevisiae)
RAI1	NM_030665	Retinoic acid induced 1
RCC1	NM_007371	Regulator of chromosome condensation 1
RECQL4	NM_004260.2	RecQ protein-like 4
RECQL5	NM_145040	RecQ protein-like 5
REPIN1	NM_001099695.1	Replication initiator 1
RHBDF2	NM_001005498	Rhomboid 5 homolog 2 (Drosophila)
Rnf207		
RNF40	NM_014771	Ring finger protein 40
RNMT	NM_003799	RNA (guanine-7-) methyltransferase
RUNDC3A	NM_006695.3	RUN domain containing 3A
RUSC1	NM_014328	RUN and SH3 domain containing 1
RXRB	NM_021976	Retinoid X receptor, beta
SACM1L	NM_014016	SAC1 suppressor of actin mutations 1-like (yeast)
SCAF1	NM_021228	SR-related CTD-associated factor 1
SEC14L2	NM_012429	SEC14-like 2 (S. cerevisiae)
SEMA6B	NM_032108	Sema domain, transmembrane domain (TM), and cytoplasmic domain, (semaphorin) 6B
SERINC5		Serine incorporator 5
SF3A2	NM_007165	Splicing factor 3a, subunit 2, 66kDa
SFRP5	NM_003015	Secreted frizzled-related protein 5
SFRS4		Splicing factor, arginine/serine-rich 4
SH2B3	NM_005475	SH2B adaptor protein 3
SH3YL1	NM_015677.1	SH3 domain containing, Ysc84-like 1 (S. cerevisiae)
SHF	NM_138356	Src homology 2 domain containing F
SHOX2	NM_003030	Short stature homeobox 2
SKIV2L	NM_005561.3	Superkiller viralicidic activity 2-like (S. cerevisiae)
SLC25A22	NM_024698	Solute carrier family 25 (mitochondrial carrier: glutamate), member 22
SLC25A37		Solute carrier family 25, member 37
SLC30A2	NM_001004434	Solute carrier family 30 (zinc transporter), member 2
SLC41A3	NM_001008485	Solute carrier family 41, member 3
SLC7A10	NM_019849	Solute carrier family 7, (neutral amino acid transporter, y+ system) member 10
SMAD9	NM_005905	SMAD family member 9
SND1	NM_014390	Staphylococcal nuclease and tudor domain containing 1
SNN	NM_003498	Stannin
SPHK1	NM_000289	Sphingosine kinase 1
Spnb4		
SPRED3	NM_001039616.1	Sprouty-related, EVH1 domain containing 3
SS18L1	NM_015558	Synovial sarcoma translocation gene on chromosome 18-like 1

SSU72	NM_014188	SSU72 RNA polymerase II CTD phosphatase homolog (S. cerevisiae)
STK24	NM_001032296	Serine/threonine kinase 24 (STE20 homolog, yeast)
STK35	NM_080836	Serine/threonine kinase 35
SYNGR3	NM_004209	Synaptogyrin 3
SYNPO2L	NM_024875	Synaptopodin 2-like
SYT2	NM_177402	Synaptotagmin II
SYT6	NM_205848	Synaptotagmin VI
TAGLN2	NM_003564	Transgelin 2
TAPBP	NM_003190	TAP binding protein (tapasin)
TAS1R1	NM_138697	Taste receptor, type 1, member 1
TAS1R2	NM_152232	Taste receptor, type 1, member 2
TBCB	NM_001281	Tubulin folding cofactor B
TBX18	NM_001080508	T-box 18
TDP1	NM_001008744	Tyrosyl-DNA phosphodiesterase 1
TESK2	NM_007170.2	Testis-specific kinase 2
TMEM132E	NM_207313	Transmembrane protein 132E
TMEM134		Transmembrane protein 134
TMEM150	NM_001031738	Transmembrane protein 150
TMEM151A	NM_153266	Transmembrane protein 151A
TMEM184B	NM_139076	Transmembrane protein 184B
TMPRSS2	NM_005656	Transmembrane protease, serine 2
TNFRSF12A	NM_016639	Tumor necrosis factor receptor superfamily, member 12A
TOB2	NM_016272	Transducer of ERBB2, 2
TPM3	NM_001043351.1	Tropomyosin 3
TRABD	NM_025204	TraB domain containing
TREML2	NM_024807	Triggering receptor expressed on myeloid cells-like 2
TRIB2	NM_021643	Tribbles homolog 2 (Drosophila)
TRIM33	NM_015906	Tripartite motif-containing 33
TRIO	NM_007118	Triple functional domain (PTPRF interacting)
Trp73		
TSKU	NM_015516	Tsukushin
TUBA1C		Tubulin, alpha 1c
U2AF2	NM_001012478.1	U2 small nuclear RNA auxiliary factor 2
UBAC2	NM_177967	UBA domain containing 2
UBTD1	NM_024954	Ubiquitin domain containing 1
UBTF	NM_001076683.1	Upstream binding transcription factor, RNA polymerase I
UNC5A	NM_133369	Unc-5 homolog A (C. elegans)
VARS	NM_006295	Valyl-tRNA synthetase
WASF3	NM_005627	WAS protein family, member 3
Wbp7		
WDR46		WD repeat domain 46
WDR51B	NM_172240	WD repeat domain 51B
Whrn		
WNT10A	NM_025216	Wingless-type MMTV integration site family, member 10A
WNT5A	NM_003392.3	Wingless-type MMTV integration site family, member 5A
WNT7B	NM_058238	Wingless-type MMTV integration site family, member 7B
WT1	NM_000378.3	Wilms tumor 1

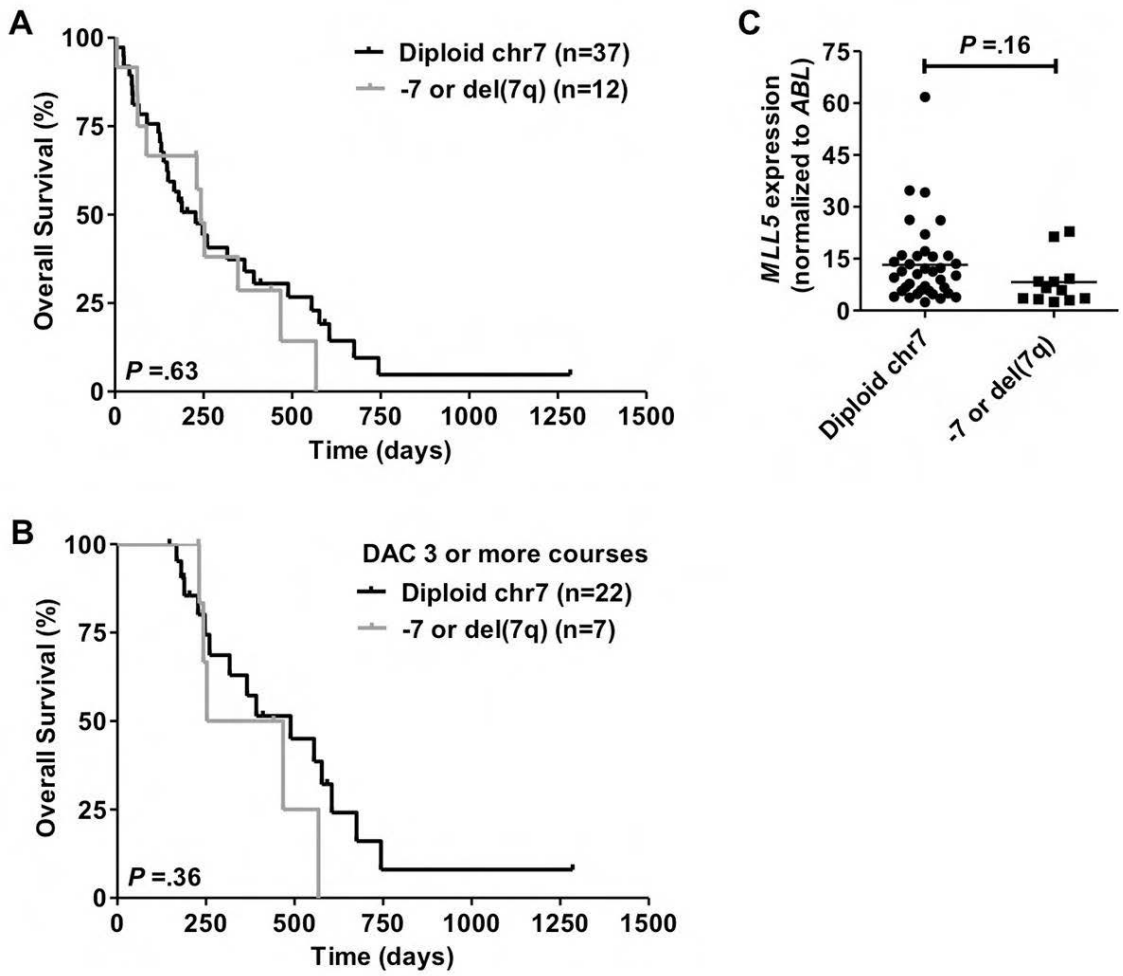
XRCC3	NM_001100118.1	X-ray repair complementing defective repair in Chinese hamster cells 3
YBX1		Y box binding protein 1
YTHDF1	NM_017798	YTH domain family, member 1
Zfp13		
Zfp185		
Zfp316		
Zfp319		
Zfp358		
Zfp385a		
Zfp503		
Zfp579		
Zfp703		
Zfp768		
ZMIZ1	NM_020338	Zinc finger, MIZ-type containing 1
0610025P10Rik		
1110049F12Rik		
1700123O20Rik		
2310021P13Rik		
2600011E07Rik		
2610039C10Rik		
2610204M08Rik		
4933406E20Rik		
5730507A09Rik		



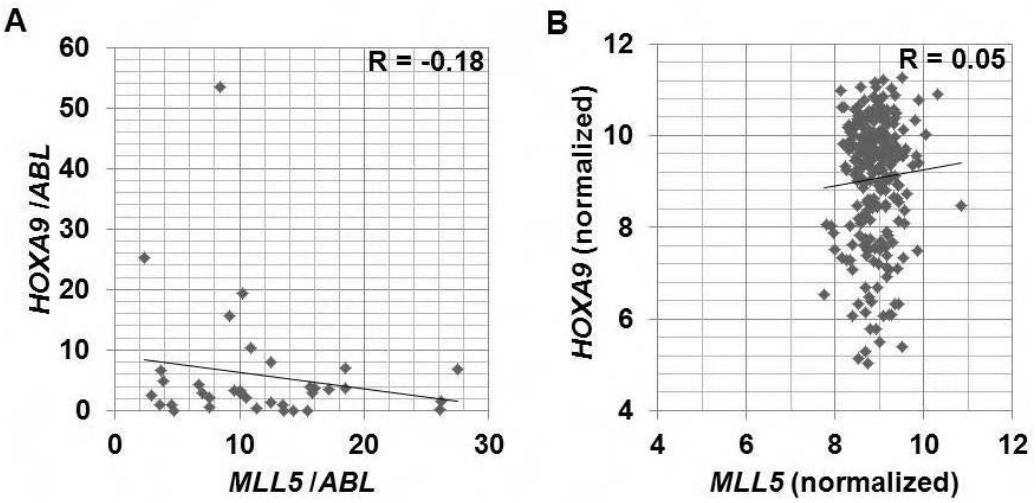
Supplementary Figure S1. Prognostic impact of *DNMT3A* mutation status on overall survival in AML patients treated with decitabine.



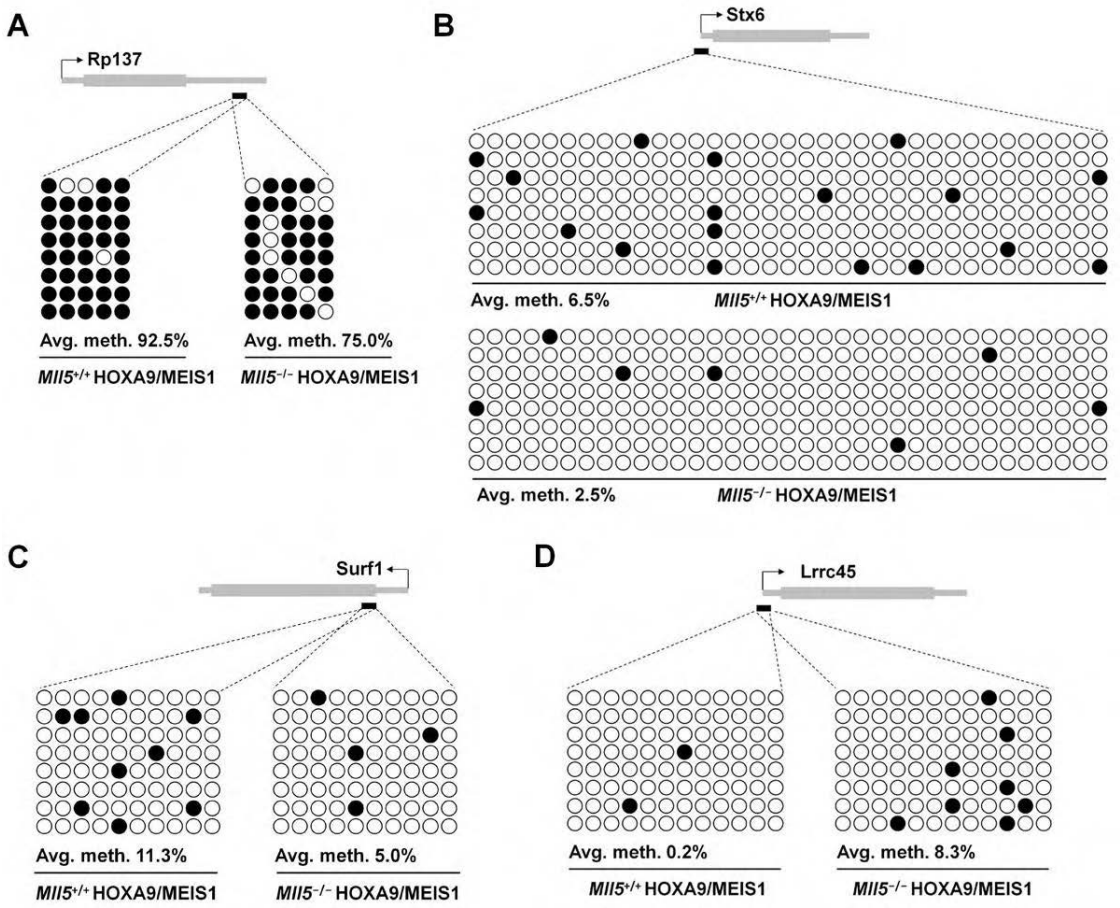
Supplementary Figure S2. ***MLL5*** **transcript expression and protein expression in different human leukemia cell lines, KG1a and HL60, and human embryonic kidney-derived 293T cells.** (A) *MLL5* transcript expression was quantified by real-time RT-PCR (data normalized to *ABL* transcript levels). (B) MLL5 (100 kDa isoform) and β-actin (42 kDa) protein expression was detected in the three indicated cell lines by Western blot.



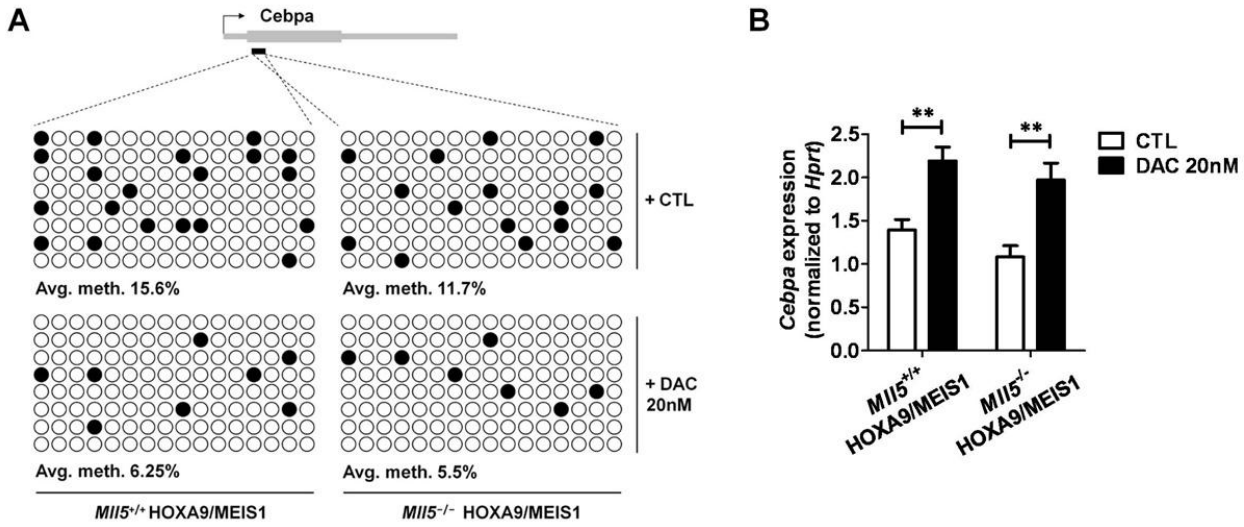
Supplementary Figure S3. Comparison of overall survival (OS) and *MLL5* expression levels of AML patients treated with decitabine according to chromosome 7 (chr7) cytogenetic status. Chr7 abnormalities include monosomy 7 (-7) or loss of 7q (del(7q)). (A and B) OS of all patients (irrespective of the number of decitabine treatment courses) (A) and patients who received 3 or more courses of decitabine (B), respectively. (C) *MLL5* mRNA expression in all patients (irrespective of the number of decitabine treatment courses). Expression values were normalized to *ABL* expression.



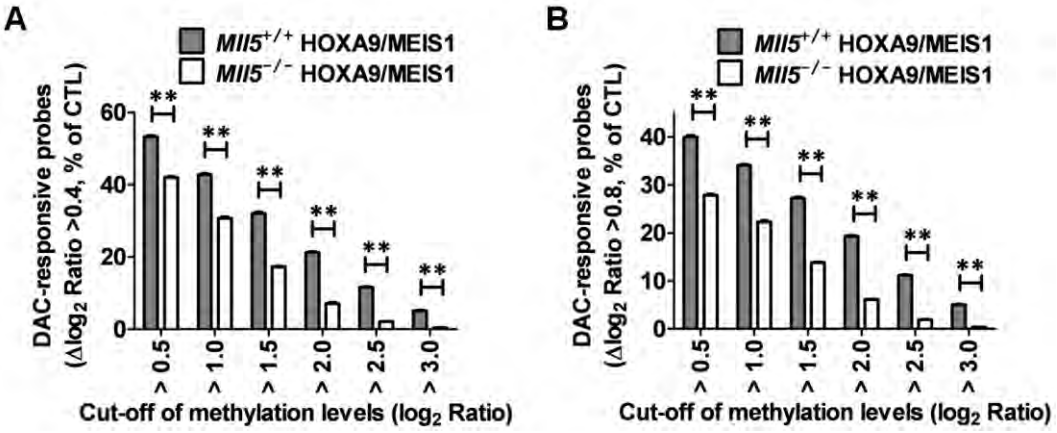
Supplementary Figure S4. **Correlation of *MLL5* and *HOXA9* transcript levels in AML patients.** (A) *MLL5* and *HOXA9* expression levels were quantified in 35 AML patients treated with decitabine. *MLL5* values were normalized to *ABL* and *HOXA9* values to 10^2 *ABL*, respectively. (B) *MLL5* and *HOXA9* expression values were extracted from a published AML gene expression profiling data set.[9,11] 241 of 344 AML patients expressed HOXA9 above the detection limit are included in this analysis. Data was processed by global normalization and $\log_2$ transformation (R, Pearson coefficient of correlation).



Supplementary Figure S5. **Bisulfite sequencing of four differentially methylated gene CpG clusters in Mll5 wildtype *vs.* null HOXA9/MEIS1 cells.** Each circle represents a single CpG. Open circles indicate unmethylated CpGs, while black indicate methylated CpGs. Percentage of methylated CpGs among all CpGs is shown. (A to C) Selected regions with increased methylation in Mll5 wildtype cells compared to Mll5 null cells in MeDIP-chip were validated by bisulfite sequencing. (D) Selected regions with decreased methylation in Mll5 wildtype cells than Mll5 null cells in MeDIP-chip were validated by bisulfite sequencing.



Supplementary Figure S6. **Promoter DNA methylation and mRNA expression of *Cebpa* in Mll5 wildtype or null HOXA9/MEIS1 cells, upon DMSO (CTL) or 20nM DAC treatment.** (A) Methylation pattern of a selected promoter region of *Cebpa* (bisulfite sequencing). Each circle represents a single CpG. Open circles indicate unmethylated CpGs, while black circles indicate methylated CpGs. Percentage of methylated CpGs among all CpGs is shown. (B) Real-time RT-PCR quantification of *Cebpa* mRNA expression normalized to *Hprt* expression. mean ± SEM, n = 3, $^{**}P < .01$.



Supplementary Figure S7. **Percentage of DAC responsive probes in Mll5 wildtype versus null cells.** (A and B) DAC-responsive probes were compared when DAC-induced DNA demethylation was defined by a decrease of the $\log_2$ ratio of more than 0.4 ($\Delta\log_2$ ratio > 0.4) (A) or more than 0.8 ($\Delta\log_2$ ratio > 0.8) (B).

A

277 DAC-responsive genes specificly in *Mll5*$^{-/-}$ HOXA9/MEIS1

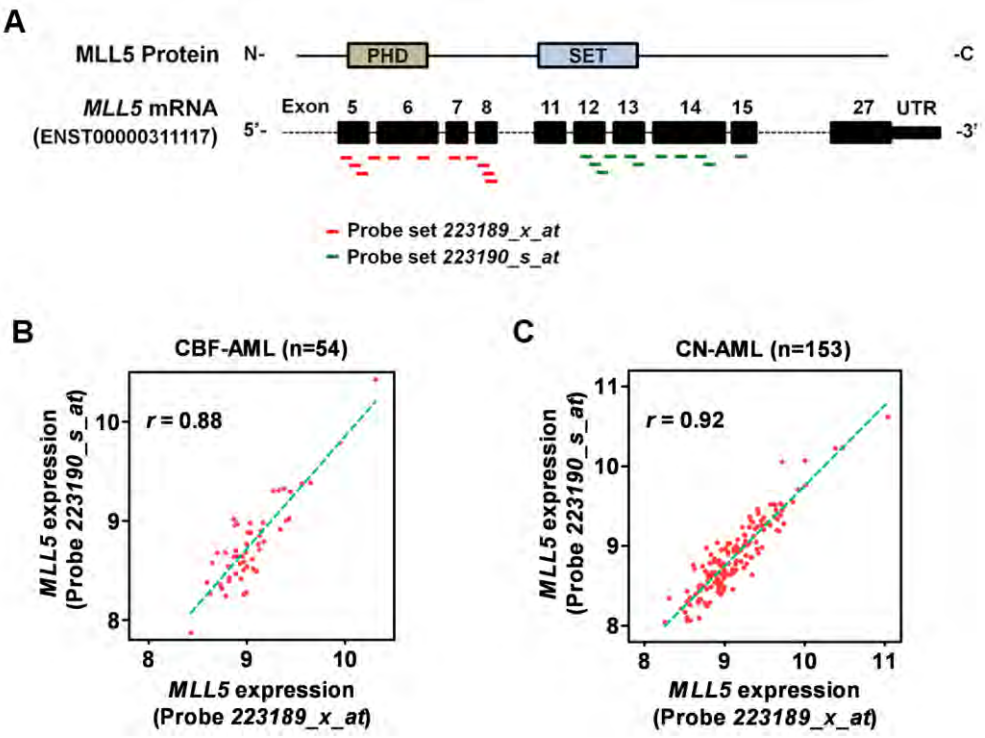
Rank	GO clusters	ES
1	Heart development	1.87
2	Non-membrane organelle	1.68
3	GTPase regulator activity	1.61
4	Cell morphogenesis	1.58
5	Transcription regulation	1.51

B

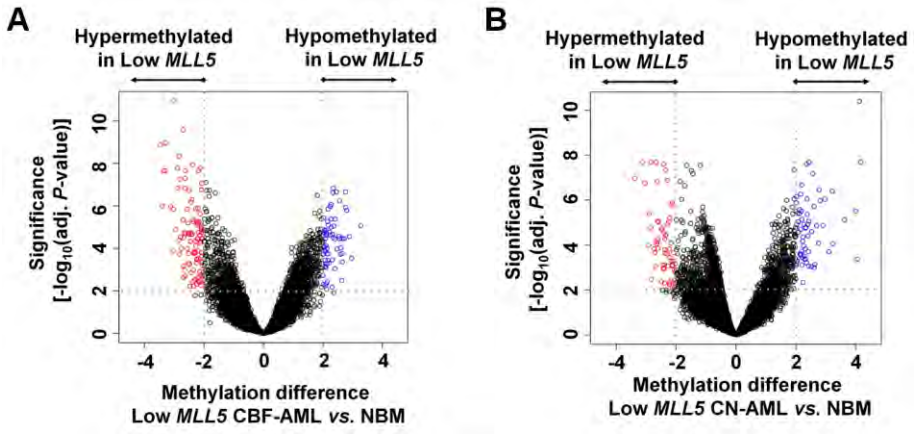
343 DAC-responsive genes in both *Mll5*$^{+/+}$ and *Mll5*$^{-/-}$ HOXA9/MEIS1

Rank	GO clusters	ES
1	Transcription regulation	3.90
2	Neuron differentiation	3.13
3	NLI interacting factor	2.15
4	SH3 domain	1.95
5	Lipid metabolism	1.90

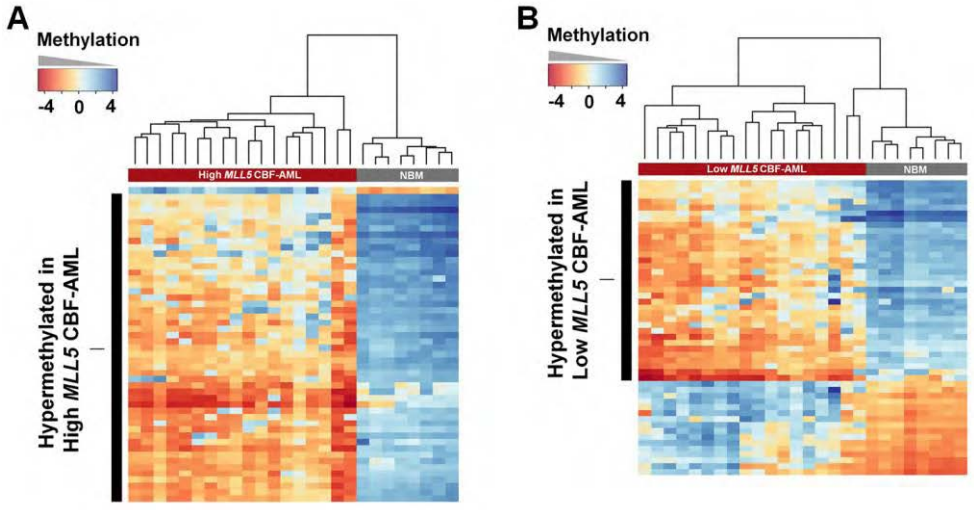
Supplementary Figure S8. (A and B) Functional annotation of genes that were differentially demethylated upon DAC treatment in Mll5 null cells (A) or were commonly demethylated upon DAC treatment in both Mll5 wildtype and null cells (B).



Supplementary Figure S9. **Array-based expression of *MLL5* in AML patients with CBF-AML and CN-AML.** (A) Representative coverage of *MLL5* full-length transcript specific probe sets *223189_x_at* and *223190_s_at* from Affymetrix HG-U133 plus 2.0 GeneChips. (B and C) Correlation of the expression values from two *MLL5*-sprecific probe sets in CBF-AML (n=54) (B) and CN-AML (n=153) (C).

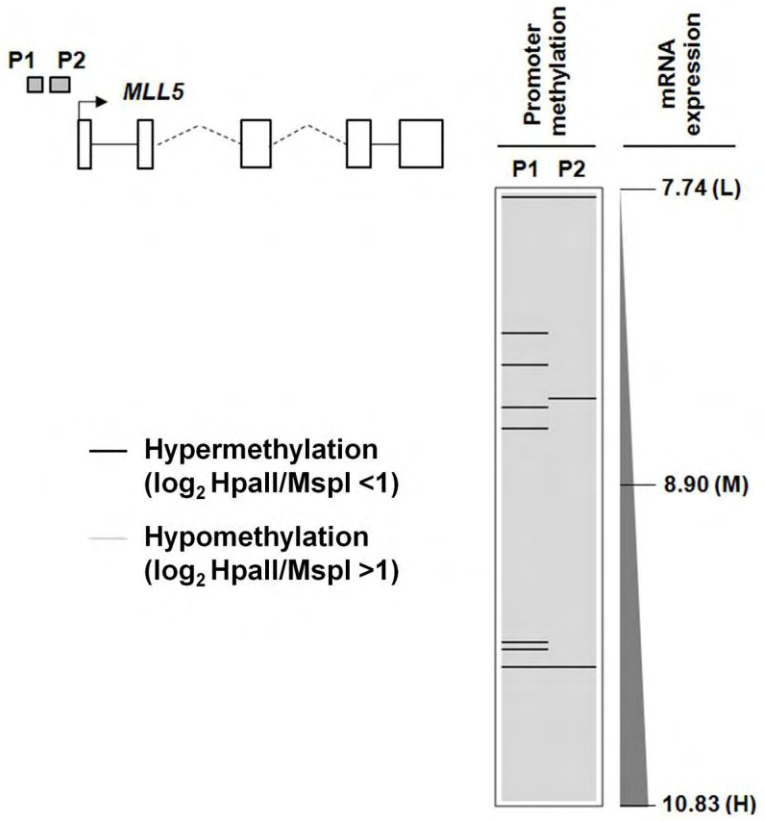


Supplementary Figure S10. **Volcano plot of methylation differences between *MLL5* low-expressing patients and CD34+ normal bone marrow cells.** (A and B) *MLL5* low-expressing CBF-AML patients (n=18) (A) and CN-AML patients (n=51) (B) versus CD34+ normal bone marrow cells (NBM) (n=8). Methylation difference is represented by the $\log_2$(HapII/MspI) values of patient group minus $\log_2$(HapII/MspI) values of CD34+ normal bone marrow. Hyper- or hypomethylated probe sets were defined by methylation difference <-2 or >2 with Benjamini-Hochberg corrected *P*-value <.01, marked by red or blue circles, respectively.



Supplementary Figure S11. **Heatmap with supervised hierarchical clustering showing the 50 most differentially methylated probe sets of CBF-AML patients *versus* CD34+ normal bone marrow cells.** (A and B) CBF-AML patients with high *MLL5* (n=18) (A) and low *MLL5*

(n=18) (B) expression *versus* CD34+ normal bone marrow (NBM) (n=8). Black bars indicate the hypermethylated probes in patients compared to CD34+ normal bone marrow.



Supplementary Figure S12. ***MLL5*** **promoter DNA methylation and transcript expression in AML patients.** A published data set including 344 AML patients was selected for the analysis.[9-11] P1 (HELP array ID: MSPI0406S00390593) and P2 (HELP array ID: MSPI0406S00390594) indicates the locus of two probe sets for the measurement of DNA methylation levels using the HELP assay. Hypermethylation was defined as $\log_2$ HpaII/MspI less than 1, while hypomethylation was more than 1. *MLL5* mRNA expression values were generated with Affymetrix HG-U133 plus 2 GeneChips, and data was processed by global normalization and $\log_2$ transformation.

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